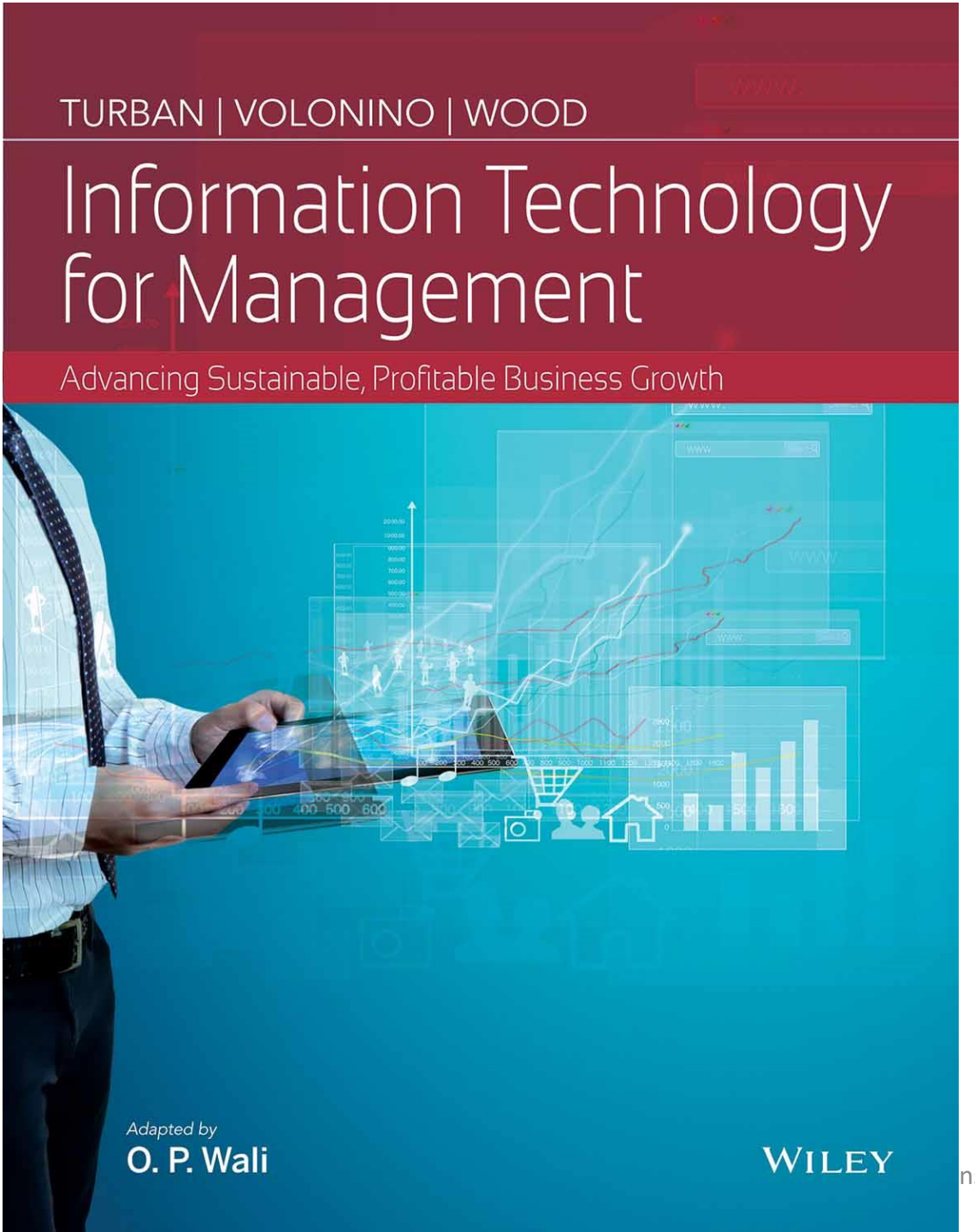


Chapter 2

Data Governance, IT Architecture, and Cloud Strategies

Chapter Outline

1. Data Governance Strategy
2. Enterprise IT Architecture
3. Information and Decision Support Systems
4. Data Centers and Cloud Computing
5. Cloud Services Delivery Models

1. Data Governance Strategy

Information Management

- Information Management
  - The use of IT tools and methods to collect, process, consolidate, store, and secure data from sources that are often fragmented and inconsistent.
  - Why a continuous plan is needed to guide, control, and govern IT growth.

Information Management

- Information Management
  - Information management is critical to data security and compliance with continually evolving regulatory requirements, such as
    - The sarbanes-oxley act,
    - Basel III,
    - The computer fraud and abuse act (CFAA),
    - The USA PATRIOT act, and
    - The health insurance portability and accountability act (HIPAA).

Data Governance Strategy

Success or failure of business depends upon quality of their data?

- **Information Management** is the use of IT tools ad methods to collect, process, consolidate, store, and secure data from sources that are often fragmented and inconsistent

Data Governance Strategy

- **Master Data Management (MDM)** methods synchronize all business-critical data from disparate systems into a master file, which provides a trusted data source.
- Benefits:
  - Better CX
  - Grater customer loyalty and retention
  - Increased sales growth
  - Accurate sales forecast and order processing

Information Management

- Reasons information deficiencies are still a problem
  - Data Silos
  - Lost of bypassed data
  - Poorly designed interfaces
  - Nonstandardized data formats
  - Cannot hit moving targets

Information Management

- Data Silos
  - Stand alone data stores not accessible by other information systems that need data, cannon consistently be updated.
  - Exist from a lack of IT architecture, only support single functions, and do not support cross-functional needs.

Information Management

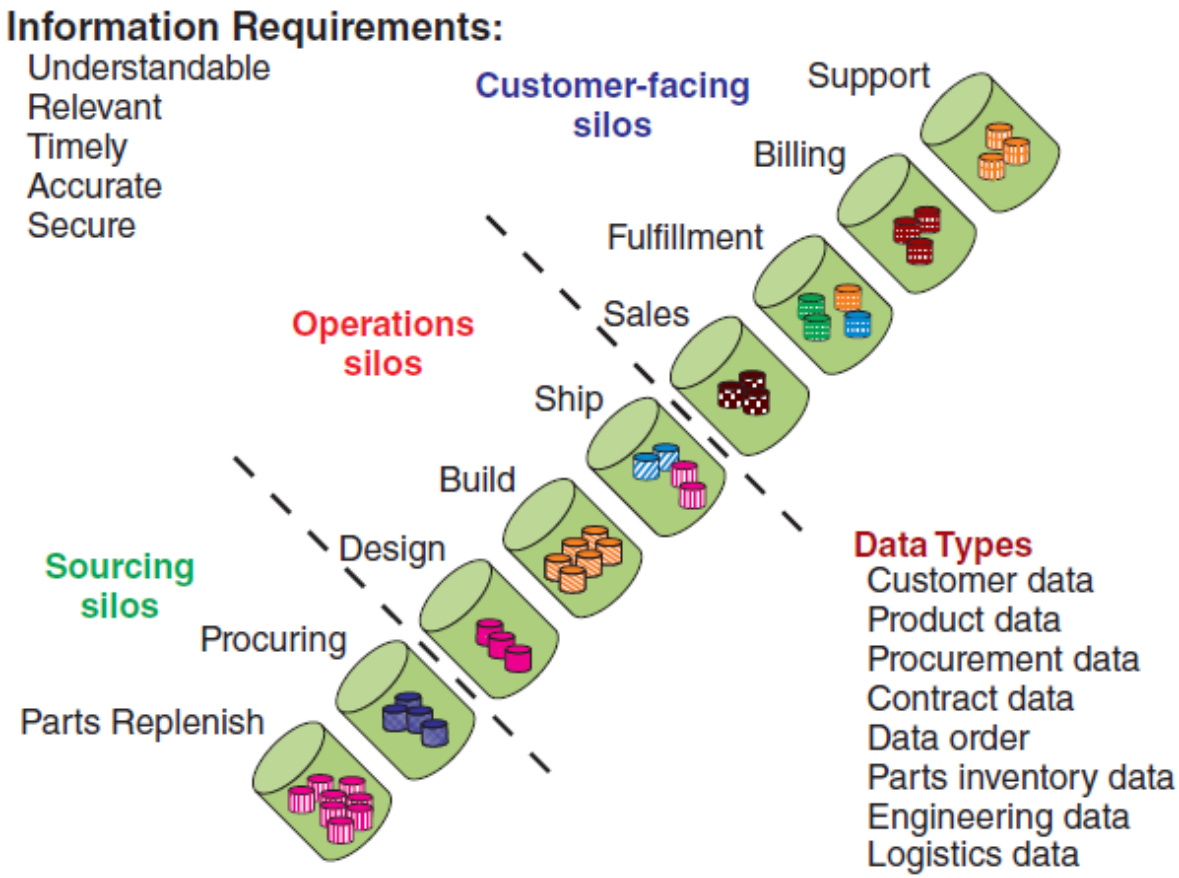


Figure 2.4 Data (or information) silos are ISs that do not have the capability to exchange data with other ISs, making timely coordination and communication across functions or departments difficult.

