



Module Notes use EXAM

Business Technology Management (Concordia University)

MODULE 1 NOTES: MIS AND YOU

What is an Information System?

- **System:** group of components that interact to achieve some purpose
- **Information system (IS):** group of components that interact to produce information
- Not all info systems require computerization
 - Public library, calendar is IS
 - Smartphone, databases, etc
- Customer Relationship Management (CRM): uses algorithms and databases to predict consumer behaviors
 - Information Systems comprise a 5 component framework of
 - Hardware
 - Software
 - Data
 - Procedures
 - People
- 5 components linked together through networks
- **Hardware:** electronic components and gadgetry that make a computer system
 - Cds and other media are not hardware
- **Software:** programs, apps that run, operate on comp systems
- **Data:** building blocks of info (facts or observations)
- **Procedures:** instructions or processes that you follow to achieve objective
- **People:** actors who want to achieve a part. Outcome

What is MIS?

- Management information systems: help orgs achieve objectives by comprising development and use of info systems
- 3 Key Elements of MIS:
 - development and use
 - info systems
 - goals/objectives

DEVELOPMENT AND USE OF INFO SYSTEMS

- You will need to know how they work because it will help facilitate things in your career like working when the system is down, not getting ripped off by software solution consultants, knowing how the system works, etc

ACHIEVING BUSINESS GOALS AND OBJECTIVES

- Information systems are found in almost every type of enterprise/industry, nonprofit or social organization, government
- Some companies only develop MIS because other companies have it → not good

- Some companies are convinced by people that they *NEED* the new update when they don't
- We need to learn how to look through the lens of **organizational need**

How does IS Differ from IT?

- They are closely related but they are different
- Information Technology (IT): methods, inventions, standards, products
 - Raw technology (hardware, software, data components and how they are networked together)
- Information System: system of hardware, software, data, procedures and people who produce information
- IT by itself does not help an org achieve its goals
 - Only when IT is embedded into an IS does it become useful
- IS includes people into the equation, and IT does not
 - This makes a big diff in how you design and implement systems

How Important are Information Systems to our Economy?

- It is becoming increasingly important to our Canadian economy
- Industry Canada → government agency tht categorizes sectors and collects information about them
 - **Information and communication technology (ICT) sector**
- This sector collected over \$162 billion in revenue in 2010
- The growth in this sector annually is about 3.8%
 - Twice as high as that of the economy
 - Accounts for 0.5% of canadas GDP growth since 2002
 - More jobs
- Most of the money comes from the service industries
- People in the software/computer services are most highly paid

How do Successful Business Professionals Use Information Systems?

- Pretty much everyone interacts with a variety of info systems every day
 - E-mail, webpages, word processors, spreadsheets, powerpoint, phones
- We should understand technology so we can identify opps for innovation
- Business professionals need to consider IT and IS when they think about problems and opportunities that confront a department or organization

What is the Shape of Things to Come?

- Moore's Law: density of circuits on an integrated chip is doubling every 2 years or so
 - Cost of comps are declining and for same amount of money, capacity has increased
- Network effect: value received increases significantly as # users increases
 - Social networking, people who have fax machines, useless if theres only 1
- Shrinking of device size → tied to moores law
 - Adoption of location based services (GPS) and existence everywhere

- *IT is all about innovation, so the future of IT is hard to predict*
- *We predict that in the future unlimited storage will be almost free*
- *Real world and virtual world will collide as WAN's become cheap, reliable and widely available*
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MODULE 2 NOTES

WHY DO YOU NEED TO KNOW ABOUT INFORMATION TECHNOLOGY?

- *True understanding of tech is understanding past and present technology*
- *You can consider how it will work in business, its + and – affects on society*

WHERE DID ALL THIS INFORMATION TECHNOLOGY STUFF COME FROM?

- *First computing devices were in 1940s*
- *First commercial comps in 1950s*
- *First PCs in 1980s*
- *Cell phones → 1990s after world wide web invented*

EARLY COMPUTERS: 1939-1952

- *Early comps financed by US military*
- *First were firing tables for ballistic missiles*
 - *Large, complex, expensive, ran one program at a time*
- *Computer bug or bug was coined when moth was caught b/w relays of calculator*
- *Comp in mobile phone in the present is 1000 times smaller and 10,000 times faster than earlier comps*

MAINFRAMES: 1952-Present

- *Large, room-sized, based on now obsolete vacuum tube technology*
- *Used by businesses and government*
- *Costs: \$200,000 to \$400,000*
- *Add or subtract 16,000 numbers per second*
- *Second gen → transistors*
- *Third gen → OS and multiprocessing capability*
 - *Cost millions of dollars*
- *Only one user can interact with it at a time*
- *Mainframes are designed for fast processing and massive storage*
 - *Will be useful for the future*

MICROCOMPUTERS: 1975-PRESENT

- *Microprocessor → early 1970s by TI and Intel*
 - *CPU and short term memory into a single chip using integrated circuits (IC)*
- *Microcomputers: developed in 1975. No screen, users had to develop programs*

- Microsoft created programming languages (BASIC) and OS's (DOS) for microcom

NETWORKING PERSONAL COMPUTERS: 1985-PRESENT

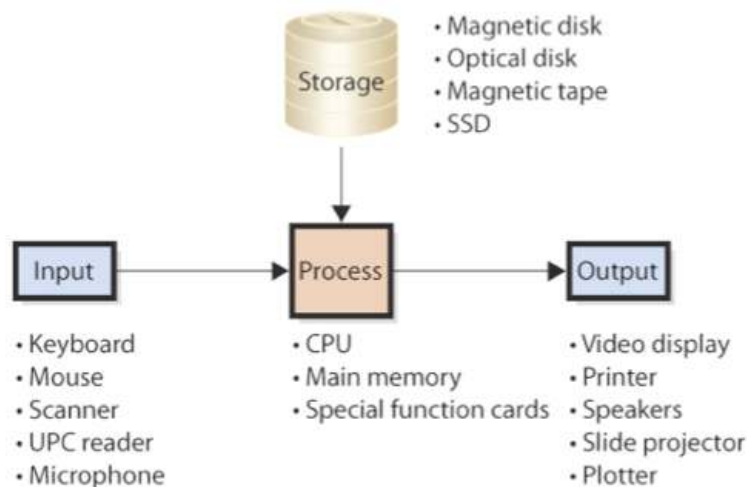
- LAN solved the lack of networking capability
- Ethernet: set of rules, protocols that allow connected devices to communicate and share info
 - Connect many PC's together
 - Shared access to data, printers, peripherals
- 1980s: WAN is made

MOBILE AND TABLET COMPUTING: LATE 1990s-PRESENT

- Dot com bubble: new internet companies funded by venture capitalists and went bankrupt
- K=1024
- Lowering of costs for cellular tech made everyone buy it

WHAT DOES A MANAGER NEED TO KNOW ABOUT COMPUTER HARDWARE?

- Hardware: physical and electronic components and related gadgetry that input, process, output, store data according to instructions encoded in computer programs or software
- Computers consist of 4 components:
 - Input (keyboard, mouse, scanner, mic, etc)
 - Processing (CPU, main memory, special function cards)
 - Output (video display, printer, speaker, plotter, projector, etc)
 - Storage (magnetic disk, optical disk, magnetic tape, SSD)



INPUT, PROCESSING, OUTPUT AND STORAGE HARDWARE

- Input devices: one of two most visible or familiar parts of the computer

- Keyboard, touchscreen, scanner
- Processing devices → CPU: central processing unit
 - Brain of the computer
 - Selects instructions, processes them, performs arithmetic comparisons, stores results of operations in memory
 - Measured in Hertz (hz) kilohertz (kHz) megahertz (mHz) gigahertz (GHz)
 - Type of CPU depends on computing that you do
 - Main memory: RAM
 - Cpu reads data/instructions from RAM and stores results of computations in the main memory
- Output hardware: more familiar or common part of a computer
 - Most physical interaction with computer user by producing/displaying desired results of a computational task/request
- Storage hardware: saves data and programs
- Special function cards: added to comps to augment each of its components

COMPUTER DATA

- Binary digits: computers represents data in binary digits, called bits
 - Either a 0 or a 1, easy to represent physically
- Switch can be open or closed
- Open switch represents 0, closed represents 1 if designed that way
- Small pits burned onto surface of disks so they reflect light
 - Reflection means 1, no reflection means 0

Sizing Computer Bytes

- Computer data represented by bits
- Bits are grouped into 8 bit chunks called bytes
- Bytes can measure sizes of non-character data as well
 - Kilobyte (k): 1024 bytes
 - MB: 1024 k
 - GB: 1024 MB
 - TB: 1024 GB

HOW DOES A COMPUTER WORK?

- CPU is a major actor
- CPU must first transfer program/data from disk to main memory
- Moves instruction from main memory into the CPU by the data channel or bus
- CPU has a small amount of very fast memory, called a cache
- Computer's main memory contains program instructions for Excel
 - Contains instructions for operating system
 - Operating system controls computers resources and data blocks
- CPU loads programs into the memory in sections
- CPU removes blocks of memories to store more memory for opened program
 - This is called memory swapping

WHY SHOULD A MANAGER CARE HOW A COMPUTER WORKS?

- *Cache and main memory are volatile → lost when power goes off*
- *USB sticks, magnetic disks, optical disks → nonvolatile*
- *Hertz: speed or number of cycles per second a computer works at*
- *Gigahertz: billion cycles per second*

WHAT IS THE DIFFERENCE BETWEEN A CLIENT AND A SERVER, AND WHAT IS CLOUD COMPUTING?

- *Client: connects to a network*
- *Servers: provide services (facebook, google, amazon, youtube) accessed by comps*
- *Server farm: server that is a large collection of comps that coordinate activities*
- *Cloud computing: hardware, software, applications provided as a service, usually through a web browser*
- *Grid computing: several comps used to address a single problem at the same time*
 - *Uses software to divide and apportion pieces of a program among several computers*

WHAT DOES A MANAGER NEED TO KNOW ABOUT SOFTWARE?

- *Software categorized into one of two varieties*
 - *Operating systems (large complicated programs to control comps resources)*
 - *Application software (programs that perform specific user tasks)*
- *Two important software constraints*
 - *Each version of OS is developed for particular type of hardware*
 - *Application programs are written to use on a particular OS*

WHAT ARE THE 4 MAJOR OPERATING SYSTEMS?

- *Windows*
 - *Business users*
 - *On more than 85% of world's desktops*
- *Mac OSX*
 - *Apple comps can run in windows*
 - *Accounts for less than 1/10 comp purchases*
 - *Selling price is much higher*
- *Unix*
 - *Developed at bell labs in the 1970s*
 - *Workhorse of the scientific and engineering communities*
 - *More diff to use than windows or mac*
 - *Arcane language for manipulating files/data*
 - *Not used by av business user*
- *Linux*
 - *Developed by **open-source community***
 - *No fee to use it, used for servers (web servers in particular)*
 - *IBM is primary proponent of Linux (no licence fee to use it)*

OWNING VERSUS LICENSING

- *What is actually purchased is a LICENCE to use that program, not program itself*
- *No one can sell you a licence to use Linux*

WHAT TYPES OF APPS EXIST AND HOW DO ORGS USE THEM

- *Application software: consists of programs that perform a business function*
 - *Excel, word, quickbooks, etc*

What Categories of Application Programs Exist?

