COMM 226 NOTES

Chapter 1

Moore's law: the number of transistors per square inch on an integrated chip doubles every 18 months

Because of moore's law, the cost of data processing, communications, and storage is basically zero.

Importance of MIS in business school today:

- Future business professionals need to be able to assess, evaluate, and apply emerging information technology to business
- collaboration
- employment

How MIS helps you learn nonroutine skills:

- Abstract reasoning: ability to make and manipulate models

Systems thinking: ability to model the components of a system and to connect the inputs and outputs among those components into a sensible whole, one that explains the phenomenon observed. E.g.: output of production is the input to the sales process

Experimentation: making a careful and reasoned analysis of an opportunity, envisioning potential products or solutions or applications of technology, and then developing those ideas that seem to have the most promise, consistent with the resources you have

MIS: "Management Information Systems" ; the management and use of processes, information systems, and information to help organizations achieve their strategies. Three key elements:

1. Processes, information systems, and information
2. Management and use
3. Achieve strategies

Processes, information systems, and information

- Process: way of doing something

- Information systems: collection of components, including but not limited to a computer, that stores and retrieves data and produces information
- Information: meaningful insight that helps employees do their jobs

Management & Use

- Management (of MIS) is the creation, monitoring and adapting of processes, information systems and information

Achieve Strategies

- Help organizations achieve their strategies

Competitive strategy: organization's goals and objectives

Figure 1-8

Five forces that determine industry structure (profitability):

1. Threat of **substitutes** (performs the same or similar function as an industry's product by another means)
2. Threat of new entrants (industry's barriers to entry & reaction new entrants can expect from established companies in the industry)
3. Existing rivals
4. Bargaining power of suppliers
5. Bargaining power of customers

Porter's four fundamental competitive strategies: cost, differentiation, industry-wide, focus

Figure 1-11

- Porter defined value as amount of money that a customer is willing to pay for a resource, product or service.
- Difference between value that an activity generates and the cost of it = the margin
- Value chain: network of value-creative activities ; consists of 5 primary activities and 4 support activities

5 primary activities in a value chain:

1. Inbound logistics: receiving, storing and disseminating inputs to products
2. Operations & Manufacturing: transforming inputs into final products

3. Outbound logistics: collecting, storing and physically distributing products to buyers
4. Sales & Marketing: including buyers to purchase products and providing a means for them to do so
5. Customer service: assisting customer's use of products and thus maintaining and enhancing the product value

Four Support Activities in Value Chain

Support activities: contribute indirectly to all of the primary value chain activities:

1. procurement : process of finding vendors, setting up contractual arrangements and negotiating prices
2. Technology: includes research and development, and other activities within the firm for developing new techniques, methods and procedures
3. Human resources: recruiting, compensation, evaluation and training of full and part time employees
4. Firm infrastructure: general management, finance, accounting, legal and government affairs

Value chain linkages: interactions across value activities. E.g.: manufacturing systems use linkages to reduce inventory costs

Figure 1-15: bpmn

Chapter 2

Business process: sequence of activities for accomplishing a function. E.g.: add a class to the business curriculum

Activity: task within a business process. E.g.: computer final grades

Business process model and notation (BPMN): technique for documenting business processes

Includes: roles, actors and swimlanes

- Roles (columns): subset of the activities in a business process that is performed by a particular actor
- Actors: can be people (or computers)
- Swimlanes (columns): contains all the activities for a particular role

Figure 2.1

Repository: a collection of something, usually a collection of records; looks like a small tin can

Benefits of standardizing processes:

- Policies can be enforced
- Results are more consistent
- Processes can be copied and reused; they are scalable
- Risks from errors and mistakes are reduced

Information system

System: group of components that interact to achieve some purpose

Information system (computer-based information system): group of components that interact to produce information

Five component framework for IS:

1. Computer hardware
2. Software
3. Data
4. Procedures (set of instructions for a person to follow when operating an IS; e.g.: filling out information for FB account)
5. People

Processes can be divided in 2 broad categories:

1. Structured processes: formally defined, standardized processes. E.g.: day-to-day operations = scheduling work shifts, calculating daily sales tax totals, etc.
2. Dynamic processes: less specific, more adaptive and even intuitive. E.g.: deciding whether to open up a new store location

Various definitions for “information”:

1. Knowledge derived from data, whereas data is defined as recorded facts or figures
2. Information is data presented in a meaningful context
3. Information is processed data or sometimes, information is data processed by sorting, filtering, grouping, comparing, summing, averaging and other similar operations

4. Information is any difference that makes a difference

Main idea about information: information is not data, it is more; varies from person to person; located inside of you

Using these ideas about information:

- assume it is hard to communicate
- Recognize that all new information systems are frustrating at first
- Understand how to be effective on a team
- Stay curious

Necessary data characteristics:

1. Accuracy
2. Timely
3. Relevant (to context & subject)
4. Sufficiency
5. Worth its cost

Chapter 3

Hardware components

Central processing unit (CPU): "the brain" of the computer, selects instructions, processes the, performs arithmetic and logical comparisons and stores results of operations in memory

- Dual - processor: computer with 2 CPU
- Quad - processor: computer with 4 CPUs

Main memory: CPU works in conjunction with main memory; CPU reads data and instructions from memory, and it stores results of computations in main memory which is also known as RAM (random access memory)

Storage hardware: used to save data and programs. E.g.: magnetic disk, CD, DVD, thumb drives

Types of Hardware

- Personal Computer (PC) (including desktops and computers): apple mac pro

- Tablet (ebook readers): ipad, kindle fire, nexus 7
- (smart) phone: motorola (google), droid
- Server: dell poweredge server
- Server farm: racks of servers

Computer data

- Computers represent data using binary digits called “bits” which is represented by either a “0” or a “1”
- Data can be numbers, characters, currency amounts, photos, recordings, etc
- A switch can be either “opened” or “closed”; a computer can be designed so that an open switch represents “0” and a closed switch represents “1”
- Bits that are grouped in 8-bit chunks are known as “**bytes**”

Storage-capacity terminology

- Bytes: number of bits to represent on character
- “K” = Kilobyte: 1,024 bytes
- “MB” = Megabyte: 1024K = 1,048,576 bytes
- “GB” = Gigabyte: 1,024 MB = 1,073,741,824 bytes
- “TB” = Terabyte: 1,024 GB = 1,099,511,627,776 bytes
- “PB” = Petabyte: 1,024 TB = 1,125,899,906,842,624 bytes
- “EB” = Exabyte: 1,024 PB = 1,152,921,504,606,846,976 bytes

CPU speed is expressed in cycles known as “hertz”

Operating system (OS): program that controls computer’s resources

- Functions: read and write data, allocate main memory, perform memory swapping, start & stop programs, response to error conditions and facilitate backup and recovery, create & manage the user interface, including the display, keyboard, mouse, and other devices

Major operating Systems

1. Non-mobile client operating systems: used on personal computers. E.g.: microsoft windows
2. Mobile clients: used on phones. E.g.: android, blackberry OS, iOS
3. Servers: windows server, unix, linux

Categories of computer software:

Operating systems:

1. Client: programs that control the client computer's resources
- Application programs: applications that are processed on client computers
2. Server: programs that control the server computer's resources
- Application programs: applications that are processed on server computers

ARM: Power-saving computer architecture that is designed for portable devices such as phones and tablets