Information Management

- Key Performance Indicators (KPIs)
  - These measures demonstrate the effectiveness of a business process at achieving organizational goals.
  - Present data in easy-to-comprehend and comparison-ready formats.

KPI examples: current ratio; accounts payable turnover; net profit margin; new followers per week; cost per lead; order status.

Information Management

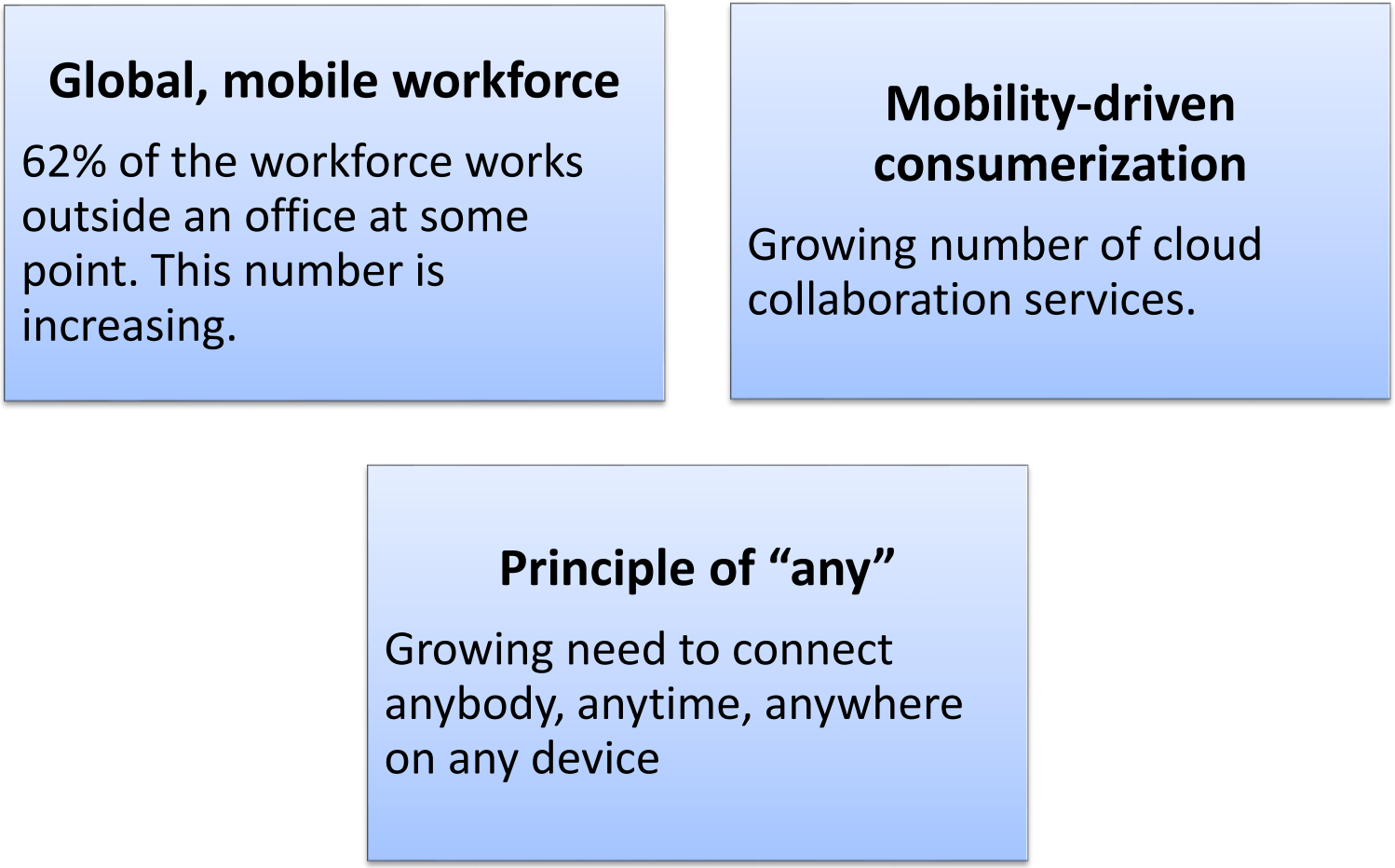


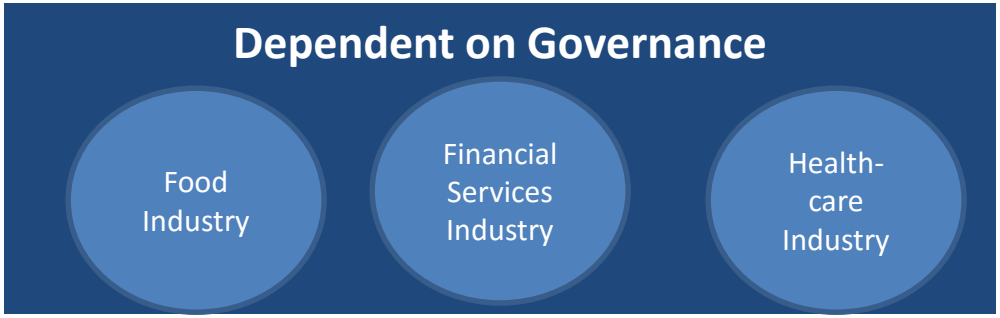
Figure 2.5 Factors that are increasing demand for collaboration technology.

Information Management

- Obvious benefits of information management
  - Improves decision quality
  - Improves the accuracy and reliability of management predictions
  - Reduces the risk of noncompliance
  - Reduces time and cost

Enterprise IT Architecture

- Enterprise-wide Data Governance
  - Crosses boundaries and used by people through the enterprise.
  - Increased importance through new regulations and pressure to reduce costs.
  - Reduces legal risks associated with unmanaged or inconsistently managed information.



Data Governance Strategy

Customer –centric companies use customer data to better understand and segment their customers. They identify what their customers value and estimate the value of the customer to their bottom line.

Customer Touch points are the various ways consumers interact and experience a product or service.

Information Management

1. Explain information management.
2. Why do organizations still have information deficiency problems?
3. What is a data silo?
4. Explain KPIs and give an example.
5. What three factors are driving collaboration and information sharing?
6. What are the business benefits of information management?

2. Enterprise IT Architecture

Enterprise IT Architecture

- Enterprise: business or company
- Architecture: orderly arrangement of components

Enterprise IT Architecture

- Enterprise architecture (EA)
  - The way IT systems and processes are structured.
  - Helps or impedes day-to-day operations and efforts to execute business strategy.
  - Solves two critical challenges: where are we going; how do we get there?

Enterprise IT Architecture

- Strategic Focus
  - IT systems' complexity
  - Poor business alignment

Components of EA

TABLE 2.3 Components of Enterprise Architecture

Business architecture	The processes the business uses to meet its goals.
Application architecture	How specific applications are designed and how they interact with each other.
Data architecture	How an enterprise's data stores are organized and accessed.
Technical architecture	The hardware and software infrastructure that supports applications and their interactions.