- *Horizontal market application software: provides capabilities common across all organizations and industries*
 - *Word processors, graphics programs, spreadsheets, presentation programs*
- *Vertical market application software: serves needs of specific industry*
 - *Dental offices use a specific program*
- *One-of-a-kind application software: for specific, unique need*
 - *Canada Revenue Agency develops their own software bc of specific requirements that no other organization has*
- *CRM software is both vertical and horizontal (specific industry, unique needs)*
- *Buy computer software in the following ways:*
 - *Off the shelf*
 - *Off the shelf with alterations*
 - *Tailor made (custom developed software)*
- *Custom development for software is difficult and risky*
 - *Costs are usually higher than forecasted*
 - *Adaptation of the software to company changes over time is costly*

BROWSERS

- *Debate about whether web browsers are application software or operating SW*
- *Have chars of both*

WHAT ARE FIRMWARE AND UTILITY SOFTWARE?

- *Firmware: comp software installed into such devices as printers, print servers, various types of communication devices*
 - *Coding is similar to that of other software*
 - *Program becomes part of the devices memory*
 - *Driver software is utility software*
 - *Other examples of utility: disk optimization, data encryption, file/data recovery*
- *Basic Input/Output System (BIOS): used when comp is initially booted up*
 - *BIOS is required because all volatile memory is lost when comp shuts down*
 - *Set of instructions to get comp running again through nonvolatile ROM*
 - *First thing comp does when starting up is loads BIOS from ROM and runs commands*
 - *BIOS checks to make sure memory and input devices are functional*

- *Once these are working, OS can be loaded*

WHAT IS THE DIFF BW A THIN CLIENT AND A THICK CLIENT

- *Thin client: app that requires nothing more than a browser*
- *Thick client: app that requires programs other than a browser on comp*
 - *Microsoft outlook*
- *Thin and thick refer to amount of code needed to run on client comp*
- *Thick client doesn't need to access the network to run*
 - *Still available if internet is down*

WHAT ARE VIRUSES, WORMS AND ZOMBIES?

- *Virus: comp program that replicates itself*
 - *Virus ends up consuming comp's resources*
- *Payload: program code that causes unwanted activity*
 - *Can delete programs, data, modify data in undetectable way*
- *Macro-viruses: attach themselves to word, excel, other documents*
 - *When infected doc is opened, virus places itself in startup files of app*
 - *After that, virus infects every file that app creates/processes*
- *Worm: virus that propagates using the Internet or other comp network*
 - *Spread faster because they are programmed to spread*
 - *Worms use network to spread, instead of waiting for someone to open a file*
 - *Zombie: computers infected with the worm or virus*
 - *Botnet: set of compromised comps and apps coordinated thru a network to perform malicious tasks*
 - *In 2003, Slammer worm clogged Internet and caused Bank of America's ATM machines and information systems of hundreds of other orgs to fall*
- *Patch: fix security holes in comp programs*
- *Antivirus program*

MODULE 3: WHY SHOULD I CARE ABOUT PRODUCTIVITY AND INNOVATION?

- *In order to enhance productivity, we need innovation*
- *Productivity paradox: we see computers everywhere but in productivity statistics*
- *Question of how IT adds to productivity and creates business value is important*
- *It is hard to measure increase in productivity from IT additions*
- *How much time does it save? How much would the support it provides improve your performance?*
- *3 different ways through which value of IT can be realized*
 - *productivity (more or better output from same inputs)*
 - *structure of competition- IT can alter way corporations compete*

- *benefits to the end customer- helps make processes more efficient*
- *might create cheaper goods, for example*

WHAT IS BUSINESS TECHNOLOGY MANAGEMENT (BTM) AND HOW IS IT RELATED TO PRODUCTIVITY AND INNOVATION?

- *It is important because it includes technologies that can enhance individual and organizational productivity across many industries*
- *It is seen as an invisible industry sector because it doesn't produce direct output as other industries do*
- *The need for students with combined technology and business skills has increased the need for educational programs that combine business and tech training*
- *Unis across Canada are developing programs for BTM*

HOW DO INFORMATION SYSTEMS IMPROVE PRODUCTIVITY?

- *Increasing efficiency means that business processes can be accomplished more quickly or with fewer resources and facilities (or both)*
- *Efficiency is usually easy to measure once you have decided what measures are important*
- *Effectiveness: focus on doing the right things*

BUSINESS PROCESSES AND VALUE CHAINS

- *Value chain: network of activities that improve effectiveness (or value) of a good or service*
- *Made up of at least one and often many business processes*
- *Intermediaries add value by adding to product or adding services to product*
- *The more a company adds to a good or service in its value chain, the higher the price the company can charge for the final product*
- *Diff between price the customer is willing to pay and cost that company incurs is defined as the margin (profit margin)*
- *Raw diamonds → sold at less than finished diamonds*
- *Greater the margin → greater the profit for the company*
- *Two types of activities that support value chains*
 - *Primary activities (installing tires, manufacturing, shipping, directly adding value to product)*
 - *Support activities (maintaining machines in factories, paying workers, keep track of mechanics hours, activities that support the primary activities)*
- *Support activities only add value indirectly*
- *Increasing efficiency and effectiveness increases the profit margin*
- *Primary activities*
 - *Inbound logistics*
 - *Operations*
 - *Outbound logistics*
 - *Marketing and sales*
 - *Service*

HOW ARE ORGANIZATIONAL STRATEGY AND INDUSTRY STRUCTURE RELATED?

- *Porter's five forces model*
 - *Five forces determine industry profitability*
 - *Bargaining power of customers*
 - *Threat of substitutions*
 - *Bargaining power of suppliers*
 - *Threat of new entrants*
 - *Rivalry among existing firms*
- *The intensity of each determines the characteristics of the industry, how profitable it is, and how sustainable that profitability will be*
- *Companies may also have power over their suppliers*
- *To be successful, organizations examine the 5 forces mentioned and determine how they intend to respond to them*
- *Responds to structure of its industry by choosing a competitive strategy*
- *4 types of competitive strategies to respond with:*
 - *be a cost leader*
 - *differentiate products from those of the competition*
 - *employ the cost or differentiation strategy across an industry*
 - *focus strategy on a particular industry segment*
- *EXAMPLE: car rental company can provide lowest cost car rentals across industry, or seek to provide lowest cost car rentals to industry segment (for example, business travellers)*
- *ACCORDING TO PORTER → to be effective, org's goals, objectives, culture and activities must be consistent with the org's strategy*
- *All information systems must facilitate and be aligned with org's comp. strategy*

WHAT IS THE RELATIONSHIP BETWEEN INNOVATION AND INFORMATION TECHNOLOGY?

- *Two general types of technological innovations*
- *Sustaining technologies: changes in technology that maintain rate of improvement in customer value*
 - *Vulcanization of rubber allowed tire manufacturers to produce tires that facilitated faster and more comfortable rides*
- *Disruptive technologies: introduce a very new package of attributes to the accepted mainstream products*
 - *Advent of MP3- offered ability to store and play music, no more buying CDs*
- *In some cases, competitive advantage is so large that it leads to a new industry*
 - *Microcomputer*
- *Diffusion of innovation: process by which an innovation is communicated through certain channels over time among members of a social system*
 - *5 steps*
 - *knowledge: first hear about innovation but lack info about it*
 - *persuasion: become interested in innovation, find out more about it*

- *decision: consider pros and cons of adopting, make decision to Ac or Re*
- *implementation: use innovation and figure out whether to continue using it*
- *confirmation: use innovation to its full potential*
- *Way of thinking about process of adoption of new technology*

HOW DO INFORMATION SYSTEMS PROVIDE COPETITIVE ADVANTAGE

- *Competitive advantages can be created by products/services or development of business processes*

COMPETITIVE ADVANTAGE VIA PRODUCTS AND SERVICES

- *Gain comp advantage by*
 - *Creating new products or services*
 - *Enhancing existing products or services*
 - *Differentiating products and services from those of their competitors*

COMPETITIVE ADVANTAGE VIA BUSINESS PROCESSES

- *Orgs can retain customers by making it difficult or expensive for them to switch to another product (gym membership, phone plan)*
 - *This is referred to as adding switching costs*
- *They can lock in suppliers by making it expensive for them to switch*
- *They can create entry barriers that make it difficult and expensive for new competition to enter the market*
- *They can establish alliances with other organizations*
 - *This can create standards, promote product awareness and needs, develop market size, reduce purchasing costs, provide other benefits*

CAN COMPETITIVE ADVANTAGE THROUGH INFO SYSTEMS BE SUSTAINED?

- *Can the advantages be sustained?*
- *Usually other companies copy companies' information system innovations*
- *Technologies become like commodities after a while when everyone adopts them*
- *However, the same IT installed in diff organizations may have a diff outcome*
 - *Companies need diff IT's depending on their structure*
- *Long term competitive advantage lies not with technology but rather in how a company and its people adopt the technology*
- **Sustained competitive advantage:** *requires companies to find a distinctive way to compete, will change over time*
 - *Comes from developing people and procedures that are well supported by the underlying technology*

MODULE 4: USING IS TO IMPROVE PROCESSES

- *Hundreds/thousands of processes bring you a bagel in the morning*

- *All business activity comes about through the interaction of business processes*

WHAT ARE THE FUNDAMENTAL TYPES OF PROCESSES IN ORGANIZATIONS?

- *Business process: sequence of activities for accomplishing a function*
- *Activity: task within a business process*
- *Resources: items, such as people, comps, data necessary to accomplish activity*
- *Actors: resources who are either humans or comps*
- *Role: activities in a business process that is performed by actor*

Examples of Processes

- *To fulfill a pizza order:*
 - *Order*
 - *Assemble*
 - *Bake*
 - *Package*
 - *Deliver*
- *IS can be used to improve processes*
 - *Both sequential processes and independent processes*
 - *Ex: facebook to do events, turbotax to do taxes*

Scope of Processes

- *Landscape of business processes*
 - *3 categories*
 - *strategic: broad scope, organizational issues (more people)*
 - *managerial: allocation and use of resources (mix of ppl and comps)*
 - *Operational: common, routine, day to day (more comps than other processes)*

Scope	Characteristics	Mix of Actors	Frequency	Examples	IS Supporting This Type of Process
Strategic	Broad-scope, organizational issues	More people than other processes	Low	Decide on new restaurant location, corporate budgeting	Executive support system (ESS)
Managerial	Allocation and use of resources	Mix	Medium	Assess seasonal promotions, plan and schedule cashiers	Management information system (MIS)
Operational	Common, routine, day-to-day	More computers than other processes	High	Order supplies, pay bills, check out customers	Transaction processing system (TPS)

- *Strategic has low frequency, managerial has medium frequency, operational has high frequency*
- *Operational processes: common place, routine, everyday business processes → ordering supplies, paying bills etc.*
 - *Rely more on comp actors*

