Week 1: Introduction Systems & Business Strategy

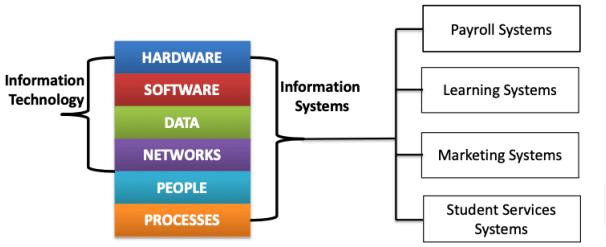
What is Information System (IS):

Collects, processes, stores, analyzes and disseminates information for a specific purpose. IS also uses computer-based tools that are used to work with information and support the information and information processing needs of an organization. It is a combination of technology, people and processes to capture, transmit, store, retrieve, manipulate and display information.

- What is the purpose?
    - To get the right information to the right people at the right time in the right amount and in the right format to support business processes and decision making.

What is Information Technology (IT)

Any computer-based tool that people use to work with information and to support the information and information-processing needs of an organization



What is Management Information Systems (MIS)?

- This functional area "deals with the planning for and the development, management, and use of IT tools to help people perform all the tasks related to information processing and management.
- MIS is a business function, similar to Accounting, Finance, Operations and HR. In organizations, this function is also referred to as IS or IT or Information Services.

What is Computer Based IS (CBIS)?

Any information systems that use computer technology to perform some or all of its intended tasks. The basic components of a CBIS are:

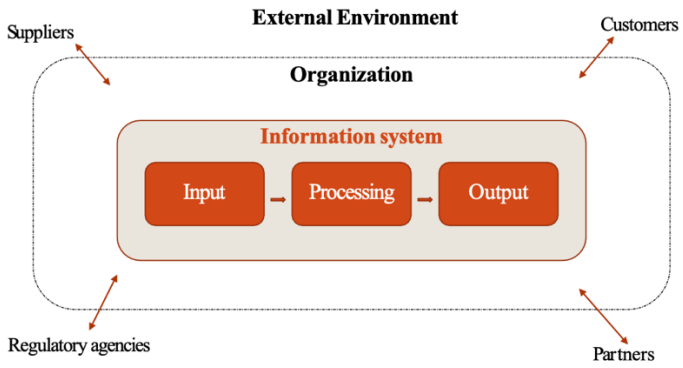
- IT Components (Tools):
    - Hardware
    - Software
    - Database
    - Network
- Trained personnel
- Policies, Procedures and Ethical Measures

IS: Input-Processing-Output

- Input → Captures info within the organization or from its external environment
- Processing → Conversion, manipulation and analysis of input

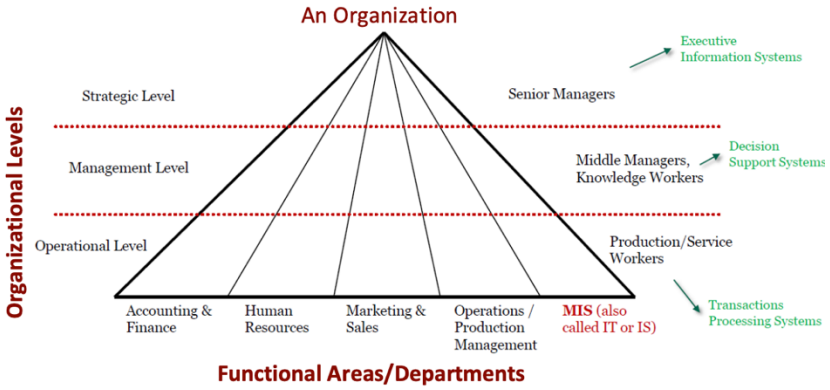
- Output → Distribution of processed info to people or to other IS

IS: External Environment



What is Data?
It is the raw facts representing events such as business transactions. Specific facts or observations.
What is Information?
It is the data shaped into a form that is meaningful and useful to human beings. Data made relevant and purposeful.
What is Knowledge?
It is created by analyzing information; may lead to action. Richer and more valuable than information because someone has added his/her own unique experience and judgement.
What is Business Intelligence (BI)?
It is an organizational process for converting data into useful info and through human analysis, into knowledge.
What is Knowledge Management (KM)?
It is an organizational process for acquiring, organizing and disseminating knowledge.

Functional Areas in Organizations



What is Operational-Level?

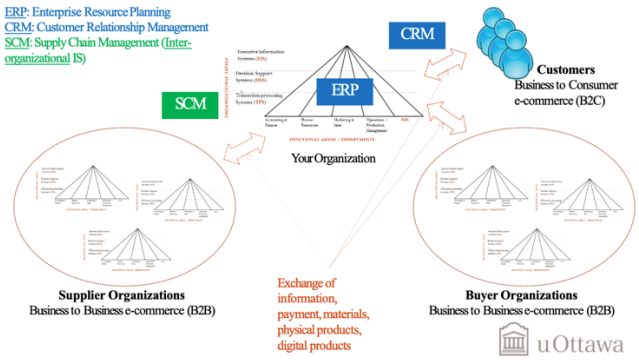
IS to support operational managers in keeping track of elementary activities and transactions. "What is the inventory level?"

What is Management Level?

IS to help in monitoring, controlling, decision-making and administrative activities of middle managers. "Is production running according to plan?"

What is Strategic Level?

IS to help senior managers address strategic issues. "What will employment levels be in 5 years?"



Skills needed by IS specialists

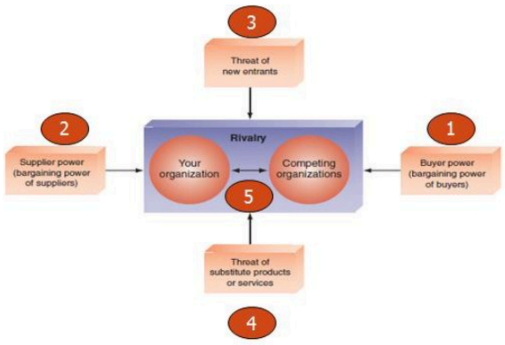
Skill	What it Means
Communications	The ability to communicate and influence at all levels
Business Knowledge	A need to understand and focus on how they can help their businesses grow and not just look at cutting costs and being more efficient.
Innovation / Creativity	The vision that differentiates a CIO from a more traditional IT director—innovation, creativity, flair, and an entrepreneurial spirit.
Leadership	Good leaders inspire and motivate their teams and drive them to achieve remarkable things.
Domain Knowledge	A practical understanding of technology fundamentals in order to make the right strategic calls about the deployment and exploitation of IT

Information System Roles and Responsibilities

1. Chief Information Officer (CIO)
    - Oversees all uses of IT and ensures the strategic alignment of IT with business goals and objectives
    - CIO functions include:
        - Mangers → Ensures the delivery of all IT projects, on time and within budget
        - Leader → Ensures the strategic vision of IT is in line with the strategic vision of the organization
        - Communicator → Builds and maintains strong executive relationships.
2. Chief Knowledge Officer (CKO)
3. Chief Privacy Officer (CPO)
4. Chief Security Officer (CSO)
5. Chief Technology Officer (CTO)
    - Responsible for ensuring the throughput, speed, accuracy, availability and reliability of IT.

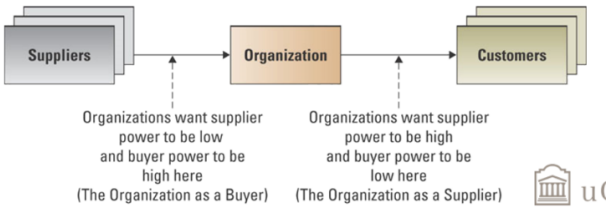
Michael Porter's Five Forces Model

Porter's model helps determine the attractiveness of an industry by looking at the 5 forces that organizations within the industry must deal with. A firm can achieve competitive advantage over its competitors (threat 5) by enhancing its ability to deal with threats 1,2,3 and 4.



1. Buyer Power
    - The ability of buyers to affect the price of an item.
    - High when buyer have many choices of whom to buy from and low when their choices are few
    - Use IS to reduce buyer power through loyalty programs
        - Loyalty programs reward customers based on the amount of business they do with an organization (frequent flyer programs)
    - Customers have access to more info on products & pricing
2. Supplier Power

- High when organizations have few choices of whom to buy (raw materials, supplies, etc.) from and low when their choices are many.
- Use IS to reduce supplier power by locating alternative supply sources through Business-to-Business e-commerce (B2B)
- B2B e-commerce is an Internet-based service that brings together buyers and sellers
- Suppliers have more options to sell their products



3. Threat of New Entrants
    - Threat of new entrants – high when it is easy for new competitors to enter a market and low when there are significant entry barriers to entering a market
    - Use IS to create and Entry Barrier
    - Entry barrier
        - A product or service feature that customers have come to expect from organization to compete and survive
        - Ex: Online banking for banks, online package tracking for shipping companies
    - The internet reduces barriers to entry, such as physical presence
4. Threat of Substitute products or services
    - High when there are many alternatives to a product or service and low when there are few alternatives from which to choose
    - Use IS to create switching costs (monetary or otherwise) to make customers reluctant to switch to another product or service
    - New substitutes emerge (ex; online music lowers the value of record stores)
5. Rivalry among existing competitors
    - High when competition is fierce in a market and low when competition is moderate
    - Use IS to build effectiveness and efficiency into the supply chain
    - The internet widens geographic markets, increasing the number of competitors.

Week 2: Organizational Strategy, Competitive Advantage, and IS

What is Transactional Data?

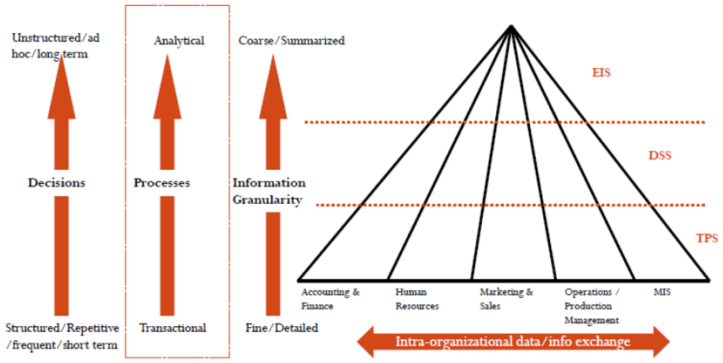
- Encompasses all the raw facts within a single business process or unit of work
- Supports daily operational tasks
    - Ex: Order size, manager's salary, product price, stock price, shipping date

What is Analytical Information?

- Summarized transactional data
- Used to support analysis and decision making
    - Ex: market trends, forecasts, sales by region, environmental scans

Classes of Information Systems

1. Transactions Processing Systems:
    - Handles data for the operational level
    - Performs OLAP for transactional data
2. Decision Support Systems:
    - Models data and information to support managerial decisions
    - Performs OLAP
3. Executive Information Systems:
    - Highly aggregated data for strategic decisions
    - Usually presented in a graphical format



What is Business Process?

It is related activities that create a product or a service of value to the organization, its business patterns and or its customers. A process involves:

- Inputs → Materials, services and information that flow through and are transformed as a result of process activities
- Resources → People and equipment that perform process activities
- Outputs → Products or services created by the process.

Business Process: Categories

1. Customer Facing Processes (Front-Office Processes):
    - Result in a product or service that is received by an organization's external customer (ex, customer service process)
2. Business Facing Processes (Back-office processes):
    - Are invisible to the external customer but are essential to the effective management of the business (ex, budget planning process)
3. Single Functional Processes
    - Involve a single functional area (ex, managing accounts payable process)
4. Cross functional (or organization-wide) processes
    - Span 2 or more functional areas of an organization (ex, order process)
5. Inter-organizational processes:
    - Span 2 or more organizations (ex, supply chain process)

Business Process: Efficiency vs. Effectiveness

Business processes can create competitive advantage if they enable the company to innovate or to execute more effectively and efficiently than its competitors.

- What is Efficiency?
    - Doing things well in the process
        - Is the organization using its resources in an optimal way?
            - Not wasting time, money or resources
- What is Effectiveness?
    - Doing the things that matter
        - Is the organization achieving its goals and objectives?
            - Creating high quality products, keeping customer happy

IS and Business Processes: IS to <u>execute</u> a process

- IS helps execute processes efficiently and effectively
- IS automate tasks that were initially done by humans
    - Check credit, check inventory
- IS informs people of the task to perform and when to perform it and provide the necessary data to complete the tasks
    - Inform Accounting of the order, transfer the order data to the right pers/system, notify customer when order is ready

IS and Business Processes: IS to <u>capture</u> & store process data

- IS capture and store process data such as "dates, times, product numbers, quantities, prices and addresses, as well as who did what, when and where"
- Data can be entered automatically or manually into the IS
- Example: Order Process

IS and Business Processes: IS to <u>monitor</u> process performance

- IS used to evaluate how well a process is executing
    - At the instance level (ex, for a particular customer order): where is the order within the process? Was it shipped? If so, when? If not, when will it be shipped?
    - At the process level (for the order process as a whole): evaluating how well the process is being executed by calculating the average time it takes to fulfill an order
- IS can detect problems within the process by comparing its calculations (ex, average time to execute a task) with the standards set by the company.

How to make sure that an organizational process is effective or efficient?

1. Document the process (process modelling) by describing its steps, its inputs and outputs and its resources
    a. Modeling (visualizing) a process is a step towards understanding
2. Analyze the process: discovering inefficiencies, redundancies, bottlenecks
3. Modify the process by performing Business Process Improvement (BPI) or Business Process Reengineering (BPR)

What is Process Modelling?

It is the activity of creating a detailed flow chart or process map of a work process showing its inputs, tasks and activities in a structures sequence. Process modelling (or mapping) is a detailed graphical representation (called flow chart or process model) of all the steps in a process.

- Shows the interactions among the people involved in the process, the IS they use and the information they require to perform their tasks.
- As-Is Process Model
    - Current state of the operation without improvements or changes
- To-Be Process Model
    - Shows the results of proposed changes to As-Is model

What is Business Process Improvement (BPI)?