Enterprise IT Architecture

- Business and IT Benefits of EA
  - Cuts IT costs; increases productivity with information, insight, and ideas
  - Determines competitiveness, flexibility, and IT economics
  - Aligns IT capabilities with business strategy to grow, innovate, and respond to market demands
  - Reduces risk of buying or building systems and enterprise apps

Enterprise IT Architecture

- Master Data & Management (MDM)
  - Creates high-quality trustworthy data:
    - Running the business with transactional or operational use
    - Improving the business with analytic use
  - Requires strong data governance to manage availability, usability, integrity, and security.

EA is Dynamic

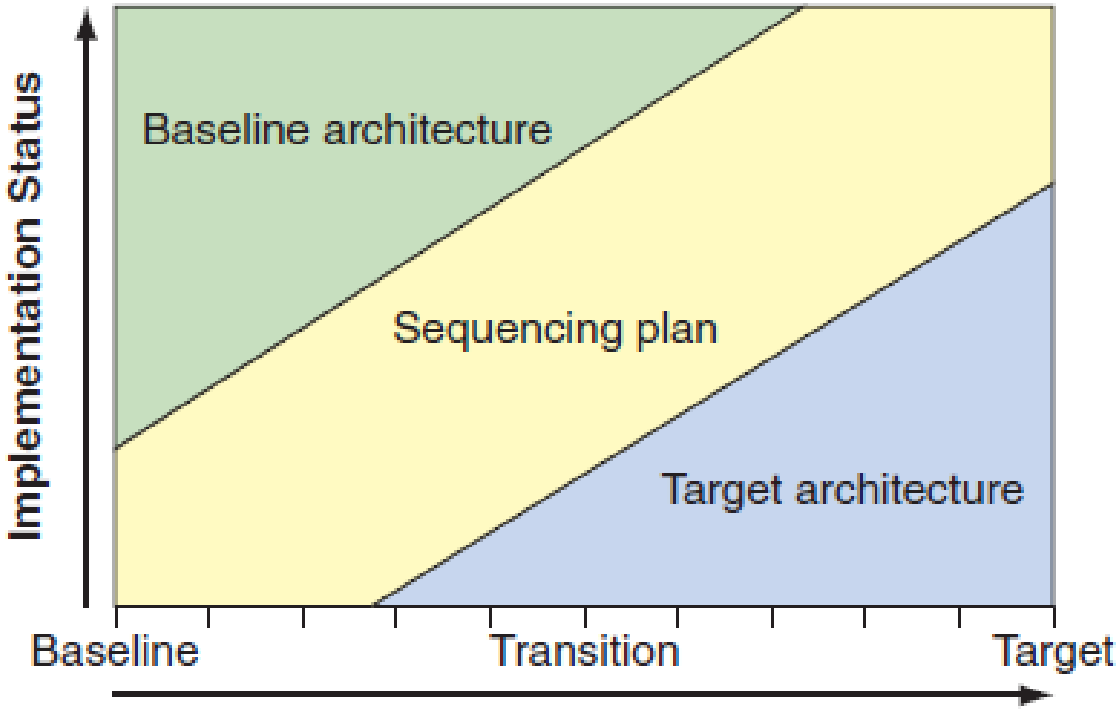


Figure 2.4 IT architecture transition plan to maintain the IT-business alignment. Changes in priorities and business are reflected in the target architecture to help keep IT aligned with them.

Career Insight 2.1 Essential Skills of an Enterprise Architect – page 41

Essential Skills of an Enterprise Architect

- Interpersonal or people skills. The job requires inter- acting with people and getting their cooperation.
- Ability to influence and motivate. A large part of the job is motivating users to comply with new processes and practices.
- Negotiating skills. The project needs resources— time, money, and personnel— that must be negotiated to get things accomplished.

Essential Skills of an Enterprise Architect

- Critical-thinking and problem-solving skills. Architects face complex and unique problems. Being able to expedite solutions prevents bottlenecks.
- Business and industry expertise. Knowing the business and industry improves the outcomes and the architect's credibility.
- Managing EA implementations requires someone who is able to handle multiple aspects of a project at one time.

Weak or Nonexistent Data Governance

Characteristics and Consequences

- Data duplication causes isolated data silos.
- Inconsistency exists in the meaning and level of detail of data elements.
- Users do not trust the data and waste time verifying the data rather than analyzing them for appropriate decision making.
- Leads to inaccurate data analysis.
- Bad decisions are made on perception rather than reality, which can negatively affect the company and its customers.
- Results in increased workloads and processing time.

Enterprise IT Architecture

- Politics: The People Conflict
  - Cultures of distrust between technology and employees may exist.
  - Genuine commitment to change can bridge the divide with support from the senior management.
  - Methodologies can only provide a framework, not solve people problems.

Enterprise IT Architecture

1. Explain the relationship between complexity and planning. Give an example.
2. Explain enterprise architecture.
3. What are the four components of EA?
4. What are the business benefits of EA?
5. How can EA maintain alignment between IT and business strategy?
6. What are the two ways that data are used in an organization?
7. What is the function of data governance?
8. Why has interest in data governance and MDM increased?
9. What role does personal conflict or politics play in the success of data governance?

3. Information and Decision Support Systems

Information Systems: The Basics

- DATA, INFORMATION, & KNOWLEDGE
  - Raw data describes products, customers, events, activities, and transactions that are recorded, classified, and stored.
  - Information is processed, organized, or put into context data with meaning and value to the recipient.
  - Knowledge is conveyed information as applied to a current problem or activity.

DIKW

Data - Factual information, especially information organized for analysis or used to reason or make decisions.

Information - Knowledge derived from study, experience, or instruction; Knowledge of a specific event or situation; intelligence

DIKW

Knowledge - The state or fact of knowing. **2.** Familiarity, awareness, or understanding gained through experience or study. **3.** The sum or range of what has been perceived, discovered, or learned

Wisdom - Understanding of what is true, right, or lasting; insight; Common sense; good judgment

DIKW

Data - Factual information,

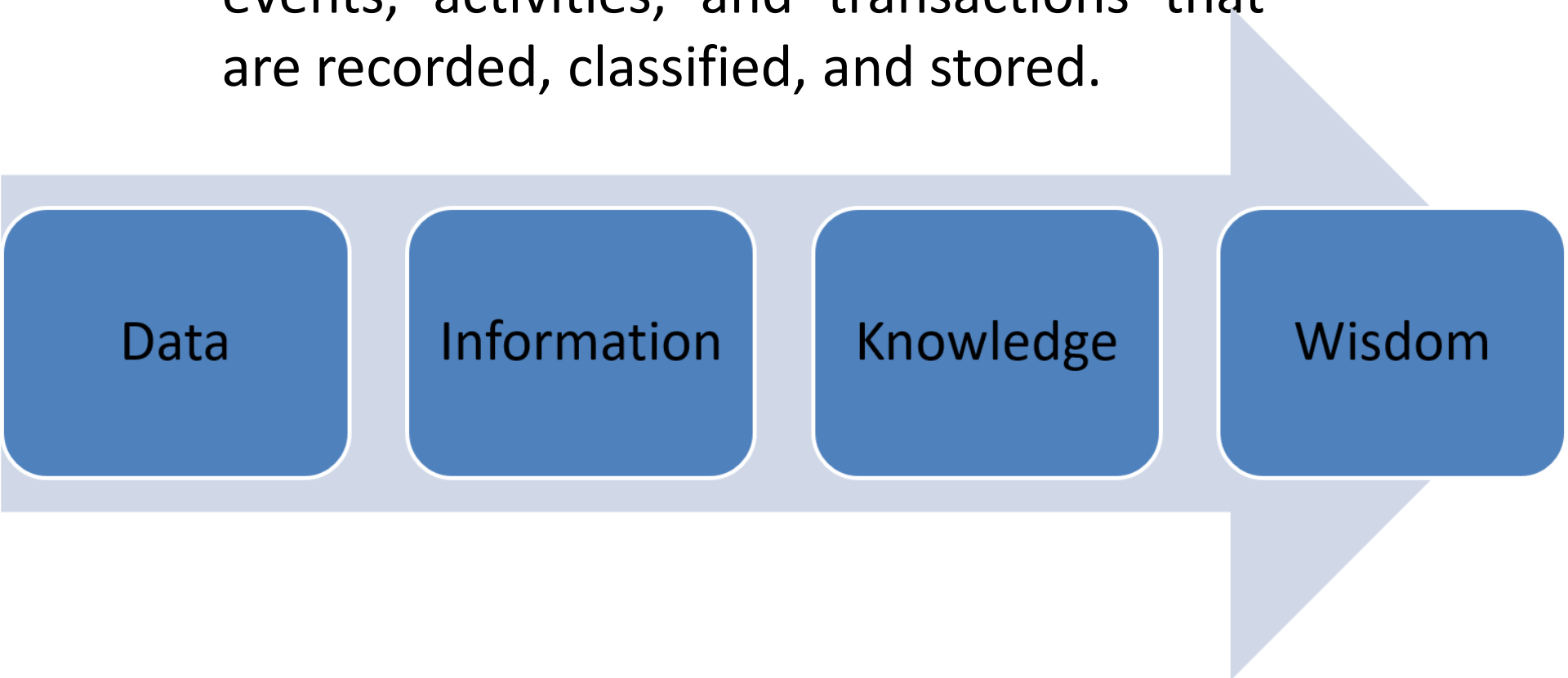
Information - Knowledge of a specific event or situation;