- Changing them is more difficult than changing other types because many actors contribute to this process
 - Information systems used for this are transaction processing systems (TPS)
- *Managerial processes: concern resource use, planning, assessing, analyzing resources in pursuit of objectives, ex. Which personnel to promote*
 - Occur less frequently and with less computerized actors
 - Information systems used for this are management information systems (MIS)
- *Strategic Processes: resolve issues that have long-range impact on the organization, broad scope and impact most of the firm, more human actors than operational or managerial processes*
 - Ex determining where to locate a new restaurant, setting budgets, introducing new product
 - Information system for this is called executive support system (ESS)

Objectives of Processes

- *Objective: desired goal an org has decided to pursue*
 - Objective be effective or efficient
- *Effective objective: helps achieve organizational strategy*
 - Ex: objective of pizza shop Sales process is to sell to freshmen
- *Efficient objective: seeks more output with the same inputs or same output with fewer inputs*
 - Ex. Pizza shop tries to improve efficiency of Deliver process by reducing unnecessary delays
- *Effective objectives help achieve company strategy → doing things right*
- *Efficient objectives seek to conserve limited resources → doing the right things*
- *These 2 categories of objectives can occur during any of the 3 processes*

WHAT ARE EXAMPLES OF COMMON BUSINESS PROCESSES

- *Three characteristics of processes*
 - Scope (strategic, managerial, operational)
 - Objectives (effective, efficient)
 - Place within value chain

Inbound Logistics Processes

- *Receives, stores, disseminates product input*
- *Procurement: operational process that acquires goods and services*
 - Ordering ingredients

Operations Processes

- *Transform inputs into outputs*
 - Schedule equipment, people, facilities necessary to build or assemble product/service

EXAMPLE OF PROCESSES W/ VALUE CHAIN INTO CONSIDERATION: PG 136

Outbound Logistics Processes

- *Collect, store, distribute products to buyers*
- *Management of finished goods inventory and movement of goods from that inventory to the customer*
- *Sales process: records sales order, ships product, bills customer.*
 - *Example of operational outbound process*

Sales and Marketing Processes

- *Provide means and incentives for customers to purchase product/service*
- *Strategic marketing process: launch new product, open new restaurant*

Service Processes

- *Providing after sales support to enhance or maintain value of a product*
- *Operational customer service processes: tracking orders, customer support, customer support training*
- *Management: evaluate customer complaints*
- *Strategic: evaluating outsourcing service options*

Human Resources Processes

- *Assess motivations and skills of employees, create job positions, investigate employee complaints, train, staff evaluate personnel*
- *Operational human resources process: recruit, compensate, assess employee performance*
- *Management processes: development/training of organization's workforce*
- *Strategic processes: pay scales, authorize incentive types, decide org structure*

Technology Development Processes

- *Designing, testing, developing technology in support of primary activities*
- *Operational process: tests whether new software can handle keystrokes*
- *Managerial: estimates time required for each step in software dvlpmt process*
- *Strategic: decide whether technology should be purchased or dvlped by company*

HOW CAN ORGANIZATIONS IMPROVE PROCESSES

- *Three fundamental steps in a process for improving processes*
 - *Objectives*
 - *Measures*
 - *Information Systems*
- *OMIS Model ^*

Process Objectives

- *Each model has 1+ objective*
- *Unstated and explicitly stated objectives*
- *Mgmt. may fight over stating objectives*
- *Inappropriate objectives → not matched to the strategy*
- *Vague objective → not specific → increase sales*
- *Objectives:*

- *Classify objectives as effectiveness or efficiency*
- *Make objectives explicit*
- *Obtain agreement about objectives*
- *Ensure that objectives are not vague/inappropriate*
- *Measures: specify and improve*
- *IS: Implement IS improvements*

Process Measures

- *Measures are also called metrics*
 - *Quantities assigned to attributes*
- *Can be:*
 - *Common*
 - *Unique*
- *MEASURES MUST BE: REASONABLE, ACCURATE, CONSISTENT*
- *Reasonable: valid and compelling*

HOW CAN ORGANIZATIONS USE IS TO IMPROVE PROCESSES?

Three ways IS Improve Processes

- *1) Improve efficiency or effectiveness of activities*
- *2) Improving links among activities either in same processes or among activities in diff processes*
 - *Linkage: impact of one activity on another activity*
- *3) Improve control of the process*
 - *Control: limits behavior → make every pizza the same size, same temperature*
- *These all show how to improve processes by using information systems*

Non-IS Process Improvements

- *Two general categories*
 - *Add more resources*
 - *Change structure of the process*
- *Six Sigma: most common approach to process improvement (part in manufacturing ind)*
 - *Improve process outputs by removing causes of defect and minimizing variability in the process*

Participants and Diagrams in Process Improvement

- *As-is diagrams: diagrams of the current process*
- *Ought-to-be diagrams: diagrams of suggested improvements*
- *BPMN: diagram*
- *Objectives: good quality, low cost → effectiveness, efficiency.*

HOW CAN IS HINDER A PROCESS?

- *Storing data in multiple places can hinder a process and make it difficult to improve*

Information Silos

- *Information silos: Maintaining data in multiple places*
- *Data can be duplicated in various places → if one copy is changed, then not all copies are the same*
- *Fix it by storing only one copy*

Why Information Silos May Exist

- *Running out of items because not all info is in one system*
- *Why does this happen then?*
 - *One department may want to have control over system they use*
 - *One deptmt may have diff objective than other*
 - *Departmental IS is more affordable → enterprise systems can cost 10 to 50 times as much than a single-department application*

HOW CAN SOA IMPROVE PROCESSES?

- *SOA: services oriented architecture: makes it easier to share data among process activities*
 - *Facilitates data sharing and improves control by enforcing standards*
 - *Originally used to design interacting, widely distributed, internet-based computer programs*
 - *Enables development of middleware*
 - *Middleware: software that sits between 2 programs and facilitates interprogram communication and data sharing*
- *SOA is a design philosophy*
- *2 previous design philosophies*
 - *standalone computers*
 - *client-server architecture*
- *SOA is a design where every activity is modeled as an encapsulated service and exchanges among those services are governed by standards*
- *Definition has 3 key terms:*
 - *Service: repeatable task that a business needs to perform*
 - *Encapsulation: hides details inside a container*
 - *Allows devices to communicate containers of data without being concerned about data inside*
 - *Standards: data and messages are exchanged among services using standardized formats and techniques, which are referred to as SOA standards.*

WHAT PROBLEM DOES AN ERP SYSTEM SOLVE?

- *Data is consolidated in one central database with ERP*
- *ERP and EAI systems are sometimes referred to as enterprise systems*
- *EAI: enterprise application interface*

Enterprise Application Integration (EAI)

- *Tackles the silo problem by providing layers of software that connect info systems together*

- *Enables info silos to communicate with each other to share data*
- *Accounting IS sends info to HR IS, info converted into something that works in their system*
- *There is no centralized EAI database- but they keep files of metadata that describe where all orgs data are located and how data must be transformed to work*
- **EAI DOES THE FOLLOWING:**
 - *Connects info silos via new layer of software*
 - *Enables existing apps to communicate and share data*
 - *Provides integrated data*
 - *Leverages existing systems, leaving dptmtl information systems as is, but provides integration layer over the top*
 - *Enables a gradual move to ERP*
- *Benefit: enables orgs to use existing apps while eliminating many of the problems of information silos*
- *Converting to an EAI system is not as disruptive as converting to ERP*
 - *Less expensive*
 - *Provides many of benefits of ERP*

Enterprise Resource Planning (ERP)

- *Definition: suite of software, database, procedures and a set of processes for supporting business operations with a single, consistent, information system*
- *Integrate data from acc, HR, sales departments into single system*
- *Allows the left hand of org to know what the right hand is doing*
- *Consolidates info about customers, products, people, equipment, etc into a single database*
- *Data will always be up to date and available in real time to be used by anyone*
- *ERP can reduce cost by maintaining all info in one central database*
- *If sales managers decide to change production, ERP system will notify all managers in inbound logistics, operations, outbound with supply/production schedules!*
- *By consolidating data in one place, impact of the sale can be shared in real time with all affected processes*

WHAT ARE THE ELEMENTS OF AN ERP SYSTEM?

- *MRP: material requirements planning: efficiently manage inventory, prod, labor*
 - *1970s*
- *MRPII: manufacturing resource planning: added financial tracking capabilities as well as schedule equipment and facilities → as comps became cheaper*
- *JIT: just in time: synchronizes manufacturing and supply*
- *SOX: Sarbanes-oxley Act: required companies to exercise greater control over their financial processes → ERP systems addressed this*
- *Business and IS coevolve- one makes progress and impacts the other, and other way around*
- *As business changes, so must ERP systems →*
- *to be considered a true ERP product, it must include apps to integrate following business functions:*
 - *Supply chain mgmt.: procurement, sales orders, inventory, supplier, etc)*

- *Manufacturing (manufacturing scheduling, capacity planning, quality control)*
- *CRM (sales prospecting, customer management, marketing, etc)*
- *HR (payroll, time and attendance, HR mgmt., commission calculations)*
- *Accounting (ledger, AR, AP)*

The Five Components of an ERP System: Software, Hardware, Data, Procedures and People

- *ERP product includes 3 of 5 components of an IS*
 - *Software: data integration, servers, clients, can be configured,*
 - *Code can be added to ERP, such as Java*
 - *Databases: database design, initial configuration data*
 - *Doesn't contain companies operational data*
 - *Procedures: instructions and methods for users to interact with application*
 - *Train the trainer: training the orgs users to become trainers*
- *ERP systems: SAP, Oracle, Microsoft*
- *Databases: IBM DB2, Oracle Database, Microsoft SQL Server*
- *ERP implementations require a wide variety of hardware → disk storage, servers, clients, printers, scanners, network devices, cables*
 - *Determine levels of these hardware devices → org estimates # of users, processes supported, volume of data for system.*
- *ERP dilemma → employees increasingly using smartphones to accomplish business activities*
 - *Should they purchase company smartphones or do employees use their own?*
- *Integrating new hardware is expensive and challenging*
- *Analysts have training for them to support, maintain, adapt system after its implemented*
- *Consultant → helps budget, plan, train, configure and implement the system*
- *Inherent process: specify processes for the implementing organization*
- *Process blueprints: hundreds and thousands of processes and activities, they are inherent processes*

Title	Job Description	Salary (in U.S. dollars)
Consultant	Employed by firm other than implementing company or ERP vendor, can perform any of the following roles during implementation	60,000–100,000
Systems analyst	Understands technical aspects of ERP; helps plan, configure, and implement ERP system for company use	70,000–90,000
Developer	Writes additional code where necessary for implementing ERP systems	76,000–92,000
Project manager	Defines objectives; organizes, plans, and leads team that implements ERP solution	70,000–110,000
Business analyst	Understands process aspects; helps plan, configure, and implement ERP system for company use	75,000–95,000
Architect	High-level planner of IS at an organization; ensures compatibility of technology and directs technology toward strategic goals	90,000–130,000
Trainer	Trains end users on how ERP system operates, explains their roles, and trains trainers	65,000–78,000

WHAT ARE THE BENEFITS OF AN ERP SYSTEM?