It is the attempts to understand and measure current processes and make performance accordingly. BPI projects usually follow five basic (DMAIC) steps:

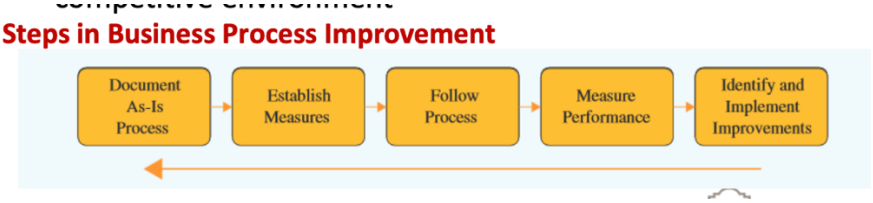
1. Define → Document the existing process by creating a process model that captures all activities, resources, inputs and outputs
2. Measure → Identify process metrics (time it takes to perform a task)
3. Analyze → Examine the "as is" process and the collected metrics to identify problems with the process's efficiency and effectiveness and their causes
4. Improve → Identify solutions to address the problems, and map the "to be" process alternatives, them selects an alternative and implements it
    a. Possible improvements: eliminating activities, combining activities

b. Make sure the new process still adheres to the organization's rules and regulations

5. Control → After the solution is implemented, establish process metrics and monitor the performance of the improved process

Business Process Improvement

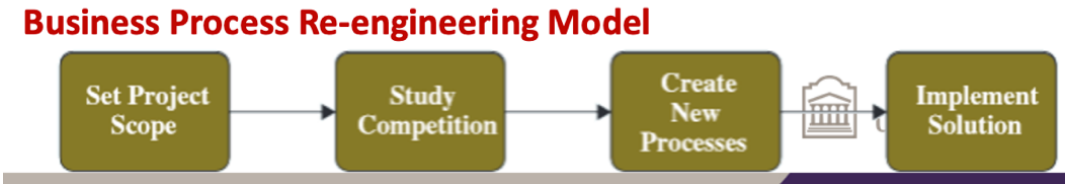
- What is Workflow?
  - Tasks, activities and responsibilities required to execute each step in a business process.
- It is critical to understand workflow, customer expectations and the competitive environment in the Improvement Process



What is Business Process Engineering (BPR)?

It is a strategy for making a organization's business processes more productive and profitable. BPR is usually difficult, radical lengthy and comprehensive.

- The purpose of BPR is to make all business processes best-in-class
- Unlike "business process improvement", BPR assumes the current process is broken and must be redesigned from scratch
- Unlike "business process improvement" which brings "slow and incremental improvements, BPR brings "rapid and dramatic improvements"

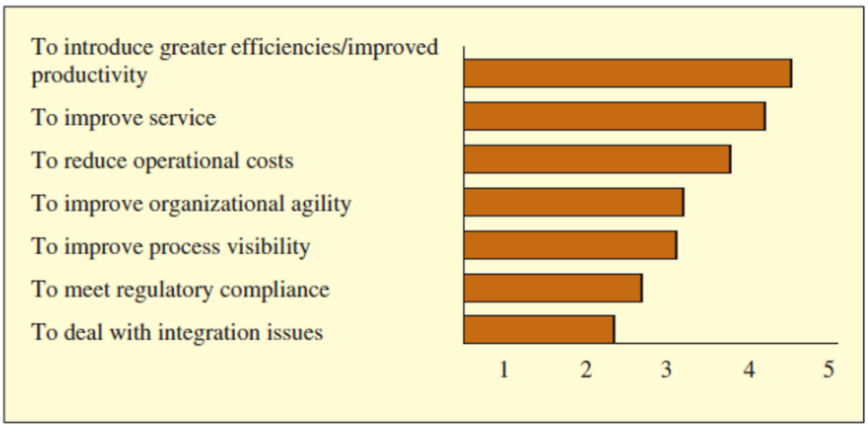


What is Business Process Management (BPM)?

BPM represents the methods and tools to support the design, analysis, implementation, management and continuous optimization of core business processes throughout the organization. BPM makes sure BPI initiatives are executed consistently.

- Components of BPM
  - Process modeling tools
  - Web based technologies that enable people and applications to be integrated in various processes
  - Business activity monitoring: real time approach for measuring and managing business processes, identifying problems and addressing them

- Requirements
  - Flexibility with cultural and organizational change
  - Willingness to share power and information



Scale 1 to 5 where 1 = not important and 5= very important

Week 3: Data and Data Management

Difficulties of managing data

- The amount of data increases exponentially
- Data is scattered throughout the organization in various formats, residing on various systems
    - Duplication of data, had to exchange data between ISs
- Data comes from internal sources (the organization's various ISs), external sources (government sources, research reports, etc.) and the organization's website (clickstream data produced by visitors)
- Data comes from new sources such as social media (FB,Twitter, etc.), various sensors (wired or wireless)
- Data can degrade over time (e.g., customer moves to new address)
- Quality, security, and privacy issues related to data

The Database Approach

What is Field?

Group Characters representing an attribute or characteristic

What is Record?

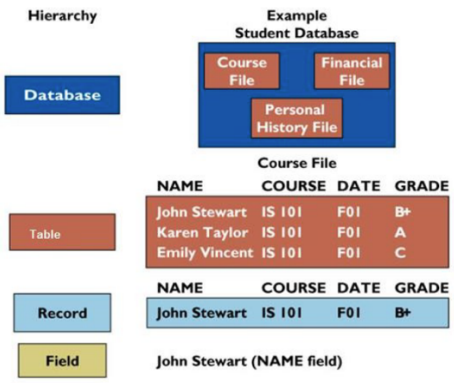
Group of related fields describing an entity

What is Table?

Group of related records of the same type

What is Database?

Group of related tables



Data Warehouse before & after

Before → DSS or EIS = Database + Model + Interface

After → Introduction of the Data Warehouse (DW)

- To separate reporting & analysis from transaction in order to maximize the performance of both.

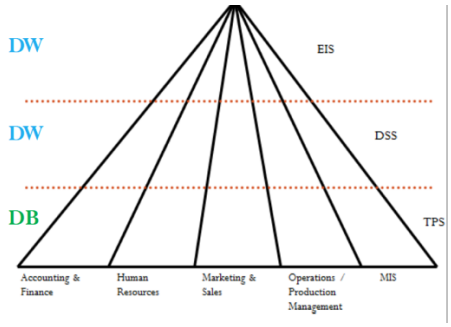
What is Data Warehouse?

A data warehouse is a logical collection of information – gathered from many different operational data bases – that supports business analysis activities and decision-making tasks.

- The primary purpose of a data warehouse is to aggregate information throughout an organization into a single repository for decision making purposes
- Data warehouse "repository of historical data that are organized by subject to support decision makers.
- A DW is an aggregation of an organization's data gathered from many sources (ERP, SCM, CRM, website, external sources,etc.)
- A DW provides a platform of consolidated, historical data for analysis
- A DW is an important asset for the organization to maintain efficiency, profitability & competitive advantage

Databases and Data Warehouses are the centre of all information systems

- Databases store the information necessary for day-to-day transactions (operational level)
- Data Warehouses store information for analysis and decision making (management and strategic levels)



DB designed (and optimized) to record (write, update);

DW designed (and optimized) to respond to analysis questions

DB is for OLTP (On-Line Transaction Processing) where every transaction has to be recorded;

DW is for OLAP (On-Line Analytical Processing), to facilitate querying and analysis

OLTP system is write-optimized;

OLAP system is read-optimized

Why separate DB from DW?

1. Performance
    a. High demand for data analysis might slow down operational systems
2. Data access
    a. Analysis requires data from different sources (a DW aggregates data from these sources)
3. Data formats
    a. Need for summarized and time-based data

DB	DW
Used to execute business	Used to analyze business
Detailed data	Summarized data
Current up to date	Snapshot data (historical data)
Isolated Data	Integrated Data
Repetitive access	Ad-hoc access
Clerical User	Manager (but this is changing)
Performance Sensitive	Performance relaxed
Read/Update Access	Mostly Read (Batch Update)

Data Warehouse Fundamentals

1. DW is Subject-Oriented

- A DB is process oriented: organized by business processes such as ordering, hiring, etc.
- DW is organized by subject (or business dimension) such as customer, sales, etc.
    - A DW provides a simple and concise view around a particular subject

2. DW is Integrated

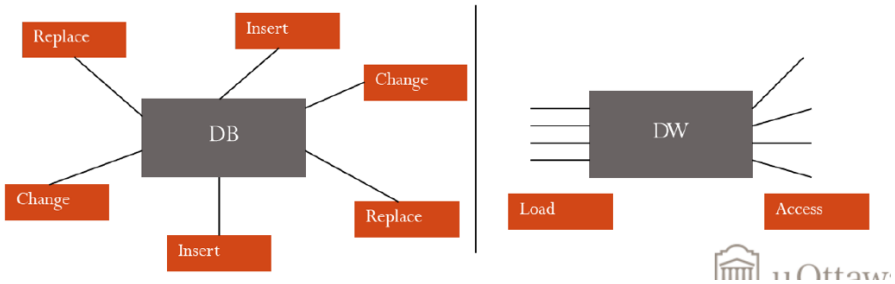
- Data is collected from multiple systems, then integrated
- DW contains rules to integrate data from different applications
- Data is organized around a common identifier, consistent names and the same values throughout

3. DW is Time-Variant

- Data shows history, not current status
    - DB (operational) data is accurate when users access it
    - DW data is accurate only at the time it is loaded – not necessarily accurate "right now"
        - Data in DW is time-Stamped

4. A DW is Non-Volatile

- Data does not change over time
    - BD (operational): Updates are done as changes occur
    - DW: New info is added at the time of loading, old info is never changed



Characteristics of High-Quality Data & Information

1. Accuracy

Are all the values, correct? Ex: Is the name spelled correctly? Is the dollar amount recorded properly?

2. Completeness

Are any of the values missing? Ex: Is the address complete including street, city, province and postal code?

3. Consistency

Does aggregate or summary information agree with detailed information? Ex: Do all total field equal the true total of the individual fields?

4. Uniqueness

Is each transaction, entity and event represented only once in the information? Ex: are there any duplicate customers?

5. Timeliness

Is the information current with respect to the business requirements? Ex: Is information updated weekly, daily or hourly?

What is Data Cleansing DW?

ETL → Extraction, Transformation and Loading

1. Extraction

A process that extracts information from internal and external databases

2. Transformation

Transforms the information using a common set of enterprise definitions

3. Loading

Loads the information into a data warehouse

What is Data Mart?

- Contains a subset of data warehouse information
- Extracted to be analyzed for specific objectives.
    - Provides historical data for a single department (or subject such as sales) rather than an entire organization

Business Intelligence tools

After an organization builds a DW and/or data marts, it uses them to gain insight into its operations, its customer's behavior & buying habits, etc. For that it needs BI tools such as:

1. Multidimensional Analysis

- DB contain information in two-dimensional tables
- In a DW and data mart, information is multi-dimensional – it contains layers of columns and rows
    - Dimension → A particular characteristic of information
    - Cube → Common term for the representation of multi-dimensional information

2. Queries & Reporting

3. Visualization

4. Data Mining

What is Big Data?

Collection of data so large and complex that it is difficult to manage using traditional database management systems. It is also defined as a diverse, high volume, high-velocity information assets that require new forms of processing to enable enhance decision making, insight discovery and process optimization.

- Predictions → Using big data apply mathematics to huge quantities of data to infer probabilities
- Transitional Enterprise data → Customer data, ERP data, HR data, accounting data, website data
- Machine generated/sensor data → Temperature data: pollution data, data coming from sensors on airplanes and all types of machines, etc.
- Social data → Tweets, Facebook posts,
- Images → Captured by devices such as digital cameras.

Three Characteristics of Big Data

1. Volume

- Machine generated data comes in huge volumes.
- Example: sensors in a single jet engine can generate 10 terabytes (1 terabyte = 1,024 gigabytes) of data in 30 min. There are 25000

flights per day

2. Velocity

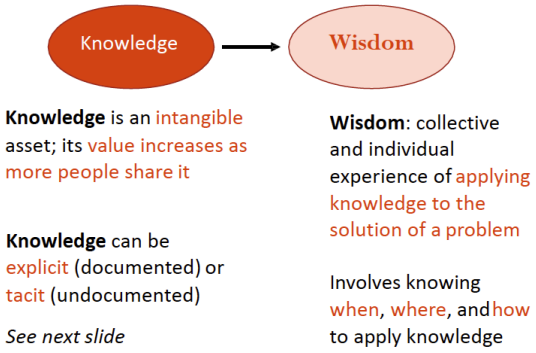
- The rate at which data flows into the organization is rapidly increasing.
- Example: online retailers are able to analyze data coming from their websites in real time, and react immediately based on the behavior of online users

3. Variety

- Big data comes in various formats (structures and unstructured) and such formats can change quickly.
- Example: satellite images, audio and video streams, etc.

What is Knowledge Management (KM)?

KM is an organizational process that captures and stores knowledge in forms that all organizational employees can access and apply. KM is a business discipline for managing the cultural conditions necessary to ensure the effective capture, transfer and translation of knowledge from those who "know" to those who "need to know" in support of organizational goals.



What is Explicit Knowledge?

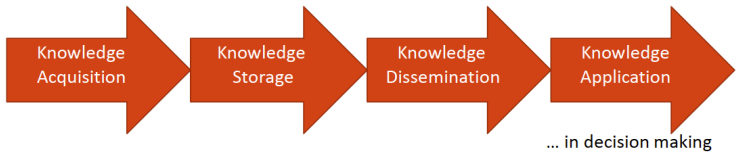
It consists of knowledge that can be documented, archived and codified, often with the help of IS

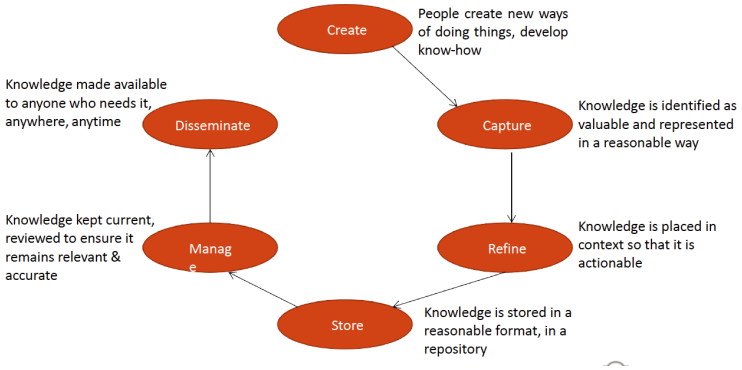
- Patents, marketing research, blueprints, designs
- How to process a job application as documented in an HR manual

What is Tacit Knowledge?

It is knowledge contained in people's head. Experiences, insights, expertise, know-how etc.

Creating value from knowledge:





What is Knowledge Management Systems?