Virtualization: process by which one computer hosts the appearance of many computers

- One operating system, known as "host operating system" runs one or more operating systems as applications
- Those hosted operated systems are known as "virtual machines" (VM)

3 types of virtualization:

1. PC virtualization: a personal computer, such as a desktop or portable computer, hosts several different operating systems
2. Server virtualization: a server computer hosts one or more other server computers
3. Desktop virtualization: a server hosts many versions of desktop operating systems

Own vs. License

License: when you buy a computer program, you are actually purchasing the license to use that program (not own). E.g.: buying a Windows license, Microsoft is selling you the right to use Windows

Site License: a flat fee that authorizes a company to install the product (Operating system or application) on all company's computers or on all of the computers at a specific site

Applications & how organizations obtain them:

Application Software: performs a service or function

Categories of application:

- Horizontal market application: software provides capabilities common across all organizations and industries. E.g.: word processors, graphics program, spreadsheets, presentation programs
- Vertical market application: software serves the needs of a specific industry. E.g.: programs used by dental offices to schedule appointments and bill patients
- One of a kind application: software is developed for a specific, unique need. E.g.: the IRS develops such software, because it has needs that no other organization has

Different ways you can buy computer software:

1. Off the shelf software: horizontal & vertical applications
2. Off the shelf software with alterations software: vertical applications
3. Customer developed software (tailor-made software): one-of-a-kind applications

Firmware: computer software that is installed into devices (printers, print servers, communication device), is coded & installed into special, read-only memory of the printer (or other device) & becomes part of the device's memory

Source code: computer code that is written and understood by humans

Machine code: source code that is compiled into machine code that is processed by a computer; not understandable by humans and cannot be modified

- "Open source": source code of the program is available to the public. E.g.: open office, firefox (browser), android
- "Closed source": source code is highly protected and only available to trusted employees and carefully vetted contractors

Applications can be categorized as:

Native applications: can run on just one operating system

- Developed using serious, heavy-duty, professional programming languages
- All of these "languages" are **object-oriented** meaning they can be used to create difficult, complex applications & (if used properly), will reach in high-performance code that is easy to alter when requirements change
- Benefit of object-oriented: give programmers close control over the assets of the computing device and enable the creation of sophisticated/complicated user interfaces
- Con of native application: they are "native", only run on the operating systems for which they are programmed, general cost = high

Thin-client applications: can run in browsers on many different operating systems

- Such applications run inside a browser (firefox, chrome, safari, internet explorer)
- Browser handles the idiosyncrasies of the operating system & underlying hardware
- Pros: cheaper, languages used (html5, css3, javascript) are not object-oriented and are much easier to learn, will run on any operating system & device
- Cons: limited by the capabilities of the browser, thus are unable to support specialized & complex applications

User interface (UI): the presentation format of an application

- Consists of windows, menus, icons, dialog boxes, toolbars, etc
- **User experience (UX)** = newer term; refers to not only UI but how the user responds to the application

Characteristics of quality mobile UX

- Feature content and support direct interaction

Chrome is a term that refers to the visual overhead in computer display

Direct interaction: using content to drive application behavior. E.g.: when you see blue, underlined type, you know to tap on it to navigate to that web site

- Use context-sensitive chrome when needed

Mobile applications do provide chrome, but it is **context-sensitive chrome,** it pops up in the display when appropriate

- Provide animation and lively behavior
- Design to scale and share (display and data)

Applications must be designed so that they can scale up and down without appearing awkward or taking over the device

- Use the cloud

Quality applications utilize data and computing resources that are remote from the user and are likely not even known by the user

Roaming; when users move their activities, (especially long-running transactions, e.g.: reading a book) across devices. The best mobile applications do this transparently; the user need to take no action

Figure 3-11

Data communications

A computer network is a collection of computers that communicate with one another over transmission lines or wireless connections. There are 3 basic types of networks:

1. Local area network (LAN): computers connected at a single location; number of connected computers can range from 2-several hundred
2. Wide area networks (WAN): connect computers between 2 or more separated locations
3. Internets: a network of networks; data must flow seamlessly across communication methods, therefore **layered protocol** is used (**protocol** = set of rules that 2 communicating devices follow)

Bluetooth: common wireless protocol; designed for transmitting data over short distances, replacing cables

Connecting LAN to the Internet

When you connect to the internet you are actually using an Internet Service Provider (ISP). ISP: has three important functions:

1. Provides you with a legitimate internet address
2. Serves as your gateway to the Internet
3. ISPs pay for the Internet

Small office/Home office (SOHO) LANS are connected to an ISP in 3 ways:

1. Digital subscriber line (DSL Line): operates on the same line as voice telephones, but does not interfere with voice telephone services
2. Cable TV line: provides high-speed data transmission using cable television lines
3. Wireless-phone like connection (WAN wireless connection)

Typical web server

Almost all e-commerce application use the three-tier architecture, which is an arrangement of user computers and servers into 3 categories (or tiers)

1. User tier: consists of computers, phones and other devices that have browsers that request and process web pages
2. Server tier: consists of computers that run web servers and process application programs
3. Database tier: consists of computers that run a DBMS that processes requests to retrieve and store data

When you enter a website in your browser, the browser sends a request that travels over the internet to a computer in the server tier at the website indicated

In response to request, a server-tier computer sends back a Web Page, which is a document that is coded in one of the standard page markup languages (most popular markup page languages = html)

Web servers are programs that run on a server-tier computer and that manage the http traffic by sending and receiving web pages to and from clients

A commerce server: application program that runs on a server-tier computer; receives requests from users via the web server, takes some action & returns a response to the users via the web server

Figure 3-23 three-tier architecture

Hypertext markup language (HTML): most common language for defining the structure and layout of web pages

- An html "**tag"** is a notation used to define a data element for display or other purposes
- **Hyperlinks**: included in webpages; pointers to other webpages
- Tags have **attributes** (most of the time) which is a variable used to provide properties about a tag
- Attribute for a hyperlink is **href,** and its value indicates which web page is to be displayed when the user clicks the link

The cloud

Defined as the elastic leasing of pooled computer resources over the internet

- Known as "cloud" because early diagrams of three-tier and other internet based systems used a cloud symbol to represent the internet

- The term “elastic” refers to the amount of resources leased can be increased or decreased dynamically, programmatically, in a short span of time and organizations pay only for the resources used
- Resources are “pooled” because many different organizations use the same physical hardware; they share that hardware through virtualization
- Resources are accessed via “internet protocols and standards”; are additions to TCP/IP that enable cloud-hosting vendors to provide processing capabilities in flexible yet standardized ways

Why is the cloud preferred vs. in-house hosting?