Knowledge – something which has been discovered or learned

Wisdom - insight

Information Systems: The Basics

- DATA, INFORMATION, & KNOWLEDGE
  - Raw data describes products, customers, events, activities, and transactions that are recorded, classified, and stored.



Information Systems: The Basics

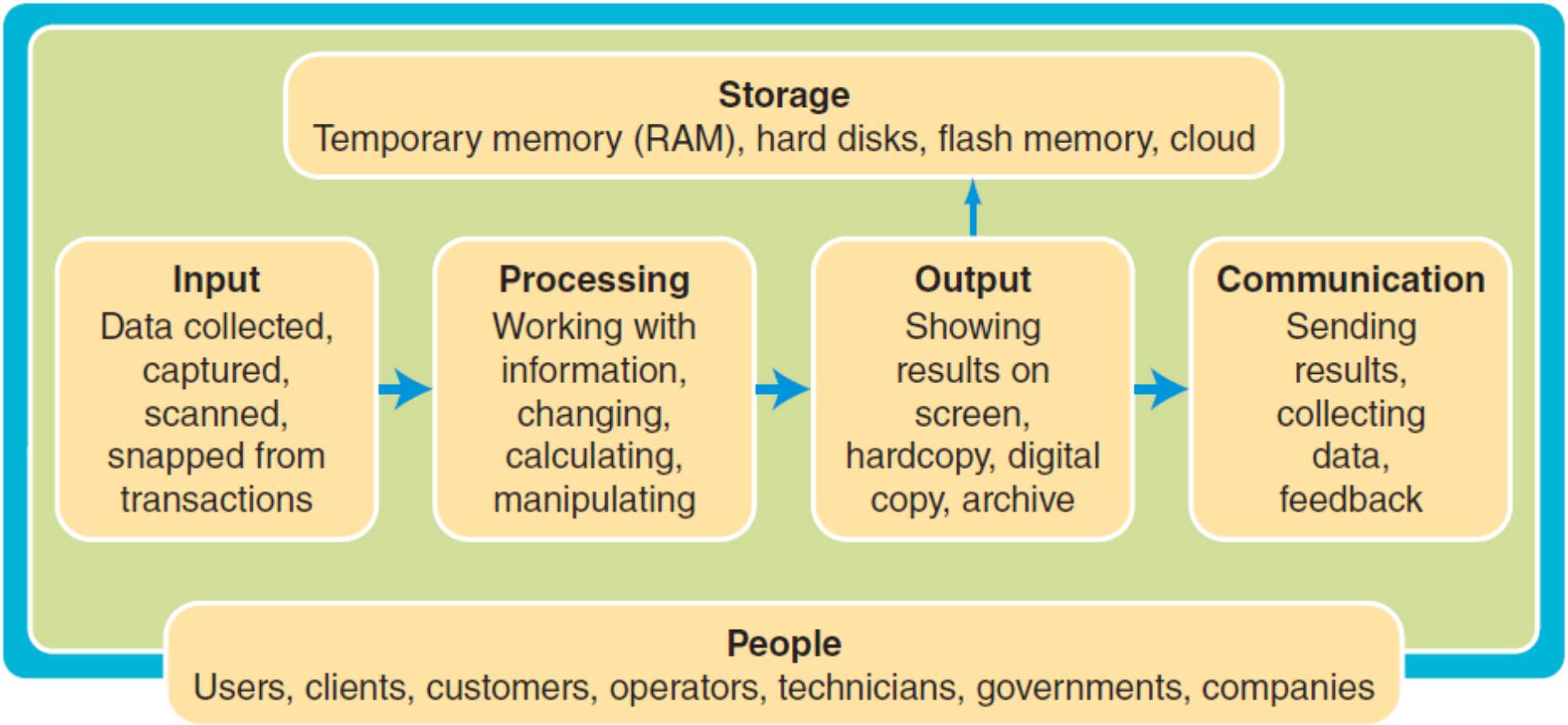
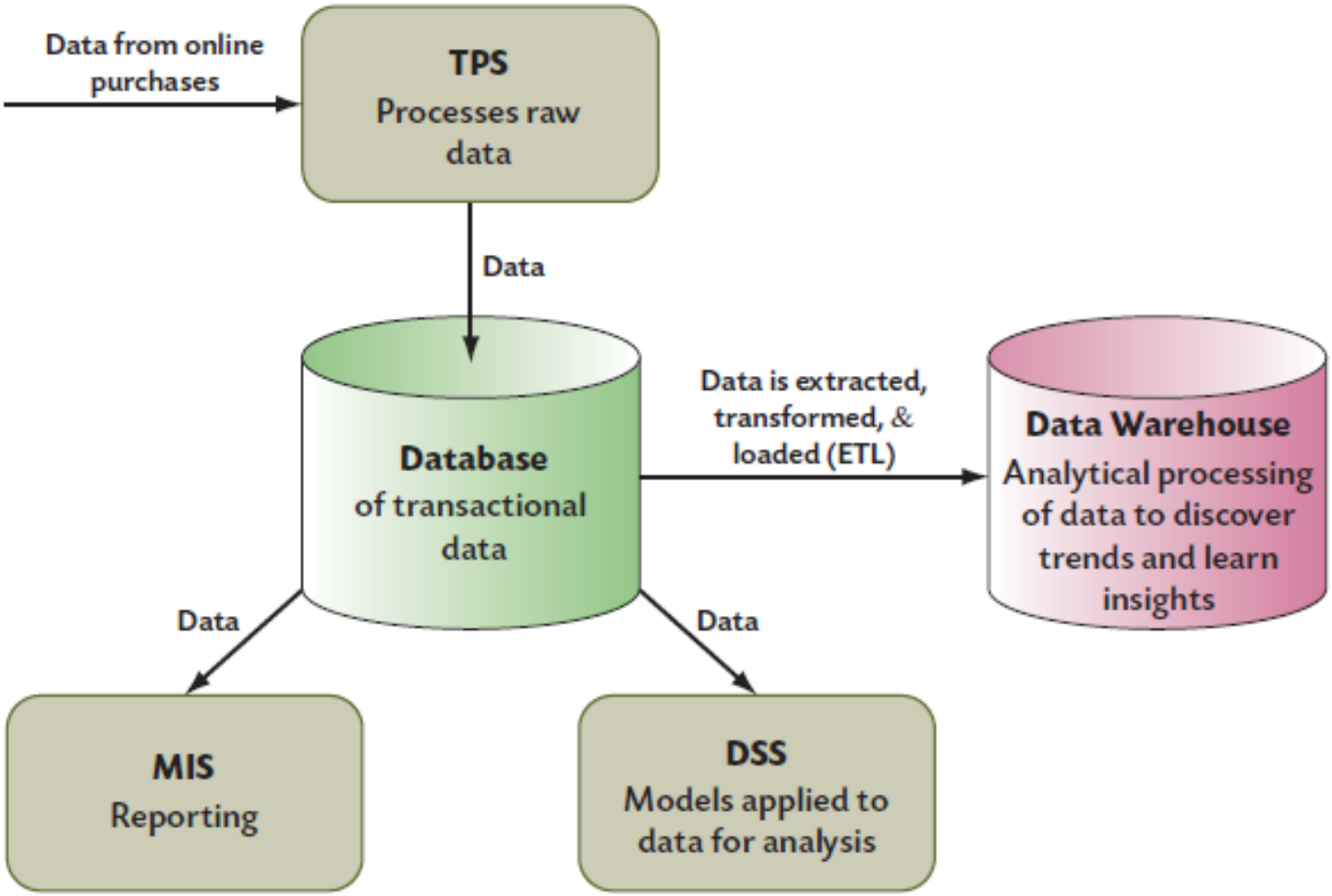


Figure 2.8 Input-processing-output model.