Organizations use Information Systems to manage their knowledge in an efficient and effective way. These Information Systems are referred to as KMS

Week 4 – E-Business and E-Commerce

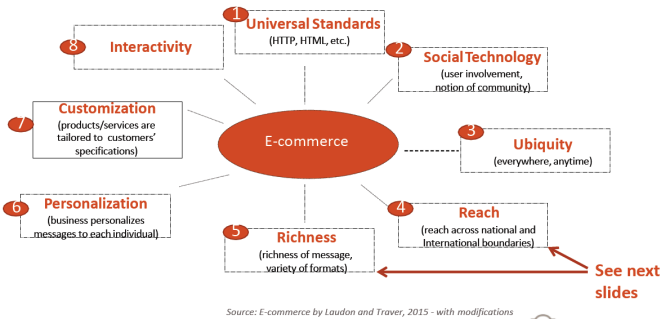
What is E-Commerce?

The process of buying, selling, transferring or exchanging products, services or information via computer networks, including the Internet.

What is E-Business?

In addition to the buying and selling goods and services, e-business involves serving customers, collaborating with business partners and performing electronic transactions within an organization.

E-Commerce Features

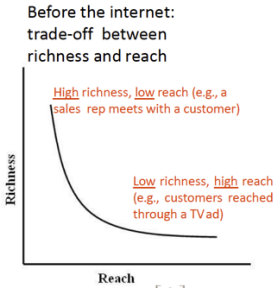


1. Richness

The depth and breadth of details contained in information, regardless of the format. The complexity of the message.

2. Reach

The number of possible recipients of the information.



Types of E-Commerce

Classification based on who is involved:

1. B2C → Business is selling to consumers
2. B2B → Business selling to businesses; represents the highest e-commerce volume
3. C2C → Consumers selling to consumers
4. C2B → Consumer indicates a need; business compete to fulfill it
5. B2E → (Business to Employee) Organization uses e-commerce to provide information and services to its employees. (Online training for employees, employees managing benefits online)
6. E-Government → Using the Internet and e-commerce to deliver information and services
    a. To Citizens (Government to citizens G2C)
    b. To business (Government to business G2C)

Classification based on the medium:

1. M-Commerce (mobile commerce) → The ability to purchase goods and services through a wireless Internet-Enables device.
2. L-Commerce (Location based commerce) →M-commerce transactions targeted to individuals in specific locations.

Classification based on physical/virtual presence:

1. Bricks and mortar → sells in a physical store but not online
2. Clicks and mortar → sells in a physical store and online
3. Pure play → sells only online (internet only, virtual), there is no physical store.

Service offered	Description	Examples
Content provider	Provides digital content such as news, music, videos, etc.	Netflix CNN.com
Infomediary	provides information about companies, products, etc. which is useful to consumers when considering a purchase	Tripadvisor.ca
Online marketplace	Brings together buyers and sellers of products and services	eBay.com
Portal	Central website serving as a gateway to the web	MSN.ca
Service provider	Provides online services such as file storage, email, etc.	Dropbox Gmail
Electronic retailer	Sells products online	Walmart.ca
Transaction broker	Processes online sales transactions, such as stockbrokers and travel agents	Expedia.ca Etrade.com

Revenue method	Revenue source	Examples
Advertising	Fees from advertisers in exchange for advertisements	Facebook.com
Subscription	Fees from subscribers in exchange for access to content and services	WSJ.com
Transaction fee	Fees (commissions) for enabling or executing a transaction	ebay.com etrade.com
Sales	Sales of goods or services	iTunes Gap.ca
Affiliate	Fees for business referrals (make money by referring people to other websites)	Amazon.ca

What are Electronic Auctions?

1. Forward Auction:

- Seller of an item solicits bids from potential buyers
- Buyers make bids
- The highest bidder wins the item

2. Reverse Auction

- Buyer wanted to buy a product or service
- Buyer posts a request for quotation (RFQ)
    - RFQ provides detailed info on the desired purchase
- Potential suppliers submit bids
- Everything else being equal, the lowest bid wins the auction

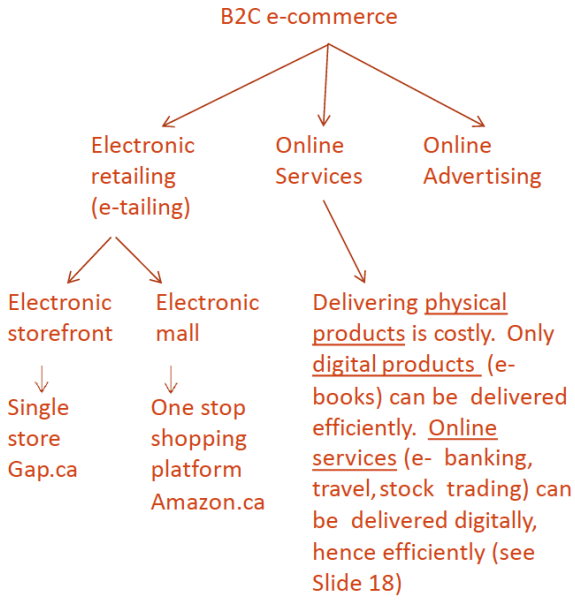
E-Payment Mechanisms

What is Electronic Check?

An electronic check, also referred to as an e-check, is a form of payment made via the Internet or another data network, designed to perform the same function as a conventional paper check. Since the check is in an electronic format, it can be processed in fewer steps.

- Stored value money card
    - Presto Card used on OCT
- Digital Wallet
    - Google/Apple Pay

B2C e-commerce



What is Online Advertising?

Online Advertising aims to build consumer relationships. These relationships are the foundation for the firm's brand. Characteristics that distinguish online from traditional advertising:

- Personalization (targeted to your interests)
- Participation (you comment on social media)
- Community (you share opinions with your community)
- One-to-one (instead of one-to-many)

Online Advertising

1. Associate (affiliate program)

- A business (or individual) signs up as an associate of Amazon
- The business (or individual) sends potential buyers to Amazon using a banner ad
- The business (or individual) receives a commission when the referred customer makes a purchase on Amazon

2. Banner ad

- Box running across a webpage that contains ads. Can be tracked (ad views, click – through)

3. Ad views

- Each time you view a webpage with a banner ad (also called impressions)

4. Click-through

- Number-of-banners-clicked/number-of-banners-viewed
- Effectiveness of banner ads
    - Less than 2% click-through rate

    - But exposure to banner ads improves brand image
    - The ability to measure their impact (which site provided the most click-through) is important

5. Video ads

- Are a small form of online advertising but are one of the fastest growing
- Users are willing to tolerate advertising in order to watch online as long as the ads are not too long and do not interfere too much with the viewing experience

B2B E-Commerce

1. Sell-Side Marketplace

- Buyer comes to the seller's website (marketplace), views catalogues, and places an order
- Uses direct sales or auctions

2. Buy-Side Marketplace

- Organizations use a procurement process to acquire goods and services
    - Procurement is more than purchasing as it involves market research, vendor evaluation and contract negotiation
    - Purchasing (ordering and receiving) is a subset of procurement
- A buy-side marketplace is used to perform the procurement process electronically

3. Electronic exchanges

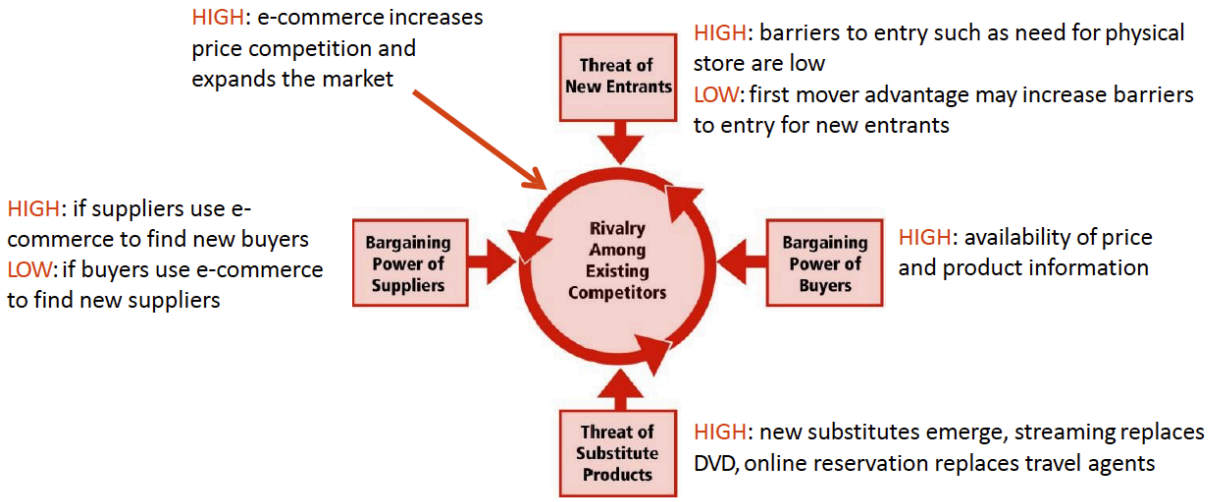
- Owned by third parties
- Connect buyers and sellers
- The equivalent of eBay for Business

Some benefits of E-Commerce

- Better Accessibility → Businesses operate 24/7
- Increased Customer Loyalty →Additional channels to contact, respond to, and access customers contribute to customer loyalty
- Improved Information Content →Website presents customers with updated information in real-time about goods, services, and prices
- Increased Convenience →E-commerce automates and improves many of the activities that make up a buying experience

- Increased Global Reach → Businesses, large and small, can reach new markets
- Decreased Cost →The cost of conducting business on the Internet is substantially smaller than traditional forms of business

Porter's 5 Forces



Week 5 – Information Ethics, Privacy and Security

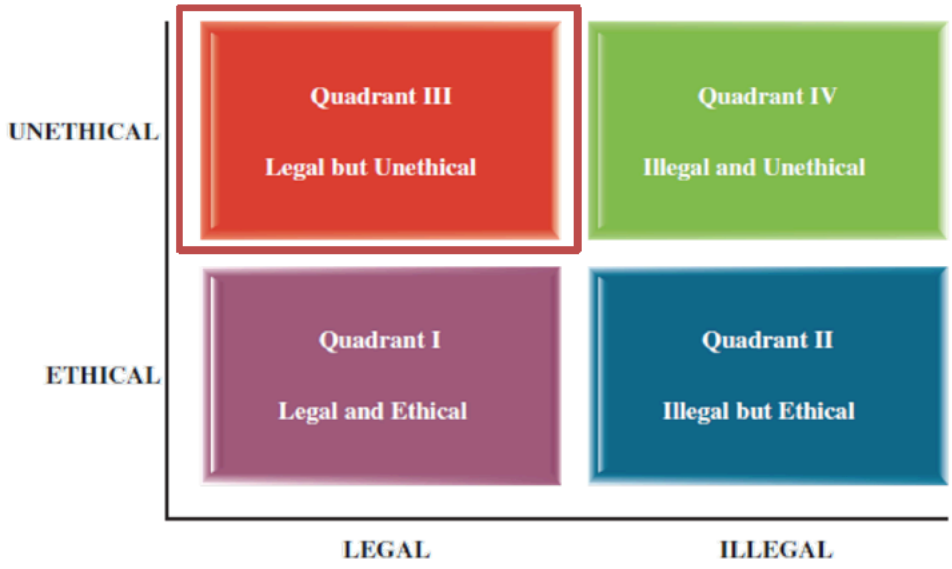
What is Ethics?

It is the principles of right and wrong that individuals use to make choices that guide their behaviour. What is ethical to one person or a group might be unethical to another person or group. Ethics (from the Ancient Greek "ethikos" meaning "theory of living") attempts to understand the nature of morality; to distinguish "right" from "wrong".

What are the Ethical Frameworks?

- Utilitarian:
  - an ethical action is the one that provides the most good or does the least harm
    - e.g., a corporation uses and promotes environmentally sustainable computing (aka green computing)
- Rights:
  - an ethical action is the one that best protects and respects the moral rights of the affected parties
    - e.g., a corporation protects the privacy of its customers
- Fairness:
  - treat all humans equally, or if unequally, then fairly
- Common Good:
  - respect and compassion for all others is the basis for ethical actions

Unethical vs. Illegal



What is a hacktivist?

A hacktivist (hacker activist) is a person who gains unauthorized access to computer files or networks in order to further social or political ends. Hacktivists believe they are doing the right thing (ethical) although hacking is illegal.

What is Information Privacy?

The right to determine when, and to what extent, information about you can be gathered and/or communicated to others.

Expectation to PIPEDA?

- The right of privacy is not absolute, it must be balanced against the needs of society.
- The public's right to know supersedes the individual's right of privacy.

Information Privacy Challenges:

- Individuals increasly release info about themselves
    - credit card purchases, video rental, magazine subscriptions, etc.
- Data storage costs are declining
    - It is cheap to maintain databases on individuals
- Computing power doubles every 18 months
    - Information processing is becoming faster
- Advances in data analysis techniques
    - More accurate profiles of individuals are created
- Advances in networking
    - Invasion of privacy can be done on a larger scale

Some negative effects of employee monitoring

- Lower job satisfaction
- Rise in employee absenteeism
- The desire of employees to do something will likely increase if they are told not to do it (psychological reactance)
- Lack of trust between employee and employer
    - If the employer does not trust tis employees, then perhaps it should find new ones

Monitoring Technologies

- Key logger
    - Program that records keystrokes and mouse clicks
- Hardware key logger
    - Device that captures keystrokes on their journey from the keyboard to the motherboard
- Cookie
    - File deposited on a hard drive by a website containing info about customers and their web activities
- Spyware
    - Program hidden in free downloadable software which tracks online movements, mines the info stored on a computer

Sometimes monitoring is required

- Organizations can be held responsible, for their employees' actions, may be liable for the risks, their employees take
- In this case, organizations must communicate with employees regarding monitoring

What is an Opt-In model?

It prohibits an organization from collecting personal info unless the user agrees to it

- The default is to assume consent is not given

What is the Opt-out model?