- *Converting processes to the vendor's inherent, best practice processes that are appropriate for the company's strategy*
- *Real time data sharing allows managers to see trends as they are occurring and to respond appropriately*
 - *Purchasing office can see trends in how much is spent on food delivery*
- *Effective ERP system can lead to better management as more managers have visibility to more data*
 - *Athletics director can check status of order before meeting with coach*
- *Solves the information silo problem*
 - *University departments no longer create and maintain their own purchasing databases*

WHAT ARE THE CHALLENGES OF IMPLEMENTING AN ERP SYSTEM?

- *Daunting and expensive to convert org into ERP-supported org*
 - *Users must be trained on processes*
 - *Company has to conduct simulation test to identify problems*
 - *Org needs to convert current data, procedures, personnel to new ERP system*

Implementation Decisions

- *The devil is in the details for a successful implementation → lots of details*
- *Can be tens of thousands of configuration details to decide*

- *Experts are needed because a wide understanding of business and ERP is needed*
- *Additional challenges, such as effective collaboration, communication, commitment, etc*
- *Resupply times must be provided → based on how long orders take, etc*
- *Companies must decide how big the order size will be*
- *BOM: bill of material: specifies raw materials, quantifies, subassemblies needed*
 - *Deciding on BOM structure can be challenging*

People Issues

- *People in the implementing organization can make the situation worse:*
 - *Work is changed*
 - *Top mgmt. involvement after initial decision to implement*
 - *Top mgmt. oversells capabilities*
 - *Perceived threat to department autonomy*
 - *Failure to specify objectives and measures for new processes*
- *People tend to resist change when it doesn't directly benefit them*
- *Another problem is that management feels as though after the decision is made it is easy but it is not- they have to monitor the implementation process*
- *Top management oversells the vision of what the system will do*
 - *Don't look at assumptions behind promises of what system will do*
- *Manager views the ERP solution as a threat to his dptmts autonomy*
- *Management may fail to specify how their grand vision of ERP system translates into day-to-day operations*

WHAT TYPES OF ORGS USE ERP?

- *Org's industry and org's size are examined*

ERP by Industry Type

- *Aerospace, automotive, industrial equipment, hospitals, government, utility, retail, education*

ERP by Organization Size

- *Originally adopted by large organizations*
- *Smaller organizations have now adopted it today*

International ERP

- *Companies that operate in diff countries may have ERP systems in different languages*
- *Usually it is all in English*
- *International ERP solutions can work with multiple currencies, manage international transfers, international supply chains*
- *Can produce one set of financial reports, analyze costs savings, production optimization*

WHO ARE THE MAJOR ERP VENDORS?

- *Epicor: retail-oriented ERP software (small to medium sized)*

- *Microsoft Dynamics: composed of AX, Nav, GP, SL (small to medium sized)*
- *Infor: consolidates many product offerings (medium sized)*
- *Oracle: high-quality tech staff, mid to large companies*
- *SAP: most expensive ERP products, mid to large companies*

WHAT MAKES SAP DIFFERENT FROM OTHER ERP PRODUCTS?

- *Sells licenses*
- *Offers consulting, training, other services*
- *Stands for SYSTEMS, APPLICATIONS, PRODUCTS*
- *Industry-specific platforms are sold by SAP*
- *Module: distinct and logical grouping of processes*

SAP Inputs and Outputs

- *Different roles in the org give people access to different screens and diff data*
- *No option to delete an order once it is saved*
 - *Reduces risk of fraud*

SAP Software

- *First ERP software designed to work at different companies*
- *First SAP program was to consolidate data for financial, acc, inventory, production planning processes*
- *R/3: truly integrated system to support most of an org's major operational processes → stands for real-time*
- *Rebranded R/3 as the SAP Business Suite: runs on an application platform*
 - *This app platform is called NetWeaver*
 - *It connects SAP to hardware, third-party software, output devices*
 - *It has SOA capabilities that help it integrate SAP with non SAP apps*
- *ABAP is SAP's high-level application language that is used to enhance the functionality of SAP implementation*
-

WHAT ARE THE FUNDAMENTALS OF A PROCUREMENT

- *Procurement: process of obtaining goods and services*
- *3 main activities:*
 - *order*
 - *receive*
 - *pay*
- *it is the most common organizational process*
- *Inbound logistics are procurement*
- *Important process because it is the only one that spans the entire new org*
- *Purchase order: written document requesting delivery of a specified quantity of a product/service*

- *Tires are received*
- *CBI updates raw materials inventory*
- *Bill arrives from supplier*
- *Supplier is paid*
- *CBI maintains 2 types of inventory: raw materials and finished goods*
- *Raw materials: produced from suppliers*
- *Finished goods: completed products waiting to be delivered to customers*

HOW DID THE PROCUREMENT PROCESS AT CBI WORK BEFORE SAP?

- *6 roles*
 - *notice item is below reorder point, look over previous purchases to discover a good supplier, determine his order quantity, create purchase order, order goods*
 - *Item is received, unpacked, counted, updates inventory*
- *Invoice: itemized bill*
- *Three way match: invoice matches purchase matches goods receipt*
- *Four databases are used in the procurement process*
 - *Sales, 2 warehouse, 1 accounting*
 - *These result in INFORMATION SILOS*

WHAT WERE THE PROBLEMS WITH THE PROCUREMENT PROCESS BEFORE SAP?

Warehouse Problems

- *Running out of raw materials because finished goods inventory and raw material inventory shared the same warehouse*
- *Database did not include price discounts, so didn't know if increase in sales was due to deep price discount or whether product was being bundled with something else that was selling well*
- *Maybe it was due to marketing campaigns, or maybe popularity in the bike for some reason- but no one could tell.*
 - *Because of this, too few or too many bike components were always ordered*

Accounting Problems

- *When there was a discrepancy in 3-way match, they had to do a costly and labor intensive process to send many e-mails to warehouse and suppliers to resolve*
 - *Warehouse may have miscounted and supplier may have shipped wrong components*
- *Reports always lagged, never up-to-the-minute or up-to-the-day.*
 - *Result of not sharing real-time accounting data throughout org*
- *Roll up: compile and summarize accounting transactions into balance sheets and income statements*
- *With more current data, managers at other firms could notice problems sooner and respond to customers more quickly*

Purchasing Problems

- *Purchasing agents were scattered throughout the firm*
- *Diverse training, experience and motivation*
 - *As a result they produced a variety of mistakes on the purchase orders*
 - *Hard to train them because they were scattered throughout the organization, had differences in training needs and diff expectations from their bosses*
- *Internal control: systematically limit the actions and behaviors of employees, processes and systems within the organization to safeguard assets and to achieve objectives*

HOW DOES CBI IMPLEMENT SAP?

- *Strategy examination process has 3 activities:*
 - *Determine industry structure (porters 5 forces)*
 - *Commit to a specific competitive strategy*
 - *Develop objectives and measures for processes to support the competitive strategy*
- *Inventory turnover: number of times inventory is sold over a given period*

HOW DOES THE PROCUREMENT PROCESS WORK?

- *Purchase requisition (PR): internal company document that issues a request for a purchase*
 - *Automatically generated when amount of raw material inventory goes below the reorder point*
 - *The Purchase Requisition is the first step in the Procurement process*

Purchasing (order)

- *Purchase is approved, converts PR into PO, records the data in the database, unique PO number generated, vendor is notified by e-mail automatically, shipment's weight and cost are calculated and inbound raw material inventory is updated.*

Warehouse (receive)

- *Goods are received, PO number is on the box, box is opened, counted, inspected, checks OK on SAP to confirm that materials arrived in acceptable condition, enters quantities that arrived, clicks Save, and exits SAP.*

Accounting (pay)

- *Next activity is Receive Invoice*
- *Enters date, amount, purchase order number of invoice*
- *Pay Supplier activity*

The Benefits of SAP and the CBI Procurement Process

- *SAP helps overcome problems of old Procurement process by bringing all the data into one place for use in real time*
- *SAP helps a company follow their strategy*
- *It helps to reduce errors*

- *It helps to be more responsive to customer demands*

HOW CAN SAP IMPROVE THE INTEGRATION OF SUPPLY CHAIN PROCESSES AT CBI?

Supply Chain Processes

- *Supplier Relationship Management (SRM) process: automates, simplifies, accelerates a variety of supply chain processes*
 - *Helps companies reduce procurement costs, build collaborative supplier relationships, better manage supplier options, improve time to market*
- *Returns Management process: manages return of faulty products for business*
- *Supplier Evaluation Process: determines criteria for supplier selection and adds and removes suppliers from the list of approved suppliers*

Supply Chain Process Integration

- *Supply chain management (SCM): the integration of supply chain processes*
 - *It is the design, planning, execution, integration of all supply chain processes*
 - *Sharing data between processes and increasing process synergy*

Improving Supply Chain Process Integration by Sharing Data

- *SAP can integrate processes with other supply partners by sharing data*
- *Bullwhip effect: companies order more supplies than are needed due to a sudden change in demand*
 - *Integrating supply chain helps to reduce this because SAP immediately notifies when there is a change in demand so goods immediately are ordered and aren't delivered days after the spike in demand*

Improving Supply Chain Process Integration by Increasing Process Synergy

- *A second way to improve process integration is to increase process synergy*
- *This occurs when processes are mutually supportive*
 - *When one does well, objectives of another process are supported*
- *Study with significant another → see significant other while studying*
- *When the Returns Management process is done well, an objective of the Production Process is supported*
- *Can also be in supply chain*
 - *Can quickly shift production lines to meet new demand*
 - *Bottleneck: limited resource greatly reduces output of integrated series of activities or processes*
 - *Improve shipping process by keeping excess capacity available*
 - *As a result, Production is improved, because one objectives is being responsive to consumer demand*
 - *Improved procurement*

SAP Integration Problems with Emerging Technologies

- *New technologies need to be integrated with SAP*

- *Augmented Reality: computer data/graphics are overlaid into physical environment*
- *RFID (Radio-frequency identification): used to identify/track items in supply chain, small and cheap, chips*
- *Sensors:*
- *Robotics*
- *3D Printing: objects are manufactured through deposition of successive layers of material in third dimension*
- *This is expensive but must be done*
- *Organizations will have to develop their own patches of the new technology into SAP.*

HOW DOES THE USE OF SAP CHANGE CBI?

- *They had to get a new purchase department to accomplish the Procurement process*
- *Some other changes are more subtle*
 - *New sets of skill necessary to optimize a supply chain*
 - *Becomes more process focused*
 - *May lead CBI to use more outsourcing*
 - *Organizational and technological changes*
 - *Less production of bicycles and purchasing more finished bikes*
 - *Lowering costs by using more full truck shipments rather than partial loads*
 - *Storage is thus optimized*
 - *Much more data produced in new system and is shared with CBI customers and suppliers than ever was done in the past*
 - *Notice low raw material levels and use their experience to decide if, when and how many parts or bikes were ordered*

Wally's Job Change

- *Wally was maintaining inventory but now had to help schedule and train people in order to implement SAP system*
- *Data was spread out and not as easy to find as before*
- *Some people got let go*
- *Other people's jobs were redesigned*

APPLICATION EXTENSION 5A

HOW ARE DATABASE APPLICATION SYSTEMS DEVELOPED?