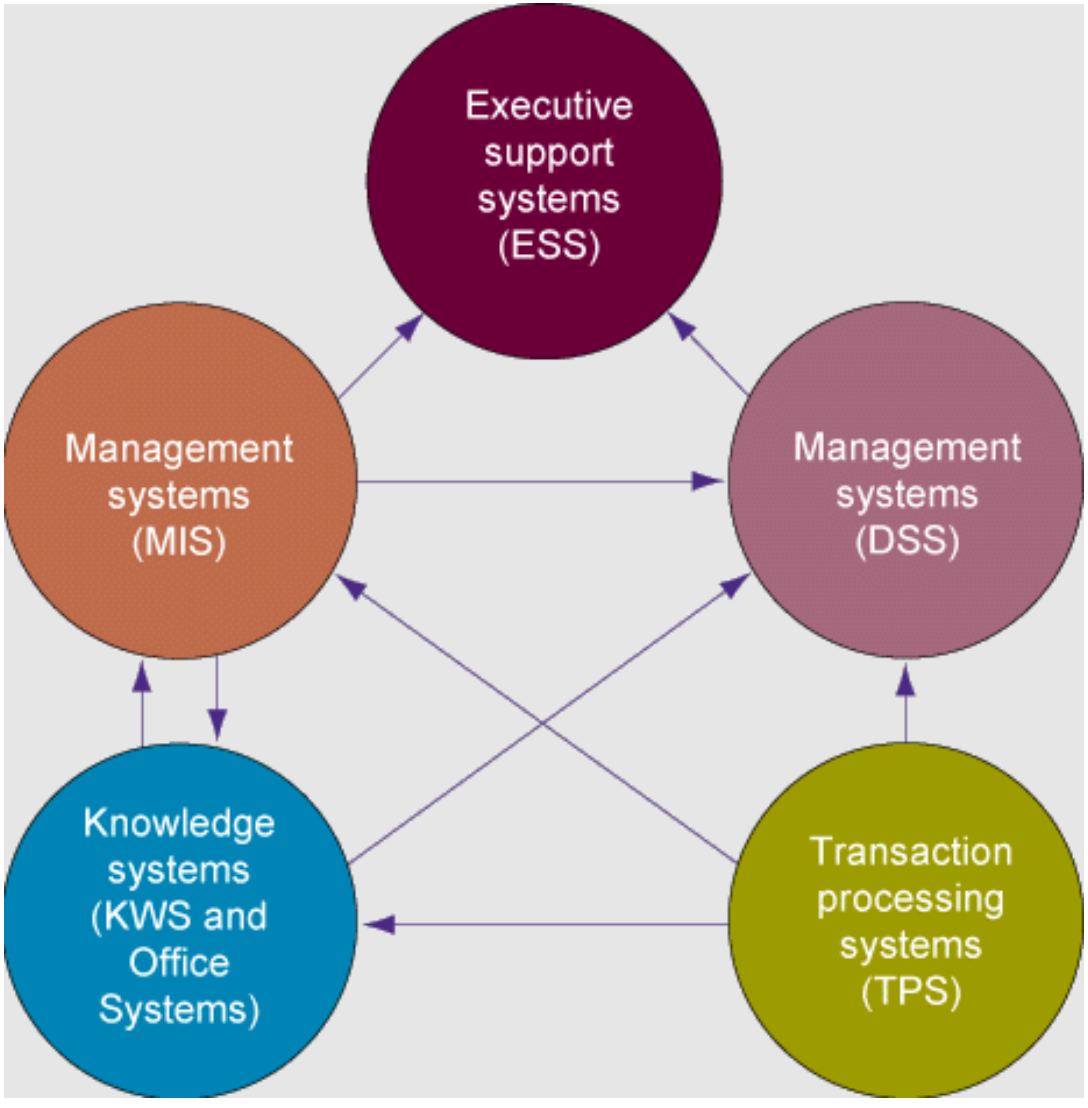
Information Systems: The Basics

- Transaction Processing Systems (TPS)
  - Internal transactions: originate or occur within the organization (payroll, purchases, etc.).
  - External transactions: originate outside the organization (customers, suppliers, etc.).
  - Improve sales, customer satisfaction, and reduce many other types of data errors with financial impacts.

Flow of data from POS through processing, storage, reporting, decision support, and analysis, also shows the relationships among information system



Interrelationships Among Systems



Please note

Interrelationships Among Systems

Type	Information Input	Processing	Information Output	User
TPS	**Transactions; events**	**Sorting; listing; merging; updating**	**Detailed report; list; summaries**	**Operations personnel; supervisors**
OAS	**Document; schedules**	**Document; management; scheduling; communication**	**Documents; schedules; mail**	**Clerical workers**
KWS	**Design specifications; knowledge base**	**Modeling; simulations**	**Models; graphics**	**Professionals; technical staff**
MIS	**Summary transaction data; high-volume data; simple models**	**Routine reports; simple models; low-level analysis**	**Summary and exception report**	**Middle manager**
DSS	**Low-volume data; analytic models**	**Interactive; simulations, analysis**	**Special report; decision analyses; responses to queries**	**Professionals; staff managers**
ESS	**Aggregate data; external, internal**	**Graphics; simulations; interactive**	**Projections; responses to queries**	**Senior managers**

Information Systems: The Basics

- Management Information Systems (MIS)
  - General-purpose reporting systems that provide reports to managers for tracking operations, monitoring, and control.

  Periodic: reports created or run according to a pre-set schedule.

  Exception: generated only when something is outside designated parameters.

  Ad Hoc, or On Demand: unplanned, generated as needed.

Information Systems: The Basics

- Decision Support Systems (DSS)
  - Interactive applications that support decision making.
  - Support unstructured and semi-structured decisions with the following characteristics:
  1. Easy-to-use interactive interface
  2. Models or formulas that enable sensitivity analysis
  3. Data from multiple sources

Information Systems: The Basics

- Transaction Issues
  - Huge database transactions causes volatility – constant use or updates.
  - Makes databases impossible for complex decision making and problem-solving tasks.

Data is loaded to a data warehouse where ETL (extract, transform, and load) is better for analysis.

Information Systems: The Basics

- Batch v. Online Real-Time Processing
  - Batch Processing: collects all transactions for a time period, then processes the data and updates the data store.
  - OLTP: processes each transaction as it occurs (real-time).
  - Batch processing costs less than OLTP, but may be inaccurate from update delays.