It permits the collection of personal info until the consumer requests that it stops

- The default is to assume consent is given

Ten Guiding Principles of PIPEDA for Organizations

PIPEDA → Personal Information Protection and Electronic Documents Act

1. Accountability
    a. An organization is responsible for personal information under its control and shall designate an individual or individuals who are accountable for the organization's compliance with the following principles.
2. Identifying Purpose
    a. The purposes for which personal information is collected shall be identified by the organization at or before the time the information is collected
3. Consent
    a. The knowledge and consent of the individual are required for collection use, or disclosure of personal information, except when inappropriate
4. Limiting Collection
    a. The collection of personal information shall be limited to that which is necessary for the purposes identified by the organization. Information shall be collected by fair and lawful means
5. Limiting Use, disclosure and retention
    a. Personal information shall not be used to disclosed for purposes other than those for which it was collected, except with the consent of the individual or as required by the law. Personal information shall be retained only as long as necessary for fulfillment of those purposes
6. Accuracy
    a. Personal information shall be as accurate, complete, and up to date as is necessary for the purposes for which it is to be used
7. Safeguards
    a. Personal information shall be protected. Y security safeguards appropriate to the sensitivity of the information

8. Openness
    a. An organization shall make readily available to individuals' specific information about its policies and practices relating to the management of personal information
9. Individual Access
    a. Upon request, an individual shall be informed of the existence, use and disclosure of his or her personal information and shall be given access to that information. An individual shall be able to challenge the accuracy and completeness of the information and have it amended as appropriate.
10. Challenging Compliance
    a. An individual shall be able to address a challenge concerning compliance with the above principles to the designated individual or individuals for the organization's compliance.

Compliance with PIPEDA is good for business

- —84% of Canadian Internet users worry about giving out personal info online
- —35% of Canadians have experienced a breach of personal info online
- —Online users are a lot more inclined to purchase a product/service on a website that has a privacy policy
- —Effective privacy would convert more online browsers into buyers

PIPEDA makes a business globally competitive

- —Canadian firms can do business with the EU, which recognizes PIPEDA as providing adequate data protection

What is Information Security?

It is the processes and policies designed to protect an organizations information and information systems (IS) from unauthorized access, used, disclosure, disruption, modification or destruction.

- **What is a Threat?**
    - A threat to information resource is any danger to which a system may be exposed
- **What is Vulnerability?**
    - It is the possibility that the system will be harmed by a threat.

- Espionage or trespass
- Information extortion
- Sabotage or vandalism
- Theft of equipment or information
- Identity theft
- Compromises to intellectual property
- Alien software
- Software attacks
- Supervisory control and data acquisition (SCADA) attacks
- Cyberterrorism and cyberwarfare

Deliberate Threats

1. Alien Software:

Clandestine Software installed on your computer without your knowledge **.**

- **Adware** → Software that causes pop-up ads to appear on your screen.
- **Spyware** → Software that collects personal information about users without their consent (It spies on them)
- **Cookie** → A small amount of information that websites store on your computer
  - It can contain login & password (so you do not have to type them again)
  - It can track your actions on particular website (what you looked at, how long you were there, etc)

2. Software attacks

- **Virus** → Computer code that performs malicious actions
- **Worm** → Like a virus but replicates and spread by itself to other computers
- **Denial of Service (DoS) attack** →
  - Flood of messages sent to a server in order to crash it
  - The intent is to deny access to legitimate users
- **Distributed denial of service (DDoS)**
  - DOS attack comes from numerous sites
  - It is harder to detect and protect against
- **Detection and response to DoS attacks**
  - Use filters to identify messages with a common characteristic (e.g., coming from the same site)
  - Place "choke points" in the system: a router can have a "limit" built into it that disallows the sudden flood of messages
  - Be Prepared: backup equipment, IT staff should prepare &rehearse for a DoS attack, etc.
  - Intrusion Detection System (IDS)

- monitors incoming network traffic and flags any communication, usually at the packet level, that does not conform to the usual patterns

Three Security Controls

1. What is Physical Control

- Prevent unauthorized individuals form gaining access to a company's facilities (gates, locks, badges, guards, alarm systems, pressure sensors, motion detectors, etc.)

2. Access Controls

- Restrict unauthorized individuals from using information resources (using authentication)

3. Communication Controls

- Aka network controls: secure the movement of data across networks (firewalls, encryption)

What is Authentication & Authorization?

Authentication → Method for confirming user identity. The most secure type of authentication involves:

1. Something the user knows such as a user ID and password
2. Something the user has such as a smart card
3. Something that is part of the user such as a fingerprint or voice signature (biometrics) – (can be costly and intrusive)

Authorization → Gives someone permission to do something.

What is Encryption?

Encryption is the science of encrypting (scrambling) a message to ensure its privacy and integrity. Useful in email, online banking transactions.

1. Single Key Encryption

2. Public Key Encryption (PKE)

- Uses 2 keys: a public key and a private key, which are mathematically related.
- Data encrypted with the public key can be decrypted only using the private key and vise-versa
- The public key is passed openly between the parties or published in a public repository, but the related private key remains private

What is Firewalls?

Hardware or software that guards a private network by analyzing data entering and leaving it. Detect machine-to-machine interaction as well as human sources transmissions.

What is Virtual Private Network (VPN)?

A VPN creates a virtual tunnel through the Internet between Points A and Busing encryption.

Types of Hackers

Hacker. Someone very knowledgeable about computers who uses his or her knowledge to invade other people's computers.

White-hat hacker. One who works at the request of the system owners to find system vulnerabilities and plug the holes.

Black-hat hacker. Someone who breaks into other people's computer systems; might just look around, or might steal and destroy information.

Hactivist. Someone who has philosophical and political reasons for breaking into systems and will often deface a website as a protest.

Script kiddies or ***script bunnies***. Someone who finds hacking code on the Internet and clicks-and-points his or her way into systems to cause damage or spread viruses.

Cracker. A hacker with criminal intent.

Cyberterrorist. Someone who seeks to cause harm to people or to destroy critical systems or information and use the Internet as a weapon of mass destruction.

Types of Malicious Software (Malware)

Virus. Software written with malicious intent to cause annoyance or damage.

Worm. A type of virus that spreads itself, not only from file to file, but also from computer to computer. The primary difference between a virus and a worm is that a virus must attach to something, such as an executable file, in order to spread. Worms do not need to attach to anything to spread and can tunnel themselves into computers.

Denial-of-service attack (DoS). Floods a website with so many requests for service that it slows down or crashes the site.

Distributed denial-of-service attack (DDoS). Attacks from multiple computers that flood a website with so many requests for service that it slows down or crashes. A common type is the Ping of Death, in which thousands of computers try to access a site at the same time, overloading it and shutting it down.

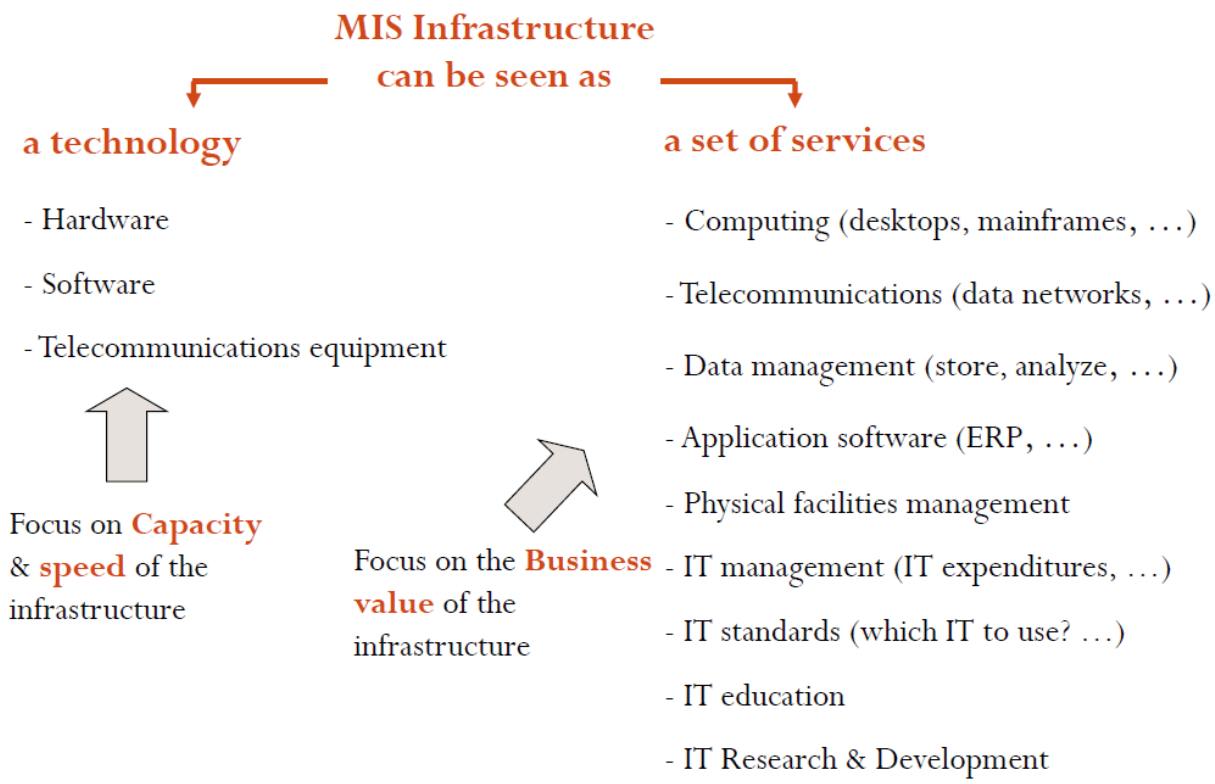
Trojan-horse virus. Hides inside other software, usually as an attachment or a downloadable file.

Backdoor programs. Viruses that open a way into a network for future attacks.

Polymorphic viruses and worms. Viruses and worms that change their form as they propagate.

Week 6: Cloud Computing

MIS Infrastructure



What is Cloud Computing?

Cloud Computing is a type of computing that delivers convenient, on-demand, pay as you go access for multiple customers to a shared pool of configurable computing resources.
Computing resources (hardware, software) accessible through the internet (the cloud).
Computing resources are offered, manages and maintained by vendors.

- Common cloud applications include, email, social media
- Users are not bound to a single computer or network and can access resources as needed
- Applications and data are stores in the cloud severs, not on the user's machines

What is On-premise Computing?

The organization uses its own IT infrastructure (software, hardware, etc.). On-premise computing means:

- Cost of buying and maintaining the IT infrastructure
- Cost of software licenses
- Cost of physical facilities where you keep the IT infrastructure
- Cost of electricity
- Salaries of IT staff

Why is Cloud Computing good?

- Users have no time to learn how to manage their IT infrastructure - they just want it to work
- Users are overwhelmed with viruses, spyware, etc.
- Users have discovered the convenience of the Software as a Service (SaaS) model such as web-based email
    - No worry about installing, upgrading, maintaining, and securing the software
- Users have grown accustomed to mobility (access data from anywhere, on any device) and collaboration
- Utilization of on-premise IT infrastructure is very low
    - Only 5 to 10 percent according to Gartner (p. 402)

Cloud Computing Characteristics

1. On demand self-service

- Provides customers with elasticity
    - Customers can increase the amount of computing they need (scale up)
    - Customers can decrease the amount of computing they need (scale down)

2. Utility Computing

- The cloud provider charges the customer for its specific usage (pay-as-you go) rather than a flat rate
- Reduces capital expense
- Reduces barriers to entry for small and medium enterprises

3. Broad network access

- Computing resources are available over the network (internet), accessed with a web browser (or an app), on any device (desktop, mobile phone, tablet, kiosk, etc)

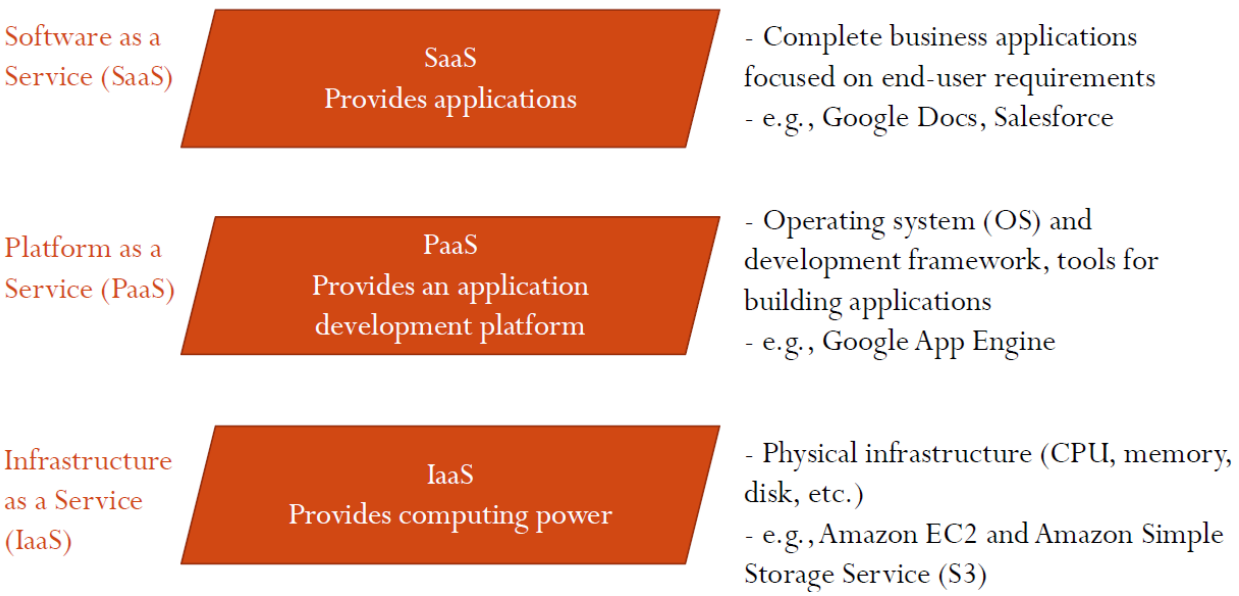
4. Shared Computing Resources

- Customer share computing resources
- The cloud providers computing resources are available to serve multiple customers. These resources are assigned and reassigned based on customer demand.