- *Database application system consists of a database, DBMS and one or more apps*
 - *Database app consists of forms, reports, queries, app programs*
- *Database Application System Development Process:*

- *Developers interview users and develop requirements for new system*
- *Developers analyze existing forms, reports, queries*
- *Requirements summarized in data model*
 - **Data model:** *contains a description of both the data and relationships among data*
 - *It is like a blueprint*
 - *Transformed into a database design*
 - *Design is implemented in a database*
 - *Database is filled with user data*
- *Users have a crucial role in success of development: validate + approve data model*
- *Developers rely on users to tell THEM what should be in the database*
- *Begin with discussion of the entity relationship model → most common tool used to construct data models*

WHAT ARE THE COMPONENTS OF THE ENTITY-RELATIONSHIP DATA MODEL?

- *Entity-relationship data model (ER): most popular technique for creating a data model*
 - *Developers describe the content of a database by defining the things that will be stored in the database and the relationship among those entities*
- *Unified Modeling Language (UML): tool for data modeling*
 - *Second, less popular tool for data modeling*

Entities

- *Entity: something that users want to track*
 - *Order, customer, salesperson, item*
- *Entities have attributes*
- *Attributes: describe the characteristics of the entity*
 - *OrderNumber, OrderDate, SubTotal, Tax, Total, etc*
- *Entities have an Identifier*
- *Identifier: attribute (or group of attributes) whose value is associated with one and only one entity instance*
 - *OrderNumber is an identifier for Order because only one Order instance has given value of OrderNumber*
 - *CustomerNumber, SalesPersonName*

Relationships

- *Entities have relationships to each other*
- *An order has a relationship to a Customer entity and also to Salesperson entity*
- *Entity-relationship (E-R) diagrams: all entities of one type represented by a single rectangle*
 - *Line used to represent a relationship between 2 entities*
- *Crow's foot: forked line on the right side of the line that signify that a department may have more than one adviser*
- *One-to-many (1:N) relationships: multiple lines between department and adviser*
- *Crow's foot appears at each end of line → adviser can be related to many student and vice versa*

- *Many-to-many (N:M) relationship*
- *Both variables can have many of each other*
- *Maximum cardinality: 1:N, N:M, 1:1*
 - *Maximum number of entities that can be involved in a relationship*
- *Minimum cardinalities: constraints on minimum requirements*

HOW IS A DATA MODEL TRANSFORMED INTO A DATABASE DESIGN?

- *Database design is process of converting a data model into tables, relationships, and data constraints*
- *2 important database design concepts*
 - *Normalization: foundation of database design*
 - *Representation of two kinds of relationships: helps understand key considerations made during design*

Normalization

- *Converting poorly structured tables into 2 or more well-structured tables*
- *Data integrity problem: misnomers in tables*
 - *Data integrity problems are very serious, as they produce inconsistent info*
 - *Data integrity problems can occur only if data are duplicated*
 - *Way to eliminate the problem is to eliminate the duplicated data*
 - *General goal of normalization is to construct tables such that every table has a single topic or theme*
 - *Every paragraph should have a single theme*
- *There are numerous ways in which tables can be poorly formed*
- *Normalization: transformation a table into a normal form to remove duplicated data and other problems is called normalizing the table*
- *If tables are not normalized → means that tables have a format that could cause data integrity problems*
- *Normalization is just one criterion for evaluating database designs*
- *Database designers sometimes accept non-normalized tables because normalized designs can be slower to process*

Representing Relationships

- *Strategy for placing foreign keys will not work for N:M relationships*
- *If the data model is wrong, the database design will be wrong as well*

WHAT IS THE USER'S ROLE?

- *The users' review of the data model is crucial*
- *You should ask for clarification if you do not understand the data model*
- *Take the review seriously when you are asked to review a data model*
- *Any mistakes you miss or do not taking into consideration will come back to haunt you*

WHAT IS CONTENT?

- *Content is property*
- *It is closely related to intellectual property*
- *Intellectual property: form of creative endeavor protected through trademark, patent, copyright, industrial design, integrated circuit topography*
 - *Documents, applications, audio files, video logs, etc*

HOW CAN CONTENT BE ORGANIZED?

- *Challenge in content management is indexing or cataloguing the right info, processing+ storing it, getting it to right person in right format at right time*
- *Data management focuses on how to efficiently/effectively store/process bytes*
- *Handled through organizational database management systems (DBMSs)*
 - *These are central to mgmt. of content data*
- *Web content management systems (CMSs) help companies organize processes*
- *Process of placing content on website:*
 - *Access web CMS*
 - *Load raw content into web CMS*
 - *Copy editor reviews document and makes changes*
 - *Passes content on to layout artists*
 - *Content and presentation stored with help of DBMS*
 - *Review content and presentation, publish work to the live website*
 - *Cms helps manage each step of process*
- *Media, documents, html pages can be searched by CMSs*

WHAT IS THE PURPOSE OF A DATABASE?

- *Databases keep track of things with more than one theme*
- *Most ppl keep track of things with spreadsheets*

WHAT DOES A DATABASE CONTAIN?

- *Database: self-describing collection of integrated records*
- *Byte: character of data*
- *Columns: group of bytes*
- *Fields: columns*
- *Rows: columns or fields are grouped into these*
- *Records: Group of rows*
- *Table: group of similar rows/records*
 - *Also called a file*
- *A database is NOT just a group of tables or files*
- *It is a collection of tables PLUS relationships among rows in tables, PLUS special data, called metadata, that describe structure of database*

Relationships Among Records

- *Values in one table relate rows of that table to rows in a second table*

- *Key: column or group of columns that identifies a unique row in a table*
- *Every table must have a key*
- *Foreign keys: keys of a different foreign table from one in which they reside*
- *Relational databases: databases that carry their data in the form of tables and that represent relationships using foreign keys*
- *Relation: another formal name for a table is relation*
- *In the past, databases existed that were not relational in format*

Metadata

- *Metadata: data that describe data*
- *Format of metadata depends on the software product that is processing the database*
- *Metadata are data about data and that such metadata are always part of a database*
- *Presence of metadata makes databases much more useful than spreadsheets or data*
- *Because of metadata, no one needs to guess, remember, or even record what is in the database*
- *To find out what a database contains, we just look at the metadata inside the database*
- *They make databases easy to use, for both authorized and unauthorized purposes*

WHAT IS A DBMS, AND WHAT DOES IT DO?

- *Database application system: consists of forms, formatted reports, queries, application programs*
- *Each of these calls on the DBMS to process the database tables*

The Database Management System

- *Program used to create, process and administer a database*
- *No organization develops its own DBMS*
- *Companies license DBMS products from vendors*
- *Popular DBMS products are DB2 from IBM, Access and SQL Server from Microsoft, Oracle from Oracle Corp*
- *MySQL → open source DBMS product that is free for most apps*
- *DBMS and Database are 2 different things*
- *DBMS is a software program*
- *A database is a collection of tables, relationships and metadata*

Creating the Database and its Structures

- *Database developers use DBMS to create tables, relationships*

Processing the Database

- *Section function of DBMS is to process the database*
- *Applications use four operations:*
 - *Read*
 - *Insert*

- *Modify*
- *Delete data*
- *There is only one language that relational databases use when communicating data from a database*
 - *Structured Query Language (SQL)*
 - *International standard language for processing a database*
- *You do not need to understand or remember SQL language syntax*
- *SQL can be used to create databases and database structures*
- *SQL is an international standard for processing a database*

Administering the Database

- *Third DBMS function is to provide tools to assist in admin of database*
 - *Accounts*
 - *Passwords*
 - *Permissions*
 - *Limits for processing the database*

WHAT IS A DATABASE APPLICATION?

- *Database Application: collection of forms, reports, queries, application programs that process a database*
 - *Database may have 1 or more applications, top 2 have multiple users*
- *Apps have different purposes, features, functions, but all process same inventory data stored in a common database*

Forms, Reports and Queries

- *Form: used to read, insert, modify, delete data*
- *Report: compute values, present data, show data in structured context, nice clean*
- *DBMS programs provide comprehensive and robust features for querying database data*

Database Application Programs

- *Forms, reports and queries work well for standard functions*
- *App programs process logic that is specific to a given business need*
- *Another important use of application programs is to enable database processing over the internet*
 - *Application program serves as an intermediary between server and database*
 - *Application program responds to events, such as when a user presses a submit button*
 - *Also reads, inserts, modifies and deletes database data*
- *Multiuser processing: multiple users processing the database*
- *Lost-update problem: characteristics of multiuser database processing, it is when 2 people are changing inventory or something at the same time, so the inventory is not the right amount at the end!*

WHAT IS THE DIFFERENCE BETWEEN AN ENTERPRISE DBMS AND A PERSONAL DBMS?

- *DBMS products fall into two categories*
 - *Personal*
 - *Enterprise*
- *Enterprise DBMS: products process large org and workgroup databases*
 - *Support many/thousands of users and many diff database apps*
 - *Support 24/7 operations and can manage databases that span dozens of diff magnetic disks and thousands of gigabytes of data*
 - *DB2, SQL Server, Oracle*
- *Personal DBMS: smaller, simpler database applications*
 - *Small or personal workgroup applications that involve fewer than 100 users*
 - *Normally fewer than 15 users*
 - *Student database is an example of database that is processed by personal DBMS product*
 - *Paradox, dBase, R:BASE, FoxPro → all old personal DBMS products that are no longer in use*
 - *Microsoft Access is the only remaining personal DBMS*
 - *Access is both a DBMS and an application development product*

CHAPTER 6

WHY SHOULD I CARE ABOUT NETWORKS?

- *You use networks everyday*
- *If it weren't for networks we would not be able to use any technologies*
- *Computing devices more useful when connected to networks*

Networks and Collaboration

- *Collaboration: occurs when two or more people work together to achieve a common goal, result or product*
 - *When it is effective, result of groups are greater than working alone*
- *4 critical factors of effectiveness of a collaborative effort*
 - *Communication skills and culture: ability to give and receive feedback, essential*
 - *Communication systems: email, virtual private networks, IM, comm systems*
 - *Content management: manage content so conflicts do not occur*
 - *Workflow control: certain members delegated to certain tasks*
 - *Workflow: process/procedure by which content is created, edited, used, disposed of*
 - *Business process focuses on delivering externally to customers*
 - *Workflow focuses on delivering internally to employees*
- *These 4 factors are not equally important for all collaborations*

Network Externalities

- *One fundamental fact about networks that is important to understand*
 - *The larger the number of people using a network, the more valuable that network is*
 - *This is called the **network effect** or **network externality***
 - *The more people, the bigger the benefit of the network (Flickr, Facebook)*

WHAT IS A COMPUTER NETWORK?