Information and DSS

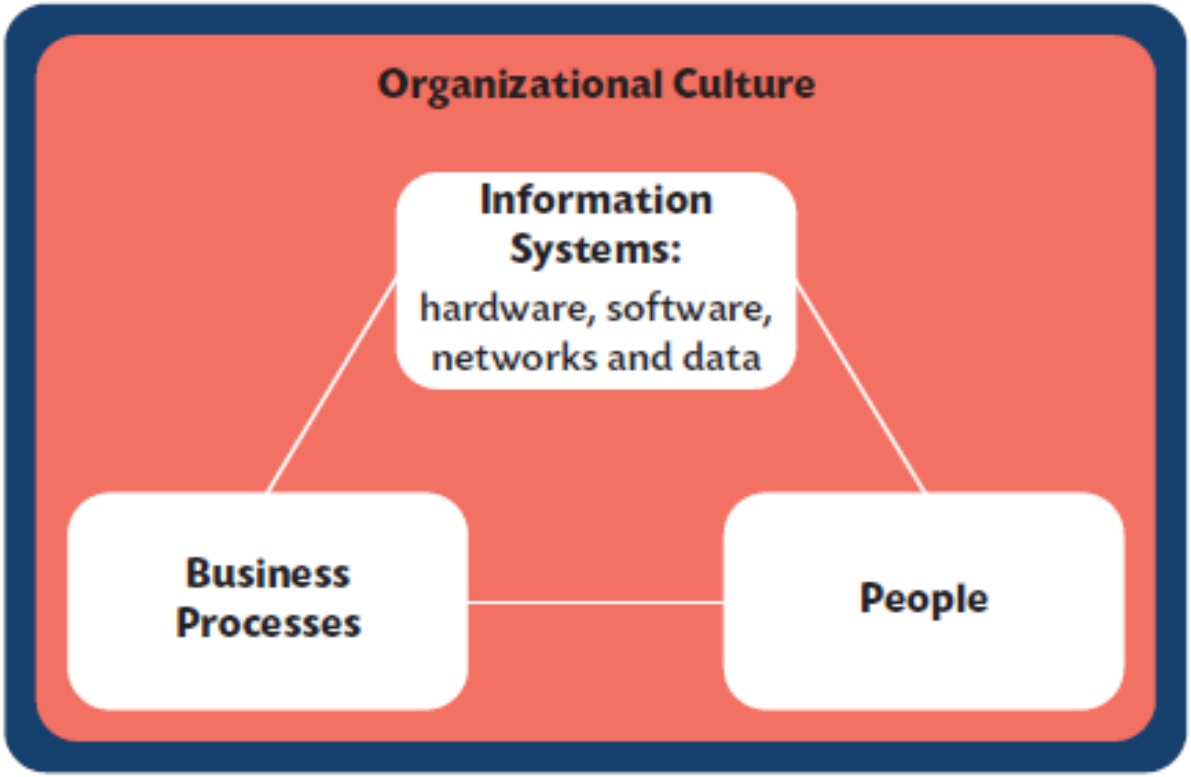
- **Degree of Structured Decisions**
  - **Structured Decisions** – decisions that have a well-defined method for solving and the data needed to reach a decision
  - **Unstructured Decisions** – decisions that depend on human intelligence, knowledge, and/or experience – as well as data and models to solve them

Three DSS Characteristics

1. An easy to use interactive interface
2. Model or formulas that enable sensitivity analysis, what if analysis, goal seeking analysis, and risk analysis
3. Data from multiple sources – internal and external and data added by decision maker.

ISs Exist within a Culture

Business value of IS is determined by the user



Organizational Culture plays a significant role in the use and benefits of IS

Business Process Management and Improvement

1. Contrast data, information, and knowledge.
2. Define TPS and give an example.
3. When is batch processing used?
4. When are real-time processing capabilities needed?
5. Explain why TPSs need to process incoming data before they are stored.
6. Define MIS and DSS and give an example of each.
7. Why are databases inappropriate for doing data analysis?

4. Data Centers and Cloud Computing

Data Centers, Cloud Computing, and Virtualization

- IT Infrastructures
  - On-premises data centers
  - Virtualization
  - Cloud Computing

Data Centers and Cloud Computing

- Data Center:
  - Large number of networked servers for
    - Storage
    - Processing
    - Management
    - Distribution
    - Archiving of data and software.

Data Centers, Cloud Computing, and Virtualization

- Business is Reliant Upon data
  - Uber (car-hailing service)
    - Users flooded social media with complaints.
  - WhatsApp (smartphone text-messaging service)
    - Competition added 2 million new registered users within 24 hours of WhatsApp outage (a record).

Data Centers and Cloud Computing

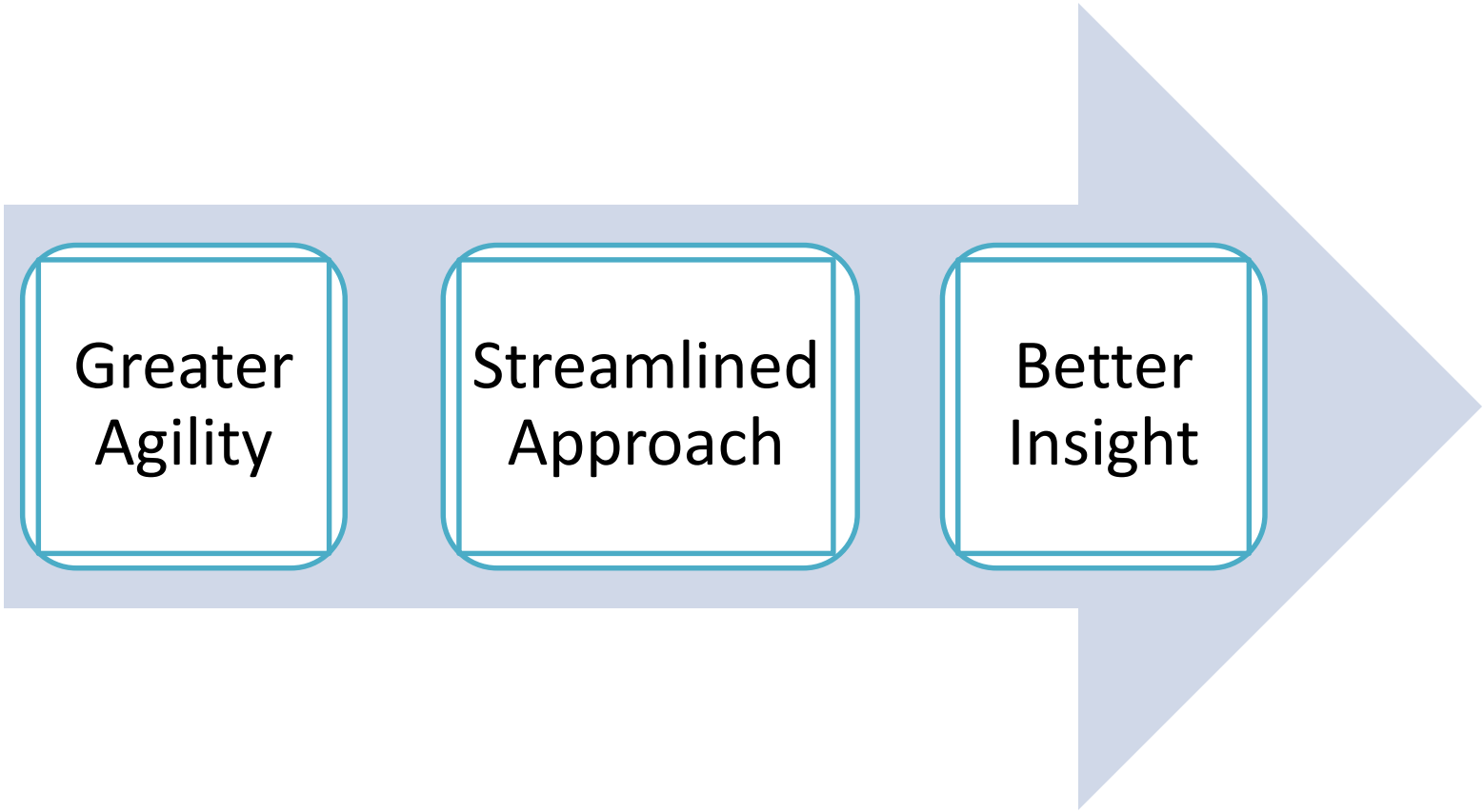
- Data integration is must to combat data chaos
- Unified Data Center (UDC) – Cisco's solution for unified platform

Data Centers, Cloud Computing, and Virtualization

- Unified Data Center
  - Cisco's single solution integrating computing, storage, networking, *virtualization*, and management into a single (unified) platform.
  - Virtualization gives greater IT flexibility and cutting costs:
    - Instant access to data any time in any format
    - Respond faster to changing data analytic needs
    - Cut complexity and cost

Data Centers, Cloud Computing, and Virtualization

Unified Data Center compared to traditional data integration and replication methods:



Data Centers, Cloud Computing, and Virtualization

- Data Centers
  - Large numbers of network servers used for the storage, processing, management, distribution, and archiving of data, systems, Web traffic, services, and enterprise applications.