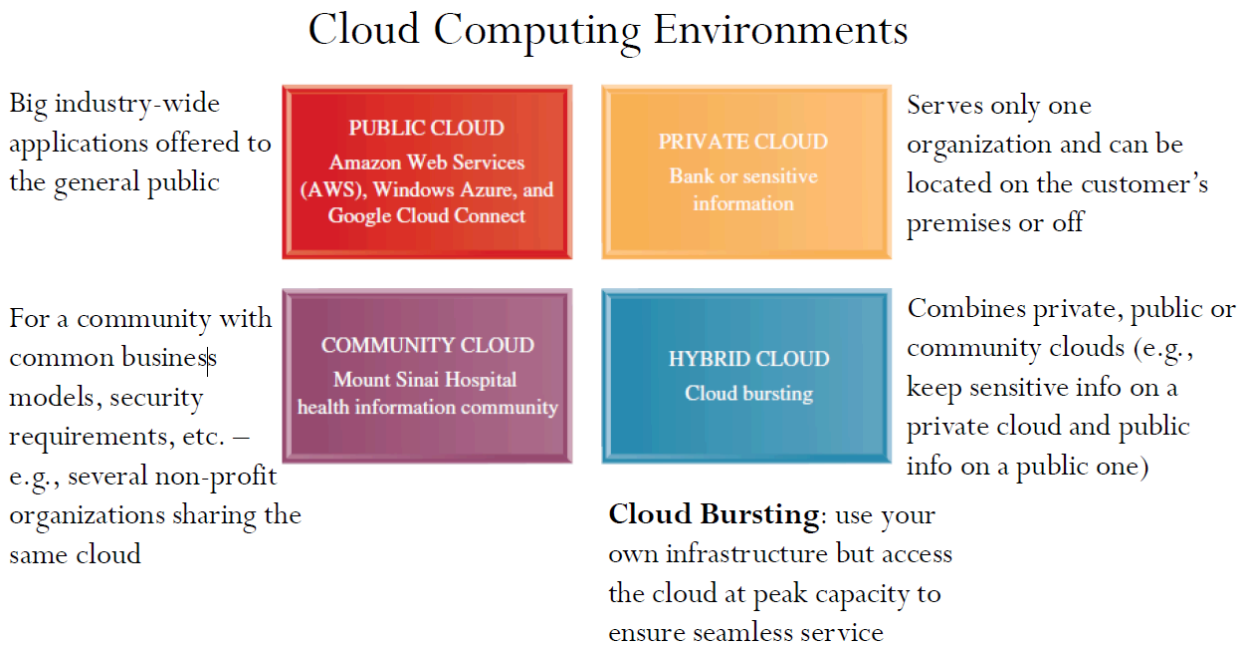
5. Server Farms

- Cloud providers own hundred (or thousands) of servers in what is called server farms
- Sever farms require massive amount of electrical power, cooling, backup generators and security
- Sever farms need to be located not far fiber optic communication links
- **What is Free Cooling Technology**
    - Uses cold air from outside to cool off server rooms

Cloud Computing Services (Delivery Models)



Cloud Computing Types of Clouds (Deployment Options)



What is Grid Computing?

Connects remote computers to create a "virtual" supercomputer by combining the unused power of all computers on the grid.

- Uses the Internet to connect computers to the grid
- Is used for applications that require heavy computing (modeling, simulations, forecasting,)

What is Grid Software?

Controls & allocates resources on the grid, divides the program into smaller tasks.

Grid Computing Business Benefits

- Optimizes computing and data resources
    - Pools resources for large capacity workloads
    - Shares resources across the network
    - Enables collaboration
- Open Standards allow for communication across
- Builds flexible architectures
- Leverages capital investment

Week 7 – Customer Relationship Management (CRM)

What is Customer Relationship Management (CRM)?

CRM is a customer focused and customer driven organization strategy (it is not just about software)

- Enables personal marketing where businesses market to each customer individually
- Enables customer intimacy where businesses offer individualized products/services to customers
- Manages customer relationships by helping businesses acquire new customers, retain existing customer, grow relationship with existing customers

What is Collaborative CRM?

Integrates communications between the organization and its customers in all aspects of marketing, sales, and service.

What is Cross Selling?

Aims to sell additional related products to customers based on a previous purchase.

What is Up-Selling?

Aims to increase the value of the sale by moving purchases to premium levels increasing volume, etc.

What is Bundling?

Form of cross selling. Selling group of products or services together at a price lower than their combined individual prices.

Organizations find their most valuable customers through RFM

- Recency → How recently has a customer purchased items?
- Frequency → How frequency does a customer purchase items?
- Monetary → How much does a customer spend on each purchase occasion?
- RFM – Spells Customer Value → At one time the data from each component was added or multiplied together. Today more sophisticated algorithms are used to extract patterns of behavior that indicate loyalty and profitability.

CRM Process

1. The organization solicits prospects from a target population of potential customers
2. Some prospects purchase and become customers
3. The organization segments repeat customer into low and high-value repeat customers
4. Some customers are lost over time (churn)
5. Goal → Use CRM to maximize the number of high-value repeat customers and minimize churn.

What is Customer Touch Points?

Different ways an organization interacts with customers.

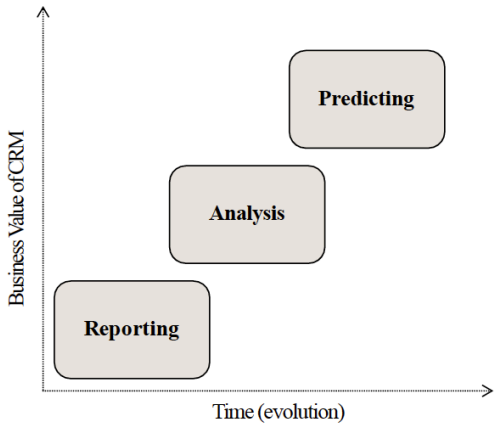
What is Data Consolidation?

All customer data must be acceptable to every unit or employee who interacts with customers.

- 360-Degree View of the customer

The Evolution of CRM

1. Reporting → Identifying most valuable customers
2. Analyzing → Raking customers from best to worst. Profiling, determining attributed of each customer segment
3. Predicting → Applying profiles to potential business opportunities. Selecting customers with highest probability of profitability & retention.

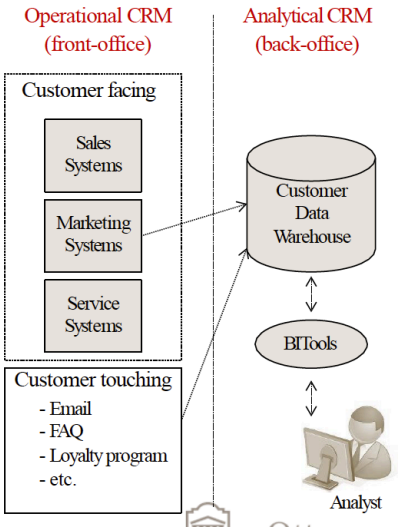


What is Operational CRM?

- Supports traditional TPS for day-to-day front office operations & system
- Deals directly with customers
- Automates call centers, marketing campaigns and sales processes.

What is Analytical CRM?

- Supports back-office operations and analysis and systems
- Does not deal directly with customers
- Digs into historical customer data and exposes patterns of behavior on which decision makers can act.
- Provide business intelligence (BI) tools to analyze customer data.



What is Customer-Facing CRM systems?

Used by an organization's employees to interact directly with customers.

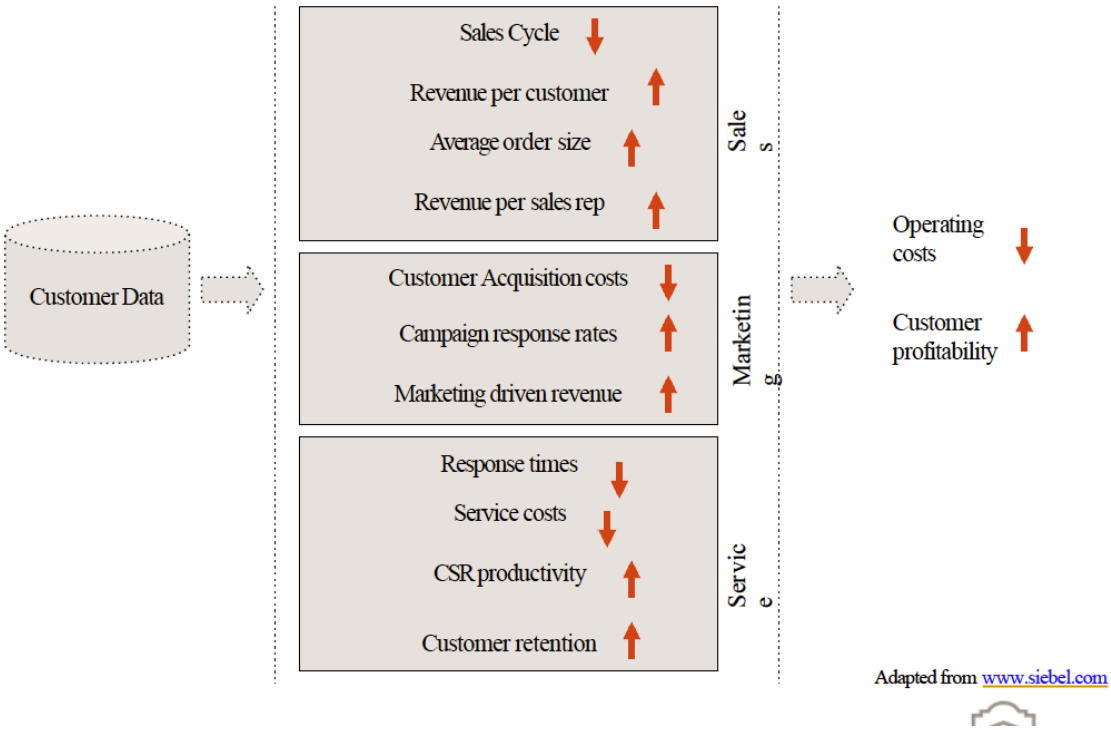
1. Sales Systems → They manage all the steps in a sales transaction
2. Marketing Systems → They enable marketers to identify and target their best customers, manage marketing campaigns, generate quality leads for the sales teams, etc.
3. Service Systems → They automate service requests, complaints, product returns, and request for information, etc.

What is Customer-Touching CRM systems?

Customers interact directly with technologies and applications (email, FAQ, Loyalty Programs, etc.)

CRM Best practices

- Clearly communicate the CRM strategy→ ensure that all employees understand what CRM means and how it adds value to the organization
- Define information needs and flows → understand the different ways information flows into and out of the organization
- Build an integrated view of the customer → even though customer data can reside in separate systems within the organization
- Implement in iterations → avoid the "big-bang" approach and implement in small and manageable pieces
- Scalability for organizational growth → ensure the CRM system can support the organization's future growth.



Adapted from www.siebel.com

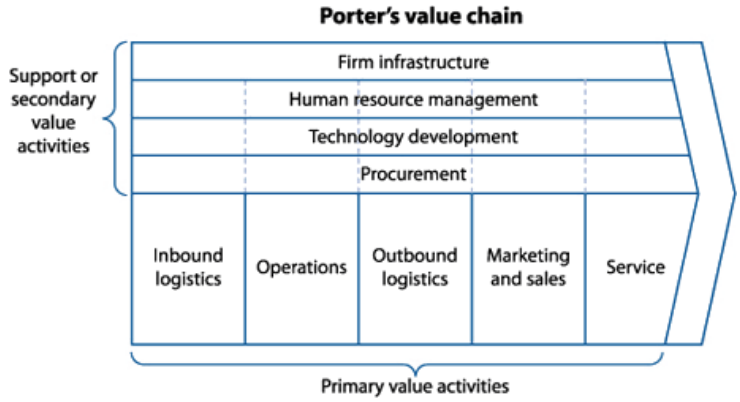
Week 8 – Management Information Systems

What is Value Chain?

It is a sequence of activities through which the organization's inputs, whatever they are, are transformed into more valuable outputs, whatever they are.

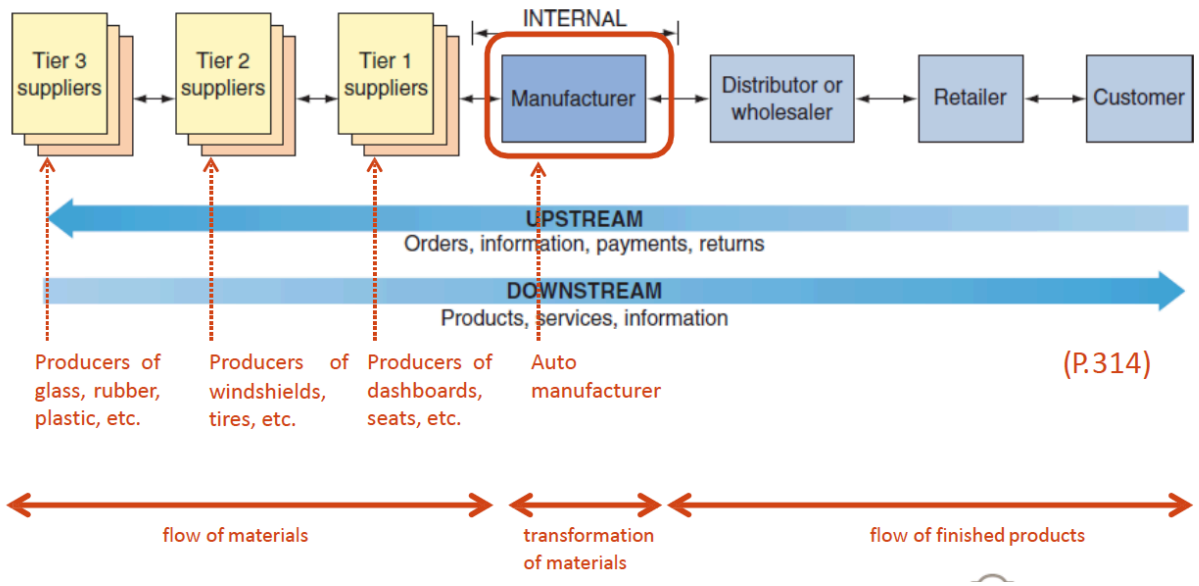
Porter's Value Chain Model

- **The Primary Activities**
  - Relate to the production and distribution of the firm's products and services. These activities create value for which customers are willing to pay.
- **The Secondary Activities**
  - Do not add value directly to the firm's products and services, they support primary activities.



What is Supply Chain?

Flow of materials, information, money and services from raw material suppliers, through factories and warehouses, to the end customers.



What is Supply Chain Visibility?

The ability for all organizations within a supply chain to access or view relevant data on purchased materials as these materials move through their suppliers' production processes and transportation networks to their receiving docks.

- The Visibility is enhanced by technologies such as RFID tags (more on this later) GPS, which provide real time information on products moving through the supply chain.
    - Shipping containers, trucks and products report on their own status without human intervention.

What is the Supply Chain (SC)?

Set of business processes that allow suppliers, manufacturers, distributors and retailers to function as "one virtual organization" to deliver products to consumers.