Figure 3-27

Three factors have made cloud-based hosting advantageous today:

1. Processors, data communication and data storage are so cheap as to nearly free
2. Virtualization technology enables the near instantaneous creation of a new virtual machine
3. Service-oriented architecture (SOA): applications use standard protocols to publish a menu of services that the application provides, the structure of the data that it expects to receive, the structure of the data it will produce & the ways in which services can be requested

Using the cloud does not make sense if: Organizations are sometime required by law or by industry standard practices to have physical control over their data

- However, private cloud, in-house hosting, delivered via web service standards, can be configured dynamically = more physical control

How Organizations use the cloud: three categories

1. SaaS: software as a service; e.g.: iCloud, Office 365
2. PaaS: platform as a service; e.g.: Microsoft Azure, Oracle on Demand
3. IaaS: infrastructure as a service; e.g.: Amazon EC2 (Elastic cloud 2), Amazon S3 (Simple storage service)

Chapter 5

Characteristics of Process:

Stability of flow

- Structured: activities typically follow a fixed predefined sequence. E.g.: lodging into your email account
- Dynamic: more informal; activity sequence is less fixed. E.g.: collaborating with classmates on a group project

Scope

- Operational: common, routine, day-to-day
    - Mix of actors: more computers than other processes
    - Frequency of occurrence: high
    - Examples: order supplies, pay bills, check out customers
    - IS supporting this type of process: **transaction processing system (TPS)**
- Managerial: allocation & use of resources
    - Mix of actors: mix
    - Frequency of occurrence: medium
    - Examples: assess seasonal promotions, plan & schedule cashiers
    - IS supporting this type of process: **Management information system (MIS)**
- Strategic: broad-scope, organizational issues
    - Mix of actors: more people that other processes
    - Frequency of occurrence: low
    - Examples: decide on new restaurant location, corporate budgeting
    - IS supporting this type of process: **Executive support system (ESS)**

Objectives: can happen at all three levels of processes (operational, managerial, strategic)

- Efficiency: process creates more output with the same inputs or the same output with fewer inputs. E.g: for pizza-making process = going green & use less energy
- Effectiveness: helps achieve an organizational strategy. E.g.: creating better-tasting pizza

Location in value chain

Primary activities:

- Inbound logistics: receiving, storing and disseminating inputs to products
- Operations: transforming inputs into final products
- Outbound logistics: collecting, storing and physically distributing products to buyers
- Sales & marketing: inducing buyers to purchase products and providing a means for them to do so
- Service: assisting customer's use of products and thus maintaining and enhancing the product's value

Support activities:

- Human resources

- Technology development
- Infrastructure

Value chain activity	Operational process	Managerial process	Strategic process
<u>Primary activities</u>			
Inbound logistics	Procurement: acquires goods/services E.g.: at pizza shop →ordering, receiving & paying for ingredients & boxes	Manage inventory	Evaluate potential suppliers
Operations	Assemble product	Schedule maintenance	Open new resto.
Outbound logistics	Sales process: records the sales order, ships the product & bills the customer	Award refund	Determine payment policy
Sales & marketing	Mail promotion	Evaluate promotional discounts	Launch new product
Service (customer service)	Track orders	Evaluate complaint patterns	Evaluate outsourcing options
<u>Support activities</u>			
Human resources	Recruit employees	Plan future needs	Determine pay scales
Technology development	Test software	Estimate milestones	Evaluate acquisition options
Infrastructure	Quality assurance test	Generate financial statements	Decide to pursue the patent

<u>Applying Process Characteristics</u>

- Ask good questions about objectives

- Standardize structured processes (making pizzas & tracking orders); keep dynamic processes flexible (dealing with customer complaints; each different in their own way)
- Don't confuse process & IT
- Ensure processes work together

How can management improve processes?

Process improvement: means that a process better achieves its objectives based on its measures. Can be better assessed through 2 main concepts:

1. Process objectives: managers must specify and communicate appropriate objectives
    - Classify objectives as effective/efficient to overcome ambiguity
    - Make unstated objectives explicit
    - Ensure objectives are appropriate for strategy
2. Process measures: managers must specify/communicate measures for each objective that are:
    - Reasonable (valid and compelling), accurate (exact & precise), consistent (reliable)
    - measures = metrics = key performance indicators "KPIs" →e.g.: measure of the deliver process is elapsed time in minutes and seconds from leaving the store to arriving to customer's home

How can information systems be used to improve processes?

An IS can improve a process in 5 ways:

1. Improve an activity
    - E.g.: driving activity improved with GPS
2. Improve data flow among activities
    - E.g.: display order process data on GPS in delivery process
3. Improve control of activities
    - E.g.: better control of order details
4. Use automation: "automation" = computer does activity or part of an activity instead of human (who used to do activity)
    - E.g.: send scheduled tweets in twitter promotion process
5. Improve procedures
    - Payment procedure improved and payment process performs better

How can process management principles improve processes?

Process principles that can improve processes:

Improvement category	Examples in pizza shop
Improve activity	Improve parking activity
Remove unproductive resources	Remove unnecessary drivers
Improve feedback	Give boss late delivery report
Remove ***bottleneck:*** when one activity reduces the performance of overall process	Add waiters
Redesign the structure	Specialize cooks
Outsource activity	Outsource accounting activites

How do process teams diagram process improvement?

Two types of diagrams:

1. "As-is": diagrams of the current process
2. "Ought-to-be": diagrams of suggested improvements

How can IS hinder a process?

Information silo:

- If an IS prevents or restricts the flow, this can hinder a process
- The data needed for a process activity is unavailable because it is stored in an isolated, separated information system
- E.g.: your smartphone → having music, mail, chat, contacts & other data on your smartphone that is **not easily synced** with similar programs on your laptop

Why information silos exist _ organizations store data in separate databases for several reasons:

- Organizational departments prefer to control the data they use
- Some processes use sensitive data that should not be shared with other processes
- Departmental IS is cheaper than enterprise systems

Chapter 6

What problem does an ERP solve?

ERP systems solve silo problems:

- ERP are very large enterprise IS that bring data together in a big database and help a company improve its processes

Two solutions (*enterprise systems*) to silo problem:

1. ERP (Enterprise resource planning): solves silo problem with centralized approach. Has 2 keys characteristics:
   - Creates a single database; by consolidating data a company can avoid the problem of having multiple versions of the same thing →e.g.: storing data about a customer in 2 silos and not knowing which customer data is correct
   - Provide a set of industry-leading processes that are well integrated with each other →e.g.: data from a new sales sent to to database & speeds the process of production & procurement of supplies
2. EAI (Enterprise application interface): provides layers of software that connect information systems together. Does the following:
   - Connection information silos via a new layer of software
   - Enables existing applications to communicate and share data
   - Provides integrated data
   - Leverages existing systems, leaving departmental information systems as is, but providing an integration layer over the top
   - Enables a gradual move to ERP
   - **Major benefit:** enables organizations to use existing applications while alleviating many of the problems of information silos

What are the elements of an ERP?