National Climatic Data Center

U.S. National Security Agency

Apple

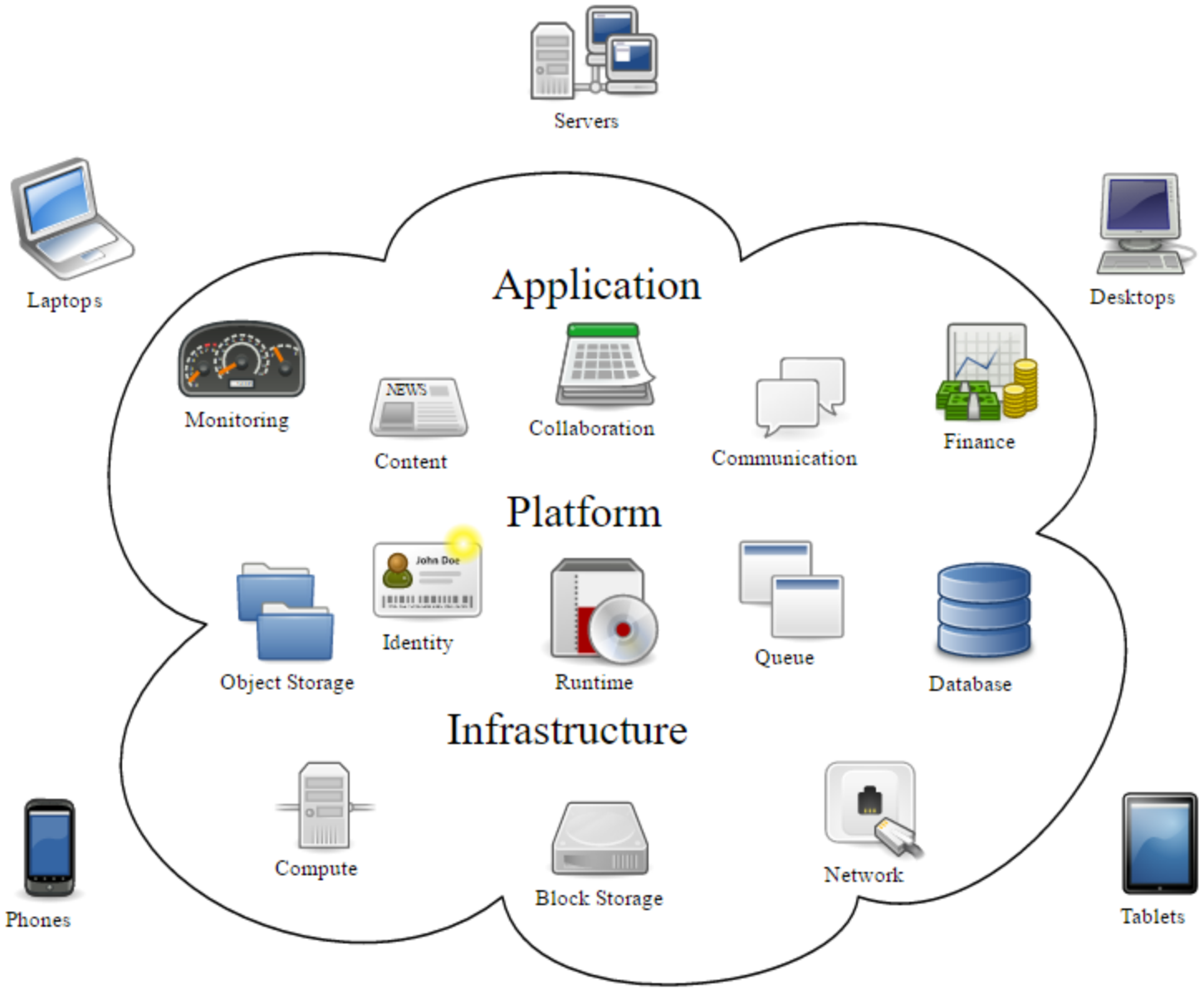
Data Centers and Cloud Computing

- Cloud Vs. Data Center:

Cloud	Data center
Off-premise form of computing	On-premise form of computing
Global network	Local network
Outsourced	In-house – run by IT department
Scalable	Not so scalable

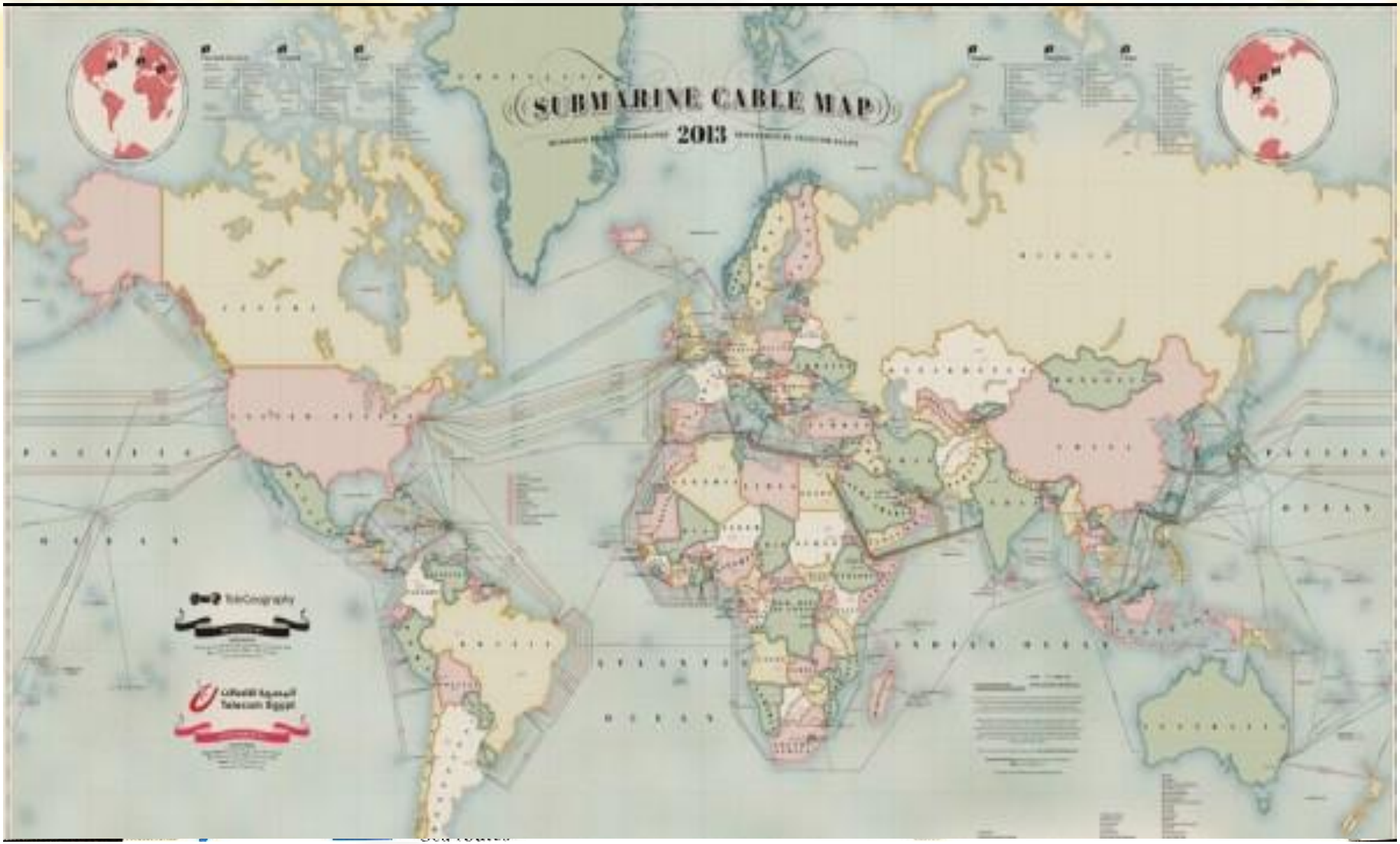
Data Centers, Cloud Computing, and Virtualization

- What is “The Cloud”?
  - A general term for infrastructure that uses the Internet and private networks to access, share, and deliver computing resources.
  - Scalable delivery as a service to end-users over a network.
  - Should be approached with greater diligence than other IT decisions as a new technology including Vendor Management and Service-Level Agreements.