- The SC Partners create value for themselves and for their customers.

What is Supply Chain Management (SCM)?

Management of information flows within a supply chain in order to maximize total supply effectiveness and profitability. A supply chain is a complex web of suppliers, assemblers, logistic firms, sales and marketing channels and other business partners linked primarily through information networks and contractual relationships.

- **What is Information Flows?**
    - Information flows are handled by SCM systems which are a type of Inter-organizational Information Systems (IOS).
    - Information Flows between organizations
    - SCM systems provide visibility into the supply chain
- **What is Total?**
    - All supply chain partners should be involved; all should benefit.

The Basic Components of SCM

1. Plan (Strategic)

- design a strategy for managing the resources that go into a product or service
- develop metrics (measurable deliverables) to monitor SC efficiency & effectiveness

2. Source (create contracts, info links)

- choose suppliers that will deliver the goods and services required for making products
- develop pricing, delivery, and payment processes with suppliers and develop metrics for monitoring and improving the relationships

3. Make (manufacture)

- schedule the activities necessary for production, testing, packaging, and preparing for delivery
- develop metrics for measuring quality levels, production output, and worker productivity

4. Deliver

- Receive orders, fulfill orders via a network of warehouses, pick transportation companies to deliver the products, and implement a billing and invoicing system to facilitate payments

5. Return

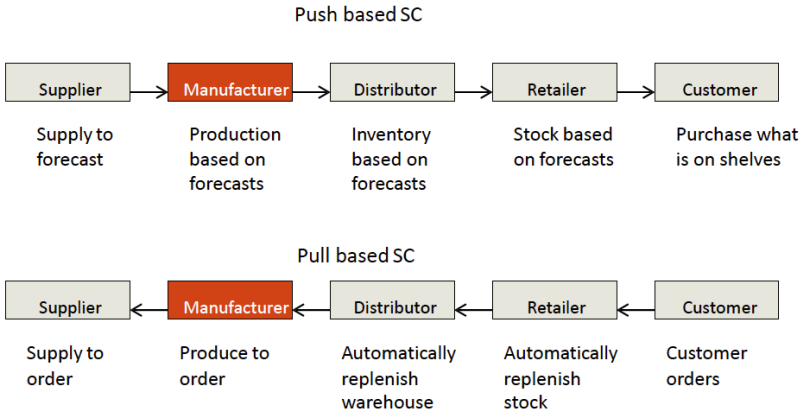
- Create a network for receiving defective and excess products and support customers who have problems with delivered products

What is the Push-Model (make to stock)

- Production begins with a forecast which is an educated guess of demand (what products do customers want? In what quantities?)
- Suppliers produce goods based on their efficiencies and push them to consumers
- Requires inventory (raw materials and finished goods) to be held at various stages of the supply chain
- The push model was effective in the early days of manufacturing, as a way to drive unit costs down (technique used by Henry Ford)
- Works best for standardized products in markets where there is high demand

What is the Pull-Model (make-to-order)

- Production begins with a customer order, so companies make only what customers want, a process closely aligned with mass customization
- The customer drives the process, and information flows mainly upstream
- Production determined by the needs of customers

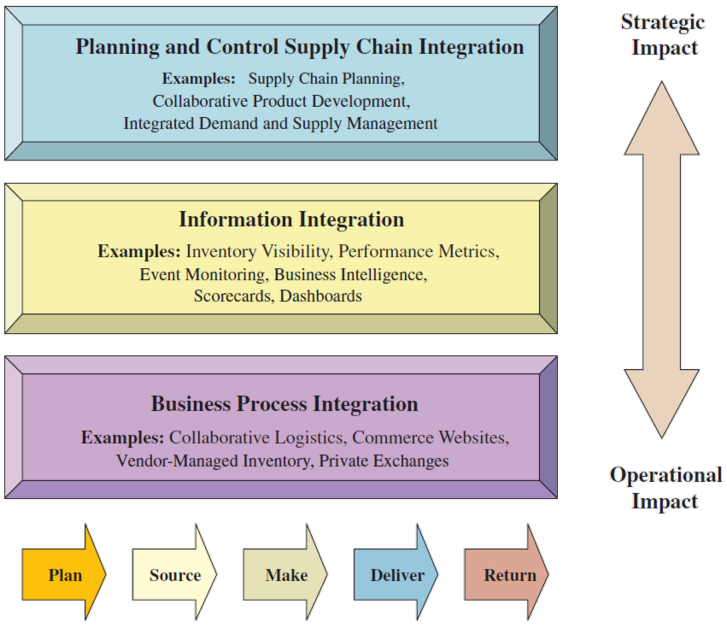


The difference between the 2 models is summarized by the slogan in a pull-based SC "we make what we sell, not sell what we make"

What is the Bullwhip Effect?

- Supply chain uncertainties can be due to incorrect demand forecast for a product
- If an incorrect forecast is passed along the supply chain then it can create a bullwhip effect
    - An incorrect demand forecast leads a supply chain partner to carry a "safety stock"
    - As we move upstream, the "safety stock" gets bigger, magnifying the issue, hence the "Bullwhip Effect"
    - This results in an inefficient supply chain

IS Role in the Supply Chain: An Integrated Supply Chain



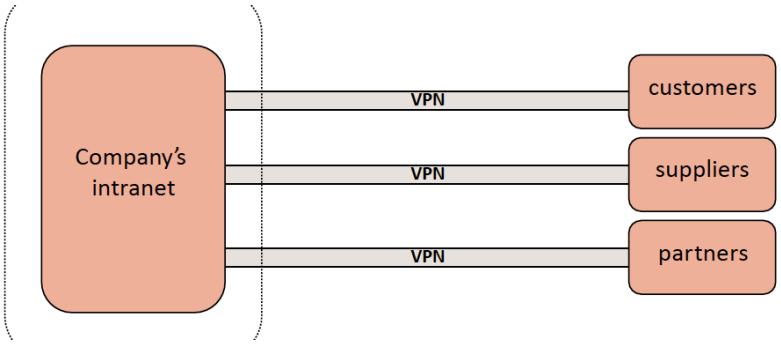
What us Electronic Data Interchange (EDI)

It is a communication standard that enables business partners to exchange routine documents electronically. The benefits include:

- Minimize data entry errors
- Shorter messages
- Messages are secured
- Reduces cycle time
- Increases Productivity
- Enhances customer service
- Minimizes paper usage and storage

What is Extranet?

An extranet allows external business partners to enter the corporate intranet, via the Internet, to access data, place orders, check the status of those orders, communicate and collaborate. Extranets use VPN technology to make communication over the Internet more secure.



What is RFID (RadioFrequency IDentification)

The emergence of cost-effective RFID chips is an opportunity for SCM.

- RFID readers detect and decode info contained in RFID tags using radiofrequencies.

Advantages of RFID

- Unlike barcode technology, RFID tags need not be directly in contact with RFID readers
- RFID tags are embedded in the products they are to identify
- RFID tags can contain significant amounts of info (when the product was manufactured, where, expiration data, etc. all machine readable.

SCM best practices cooperation

- Contrary to other information systems (ERP, CRM), the success of SCM depends of the cooperation of partner companies.
- Big firms can insist on cooperation as a condition of doing business with them.

What SCM partners must do?

1. Realignment?

Show commitment to the partnership by adjusting your processes.

2. Performance measurements

Define responsibilities and goals in the partnership & establish performance measurements (clear and agreed upon metrics)

3. Dispute resolution

Clarify and document all aspects of the partnership to avoid conflicts.

4. Security

Establish policies to ensure security and confidentiality of the data exchanged between the partners.

SCM Metrics

- SCM metrics should cover all areas of the SC
- All SC partners need to use SCM metrics to monitor their performance
- Examples
    - Back order (unsatisfied order): demand against an item whose current stock level is insufficient to satisfy demand
    - Inventory replenishment cycle time: manufacturing cycle time plus time to deploy the product to the appropriate distribution channel

Week 9 – Enterprise Resource Planning

What is Functional Area Information Systems (FAIS)?

It provides support for the various functional areas (Production, HR, Finance & Accounting) in an organization by increasing each area's internal efficiency and effectiveness.

- Pros: FAIS provide automation and decision support in all areas of the organization
- Cons: Historically, FAIS were developed independent of one another, resulting in Silos
    - Silo → Lack of integration between FAIS → Inefficiencies.

Origins of ERP:

1. Material Requirement Planning MRP (1960s)

- Computing resources applied to manufacturing problems (to inventory control, then to production schedules)

2. MRP-II (Manufacturing Requirement Planning) (1980s)

- Was introduced to encompass the entire factory production process

3. SAP (1980s)

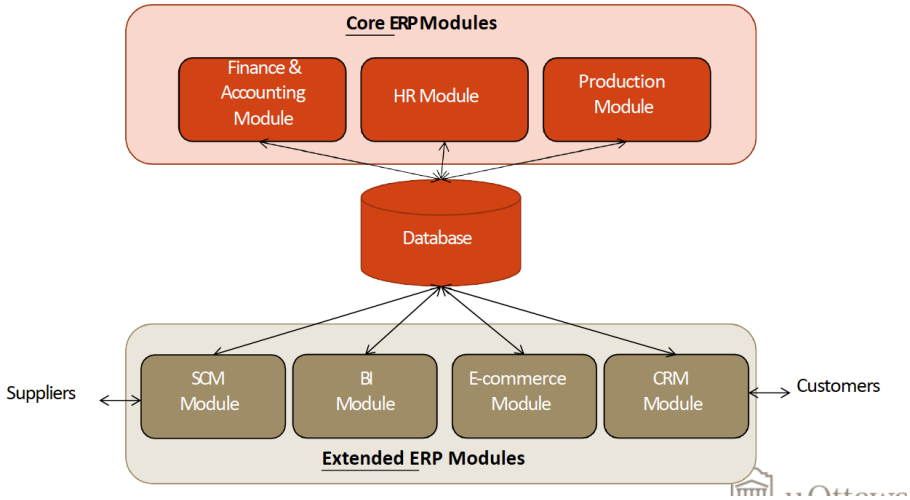
- Began seeking integration of manufacturing processes with other functional areas such as HR, engineering and project management.
    - Enterprise Resource Planning (ERP), also known as Enterprise Systems (ES)

What is Enterprise Resource Planning (ERP)?

- It is integrating the planning, management and use of all organizational resources, employing a common platform and database.
- Employees can make decisions by viewing enterprise-wide data
- ERP enables the seamless flow of information across functional areas
- ERP "attempts to integrate all departments and functions across a company to create a single software that runs off one database.
- ERP is a modular, integrated software application that spans (all) organizational functions and relies on one database at the core
- An ERP system deals with internal processes
- An ERP system is used for planning and controlling the resources (human, financial material) of the organization
- An ERP system is used at the operational (TPS) and decision-making (DSS, EIS) levels.

The New Generation

The new generation ERP systems are accessible by customers, suppliers and other partners through web-enabled links (through VPN)



ERP Modules Finance and Accounting

A finance & accounting ERP module manages accounting data and financial processes within the enterprise with functions such as general ledger, accounts payable, accounts receivable, budgeting and asset management.

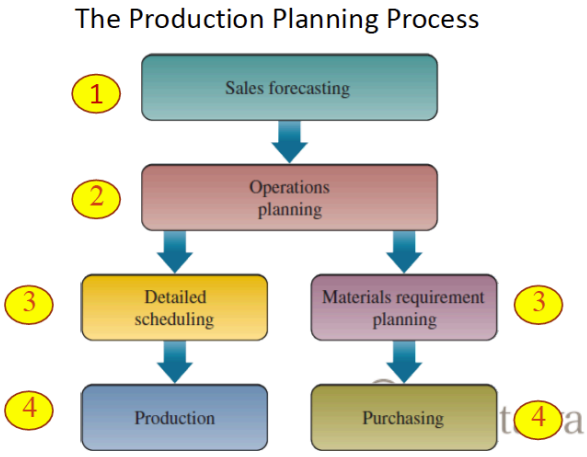
Features Include:

- Credit management → set limits on how much a customer can owe at any time (TPS level)
- Product profitability analysis (DSS, EIS level)

ERP Modules Production

A production & materials management ERP module handles production planning and execution such as demand forecasting, production scheduling, job cost accounting and quality control.

Production Planning Process



ERP Modules Human Resources

A human resources ERP module tracks employee information including payroll, benefits, compensation, performance assessment and assumes compliance with the legal requirements for multiple jurisdictions and tax authorities.

- Also supports analysis as productivity assessment, salary trends, health and safety metrics

ERP Benefits

1. Flexibility and Agility

- ERP breaks down silos
  - ERP makes organization more flexible, agile, adaptive
  - Organizations can respond quickly to change → Capitalize on opportunities

2. Decision Support

- Organization-wide (as opposed to area-wide) information enables managers to make better decision faster.

3. Quality & Efficiency

ERP Improves processes by making them more efficient and effective.

ERP Limitations

ERP systems are built based on "best practices" developed by vendors.

- ERP best practices are the "most successful way to execute a business process using an ERP system"
- Companies may have to change their existing processes to fit the best practices of the ERP system
  - e.g., in order to use an ERP HR Module, you might have to change the way you hire employees, or the way you pay them, etc.
- If your processes are important to you (the bring you competitive advantage), then adopting best practices represents a limitation

1. Costs and Risks of Implementing ERP

- If ERP implementation fails, it means losses in revenue
- Some reasons for ERP failure
  - Failure to involve employees who will be affected by the ERP system insufficient training
  - Poor conversion of data from old system to new system
  - Poor testing
  - Trying to accomplish too much too fast in the conversion process
- There are different ways to implement an ERP system
  - On-premise implementation (in-house)
    - Vanilla approach
    - Custom approach
    - Best of breed approach

Implementing ERP

1. Vanilla Approach

- Implement a standard ERP package with minimal (or no) customization

2. Custom Approach

- Customize the ERP system by developing new functions designed specifically for the organization:
  - Customization is costly and risky
  - ERP Software is complex & hard/expensive to modify
  - Modifying ERP software might degrade its performance
  - The bigger the gap between processes and best practices, the greater the effort, cost and risk of ERP failure
  - Customization will have to be done for every new version released by the ERP vendor.