History of ERP Evolution:

- 1970s: material requirement planning (MRP); managed inventory, production & labor
- Computing power became cheaper → manufacturing resource planning (MRPI); Added financial tracking capabilities, schedule equipment & facilities

- Just in time (JIT) delivery: integrates manufacturing & supply (manufacturing occurs just as supply arrives)

Today for a product to be considered an ERP, must include applications that integrate processes in the following business functions:

- Supply chain management (SCM): procurement, sales order processing, inventory management, supplier management and related activities
- Manufacturing: manufacturing scheduling, capacity planning, quality control, bill of materials, and related activities
- Customer relationship management (CRM): sales prospecting, customer management, marketing, customer support, call center support)
- Human resources (HR): payroll, time & attendance, HR Management, commision calculations, benefits administration, and related activities
- Accounting: general ledger, accounts receivable, accounts payable, cash management, fixed-asset accounting

Five components of an ERP:

1. Software:
    - Typically resides on servers and on client machines in the company
    - Can be customized without changing code →customization = **configuration**
2. Hardware: disk storage, servers, clients, printers, scanners, network devices & cables
    - New hardware: cloud computing; enables ERP systems to be rented at much lower upfront cost, stored on cloud vendor hardware & paid for by use
3. Data: three types of data
    - Transactional data: related to events such as a purchase or a student enrollment
    - Master data "reference data": used in the organization that do not change with every transaction → e.g.: supplier names & addresses
    - Organizational data: location of warehouses, mailing addresses of buildings, etc
4. Procedures: set of instructions for a person to follow when operating an IS.
    - Types of procedures: hiring procedures, production procedure, procurement procedure, other procedures
    - 1st step: crafting procedure, 2nd step: training employees to use procedure
    - **Train the trainer:** to reduce expenses, vendors sometimes train organization's users to become in-house trainers in training sessions called train the trainer
5. People: fall into 3 categories
    - Users: employees of the firm implementing the system
    - IT Analysts "system analysts": also employees with specialized training/education

- Consultant: works for the ERP Vendor called a *third party,* & helps budget, plan, train, configure & implement the system

ERP Career opportunities:

- Consultant: employed by firm other than implementing company or ERP vendor, can perform any of the following roles during implementation
- Systems analyst: understands technical aspects of ERP; helps plan, configure and implement ERP system for company use
- Developer: writes additional code where necessary for implementing ERP systems
- Project manager: defines objectives; organizes, plans and leads team that implements ERP solution
- Business analyst: understand process aspects; helps plan, configure and implement ERP system for company use
- Architect: high-level planner of IS; ensures compatibility of technology and directs technology toward strategic goals
- Trainer: trains end users on how ERP system operates, explains their roles and trains trainers

Access control: specifies limits on who can interact with an IS resource

- E.g: person A only has access to screens and data based related to being a purchasing agent; they do not have access to person B's data who works in personnel salary

Inherent business processes: ERP systems are more than an IS; they also specify processes called **inherent processes** or **process blueprints**

Process of putting together an ERP:

1. Top manager revisits strategy so that ERP system has clear goals
2. Conduct **gap analysis:** study that highlights the differences between the business requirements & capabilities of ERP system
3. Implementation team develops processes it will use and configures the software
4. IT staff writes procedures, trains the users, and tests the system

<u>Benefits of an ERP system</u>

1. Data sharing occurs in real time

2. Implements integrated processes that are industry best practices
3. More managers see more data, leading to better oversight
    - ERP can provide management with **dashboards** = easy to read, concise, up-to-the minute displays of process KPIs
4. The information silo problem is solved
5. Better integration with supply chain partners

Challenges of implementing an ERP

Implementation challenges fall into 2 categories:

1. Decision making
    - ERP vendor selection
    - Gap analysis: decide on limited numbers of "like to dos" and what to do with gaps
    - Configuration: identifiers, order sizes, **bill of material (BOM)**: specifies raw materials, quantities, and subassemblies needed to create a final product
    - Data issues
    - Cutover pressure
2. People
    - Management: moves on prematurely, oversells, fails to anticipate cultural resistance
    - Team: collaboration breaks down
    - Individual: users feel pain and get no gain

Erp upgrade challenges:

- Surprise and resistance
- Justification
- **Version lock** from customization: occurs when ERP vendor upgrades their system to a new version, the new ERP software may not be compatible with the customization done by client firms
- No long-term upgrade strategy

Type of organizations that use ERP

ERP by industry:

- Manufacturing
- Distribution
- Mining, materials, extraction, petroleum
- Medical care

- Government and public service
- Utilities
- Retail
- Education

ERP by Organization size:

- Small organization: employ only one or two IT analysts who not only manage the ERP system but also the entire IS Department
- Medium organization: small staff of IT analysts, often isolated from senior-level management
- Large organization: full IT staff headed by CIO (chief information officer), a business and IT professional who sits in executive board and participates in organizational strategic planning

International firms and ERP:

- Need of large organization differ from small one due to *international presence*
- **Single instance:** international firms consolidate all their operations within one large ERP implementation
- **Multiple instances:** ERP for each country, business unit or region

<u>Major ERP vendors:</u>

Tier 1 ERP vendors:

1. SAP (largest market share & history) "systems, applications, products"
    - Gold standard of ERP Products
    - Used by midsized and large organizations
    - Offers **industry-specific platforms** to speed up configuration process; which is a preconfiguration platform that is appropriate for a particular industry such as retail, manufacturing or health care
    - SAP = collection of interconnected and interdependent **modules** which is a distinct & logical grouping of processes (e.g.: sales & distribution module = collection of processes supervised by marketing dept.)
2. Oracle: intensely competitive, deep base of technology and high-quality staff
3. Microsoft dynamics: composed of 4 ERP products: AX, Nav, GP & SL

SAP Modules:

QM: Quality management	PP: Production planning

FI: Financial Accounting	CO: Controlling
PM: Plant maintenance	SD: Sales & distribution
HR: Human resources	MM: Materials management
PS: Project systems	BI: Business intelligence

SAP Software:

- SAP Business Suite: rebranded version of SAP
- Runs on a program called an *application platform* also known as "NetWeaver"
- NetWeaver connects SAP to hardware, third-party software & output devices, also has SOA capabilities that help it integrate SAP with non-SAP applications
- **ABAP** is SAP's high-level application language that is used to enhance the functionality of an SAP implementation

Chapter 7

The fundamentals of a procurement process

Procurement: the process of obtaining goods & services such as a raw materials, machine spare parts, and cafeteria services. Three main procurement activities:

1. Order →done by purchasing manager
2. Receive → done by warehouse manager
3. Pay → done by accountant

Procurement process within the value chain

Primary activity	Description
Inbound logistics	Receiving, storing and disseminating inputs to products
Operations	Transforming inputs into final products
Outbound logistics	Collecting, storing and physically distributing products to buyers
Sales and marketing	Inducing buyers to purchase products and providing the means for them to do so

Customer service	Assisting customer’s use of products and thus maintaining and enhancing the product's value

Terminology:

Purchase order (PO): written document requesting delivery of a specified quantity of a product or service in return for payment

Raw materials inventory: stores goods procured from suppliers

Finished goods inventory: the completed products awaiting delivery to customers

Lead time: time required for a supplier to deliver an order; ends when the order arrives at the warehouse and the receive good activity occurs

Invoice: itemized bill received by the supplier which includes amount due and purchase order number

Three-way match: between invoice, purchase order, and receipt for goods, with color coding for matching data

Internal control: systematically limit the actions and behaviors of employees, processes, and system within the organization to safeguard assets and achieve objectives

Purchase requisition: is an internal company document that issues a request for a purchase

Problems with procurement before SAP was introduced

Role	**Problems**	**SAP Benefits**
Warehouse problems	Warehouse manager does not have data on sales price discounts	Integrated inherent process allows warehouse to see sales process prices
Accounting problems	Three-way match discrepancies take time to correct. Accounting reports	Real-time data sharing limits errors. Real-time data sharing reduces roll-up time

	are not real time	
Purchasing problems	Purchasing agents not centralized; experience and motivation vary. Weak internal controls lead to limited scrutiny of purchases	Integrated purchasing activity of ERP system. Real-time data sharing increases use of financial reports

Determine industry structure with 5 forces model:

1. Threat of substitutes
2. Threat of new entrants
3. Existing rivals
4. Bargaining power of suppliers
5. Bargaining power of customers

SAP & supply chain processes improvements:

Supply chain processes:

1. Supplier relationship management (SRM): process automates, simplifies, and accelerates a variety of supply chain processes
2. Returns management process (RMP): manages returns of faulty products for businesses
3. Supplier evaluation process: determines the criteria for supplier selection and adds/removes suppliers from the list of approved suppliers

Sample of supply chain processes:

Process scope	Supply chain processes
Operational	procurement
Managerial	SRM & RM P
Strategic	Supplier evaluation

Improving supply chain processes:

Supply chain processes are improved when data is **shared**.