- *Network: collection of computers that transmit and/or receive electronic signals through transmission media*
- *Transmission media: physical media, such as copper cable and optical fibre cable, or wireless media transmitting light or radio frequencies (satellite and cellular)*
- *Three major types of networks*
 - **Local area network (LAN):** *connect computers within a small, single geographical location, two to several hundred computers connected, and LAN is in a single location*
 - **Wide area networks (WAN):** *connect computers at different geographical locations, cannot place communication lines wherever you want (like in different cities) but they are in multiple sites*
 - **Internet:** *network of networks, connects LANs, WANs, and other networks*
 - *Most famous internet is The Internet*
 - *There are private networks of networks called internets*
- *Layered protocol: set of rules that 2 communicating devices follow*
 - *Some are used for LANs, some for WANs*
 - *Some for internets and The Internet*
 - *When two devices communicate, they must **BOTH** use the same protocol*

WHAT ARE THE COMPONENTS OF A LAN

- *A LAN is a group of computers connected together on a single company site*
- *Usually within a KM or so of each other*
- *All computers located on property owned or controlled by company operating the LAN*
- *Switch: special purpose computer that receives and transmits messages on LAN*
 - *Connects computers and printers*
 - *Sends print job to switch, redirects to Printer 2*
- *Network Interface Card: connects device circuitry to the network cable*
 - *Each device on LAN (computer, printer etc) has this hardware*
 - *Works with programs in each device to implement protocols necessary for communication*
- *Newer machines have an onboard NIC: NIC built into the computer*
- *Some computers only support wireless networks*
- ***MAC (media access control) address:** Every NIC has this, which is a unique identifier*
- ***Unshielded twisted pair (UTP) cable:** most connections are made with this*

- Twisting wires reduces cross-wire signal interference
- *Some LANs use more than 1 switch*
 - *One switch is placed on each floor in an office building typically*
 - *Computers on that floor are connected to the switch with UTP cable*
 - *Switches on each floor connected by main switch, which is in comm room*
- *If UTP cables carry a lot of traffic or are far apart, optical fibre cables are used*
 - *Signals on cables are light rays carried inside the glass core of the cable*
 - *Core is surrounded by cladding to contain the light signals*
 - *Cladding is wrapped with an outer layer to protect it*

IEEE 802.3, or Ethernet, Protocol

- *All devices on LAN must use the same protocol*
- *Institute for Electrical and Electronics Engineers sponsors committees that create and publish protocols and other standards*
- *World's most popular protocol for LAN's is based on IEEE 802.3 protocol*
 - *This is called Ethernet*
- *Most PCs are equipped with onboard NIC that supports 10/100/1000 ethernet*
 - *Conform to the 802.3 specification for rate of 10, 100 or 1000 Mbps*
 - *K stands for 1000, not 1024 like it does for memory*
- *100 Mbps is 100,000,000 bits per second*
- *communication is BITS, memory is BYTES*

Wireless LANs

- *Wireless LAN: computer network that allows users to connect to a network without using a network cable*
- *Wireless NIC (WNIC): lets user move around and stay connected to his/her network without plugging in a cable*
- *Access points (Aps): wireless LANs require 1 or more of these that wireless devices connect to*
 - *AP then connects users to the wired network*
 - *Coverage of wireless access point can range from 40 to 100 meters*
 - *This depends on a variety of factors*
 - *Indoor or outdoors*
 - *Weather*
 - *Obstructions such as steel or concrete pillars*
 - *Repeaters/reflectors: used to amplify and reflect signals to extend the range*

WHY IS MOBILE COMPUTING IMPORTANT?

- *Computers are more likely to be portable laptops*
- *New smartphone is being used more often when you are on the go*
- *M-commerce: smartphone applications*

Smartphone Basics

- *Most operate on 3G (third-generation) network*

- Higher data transfer rates compared to 2G
- Allows simultaneous voice and data transfer
- 4G has already been deployed
- Mobile OS
 - *Blackberry OS (RIM)*
 - *Iphone OS (Apple)*
 - *Windows Mobile (Microsoft)*
 - *Android (Google; open source)*

Tablets and eReaders

- Reading books and magazines
- *Amazon Kindle, Barnes and Noble Nook, iPad*
- 2 big issues
 - complexity in synchronization (emails sent from another device)
 - ownership
- Bring Your Own Device (BYOD): employees encouraged to use their own mobile devices
 - Line between personal and professional is blurred

WHAT DO I NEED TO KNOW ABOUT CONNECTING TO THE INTERNET?

- *The Internet is a WAN*
- A WAN connected to computers located at physically separated sites
- *Company with offices in Regina and Toronto must use a WAN*
- *Router: special-purpose computers that implement protocols for WANs*
- Internet service provider (ISP): router is operated by this
 - *Three important functions*
 - *Provides comp, router with legitimate internet address (IP address)*
 - *Serves as gateway to internet*
 - *Help pay for the internet (collect money from customers and pay access fees)*
- *Web and the internet are not the same thing*
- *Web is subset of the internet*
- *Hypertext transfer protocol (HTTP): users use this*
- *Browser: programs that implement the HTTP protocol*
- Internet supports ALL **application-layer protocols, including HTTP, SMTP, FTP**
 - *Send an email, you use SMTP*
 - *View webpages, HTTP*
 - *Transfer files b/w computers on the internet, FTP*

Names and Addresses

- *Last letters in domain name are the top level domain (TLD)*
 - www.canada.ca
- Internet Corporation for Assigned Names and Numbers (ICANN)
 - Determine which agencies ICANN has licensed to register domain for that TLD
- Uniform resource locator (URL): www.canada.ca

- Address is given by four numbers each separated by a period (IP address)

Obtaining an IP Address

- Two kinds of IP addresses
 - *Public (used on internet)*
 - *Private (used within private networks and internets)*
- Program in OS searches for DHCP server
 - This is a comp that hosts program called Dynamic Host Configuration protocol (DHCP)
 - When program finds such device computer requests temporary IP address from DHCP server
 - IP address is loaned to you while you are connected to the LAN
 - When you disconnect, IP address becomes available again, and DHCP server will reuse it when needed

Finding Domain Names

- How does comp figure out the IP address when we type in URL
 - Service provided by the **Domain Name System (DNS)**
 - *Purpose of DNS is to convert human-friendly URL's into comp friendly IP addresses*
 - Process of *converting a domain name into a public IP is domain name resolution*
 - *Domain name resolution is now done by comps called domain name resolvers*
 - Resolvers reside at ISPs, academic institutions, large companies
- When a resolver cannot find a domain name, it searches for IP address at a resolver that is a higher level in network
- Home and small business comps connected to ISP by DSL line or through cable TV line (few ppl use dial up any longer)
- Both methods require that *digital data be converted to an analog, or wavy signal before comp can read it*
 - A device called a **modulator/demodulator** or **modem**, performs this conversion (convert digital to analog)
- Digital Subscriber Line (DSL) modem: operates on same lines as voice telephones, but signals do not interfere with voice telephones
 - DSL can download at 256-768 kbps
 - DSL lines that have diff upload/download speeds are asymmetric digital subscriber lines (ADSL)
- Most homes and businesses can use ADSL because they receive more data than they transmit and hence do not need to transmit as fast as they receive data
- Symmetric digital subscriber lines (SDSL): offer same fast speed in both directions
 - 1.544 mbps guaranteed
- *cable modem: high-speed data transmission using cable television lines*
 - optical fibre cable to a distribution centre in each neighbourhood it serves

- at distribution centre, optical fibre connects to regular cable tv cables that run to subscriber's home or businesses
- narrowband: transmission speeds less than 56 kbps
- broadband: excess of 256 kbps
- dial-up modem: narrowband access
- DSL is broadband

What About Wireless WAN?

- *Wireless wan (WWAN): differs from wireless LAN in 2 ways*
 - *Covers a larger area than wireless LAN,s use cellular networks to transfer data*

HOW DOES EMAIL ACTUALLY WORK?

Network Layers

- Definition and specifications of the layers is done by the Internet Engineering Task Force (IETF)
- *Four layer transmission control program/Internet protocol (TCP/IP)*

Step 1: Getting Internet Access and Pressing "Send/Receive"

- Program in operating system searches LAN at hotel for DHCP server
- *You are operating at layer 1 on LAN*
- *Email operates at layer 4*

Step 2: Break Apart Message and Get Ready for Transport

- *Transmission Control Program (TCP) operates at layer 3 and transports msg*
- Examines the email, breaks apart large messages into segments
- Places identifying data at front so segments can be ordered
- Translates segments between operating systems

Step 3: Send and Receive Packets

- *TCP interacts with layer 2*
- This is Internet Protocol (IP)
- IP routes messages across an internet
- Sends all pieces or segments of your email to a device called router
- Packages each segment into a packet
- *Places IP at front of packet*
- *Examines destination, uses rules defined in IP to know where to send packet*
- Router knows how to get msgs started to go to their destination
- Packets bounce through internet from router to router looking for destination

Step 4: Reassemble Packets and Display Message

- Emails sent off to a mail server once they arrive at destination
- TCP unpacks packets back into segments
- Also ensures that message is correct to make sure all segments were received
- Mail then rests on server!

WHAT ARE FIREWALLS, ENCRYPTION, AND VPNS?

What is a Firewall?

- *Firewall: computing device that prevents unauthorized network access and gets its name from the way that forest fires are contained by open spaces*
 - *Can be a computer, or program on a comp/router*
- *Port: number used to uniquely identify transaction over network*
- *Port number identifies service (HTTP or SMTP or FTP)*
- *HTTP= 80*
- *SMTP=25*
- *Port numbers can be used to create firewalls*
- *Access control list (ACL): keeps track of which IP addresses are allowed or not*
 - *Firewall usually has this*
- *Pack-filtering firewalls: simplest type of firewall*
 - *Examines each part of msg and determines whether it should pass*
 - *Examines source address, destination address, other data*
 - *Can prohibit users from starting session with user behind firewall*
 - *Can filter outbound traffic as well (keep employees from accessing sites, like competitor sites, porn sites, etc)*
- *Third parties can license firewalls*

Encryption

- *Encryption: transforming clear text into coded, unintelligible text for secure storage or communication*
- *Based on encryption keys*
- *Key: number used to encrypt data*
- *Decoding (decrypting): key applied to coded message to recover original text*
- **Symmetric encryption:** *same key used to encode and decode, much faster than asymmetric, preferred*
- **Asymmetric encryption:** *diff keys are used*
- **HTTPS:** *most secure communication over internet*
 - *Data encrypted using Secure Socket Layer (SSL)*
 - *Aka Transport Layer Security (TLS)*
 - *Use public and private key and symmetric encryption*
- *Flow works as follows:*
 - *Your Comp obtains public key of website it connects to*
 - *Your Comp generates key for symmetric encryption*
 - *Your Comp encodes key using websites public key, sends encrypted symmetric key to the website*
 - *Website decodes symmetric key using its private key*
 - *Your Comp and website communicate using symmetric encryption from this point forward*
- *At end of session computer and site discard the keys*

- *SSL/TLS makes it safe to send credit card numbers, bank balances, etc*
- *Encryption can be broken or vulnerable to attack*

Virtual Private Network (VPN)

- *VPN: additional WAN alternative that uses internet or private internet to create appearance of private point-to-point connections*
 - *VPN on remote user's comp establishes connection with VPN server in Calgary*
 - *They then have a point to point connection*
 - *This is called a **tunnel**: virtual, private pathway over a public or shared network from VPN client to VPN server*
 - *These are secure, even though transmitted over the internet publically*
 - *VPN client software encrypts original message so contents are hidden*
 - *When VPN server receives message, it strips address off front of message, decrypts coded message and sends the plain text msg to the original address on the LAN*

HOW DOES A SEARCH ENGINE WORK?