3. Best of bred Approach

- This approach combines the 2 previous ones
- Mix and match ERP modules form different ERP vendors to best fit the unique processes of the organization
  - E.g., buy a Financial Module and HR Module from an established ERP vendor to take advantage of the best practices, and buy a specialized & customized module for Production

4. SaaS

- Rent the system from an ERP vendor who offers it over the Internet using the SaaS model (similar to Vanilla Approach in terms of required changes)
- Vendor is responsible for the management, maintenance and security of the system
- Relationship between the organization (client) and the ERP vendor is regulated by contracts and Service Level Agreements (SLAs)
- Advantages
  - Anywhere, anytime use
  - Lower initial costs of hardware and software
  - Scalable: pay for only what you use
- Disadvantages
  - Security issues associated with internet-based computing
  - Using the vanilla approach potentially reduces competitive advantage
  - Usage problems if the Internet is not available or capacity problems arise with the service provider

What is Enterprise Application Integration (EAI)?

EAI integrates information systems by providing software called middleware that connects multiple applications.

ERP and Integration

Traditionally, integration of separate applications was done using point-to-point connections called interfaces

- Not good if high number of interfaces
    - 3 systems, 3 interfaces; 5 systems, 10 interfaces; n systems, n(n-1)/2 interfaces
    - Change in one system (e.g., upgrade) -> all interfaces that connect to it must be modified
- Nowadays, integration of separate applications is done using Middleware
    - Applications talk to the middleware, not to one another

Week 10 – Wireless, Mobile Computing and Mobile Commerce

What is Wrieless Devices?

A wireless device provides three major advantages to user:

- Small enough to easily carry or wear
- Have sufficient computing power to perform productive tasks
- Can communicate wirelessly with the Internet and other devices

What is dematerialization?

This means that functions of many devices are included in one physical device, so some of the devices may "disappear" or become obsolete.

Wireless Transmission Media

Wireless media, or broadcast media, transmit signals without wires.

The major types of wireless media are

1. Microwave → Using electromagnetic waves

2. Satellite → Requires communication satellite

- They can be GEO (geostationary), MEO (medium-earth-orbit) or LEO (low-earth-orbit)
- Satellites facilitate GIS (Geographic Information Systems) and Internet over Satellite, which in some places is the only way to access the Internet

3. Radio →Uses radio waves

TABLE 8.1 Advantages and Disadvantages of Wireless Media

CHANNEL	ADVANTAGES	DISADVANTAGES
Microwave	High bandwidth Relatively inexpensive	Must have unobstructed line of sight Susceptible to environmental interference
Satellite	High bandwidth Large coverage area	Expensive Must have unobstructed line of sight Signals experience propagation delay Must use encryption for security
Radio	High bandwidth Signals pass through walls Inexpensive and easy to install	Creates electrical interference problems Susceptible to snooping unless encrypted

Wireless Transmission Media GPS

The global positioning system (GPS) is a wireless system that uses satellites to enable users to determine their position anywhere on the earth

- Supported by 24 MEO satellites that are shared worldwide
- The exact position of each satellite is known because the satellite continuously broadcasts its position along with a time signal
- Three satellites (for two-dimensional location) or four satellites (for three-dimensional location) can find the location of any receiving station or user within a range of three metres
- GPS software can convert the user's latitude and longitude to an electronic map

Wireless Computer Networks

- Short range wireless networks
    - Bluetooth, Ultra-Wideband, Near-Field Communications
- Medium range wireless networks
    - Wireless Fidelity (Wi-Fi),Wi-Fi Direct, MiFi, Super Wi-Fi
- Wide area wireless networks
    - Cellular radio, wireless broadband (WiMAX)

What is Bluetooth?

It is an industry specification used to create small personal area.

- Bluetooth 1.0 can link up to eight devices within a 10-metre area with a bandwidth of 700 Kbps (kilobits per second) using low-power, radio-based communication
- Bluetooth 4.0 can transmit up to 25 Mbps (megabits per second) and at greater power, up to 100 metres.

What is Ultra-Wideband?

- Ultra-wideband (UWB) is a high-bandwidth wireless technology with transmission speeds in excess of 100 Mbps
    - Example: streaming multimedia from, say, a personal computer to a television
- Ultra-wideband technology enables firefighters to detect people behind walls, or in smoke-filled environments with zero visibility

What is Near-Field Communications (NFC)?

- Near-field communications (NFC): has the smallest range of any short-range wireless network
- NFC is designed to be embedded in mobile devices such as cell phones and credit cards
- Example: swiping your device or card within a few centimetres of point-of-sale terminals to pay for items (i.e. "tap").

Medium Range

- Wireless Fidelity (or Wi-Fi): medium-range wireless local area network (WLAN), which is basically like a wired LAN, but without the cables
- In a typical configuration, a transmitter with an antenna, called a wireless access point, connects to a wired LAN or to satellite dishes that provide an Internet connection
- Wi-Fi Direct: using peer-to-peer communications enabling devices to connect with each other directly
- MiFi: a small, portable, wireless device that provides users with a permanent Wi-Fi hotspot wherever they go
    - Users are always connected to the Internet
    - The range of the MiFi device is about 10 metres
- Super Wi-Fi: a wireless network that creates long distance wireless Internet connections

Wide Area Wireless Networks

Wide area wireless networks connect users to the Internet over a geographically dispersed territory

- These networks operate over the licensed spectrum (regulated by the government)
- In contrast, Bluetooth and Wi-Fi operate over the unlicensed spectrum
- Wide area wireless networks fall within 2 categories
    - Cellular radio
    - Wireless broadband (WiMAX)

1. Cellular Radio Network

- Cellphones communicate with radio antennas (towers) placed within adjacent geographic areas called cells

2. Worldwide Interoperability for Microwave Access

Worldwide Interoperability for Microwave Access, popularly known as WiMAX:

- has a wireless access range of up to 50 kilometres, compared with 100 metres for Wi-Fi
- has a data-transfer rate of up to 75 Mbps
- is a secure system, and it offers features such as voice and video
- antennas can transmit broadband Internet connections to antennas on homes and businesses several kilometres away
- can provide long-distance broadband wireless access to rural areas and other locations that are not currently being served

What is Mobile Computing?

- Mobile computing refers to real-time, wireless connection between a mobile device and other computing environments, such as the Internet and an intranet
- Mobile computing has two major characteristics that differentiate it from other forms of computing:

- Mobility: users carry a device with them and can initiate a real- time contact with other systems wherever they happen to be
- Broad reach: users carrying an open mobile device can be reached instantly, even across great distances

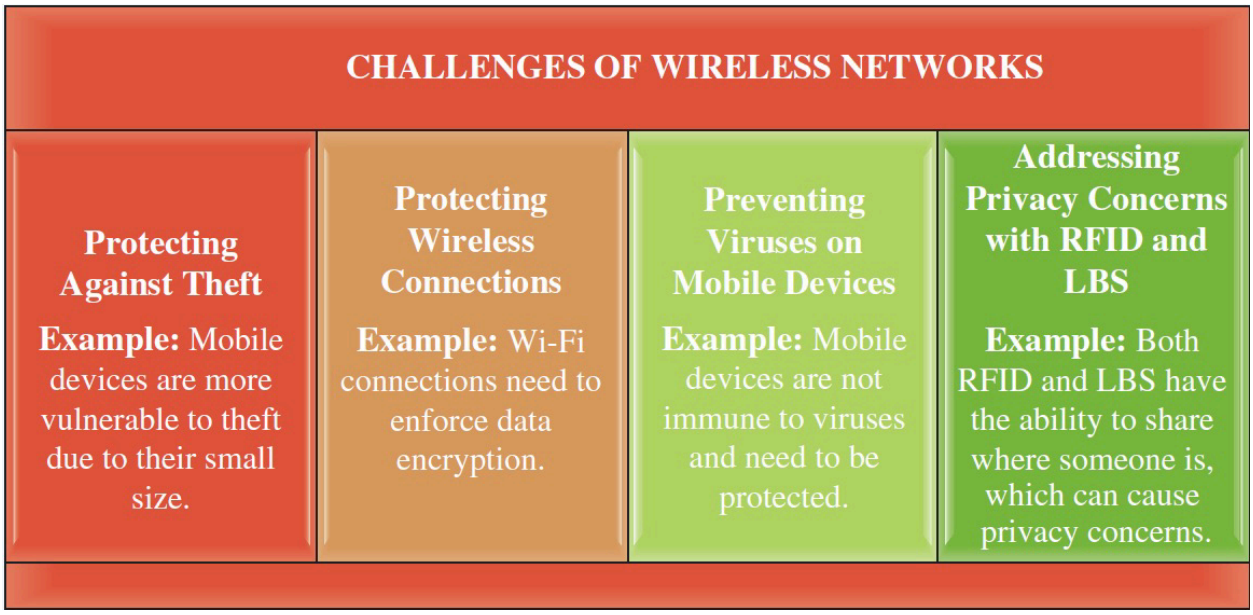
What is Mobile Commerce?

- Mobile commerce (M-commerce) and Location based commerce (L-commerce) were covered in Topic 4 (Slide 15)
- M-commerce (mobile commerce): the ability to purchase goods and services through a wireless Internet-enabled device
- L-commerce (location-based commerce): m-commerce transactions targeted to individuals in specific locations
    - e.g., the Uber app relies on the location of the drivers and users (passengers)

What is Internet of Things (LOT)?

- The Internet of Things (IoT) means that virtually every object (or "thing") has processing power with wireless or wired connections to a global network
    - Also called the Internet of Everything, the Internet of Anything, the Industrial Internet and machine-to-machine (M2M), it is a system in which any object (thing), natural or manmade, has a unique identity (a unique IP address)

Challenges of Business Mobility



Week 11 – Acquiring Information Systems

What is Systems Development?

Systems development means:

- The activities that go into producing an information system (IS) to address an organizational problem or to take advantage of an opportunity
    - Problem: e.g., customers leaving; Solution: CRM
    - Opportunity: e.g., growth; solution e-commerce, SCM

Developing IS Challenges

1. Time, Cost

- Deciding where and how to use the new IS
    - "when the wrong business process is automated, it becomes efficient at doing what it shouldn't do"
    - New IS should help an organization become more productive; otherwise it may damage productivity
- It is hard to establish the information requirements of the organization
- New IS should evolve as the organization and its business evolve

Systems Development Success/Failure

The more an organization relies on IS, the higher the consequences of IS successes and failures

- Increase or decrease revenue
    - Nike's poorly designed SCM delayed orders, increased excess inventories, and caused earnings to fall 24% below expectations
- Prevent or incur liabilities
    - FoxMeyer sued SAP for $500 million for an ERP failure
- Increase or decrease productivity
    - Defective software accounts for 45% of computer downtime and cost U.S. businesses $100 billion in 2003
- Repair or damage to brand reputation
    - Imagine how you'd feel if your bank's website goes down

Strategies for Acquiring Information Systems

1. Purchase a prewritten application

- Purchase a commercial software package from a vendor (e.g., SCM software from JDA)
- Compared to developing your own application purchasing is
    - Cost effective
    - Time saving
- BUT the organization must ensure that the software package meets its current and future requirements

Advantages	Disadvantages
• Many choices are available • Can test software before buying it • Save time • Familiar product • Eliminate need to hire specialized personnel	• May not meet needs of organization • Difficult to modify, may require changes in processes • Difficult to integrate with existing systems • May be discontinued • Controlled by another company • Buyer has no knowledge of underlying technology

2. Customize a prewritten application

- Purchase a commercial software package from a vendor and customize it
- Only possible if software is customizable
- Enables the organization to make the software fit its own processes (no need for process change)
- Difficult to do
- Customization may degrade the performance of the software
- Every new version of the software must be customized

3. Use SaaS (Software as a service)

- Offered by a cloud vendor (e.g., Salesfore.com)
- The vendor hosts the application and provides it as a service to client organizations over a network (e.g., the Internet)
- Pay-as-you-go
- No need for client organizations to install, run, and maintain the application on their own IT infrastructure
- Customer saves money, time, cost of IT staff, etc.

4. Outsourcing

- Third party company (e.g., IBM) takes care of developing, operating, an maintaining the software application for a client company
- If outsourcing outside of the country, it is called offshoring (outsourcing offshore) – e.g., offshoring to India
    - Risks of offshoring: communication issues, privacy of the data, security of the data, etc.

5. Custom Development (build)

- Organization custom builds the application itself (in-house) or by a third-party company
  - Time consuming
  - Costly
- BUT: this method produces a better fit with the organization's processes (the organization get to keep its processes, especially if they represent a competitive advantage)

Q:Which one is better?

A: It depends of many organizational factors and resources:

- Time
- Money
- Expertise
- Processes that are specific and must not be changed
- Sensitivity of the data (privacy and security considerations)
- Etc.

What is the Systems Development Life Cycle (SDLC)?

- The overall process for developing an IS from planning to implementation and maintenance
- SDLC is the foundation for many systems development methodologies such as waterfall, RAD, etc.