- E.g.: data from Returns Management process about defective product should be shared with Supplier Evaluation process to ensure that suppliers with high defect rates are removed from the list of approved suppliers

Sharing data reduces the **bullwhip effect** which is when companies order more supplies than are needed due to a sudden change in demand

Process integration: occurs when processes are mutually supportive; when one process is done well the objectives of another process are also achieved

- Reduces the chances of a **bottleneck**, occurs when a limited resource greatly reduces the output of an integrated series of activities/processes

Impacts of SAP on organizations:

- New skills needed
- Process focus
- More data sharing
- Outsourcing: many firms outsource part of their production to take advantage of other firms that can produce a service cheaper than they can

<u>New IS that will impact supply chain processes by 2024:</u>

- Augmented reality (AR): computer data or graphics are overlaid onto the physical environment
- Radio frequency identification (RFID): small, cheap, chip that broadcasts data to receivers that can display and record the data; can be used to identify and track items in the supply chain
- Sensors
- Robotics
- 3D printing also known as "*additive manufacturing"*: objects are manufactured through the disposition of successive layers of material

<u>Chapter 5 (database and content management)</u>

<u>What is content?</u>

Content: something of value & can be considered an asset just like other items of property

- Closely related to **intellectual property** which is a form of creative endeavour that can be protected through a trademark, patent, copyright, industrial design, or integrated circuit topography

- Examples of content: word-processing documents (.doc, .txt, .pdf), spreadsheets (.xls), presentations (.ppt)

Organizing content:

- Content management systems (CMSs): helps companies organize content through a series of steps supported by software

Purpose of a database: keeping track of things; it is a self-describing collection of integrated records

- Lists that involve a single theme can be stored in a **spreadsheet**
- Lists that involve multiple themes require a **database**

What does a database contain?

A **byte** is a character of data, bytes are grouped into **columns** (such as student # & student name), columns are also known as **records,** a group of similar records(or rows) is called a **table or file**...a database is a collection of tables plys relationships among the rows in those tables, plus special data (**metadata** = data that describes data) that describe the structure of the database

Key: is a column or group of columns that identifies a unique row in a table (every table must have a key)

Foreign keys: keys from a different (foreign) table from the one which they are placed in

Relational databases: carry their data in the form of tables and represent relationships using foreign keys

Database Management System (DBMS): software program used to create, process, and administer a database

- Almost no organization develops its own DBMS
- Companies license DBMS products from vendors (Microsoft, IBM, Oracle)
- Top 5 DBMS products: DB2 (IBM), Access & SQL Server (Microsoft), Oracle (Oracle corporation)

Components of a database application system:

1. User
2. Database application: collection of **forms, reports, queries,** application programs that process a database. May have one or more applications that have one or more users
    - **Forms:** used to read, insert, modify, and delete data

- **Reports:** show data in a structure context
- **Queries:** professor types in the keyword for which they're looking for

3. DBMS: database management system
4. Database: collection of tables, relationships, metadata

Functions of DBMS:

- Create tables, relationships and other structures in the database
- Process the database; uses four operations: *read, insert, modify, delete*
- **Structured query language (SQL):** international standard language for processing a database. "*Query"* = question, "*SQL"* = formal way of putting a question to a database
- Provide tools to assist in the administration of the database (used as a security system, backing up database data, etc.)

Multiuser processing problems:

- Lost-update problem →to prevent this problem some type of locking must be used to coordinate the activities of users who are unaware of each other

Enterprise DBMS vs. Personal DBMS

Entreprise:

- Process large organizational and workgroup databases
- Support many users & many different database applications
- Support 24/7 operations
- Manage databases that span dozens of different magnetics disks with thousands of gigabytes or more of data
- E.g.: DB2 (IBM), SQL Server (Microsoft), Oracle

Personal:

- Designed for smaller, simpler database applications
- Used for personal or small workgroup applications
- Fewer than 100 users (normally fewer than 15), can have 1 single user
- E.g.: Microsoft Access

Chapter extension 5a: database design

Data model: logical representation of the structure of the data; contains a description of both the data and the relationships among the data

Techniques for creating a data model:

1. **Entity-relationship Diagram (ERD):** developers describe the content of a database by defining ***entities*** that will be stored in the database and the ***relationships*** among those entities
2. Unified modelling Language (UML): less popular

Entities:

- **Entity:** something that users want to track.
    - Can be physical objects: item, salesperson
    - Can be logical construct/transaction: order, contract
    - Always singular
- **Attributes:** describe characteristics of an entity
    - E.g.: attributes of "order": order number, order data, subtotal
- **Identifier:** entities have an identifier which is an attribute (or group of attributes) whose value is associated with one and only one entity instance
    - E.g.: identifier of "order": order number

Relationships

- Entities have relationships to each other
- E.g.: *order* has a relationship with *customer* and *salesperson* entities

Lines between relationships:

- **Crow's foot:** multiple, little lines between entities
- Different lines related to different relationships:
    - **One-to-many (1: N):** one entity can have many of another entity. E.g.: one department can have many advisers
    - **Many-to-many (N:M):** many of one entity can have many of another entity. E.g.: one advisor can have many students and one student can have many advisors
    - **One-to-one (1:1):** one entity can have only one other entity

Minimum cardinalities vs. maximum cardinalities

- Minimum: constraints on minimum requirements; minimum number of entities required for a relationship
- Maximum: constraints on maximum requirements; maximum number of entities required for a relationship

Optional vs. required: symbol indicated on crow's foot

- Optional: "o" entity is optional; the relationship need not have an entity of that type
- Required: "□" means that at least one entity of that type is required

Two important database design concepts:

1. **Normalization:** process of converting poorly structured tables (remove duplicated data & other problems) into 2 or more well-structured tables
    - Data integrity problems: can only occur if data is duplicated → example: "accounting" name change is correctly made in 2 rows, but not in the 3rd row
2. **Representing relationships:**

Steps in transforming a data model into a relational database design:

- Represent each entity with a table
    - Entity identifier becomes a table key (primary key)
    - Entity attributes become table columns
- Normalize tables as necessary
- Represent relationships
    - Use foreign keys "FK"
    - Add additional tables for *many-to-many* relationships

User's role:

- Users are the final judges of what data the database should contain and how the records in that database should be related to one another

Chapter extension 5b: using microsoft access 2013

Chapter 8

Challenges managers face when making decisions (Ackoff's assumptions):

- Information overload (Overabundance of irrelevant data): poor decisions are made because managers lack relevant information
- Uncertainty: too many possibilities exist
- Poor data quality: managers are often unsure just what data they require
    - Dirty data: e.g.: "B" for customer name
    - Missing values: name, age
    - Inconsistent data
    - Data not integrated: data reside in different sources/are incompatible with the intended purpose
    - Wrong granularity: too fine, not fine enough
    - Too much data: too many attributes, too many data points

Role of information systems to meet some of these challenges:

- Can both help and hinder the process of information overload by helping managers find the appropriate data and incorporating them into their decision-making processes
- OLTP: provides raw information about transactions and status for an organization

OLTP & how it supports decision making:

Information systems are a critical component for capturing details about transactions:
Because they are very efficient and accurate

Online transaction processing (OLTP): collecting data electronically and processing the transactions online. Two ways transactions can be processed:

1. Operating in real time: transactions are entered and processed immediately on entry
2. Wait for many transactions to pile up before you process them

OLAP & the data resource challenge:

Online analytic processing (OLAP) also known as "decision support systems" (DSSs): systems that focus on making OLTP-collected data useful for decision making

- Provides ability to sum, count, average, and perform other simple arithmetic operations on groups of data
- Format is dynamic: user can alter the format of the report
- Makes it possible to **drill down** into the data (divide data into more detail)
- A **measure** is the data item of interest →the presentation of a measure is known as a OLAP cube (or simply cube)

Data resource challenge: considering whether a company views its data as an asset

Is information a company asset?