- *Web search engines require 2 things*
 - *Way to collect URLs*
 - *Method for storing/accessing url so they can be searched*
- *Finding URLs is usually the job of a web crawler*
- ***Web crawler**: software program tht browses web in a methodical way*
 - ***Sometimes called a web spider***
 - *Starts with a list of seed URL's, (may collect email addresses on webpages)*
 - *Identifies URL*
 - *Organizes info retrieved (search engine indexing accomplished by diff programs)*
 - *Indexes provide ability to make fast searches from vast amount of info*
 - *These specifics are usually NOT published by search engine companies*
- *Two important considerations for search engines:*
 - ***Breadth of coverage (% of web covered by search engines)***
 - ***Ordering of the results from a search***
- *How does a search engine choose to display results from a search?*
 - *Full-text documents, graphics, audio, video*
 - *Engine examines its index*
 - *Provides a listing o the best webpages that match query*
 - *Search engines differ in how they assign relevance*
- *Search engine companies make money by advertising revenue*
- *People pay more to have listings ranked higher in search results*

MODULE 8: E-COMMERCE, SOCIAL NETWORKING AND WEB 2.0

WHAT IS E-COMMERCE, AND HOW IS IT USED?

- *E-commerce: buying and selling of goods and services over public and private computer networks*
 - *It is not limited to transactions- there is research online, etc that is e-commerce*
- *E-business: everything having to do with application of information and comm technology to conduct business b/w organizations, C2C, or Company to Consumer*
- *Majority of commerce bay have historically been done in person*
- *Implications of e-commerce:*
 - *Additional infrastructure required*
 - *Outsource these requirements*
 - *Coordination and linkages to systems/processes may be required*
 - *E-commerce may require interconnectedness of entire ERP process*
- *Merchant companies: take title to the goods they sell*
 - *Buy goods and resell them*
- *Nonmerchant companies: arrange for the purchase and sale of goods without ever owning or taking title to those goods*
 - *Sell services provided by others*

E-Commerce Merchant Companies

- *B2C*
 - *Typically a web-based application (web storefront)*
- *B2B*
 - *Raw material suppliers, etc*
- *B2G*
 - *Computer hardware selling to government*

Nonmerchant E-Commerce

- *Most common nonmerchant e-commerce companies are auctions*
- *Ecommerce auctions: match buyers and sellers by using e-commerce auction*
 - *Ritchie Bros, eBay*
- *Clearinghouses: provide goods and services at price and arrange for delivery of goods, but never take title of these goods*
 - *Division of Amazon.ca sells books owned by other owners*
 - *Electronic exchanges: match buyers and sellers, like a stock exchange*
 - *Seller offers good at given price, buyers make offers to purchase over same exchange*
 - *Price matches result in transactions from which exchange takes commission → example is priceline.com*

Benefits of E-Commerce

- **1) Leads to greater market efficiency**
- **2) Disintermediation: removal of intermediaries between parties**
 - *Causes higher revenues for manufacturers and lower consumer prices*
 - *It is actually not easy to eliminate intermediaries, so a part of the economy has NOT been eliminated*
- **3) Channels more efficient, and there is intermediation or re-intermediation**
 - *New players have inserted themselves into the sales and distribution processes*
 - *Travelocity, Expedia, Priceline*
- **4) Improves the flow of information**
 - *You can check price comparisons, reputation, diff vendors, etc*
- **5) Seller's side → produces info about price elasticity that wasn't available**

Issues with E-Commerce

- *Companies need to consider the following economic factors:*
 - *Channel conflict: retailer can drop a manufacturer that sells to competition*
 - *Price conflict: manufacturer offers lower price (disintermediation), but channels object because the retailer does not want a lower price to be readily known via the web*
 - *Logistics expense: without distribution and retailing partners' value, the manufacturer will have increased logistics expense*
 - *Customer service expense: customers mad about order messing up*
 - *Showrooming: tries product in high-cost bricks-and-mortar retail store while completing sales transaction at low-cost internet sales channel of another retailer*
 - *Taxation: problem determining how to tax e-commerce*
 - *Reduced profitability and margin squeeze: info freely available to consumers, harder to raise prices*
 - *Consumers know a lot about competitive pricing than salespeople do*

WHAT IS SOCIAL NETWORKING, AND HOW IS IT ENABLED AND AFFECTED BY IS/IT?

- *Social capital earned through social networking*
- *Social network: structure of individuals and orgs related to each other in some way*
- *Social networking: individuals use relationships to communicate with others in a social network*

What Is Social Capital?

- *Business literature defines three types of capital*
 - *Physical capital: investment of resources for future profit*
 - *Human capital: human knowledge/skills for future profit*
 - *Social capital: investment in social relations with expectations of returns in marketplace*
 - *Attend business function for purpose of meeting people, Facebook, etc*

- *Social capital adds value in 4 ways:*
 - *Information → opportunities, alternatives, probs, other factors*
 - *Influence → influence decision makers in one's org critical to ur success*
 - *Social credentials → being linked to a network of highly regarded contacts*
 - *Personal reinforcement → being linked to social networks reinforces your professional image and positions in an organization or industry*
 - *Reinforces the way you define yourself to the world (and yourself!)*
- *Social networks*
 - *High school*
 - *Business associates*
- *Social networks with high school may be less valuable than business associates*
social network value
 - *May not be correct*
 - *Value of social capital determined by:*
 - *Number of relationships in social network*
 - *Strength of those relationships*
 - *Resources controlled by those related*
- *Frenemy: ambiguous or complex social relationships*

Important of Weak Relations

- *Weak relationships contribute most to growth of social networks*
- *Connection to someone you are not necessarily close with can open up a network to MANY other people that THEY are close with*
 - *This is called a weak connection and is crucial to increasing the number of relationships in your network*
- *People you know the least contribute the most to your network*

How Do Social Networks Add Value to Business?

- *Social capital of organization measured in same way as humans:*
 - *Number of relationships*
 - *Strength of relationships*
 - *Resources controlled by "friends"*
- *Create social capital via salespeople, customer support, public relationships, endorsements by high-profile people*
- *Maintain presence on facebook, linkedin, twitter, other sites*
- *Linkedin*
 - *Keep in touch with contacts*
 - *Choose to share variety of info and links with author*

How is Social Networking Enabled by IS/IT?

- *Improved search capabilities: enable us to quickly sort through large amounts of data and fins specific people or relationship*
- *Reduction in the trade-off of richness and reach*
- *Network effects: network of 10 people is 5x more valuable than a network of 2 people*

- *Benefit or utility that each person adds tends to increase as network grows*

WHAT IS WEB 2.0?

- *Web 2.0: first popularized in 2005 by Tim O'Reilly to refer to integration and interaction of products and services- smartphones, user-created content, social networking, location and context-based services, dynamic marketplaces*

Software as a (Free) Service

- *Google, Amazon, eBay exemplify 2.0*
 - *Provide Software as a Service (SAAS), don't sell software because software is not their product*
- *Google, Google docs, Google Earth all from a thin-client browser (works anywhere)*
- *Web 2.0 relies on advertising or other revenue, not sales revenue*
- *Web 2.0 apps are thin clients*
- *Web servers download Web 2.0 programs as code within HTML, Flash, Silverlight*
- *Applications can be changed or updated when Google wants to do so*
- *Traditional software vendors depend on software licence fees*
- *Web 2.0 → little marketing is done*
 - *Viral marketing → people talk about it, word of mouth*
- *Software as a Service → could also mean software products will be provided via the cloud rather than installing it on users' computers*
- *To be accurate, we say in the Web 2.0 world, software is provided for FREE*

Use Increases Value

- *The more people go on eBay, the more eBay gains value as a site*
- *User-generated content: website content contributed by users*
- *Crowdsourcing: customers participate in creation of products, ideas, designs*
 - *Combines social networking, viral marketing, open-source design, saving money*

Organic User Interfaces and Mashups

- *Mashups: result when the output from two or more websites is combined into a single user experience*
- *Google's My Maps → publishes google maps and provides tools for users to make custom modifications to those maps*
 - *Users have shared pics of hiking trips on certain locations on the Google maps, users have also mapped graffiti sites on Google Maps to show the police*

Participation and Ownership Differences

- *Traditional sites → publishing*
- *Web 2.0 → participation*
- *Traditional vendors/websites lock down legal rights*
 - *Oracle needs written permission before someone reuses it*
- *Web 2.0 only locks down some rights*
 - *Google: do what you want with them, we help you share them*

Advertising

- *In the Web 2.0 world, advertising can be specific to user interests*
- *Adwords → vendors pay Google a certain amount for particular search words*
 - *Bed and breakfast might pay \$2 for bed and breakfast so that they appear up top in search results, and they are charged \$2 per person that clicks*
- *AdSense: Google searches organization and inserts ads that match content on that site*
 - *When users click on those ads, google pays the organization a fee*
- *Mashups: mash up a movie and the Bay to direct you to a e-commerce site that sells you clothing that the lead actress of the movie was wearing!*
- *****NOT ALL BUSINESSES BENEFIT FROM FLEXIBILITY AND ORGANIC GROWTH***

IS THERE A WEB 3.0?

- *We cant predict this*

MODULE 9

HOW CAN INFORMATION SYSTEMS BE ACQUIRED?

- *Buy and use it as is*
- *Buy and customize → most common*
- *Rent or lease*
- *Build it yourself*
- *Outsource it*
- *Organizations will always face the cost of integrating software with current hardware, data, procedures → these costs are substantial and can be even higher than software itself*

WHAT ARE IT PROJECTS, AND WHAT DOES PMBOK MEAN?

- *Project management body of knowledge (PMBOK)*
 - *Project consists of a temporary endeavor undertaken to create a unique product, service or result*
 - *Starts with set of goals or objectives*
 - *Scope of project developed*
 - *Project managers given resources (ppl, money, working space)*
 - *Start date, end date*
- *IT projects: projects that have a large IT component*
- *Information technology project management (ITPM)*

- *Collection of techniques and methods that project managers use to plan, coordinate, and complete IT projects*
- *Basically same tools used in any project management*
- *PMBOK suggests 5 process groups in any project*
 - *Initiating*
 - *Planning*
 - *Executing*
 - *Controlling/monitoring*
 - *Closing*
- *Groups are not independent entities but, a collection of activities that overlap*
- *Process groups related to 1 or 9 project knowledge areas*
 - *Integration management*
 - *Scope management*
 - *Time management*
 - *Cost management*
 - *Quality management*
 - *Human resources management*
 - *Communications management*
 - *Risk management*
 - *Procurement management*
- *Individuals seeking certification of project management skills:*
 - *Project management professionals (PMPs)*
 - *Certified Associate in Project Management (CAPM)*

WHAT SHOULD YOU KNOW ABOUT IT OPERATIONS AND IT PROJECTS?

- *2 basic activities required to provide IT services*
 - *maintaining the current IT infrastructure*
 - *renewing and adapting the infrastructure to keep IT working effectively in the future*
- *IT operations: delivery of service, maintenance, protection, mgmt. of IT infrastructure*
 - *Referred to as “keeping the lights on” → KTLO*
- *Support operations → production systems*
- *Keywords in IT operations:*
 - *Stability*
 - *Predictability*
 - *Accountability*
 - *Reliability*
 - *Security*
- *Information Technology Infrastructure Library (ITIL): well-recognized collection of books that provide a framework of best-practice approaches to IT operations*
 - *Offers large set of management procedures designed to help businesses achieve value from IT operations*

What About the Web?