1. Investigation

- Investigation phase - involves establishing a high-level plan of the intended project and determining project goals
- The main task of the Investigation phase is the Feasibility Study
    - Do nothing and continue to use the existing system unchanged
    - Modify or enhance the existing system
    - Develop a new system
- The Feasibility Study provides an assessment of the project's:
    - Technical feasibility: determines whether the company can develop and/or acquire the hardware, software, and communications components needed to solve the business problem
    - Economic feasibility: determines whether the project is an acceptable financial risk and, if so, whether the organization has the necessary time and money to successfully complete the project
    - Behavioral feasibility: addresses the human (people) issues of the systems development project

2. Analysis

- Analysis phase - examine the business problem that the organization plans to solve with an IS:
- Gather information about existing system to determine requirements for the new or improved system
    - This is typically one of the hardest tasks to perform on any IS development project, one reason being that requirements continually change
- Perform a buy vs. build analysis
- Create process diagrams
- Deliverable:
    - User requirements: specific requirements that the system must satisfy
    - This is the most difficult task in systems development

3. Design

- Design phase - involves describing the desired features and operations of the system including screen layouts, business rules, process diagrams, pseudo code, and other documentation
- Deliverables: set of technical system specifications:
    - System outputs, inputs, calculations or processing, and user interfaces
    - Hardware, software, databases, telecommunications, personnel, and procedures
    - A blueprint of how these components are integrated

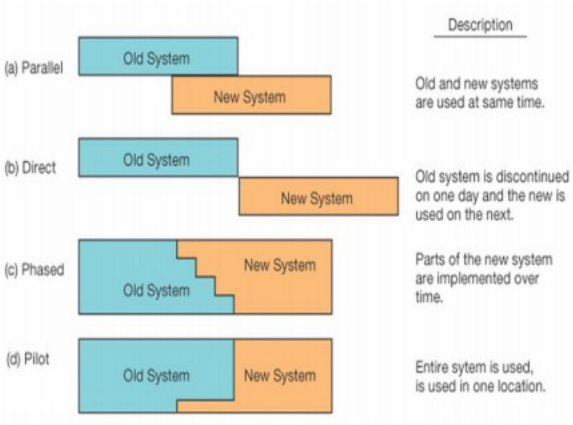
4. Programming

- Programming phase - involves taking all of the detailed design documents from the design phase and transforming them into the actual system
- IT specialists perform the majority of tasks associated with this phase

- Primary development activities include:
  - Develop the IT infrastructure
  - Develop the database and programs
- Testing phase - involves bringing all the project pieces together into a special testing environment to test for errors (bugs), and interoperability, in order to verify that the system meets all the business requirements defined in the analysis phase

5. Implementation

- Implementation phase - involves placing the system into production (going live) so users can begin to perform actual business operations with the system
- Primary implementation activities include:
  - Write detailed user documentation
  - Provide user training
  - Determine implementation/conversion strategy (see next slide)
- There are 4 main implementation methods:



6. Operation & Maintenance

- Maintenance phase - involves performing changes, corrections, additions, and upgrades to ensure the system continues to meet the business goals
- Types of maintenance
  - Adaptive - making changes to meet new business requirements
  - Corrective - repairs defective systems
  - Perfective - making changes to enhance the system (e.g., processing performance)
  - Preventive - making changes to reduce the chance of future system failures

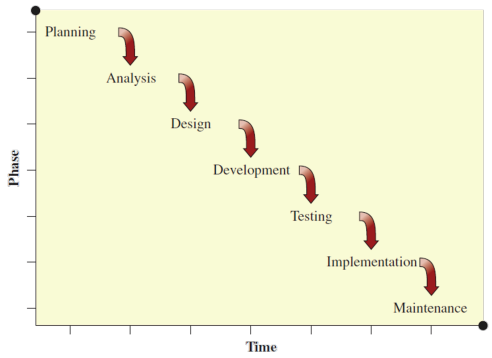
Systems Development Methods

Method: Set of policies, procedures, standards, processes, practices, tools, techniques, and tasks applied to technical and management challenges.

- Method of managing the information systems deployment
- Formal methodology can include coding standards, code libraries, development practices and much more
- Systems development methods include:
  - Waterfall
  - Agile Software Development
  - Rapid Application Development (RAD)
  - Joint Application Design (JAD)
  - End-User Development

The Traditional Waterfall Methodology

- A sequential, activity-based process in which each phase of the SDLC is performed sequentially.
- Issues with Waterfall methodology:
  - assumes users can specify
  - all requirements in advance assumes requirements do not change over time
- The success rate of software development projects that follow the waterfall methodology is only about 10%
- Failure does not mean a project is abandoned. It can mean over budget, late delivery, does not meet all requirements, etc



Agile Software Development Methodologies

1. Agile Methodology

Focus on early and continuous delivery of useful system or software components meeting bare minimum requirements.

2. Iterative Development

- The basis for Agile Methodologies
- Divide project into smaller, more manageable, shorter, more efficient, lower cost projects that achieve rapid feedback & acceptance
- Speed, size and focus account for end user satisfaction

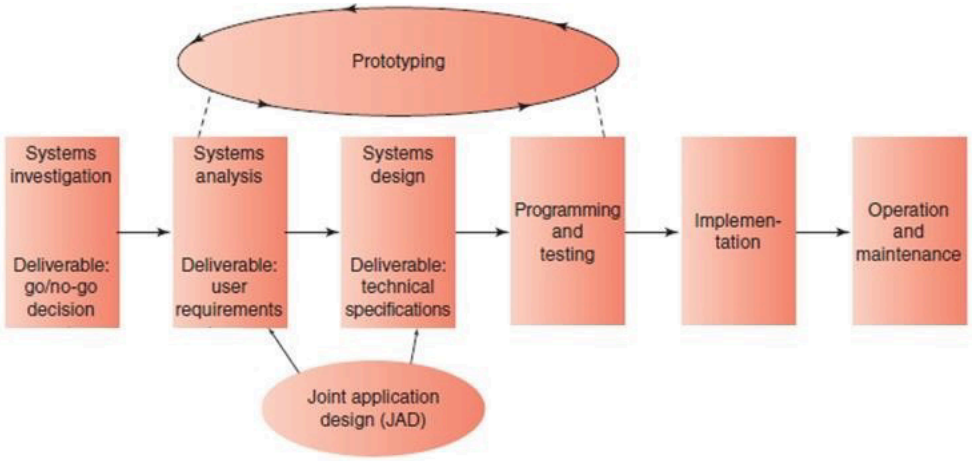
Joint Application Design (JAD)

- Focusses on the 2 SDLC phases analysis and design
- Involves group meetings of systems analysts and users (those who will use the system)
- Goal: define and agree on systems requirements
- Promotes the active involvement of end users
    - Create opportunities for mutual learning between users and designers (each has knowledge that can benefit the other)
    - Understand how users currently conduct their activities
    - Sees users as the experts
    - Why?
    - Implementing the results from the design process is likely

Rapid Application Development

Emphasizes extensive user involvement in the rapid and evolutionary construction of working prototypes that accelerate systems development.

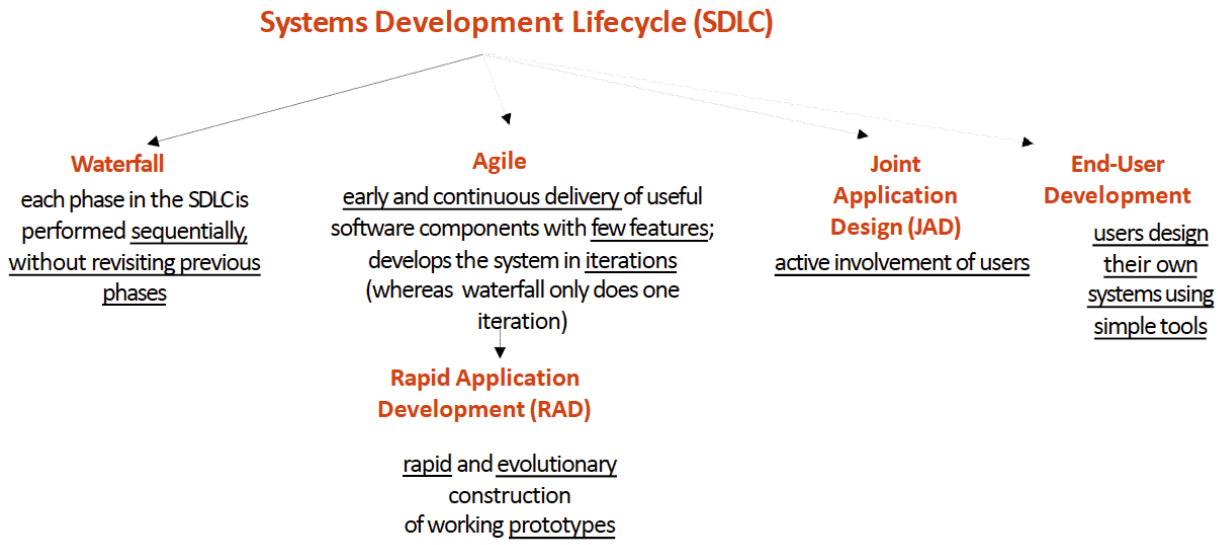
- Focus on creating a prototype that looks and acts like the desired system
- Actively involve users in the analysis, design, and development phases
- Collect the requirements through an interactive and iterative approach



End-User Development

- Development is by people who use the system
- End users build and maintain the system without much support from IT
- Ranges from simple Excel worksheet templates to complex systems including prototypes
- Advantages:
  - Meeting user requirements
  - Sense of ownership by users
  - Faster development
- Disadvantages
  - Problems due to lack of development expertise
  - Not consistent with organizational goals
  - Lack of documentation

Summary of Systems Development Methods



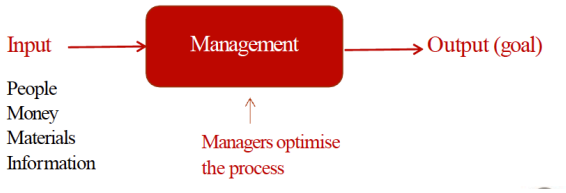
Developing Successful Systems

- Slash the budget - Small budgets force developers and users to focus on the essentials
- If it doesn't work, kill it - Bring all key stakeholders together to evaluate and assess the system
- Keep requirements to a minimum - Start each project with what the system must absolutely do
- Test and deliver frequently - As often as once a week, and not less than once a month, complete a part of the project or a piece of software
- Assign non-IT executives to software projects - Non-IT executives should coordinate with the technical project manager, test iterations to make sure they are meeting user needs, and act as liaisons between executives and IT

Week 12 – Business Intelligence and Analytics

What is Decision Making Management?

- Management is a process by which an organization achieves its goals through the use of resources (people, money, materials, and information)
    - These resources are considered to be inputs
    - Achieving the organization's goals is the output of the process



The 3 Phases of Decision Making

- A Decision is a choice among two or more alternatives that individuals and groups make
- Decision making is composed of three major phases:
    - Intelligence: examine the situation and identify and define the problem or opportunity
    - Design: build a model (an abstraction of reality) for addressing the situation; define relationships between the variables of the model; validate the model using test data
    - Choice: select a solution using evaluation criteria ; implement the solution

Decision Making is Challenging because:

- The number of alternatives is constantly increasing (e.g., online companies can offer a variety of services to different segments of the population, in various regions of the world)
- Most decisions must be made under time pressure (e.g., respond immediately to real time changes in the market)
- Decisions are becoming more complex (e.g., rely on sophisticated data analysis techniques & algorithms)
- Decision makers, as well as information, can be situated in different locations (e.g., need to bring experts together, access remote sources of information)

Types of Problems from Decision Making

- Structured decisions deal with routine and repetitive problems for which standard solutions exit
    - e.g., inventory control
    - Can be automated
- Unstructured decisions deal with complex problems for which there is no clear and agreed upon solution or procedure for arriving at the solution
    - e.g., choosing a set of R&D project for next year
    - Human intuition and judgment play a role
    - BI cannot make unstructured decisions, but can provide information that assist decision makers

The nature of decision making

- Operational: executing specific tasks efficiently and effectively
- Management: decisions concerning acquiring and using resources efficiently in accomplishing organizational goals
- Strategic: decisions concerning the long range goals and policies for growth and resource allocation

What is Business Intelligence (BI)?

Business Intelligence (BI) is a broad category of applications, technologies and processes for gathering, storing, accessing and analyzing data to help business users make better decisions

- BI: applications, technologies, and processes for "getting data in" a data warehouse or data mart and "getting data out" using BI applications (tools)
- Few BI applications: usually to satisfy a departmental need
    - Build a data mart (e.g., campaign management in marketing)
    - Make sure it is does not become a silo
- Enterprise-wide BI: infrastructure to support enterprise-wide BI (e.g., enterprise data warehouse)
    - Consolidate data from various departments
    - Present a "single face" to the customer
- Organizational transformation: BI enables the organization to transform the way it competes in the marketplace

BI Applications for data Analysis

Real-time BI: data collected in real time from sensors (e.g., temperature, humidity, etc.) or from social media (e.g., tweets) can be analyzed, and insights extracted from it in order to make better decisions

BI Applications for Data Analysis OLAP

- Users can slice and dice the cube to drill down into the information
- Cube A represents store information (the layers), product information (the rows), and promotion information (the columns)
- Cube B represents a slice of information displaying promotion II for all products at all stores
- Cube C represents a slice of information displaying promotion III for product B at store 2
- A data cube, such as sales, allows data to be modeled and viewed in multiple dimensions

BI Applications for Data Analysis: Data Mining

- Designed to find what queries and reports do not reveal
- Uses algorithms to analyze data in a data warehouse or data mart to find patterns and infer rules that can be used to guide decision making
- Examples
    - mining data about purchases in a supermarket revealed that when potato chips are purchased, soda is purchased 65% of the time
    - data mining for fraud detection triggers an alarm when you (or someone who stole your credit card) make an unusual purchase or purchase in a place you don't usually frequent
- **What is Cluster Analysis?**
    - technique used to divide info into mutually exclusive groups such that the members of each group are as close as possible to one another
    - defines groups (segments) that go together
        - e.g., CRM systems use cluster analysis to identify the best customers, online customers, etc.
- **What is Association Detection?**
    - technique used to determine the likelihood of events occurring together at a particular time or following each other
        - e.g., "55% of the time, events A and B occurred together"
        - e.g., "buying chips and soda", "buying a house then new furniture"
- **What is Statistical Analysis**
    - technique to perform such functions as information correlations, distributions, calculations, and variance analysis
    - One form of statistical analysis if forecasting: predicting future situations (e.g., "what is the likelihood that a customer switches to a competitor?

What is Market Basket Analysis (MBA)

Market basket analysis – analyzes checkout scanner information to detect customers' buying behavior and predict future behavior by identifying affinities among customers' choices of products and services

- Understanding behavior of shoppers
- Answer the question: What items are bought together
    - What's in each shopping cart/basket?

What is Decision Support Systems (DSS)

- A Decision support system (DSS): combine models and data to analyze semi- structured (and some unstructured) problems that involve extensive user involvement
- Three quantitative models used by a DSS
    - What-if analysis
        - What-if analysis checks the impact of a change in a variable on the outcome
        - "What would be the impact on the bottom line if we have a 20% increase in sales"
        - "in Excel, changing the value of a cell that is used in a formula to see the result"
    - Sensitivity analysis
        - Sensitivity analysis: interested in "what variables have the most effect on the outcome" - e.g., is the outcome more affected by age, education, or gender?
    - Goal-seeking analysis
        - Goal-seeking analysis finds the inputs (variable values) necessary to achieve an outcome
        - "how many customers are required to increase profits to $5 million"

BI Applications for presenting results

After data is processed, it can be presented to users (decision makers) in visual formats such as text, graphics, and tables

- This process is known as data visualization

BI Applications for presenting results dashboards

Dashboards are a form of EIS (executive information systems – see Topics 1 & 2) designed for the information needs of top executives (but can also be used at all hierarchic level of the enterprise)

Dashboards provide easy access to timely information and direct access to management reports, in a graphical and user-friendly manner

Dashboards enable managers to examine exception reports and to drill down into detailed data

BI Applications for presenting results dashboards

- A Digital dashboard of an Online Store:
- Shows a funnel representing conversion rates from website visits to actual sales
- Shows KPIs (key performance indicators)