- Data is a good asset →does not depreciate, does not take up much space, easy to store, provide input for decision making

BI systems & how they provide competitive advantage:

Business intelligence (BI) systems: 5 categories, characteristics and their competitive advantage

- BI: provides information for **improving** decision making

Business intelligence system	Characteristics	Competitive advantage:

		improve decision making by...
Group decision support systems (GDSS)	Allow multiple decision makers to collaborate, often anonymously and in different times/locations	Reducing biases that come with group discussion and option evaluation
Reporting systems	integrate/process data by sorting, grouping, summing and formatting. Produce administer and deliver reports	Provides relevant, accurate and timely information to the right person
Data-mining systems	Use sophisticated statistical techniques to find patterns/relationships **RFM analysis:** way of analyzing/ranking customers according to their purchasing patterns ● How recently a customer has ordered ● How frequently " " ● How much $ they spend	By doing this, predicts future outcomes
Knowledge management systems	Share knowledge of product uses, best practices, among employees, managers, customers, etc	By publishing employee & other's knowledge. Create value from existing capital. Foster innovation, improve customer service, increase organizational responsiveness, reduce costs
Expert systems	Encode human knowledge in the form of "if/then" rules and process those rules to make a diagnosis/recommendation	By non-experts by encoding, saving and processing expert knowledge

<u>Purpose & components of a data warehouse:</u>

Purpose of a data warehouse: to extract and clean data from operational systems and other sources and to store and catalogue that data for processing by business intelligence tools

Role of each component (8-7):

The difference between data mart & data warehouse:

Data mart: data collection that is created to address the needs of a particular business function, problem or opportunity

Data mark & data warehouses being part of the supply chain:

- Data warehouse can be seen as a distributor in a supply chain → takes data from the data manufacturers, cleans and processes it and locates it on warehouse computes
- Data mart can be seen as the retail store in a supply chain →is a data collection, smaller than the data warehouse, that addresses a particular component or functional area of the business

Typical data-mining applications:

Purpose of data-mining systems: application of statistical techniques to find patterns and relationships among data and to make classifications and predictions. Fall into 2 categories:

- Unsupervised data mining: analysts do not create a model/hypotheses prior to running the analysis; they create hypotheses after analysis to explain the patterns found
    - **Cluster analysis:** unsupervised technique; statistical techniques identify groups of entities that have similar characteristics →e.g.: find groups of similar customers from customer order/demographic data
- Supervised data mining: analysts do create a model prior to analysis & apply statistical techniques to data to predict the parameters of the model
    - **Regression analysis:** measures the impact of a set of variables on another variable
    - **Neural networks**
    - **Market-basket analysis:** determines sales patterns; shows the products that customers normally buy together

Big data: large amounts of varied data from a variety of sources over a period of time could be used to make better decisions

Chapter 9

E-commerce & how it is used

E-commerce: the buying and selling of goods and services over public and private computer networks

- **Merchant companies**: take title to the goods they sell; they buy goods and resell them
- **Non-merchant companies:** do not take title to goods they sell; they buy goods and resell them

Three main types of **merchant companies**:

1. Business-to-consumer (B2C): sell directly to consumers; retailer →to consumer
2. Business-to-business (B2B): sell to companies; distributor → retailer
3. Business-to-government (B2G): sell to government; retailer → government

Two main types of **non-merchant companies:**

1. E-commerce auctions: match buyers and sellers by using an ecommerce version of a standard auction →e.g.: ebay
2. Clearing houses: provide goods and services at a stated price and arrange for the delivery of goods, but they never take title →e.g.: Amazon.ca
    - Electronic exchange: example of clearing houses → similar to stock exchange

Benefits of e-commerce:

- Disintermediation: the removal of intermediaries between parties → higher revenues for manufacturers and lower cost for consumers
- Improves flow of price information → as a consumer, can go to a variety of websites that offer product price comparisons
- Produces information about **price elasticity** (to seller) which is a measure of how much demand rises/falls with changes in price

Challenges of e-commerce

- Channel conflict
- Price conflict
- Logistics expense: of entering and processing orders in small quantities
- Customer service expense
- Showrooming: occurs when customer learns/tries a product/service in retail store and completes the sales transaction at the low-cost internet sales channel of another retailer
- Taxation

Social networking & how it is enabled/affected by IS/IT

Social network: a structure of individuals and organizations that are related to each other in some way

Social networking: the process by which individuals use relationships to communicate with others in a social network

- Social capital: earned through social networking

Three types of capital:

1. Physical capital: the investment of resources for future profit →e.g.: machines, manufacturing equipment, etc
2. Human capital: the investment in human knowledge and skills for future profit →e.g.: investing in education for good job
3. Social capital: investment in social relations with the expectation of returns in the marketplace → e.g.: when you attend a social event to meet people and enforce relationships. Adds value in four ways:
    - Information: about opportunities, alternatives, problems and other factors
    - Influence: provide an opportunity to influence decision makers in one's employer or in other organizations who are critical to your success
    - Social credentials: being linked to a network of highly regarded contacts
    - Personal reinforcement: being linked to social networks reinforces your professional image and position in organization

Do social networks add value to business?

- Organizations have social capital just as humans do
- Social capital is measured in the same way: number of relationships, strength of relationships, and resources controlled by friends
- Organizations maintain a presence on facebook, linkedin, pinterest → include links to their websites and <u>make it easy for clients and interested parties to leave comments</u>

How is social networking enabled by IS/IT?

1. Improved search capabilities: enable us to quickly sort through large amounts of data and find the specific person or relationship that we are interested in
2. Reduction in the trade-off of richness and reach: the ability to keep track of many more people and enhance personalization
3. Network effects: bigger network

<u>Web 2.0</u>

Web 2.0: the integration and interaction of products and services, such as smartphones, user-created content, social networking, location and context-based services and dynamic marketplaces

- Examples: google, amazon, eBay
- Do not sell software licenses because software is not their product
- Instead, provide software as a service (SAAS)
- No marketing done → *viral marketing:* new features are released and vendors wait for users to spread the word
- Value of the site increases with number of users & their use of the site

User-generated content (UGC): refers to website content that is contributed by users

Crowdsourcing: combines social networking, viral marketing, and open-source design, saving considerable cost while cultivating customers

- Crowdfunding: start-up raises money from a large group of people who invest directly/prepay for a new good/service

Web 2.0 interfaces are organic → people find their way around Ebay and paypal

- Encourages **mashups** which result when the output from 2 or more websites is combined into a single user experience → e.g.: Google My Maps

Web 2.0 is about participation **not** publishing → users provide reviews, map content, discussion responses

Web 2.0 advertising → based on user interest

Not for all applications:

- Any information system that deals with assets (financial or material) requires some level of control
- E.g.: do not want to mash up credit card transactions on My Maps and share that mashup with the world

Chapter 10

How can information systems be acquired?