Cloud computing

Silk Route to e Route



Data Centers, Cloud Computing, and Virtualization

- Types of Clouds
  - Private Cloud: Single-tenant environments with stronger security and control (retained) for regulated industries and critical data.
  - Public Cloud: Multiple-tenant virtualized services utilizing the same pool of servers across a public network (distributed).

Data Centers, Cloud Computing, and Virtualization

- Service-Level Agreements
  - A negotiated agreement between a company and service provider that can be a legally binding contract or an informal contract.
  - The goal is not building the best SLA terms, but getting the terms that are most meaningful to the business.

TABLE 2.5 Service Factors to Consider when Evaluating Cloud Vendors or Service Providers

Factors	Examples of Questions to Be Addressed
Delays	What are the estimated server delays and network delays?
Workloads	What is the volume of data and processing that can be handled during a specific amount of time?
Costs	What are the costs associated with workloads across multiple cloud computing platforms?
Security	How are data and networks secured against attacks? Are data encrypted and how strong is the encryption? What are network security practices?
Disaster recovery and business continuity	How is service outage defined? What level of redundancy is in place to minimize outages, including backup services in different geographical regions? If a natural disaster or outage occurs, how will cloud services be continued?

Technical expertise and understanding	Does the vendor have expertise in your industry or business processes? Does the vendor understand what you need to do and have the technical expertise to fulfill those obligations?
Insurance in case of failure	Does the vendor provide cloud insurance to mitigate user losses in case of service failure or damage? This is a new and important concept.
Third-party audit, or an unbiased assessment of the ability to rely on the service provided by the vendor	Can the vendor show objective proof with an audit that it can live up to the promises it is making?

Data Centers, Cloud Computing, and Virtualization

- Cloud Infrastructure
  - Provided on demand for storage virtualization, network virtualization, and hardware virtualization.

  Software or virtualization layer creates virtual machines (VMs) where the CPU, RAM, HD, NIC, and other components behave as hardware, but are created with software.

Data Centers, Cloud Computing, and Virtualization

- Virtualization
  - Created by a software layer (virtualization layer) containing its own operating system and applications as a physical computer.

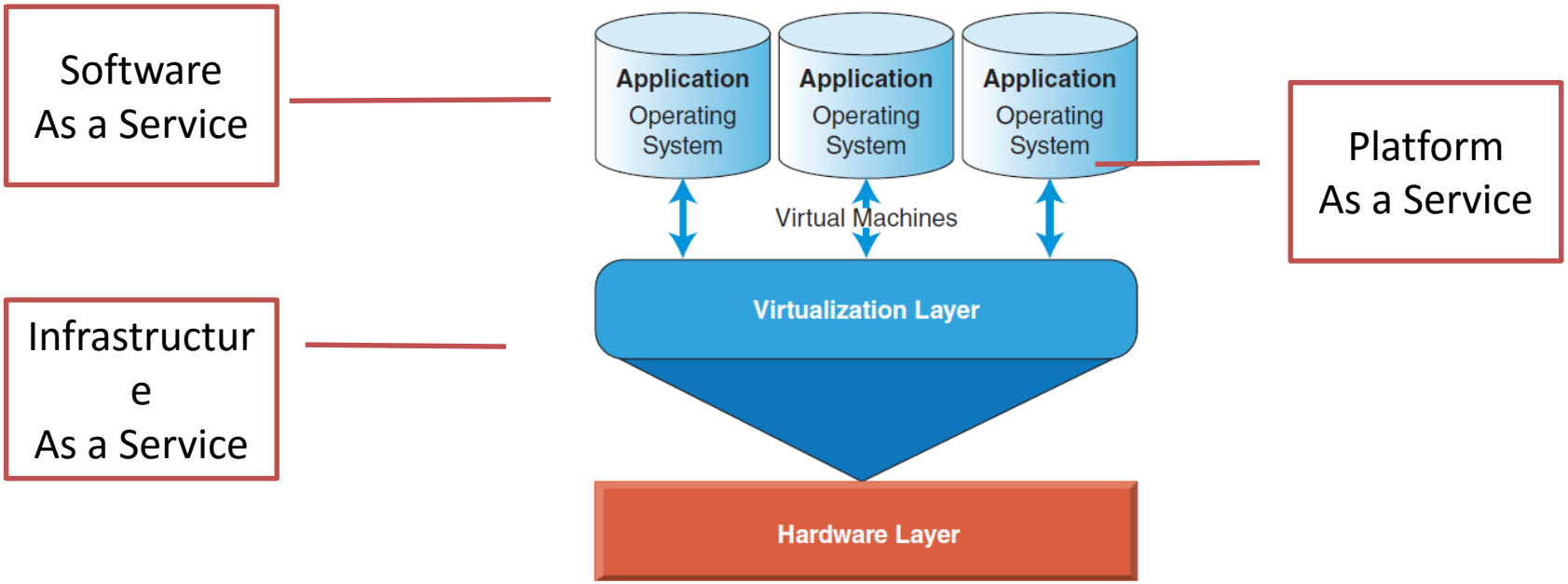


Figure 2.17 Virtual machines running on a simple computer hardware layer.

Data Centers, Cloud Computing, and Virtualization

- Characteristics & Benefits of Virtualization
  - Memory-intensive
    - Huge amounts of RAM due to massive processing requirements
  - Energy-efficient
    - Up to 95% reduction in energy use per server through less physical hardware
  - Scalability and load balancing
    - Handles dynamic demand requests like during the Super Bowl or World Series

Data Centers, Cloud Computing, and Virtualization

1. What is a data center?
2. Describe cloud computing.
3. What is the difference between data centers and cloud computing?
4. What are the benefits of cloud computing?
5. How can cloud computing solve the problems of managing software licenses?
6. What is an SLA? Why are SLAs important?
7. What factors should be considered when selecting a cloud vendor or provider?
8. When are private clouds used instead of public clouds?
9. Explain three issues that need to be addressed when moving to cloud computing or services.
10. How does a virtual machine (VM) function?
11. Explain virtualization.
12. What are the characteristics and benefits of virtualization?
13. When is load balancing important?

5. Cloud Services Delivery Models

Cloud Services and Delivery Models

- Cloud – foundation for innovative use of
  - Mobile
  - Big-data
  - Social Technologies
- Huge enabler of:
  - Mobility
  - Collaboration, and
  - New ways of Working

Cloud Services Add Agility

- Software as a Service (SaaS)
  - End-user apps, like SalesForce
- Platform as a Service (PaaS)
  - Tools and services making coding and deployment faster and more efficient, like Google App Engine
- Infrastructure as a Service (IaaS)
  - Hardware and software that power computing resources, like EC2 & S3 (Amazon Web Services)

Cloud Services Add Agility

- Data as a Service (DaaS)
  - Data shared among clouds, systems, apps, regardless the data source or storage location.
  - Easier for data architects to select data from different pools, filter out sensitive data, and make the remaining data available on-demand.
  - Eliminates risks and burdens of data management to a third-party cloud provider.

Cloud Services Add Agility

- Cloudy Weather Ahead?
  - Various at-a-service models (such as CRM and HR management) are still responsible for regulatory compliance.
  - Legal departments become involved due to high stakes around legal and compliance issues.
  - Cut costs, flexibility, and improved responsiveness require IT, legal, and senior management oversight.

Cloud Services Add Agility

1. What is SaaS?
2. Describe the cloud computing stack.
3. What is PaaS?
4. What is IaaS?
5. Why is DaaS growing in popularity?
6. How might companies risk violating regulation or compliance requirements with cloud services?