1. Buy it and use it as is
2. Buy it and customize it (most common method)
3. Rent or lease it
4. Build it yourself

5. Outsource it

What are IT Projects and define PMBOK?

Project management body of knowledge (PMBOK): defines what the project is. The guide to the PMBOK suggests there are 5 process groups in a project:

1. Initiating
2. Planning
3. Executing
4. Controlling & monitoring
5. Closing

Any of these process groups can be related to one of the 9 project knowledge areas:

1. Integration management
2. Scope management
3. Time management
4. Cost management
5. Quality management
6. Human resources management
7. Communications management
8. Risk management
9. Procurement management

IT projects: projects that have a large IT component (in terms of budget or personnel); include such things as the installation of a new email application, a CRM System, ERP etc

Information technology project management (ITPM): collection of techniques and methods that project managers use to plan, coordinate, and complete IT Projects

What should you know about IT operations?

IT operations (IT services): the delivery of service, maintenance, protection and management of IT Infrastructure are often accomplished as part of IT operations

Information technology infrastructure library (ITIL): well-recognized collection of books that provide a framework of best-practice approaches to IT operations

Why are IT projects so risky?

IT Project risk:

- Lack of good model → project models are not that easy to represent graphically
- Precise estimates difficult to develop because the technology is continuously changing
- Being able to monitor progress

What is an SDLC?

Systems development life cycle (SDLC): classic process used to acquire information systems.

How are information systems designed, implemented and maintained?

5-phase process:

1. System definition
    - Define system goals and scope
    - Assess feasibility
        - Cost
        - Schedule
        - Technical: whether existing information technology is likely to be able to meet the needs of the new system
        - Organizational : concerns whether the new system fits within the organization's customs, culture, charter, or legal requirements
    - Form project team
    - Plan project
2. Requirements analysis: in which the project team is formed and requirements are developed
    - Requirements team: usually consists of both IT personnel and user representatives
    - Analysis work: often completed by business analysts
    - Through acquiring an information system; the organization needs to match its requirements with the capabilities of **commercial off the shelf** (COTS) software & may face discrepancies such as:
        - Modify the software
        - Modify the organizational procedures and data
        - Live with the problem
3. Component design
    - Determine hardware specifications
    - Determine software specifications
    - Design the database
    - Design the procedures
    - Create job definitions

For different types of software:

- Off-the-shelf software: team must determine candidate products and evaluate them against the requirements
- Off-the-shelf with alterations software: team identifies products to be acquired off the self and determines the alterations required
- Customer-developed programs: team produces design documentation for writing program code

Procedures to be designed:

	Users	Operations personnel
Normal processing	Procedures for using the system to accomplish business tasks	Procedures for starting, stopping and operating the system
Backup	User procedures for backing up data and other resources	Operations procedures for backing up data and other resources
Failure recovery	Procedures to continue operations when the system fails Procedures to convert back to the system after recovery	Procedures to identify the sources of failure and get it fixed Procedures to recover and restart the system

4. Implementation
    - Build system components
    - Conduct unit test
    - Integrate components
    - Conduct integrated test
    - Convert to new system

System testing:

- Test plan: consists of sequences of actions that users take when using the new system → includes "normal actions" & "incorrect actions"
- Product quality assurance (PQA): consists of constructing the test plan with the advice and assistance of users
- Beta testing: process of allowing future users to try out the new system on their own

System conversion: process of converting business activity from the old to the new system. Can happen in 4 ways:

- Pilot: implementing system in a limited portion of the business → PRO: if the system fails, contained within a limited boundary, reduces business exposure & negative reputation
- Phased: new system is installed in phases across organization, once a given piece works the organization installs/tests another piece of the system till it is entirely installed
- Parallel: new system runs in parallel with old system until it is fully operational → CON: expensive running both systems, PRO: easily go back to old system
- Plunge: shutting old system down completely & implementing new → CON: if new system does not work, nothing can be done till it is fixed or old system is reinstalled → ***avoid plunge***

5. System maintenance
    - Record requests for change: failures, enhancements
    - Prioritize requests
    - Fix failures:
        - Patches: fix security and other critical problems
        - Service packs: fix hundreds of thousands of problems
        - New releases

<u>Problems with SDLC</u>

Waterfall method: sequence of nonrepetitive phases

- Often there is a need to crawl back up the waterfall & repeat the work done in a prior phase due to system malfunctions

Use → Agile method:

- More adaptable & gives developers time to work as requirements change which reduces the risk of encountering problems

What is outsourcing, and what are application service providers?

Outsourcing: process of hiring another organization to perform a service

PROS	CONS
● Easy way to gain expertise → developing expertise is expensive ● Cost reductions → hiring someone in china, india (low wages) or part-time outsourcing ● Reduce development risk → can cap financial risk by setting specific prices on components of the system ● Reduce implementation risk → reducing the risk of picking the wrong hardware/software using the wrong network protocol or implementing incorrectly	● Loss of control - Vendor in driver's seat - Technology direction - Potential loss of intellectual capital - Product fixes, enhancements in wrong priority - Vendor management, direction or identity changes ● Benefits outweighed by long-term costs - High unit cost, forever - Paying for someone else's mangement - In time, outsourcing is the sole source - May not get your money's worth ● No easy exit - Critical knowledge in minds of vendors, not employees - Expensive and risky to change vendors

Application service providers (ASPs): form of outsourcing where organization contracts with a vendor to "rent" applications from the vendor company on a fee-for-service basis vs. traditional outsourcing where the vendor maintains the systems at the organization's location

PROS	CONS
● Vendor maintains system at their own web location → reduces the costs of supporting the application for the organization	● Loses physical control over some corporate data store in vendor's machines ● Any internet failure means that client company cannot operate, even internally

	• Potential for lock in the ASP→may not allow corporate data to be easily ported to competing vendor's sites

Chapter 10: 10a →MS

Chapter 11

How is the IT department organized?

Chief executive officer (CEO)/Chief Operating Officer (COO)	
HR	Legal & other staff functions
VP Marketing VP Sales VP Manufacturing Chief information officer (CIO) *principal manager* _ Data administration Chief financial officer (CFO) VP Engineering	
Technology (CTO) *heads technology group* Operations: *manages computing infrastructure (individual computers, computer centres, networks and communications media)* Development: *manages projects that acquire new info. Systems + maintains existing info. Systems* Outsourcing relations: *present when organization has outsourcing agreements*	

What is IT architecture?

Competitive strategy: supported by activities (collection of business processes supported by information systems) in the value chain

IT architecture: basic framework for all the computers, systems and information management that support organizational services

- Complex → therefore some organizations hire a **enterprise architect,** person who creates a *blueprint* of an organization's information systems and the management of these systems

- Blueprint → provides an overview that helps people in the organization better understand current investments in technology and plan for changes

Zachman framework (for IT architecture) *figure 11-4

- Divides systems into 2 dimensions:
    1. Based on six reasons for communication (what (data), how (function), where (network), who (people), when (time), why (motivation))
    2. Stakeholder groups: planner, owner, designer, builder, implementer and worker

What is alignment, the importance of it, and the difficulties of it?

Alignment: process of matching organizational objectives with IT architecture

- Importance: studies show that the alignment improves perceived business performance → when technology is aligned with some strategic objectives
- Challenges: fitting architecture to business objectives is continually evolving

What is information systems government?

Information systems government:

- Governance: development of consistent, cohesive management policies and verifiable internal processes for information technology and related services
- Goal for ISG: improve the benefits of an organization's IT investment over time
- ISG = piece of organizational governance that is associated with IT architecture
- Increasing interest in ISG is the results of laws **sarbanes-oxley act (sox) & bill 198 (**also known as "**budget measures act**"

What is an information systems audit?

Information systems audit: focused on information resources that are used to collect, store, process and retrieve information →establishing methods for examining and verifying organization's information systems policies and procedures

- **Information systems audit and control association** : responsible for auditing for newly developed computer systems

Information systems ethics:

- Not about hardware/software → but about people involved in the system
- Details appropriate rules for our behaviour & understanding our own behavior

What is Green IT?

Green IT: using IT resources to better support the *triple bottom line* (includes measures of traditional profit along with ecological and social performance) for organizations

- Primary goal: improve energy efficiency, promote recyclability, reduce the use of materials that are hazardous to the environment
- Considers the financial implications of adopting/using IT but also the effects of those choices on people and the environment
- Example: ENERGY STAR program → intended to produce equipment that meets high-energy efficiency specifications or promotes the use of such equipment

Issues in green IT:

- E-cycling: recycling of electronic computing devices
- E-waste industry

Chapter 12

What is identity theft?

Identity theft: vital information (person's name, d.o.b, sin, mother's maiden name) used to facilitate impersonation → with this info, identity theft can open bank accounts, take luxury trips, apply for loans/credit cards, under person's name

What is PIPEDA?

Personal information protection and electronic document act (PIPEDA): intended to balance an individual's right to the privacy of their personal information with an organization's need to collect, use and share that personal information for business purposes

What types of security threats do organizations face?

Three sources of security threats:

1. Human error and mistakes:caused by both employees and others external to organization
2. Malicious human activity: hackers, viruses, spam, employees who intentionally destroy data or other system components
3. Natural events and disasters: tsunami, hurricane, earthquakes

Five types of security problems:

1. Unauthorized data disclosure
2. Incorrect data modification
3. Faulty service
4. Denial of service
5. Loss of infrastructure

	Source		
Problem	Human error	Malicious human activity	Natural events and disasters
Unauthorized data disclosure: Can occur due to human error when someone inadvertently releases data in violation of policy	Procedural mistakes	• Pretexting: occurs when someone deceives by pretending to be someone else →fake credit card caller • Phishing: pretexting via email • Spoofing: someone pretending to be someone or somewhere else • Sniffing: intercepting computer communications • Computer crime	Disclosure during recovery
Incorrect data modification	• Procedural mistakes • Incorrect procedures • Ineffective accounting controls • System errors	• Hacking: person gains unauthorized access to a computer system • Computer crime	Incorrect data recovery
Faulty service: problems that result because of incorrect system operation	• Procedural mistakes • Development and installation errors	• Computer crime • Usurpation	Service improperly restored
Denial of service: usually occurs due to human error in	Accidents	DOS attacks: denial of service attacks	Service interruption

following procedure or lack of procedure			
<u>Loss of infrastructure:</u> Due to human accidents	Accidents	• Theft • Terrorist activity	Property loss

Elements of a security program:

1. Senior management involvement
2. Safeguards of various kinds
3. Incident response

<u>How can technical safeguards protect against security threats?</u>

Technical safeguards: involve the hardware and software components of an information system
Protect by:

- Identification and authentication: e.g.: username (identifies), password (authorizes). Authentication method fall into 3 categories
  - What you know (password/PIN)
    - ❏ Use of smart card requires **PIN** (personal identification number)
    - ❏ **Challenge-response** authentication: new password is generated at each login by an algorithm stored in the chip
  - What you have (smart card)
    - ❏ Smart card: plastic card with microchip that is loaded with identifying data
  - What you are (biometric)
    - ❏ **Biometric authentication:** uses personal characteristics (fingerprints, facial features, retinal scans) to authenticate users
- Encryption
- Firewalls
- Malware protection: includes viruses, worms, trojan horses, spyware (installed on user's computer without their knowledge/permission) and adware (installed without user's permission and resides in the background to observe user's behavior)
- Design for secure applications

Malware safeguards:

- Install antivirus and anti-spyware programs
- Set up your anti-malware programs to scan you computer frequently
- Update **malware definitions:** patterns that exist in malware code
- Open email attachments from only known sources
- Promptly install software updates from legitimate sources
- Brown only in reputable internet neighbourhoods

How can data safeguards protect against security threats?

Data safeguards: protect databases and other organizational data

Two organizational units are responsible for data safeguards:

1. Data administration: organization-wide function that is in charge of developing data policies and enforcing data standards
2. Database administration: a function that pertains to a particular database

Both data administration & database administration help:

- Define data policies
- Data right and responsibilities
- Rights enforced by user accounts authenticated by passwords
- Data encryption
- Backup and recovery procedures
- Physical security

How can human safeguards protect against security threats?

Human safeguards: involve the people and procedures components of information system →generally, human safeguards result when authorized users follow appropriate procedures for system use and recovery

Human safeguards for employees:

- Position definition:
    - Separate duties and authorities
    - Determine least privilege
    - Document position sensitivity
- Hiring and screening
- Dissemination and enforcements: responsibility, accountability, compliance
- Termination: friendly, unfriendly

Human safeguard for non-employees:

- **Hardening:** hardening a site means to take extraordinary measures to reduce a system's vulnerability

Human safeguard for account administration: administration of user accounts, passwords, and help-desk policies and procedures _account management, password management

System Procedures

	System users	**Operations personnel**
Normal operation	Use the system to perform job tasks, with security appropriate to sensitivity	Operate data centre equipment, manage networks, run web servers, and do related operational tasks
Backup	Prepare for less of system functionality	Back up website resources, databases, administrative data, account and password data and other data
Recovery	Accomplish job tasks during failure →know tasks to do during system recovery	Recover systems from backed-up data, perform role of help desk during recovery

Human safeguard for security monitoring: important monitoring functions are analysis of *activity logs,* security testing and investigating/learning from security incidents

<u>What is disaster preparedness?</u>

Disaster preparedness guidelines:

- Locate infrastructure in safe location
- Identify mission-critical systems
- Identify resources needed to run those systems
- Prepare remote backup facilities
    - **hot spots:** remote processing centres, provide all equipment needed to continue operations in case of disaster
    - **Cold sites:** provide space and limited technology & customers provide and install the equipment necessary to continue operations after disaster
    - **Warm sites:** somewhere in the middle
- Train and rehearse

How should organizations respond to security incidents?

Factors in incidence response:

- Have plan in place
- Centralized reporting: enable organization to determine whether it is under systematic attack of whether an incident is isolated
- Specific responses: speed, preparation pays, don't make problem worse
- Practice