- *IT department responsible for maintaining information about IT services on the site*
- *Also, they support company website, making sure servers and apps that provide the website are up and running*
- *Thus, the Web plays an increasingly important role in the delivery of IT services in many orgs*

WHY ARE IT PROJECTS SO RISKY?

- *IT project risk: all projects, no matter what have some risks*
- *Success rate: 2/3 → 66% → only 9% are cancelled*
- *IT projects underperform at a rate of 25%, regardless of their size*
- *What makes them so risky and hard to understand?*
 - *Project definitions not easy to represent graphically*
 - *Hard to understand what it will look like or how it will behave when finished*
 - *Estimating costs for a project → IT tools are constantly changing*
 - *Risks:*
 - *How can you tell how far project has gone?*
 - *Lack of experience in team*
 - *Lack of support from top management*
 - *Lack of participation from system users*
 - *Unclear and uncertain project requirements*
 - *High level of technical complexity*
 - *Changes in the project environment*

WHAT IS AN SDLC

- *Systems development life cycle (SDLC): classic process used to acquire information systems*
- *Basic tasks to acquire and maintain information systems → systems development*
- *Systems development life cycle → 5 phase process*
 - *System definition*
 - *Requirements analysis*
 - *Component design*
 - *Implementation*
 - *System maintenance*
- *Methodologies to deal with IT problems:*
 - *Rapid application development (RAD)*
 - *Object-oriented systems development (OOD)*
 - *Agile methods: SCRUM and extreme programming (XP)*
- *Phases of the SDLC → system analysis*

Phase 1: Defining Systems

- *Organization assigns a few employees*
- *Define new system*
- *Assess feasibility*
- *Plan project*

Define System Goals and Scope

- *System definition phase: first step is to define foals and scope of new information system*
 - *Development team defines goals and purpose of new system*
 - *Definition of project scope simplifies requirements*

Assess Feasibility

- *Does the project make sense?*
- *This step is sometimes referred to "as creating the business case for project"*
- *Feasibility has 4 dimensions*
 - *Cost feasibility: straightforward, approximate*
 - *Schedule feasibility: straightforward, approximate*
 - *Technical feasibility: whether existing IT is able to meet needs of new system*
 - *Organizational feasibility: whether new system fits within the organization's customs, culture, charter, legal req's*

Phase 2: Requirements Analysis

- *Requirements analysis phase: form the project team and develop the requirements*
 - *Unique to the area of management information systems*
 - *Team consists of IT personnel and user representatives*
 - *Manager, system analysts, programmers, software testers, users*
- *Business analysts: analysis and design*
- *User involvement is critical throughout the system development process*
 - **The important point is for users to have active involvement and to take ownership of the project through the entire development process**
 - *User perspective on their business and activities affects how data model looks*
 - *User must review and approve the requirements before the project continues*
 - *Easiest and cheapest time to alter information is in the requirements phase*

HOW ARE INFORMATION SYSTEMS DESIGNED, IMPLEMENTED AND MAINTAINED?

- *5 ways to acquire an information system*
 - *buy it*
 - *buy it and customize it*
 - *rent/lease it*
 - *built it yourself*
 - *outsource it*
- *First 3 methods → IS already built*
- *When discrepancies b/w req's and capabilities of software are found:*
 - *Modify software*

- *Modify organizational procedures/data*
- *Live with problems*
- *Commercial-of-the-shelf (COTS): never fits org exactly*

Phase 3: Component Design

- *Each of 5 components of IS must be designed*
- *Accurate requirements are critical here*
- *Off the shelf- little design needs to be done*

Phase 4: Implementation

- *Building, testing, converting users to new system*
- *Developers obtain, install, test hardware*
- *License and install off-the-shelf programs and write adaptations*
- *Document, review and test procedures, create training programs*
- *Organization hires and trains needed personnel*

System Testing

- *Once developers have constructed and tested all components*
- *Integrate individual components and test the system*
- *Developers design test plans and record results of tests*
- *Devise system to assign fixes to people*
- *Test plan: actions that users take when using new system*
 - *Include normal and incorrect actions*
- *Product quality assurance: constructing test plans with advice/assistance of users*
- *Beta testing: allowing future system users to try out new system, on their own*

System Conversion

- *System conversion: converting business activity from the old system to the new*
 - *Organization installs software*
- *Can implement a system conversion in 1 of 4 ways*
 - **Pilot:** *implements system in limited part of business (failure will only be in that portion if it fails, protects new system from bad reputation)*
 - **Phased:** *installed in phases across org (once given piece works, another piece of system is installed until entire one is installed)*
 - **Parallel:** *new system runs in parallel with old system until new system is tested and fully operational (expensive, runs both systems at same time, users work double time to run both systems, then results of new system must be determined to see if it is consistent with old one, it is like insurance, provides fallback position if new system fails)*
 - **Plunge:** *aka direct or cutover installation → shuts old system down and starts new system → If new system fails, org is in trouble and must fix it or reinstall old system*
 - *Should be avoided*

Phase 5: Maintenance

- *Fix system so it works correctly or adapt it to changes in requirements*

- *Track failures, requests for enhancements to meet new requirements*
- *IS personnel prioritize system problems according to their severity:*
 - *High priority*
 - *Low priority*
- *Patch*
- *Service pack: fixes of low-priority problems into a bundle*
 - *Thousands of problems*

Problems with the SDLC

- *Waterfall method: sequence of nonrepetitive phases*
 - *Need to crawl back up the waterfall (speak, repeat the work done in prior phase)*
- *Doesn't run smoothly*
- *Difficulty of documenting requirements in a usable way*
 - *Requirements were so unwieldy as to be nearly useless*
 - *They make a requirement and realize they forgot another one*
- *Analysis paralysis: projects where people spend TOO much time documenting*
- *This makes people rely on other orgs for designing, implementing, maintaining systems*

WHAT IS OUTSOURCING, AND WHAT ARE APPLICATION SERVICE PROVIDERS?

- *Outsourcing: process of hiring another organization to perform a service*
- *Outsourced vendor can be domestic or international*
- *When vendor is overseas, it is called **offshoring***
- *Benefits*
 - *Easy way to gain expertise*
 - *Cost reductions*
 - *Reduce development risk*

Application Service Providers

- *Application Service Providers (ASPs): particular form of outsourcing*
 - *Contract with a vendor to "rent" applications from the vendor company on a fee-for-service basis*
- *Vendor will maintain systems at its own Web location*
 - *The application software, thus, does not need to be located with the client*
- *Reduces costs with outsourcing*
- *Risks:*
 - *Company loses physical control over some corporate data that are stored in vendor's machines*
 - *Any failure of the Internet means client company cannot operate*
 - *"lock in" of ASP → corporate data may not be allowed to be easily ported to competitor sites*
 - *ownership data has to be very clearly stated in the ASP contract*

MODULE 10

HOW IS THE IT DEPARTMENT ORGANIZED?

- *Big companies can have a separate department for IT, smaller companies can have it combined with another department*
- *Chief information officer: CIO → manager of IT department*
 - *They report to the CEO*
 - *Or may report to COO*
 - *COO reports to CEO*
 - *CIO may report to CFO*
- *Most IT departments have a 1) technology office*
 - *Investigate new information systems*
- *CTO: Chief technology officer → head of technology office group*
 - *Sorts through new ideas and products*
- *The 2) Operations group manages the computing infrastructure*
 - *Computers, computer centres, networks, communications, media*
 - *System and network admins*
- *The third group is the development group*
 - *Manages projects that acquire new information systems*
 - *Maintains existing information systems*
 - *If programs are not developed in-house, there will be business/system analysts*
 - *They help to acquire, install, setup licensed software*
 - *If programs developed in-house, then there will be programmers, project managers, test engineers, technical writers*
- *Last group is outsourcing relations*
 - *Negotiate outsourcing agreements with other companies to provide eqpmt, applications, other services*
 - *Protect data and information assets*

What About the Web?

- *The web affects the content/design of a site*
 - *To design website, must know TCP/IP, networks, HTML, XML*
 - *CMS, web design apps*
 - *Combine business and technical skills*
- *Web design project will need the following people:*
 - *Project manager: Interact with client, move project toward completion*
 - *Lead designer/analyst: Understand client needs, develop look/feel of site, design the elements (colors, navigation, graphics, buttons, animation)*
 - *Developer: take design, create functioning site, static content*
 - *Technical architect: make decisions about technical issues relating to site (browser support, database integration, administrator access, scripting)*

- *Putting together a website is much harder than you think*

WHAT JOBS EXIST IN IT SERVICES?

- *Data, procedures and people components of an information system require professionals with highly developed interpersonal communication skills*
- *Looking for people to bridge gap between comp technicians and business users*
- *All positions, or most, require 4 year degree*
- *Lower salaries → inexperienced people, less knowledge, small companies*
- *Higher salaries → experienced, more knowledge, bigger companies*
- *Dual major can be an excellent choice to open doors*

WHAT IS IT ARCHITECTURE?

- *Competitive strategy: supported by activities in value chain*
 - *Consist of business processes supported by information systems*
 - *Information systems need to support business objectives*
 - *This is not easy to do, a lot of companies do it wrongly*
- *IT architecture: lays out framework for all computers, systems, information management that support organizational services*
 - *Complex*
- *Enterprise architect: someone who develops IT architecture and framework*
 - *Create blueprint of organization's information systems and mgmt. of these systems*
 - *Provide overview that helps people in organization better understand current investments in technology and plan for changes*
 - *Considers org's objectives, processes, databases, info flows, OS, apps, etc*
- **Industry structure → competitive strategy → value chains → business processes → information systems**
- *Architecture usually looks like a long document with many sections that include complicated diagrams, management policies, changes*
- *Zachman Framework: divides system into 2 dimensions*
 - *First is based on 6 reasons for communication (what-data, how-function, where-network, who-people, when-time, why-motivation)*
 - *Second is based on stakeholder groups (planner, owner, designer, builder, implementer, worker)*

WHAT IS ALIGNMENT, WHY IS IT IMPORTANT, WHY IS IT DIFFICULT?

- *Alignment: matching org objectives with IT architecture*
 - *Challenge that continually evolves*
 - *Take advantage of IT capabilities as they develop, while maintaining a balance between business objectives and IT architecture*
 - *Wal-Mart is a low-cost retailer, so they spend lots of money on IT to make sure they can do everything 100% efficiently to retain low costs*
- *Alignment is hard to achieve because sometimes there is not much communication between business executives and IT executives*
- *Alignment can help provide a competitive advantage if there is communication between business exec and IT exec.*

WHAT IS INFORMATION SYSTEMS GOVERNANCE?

- *Governance: development of consistent, cohesive management policies and verifiable internal processes for information technology related services*
 - *Developing rules for sourcing, privacy, security, internal investments*
 - *Goal of IT governance is to improve benefits of org's IT investment over time*

The Sarbanes-Oxley Act and the Budget Measures Act

- *Sarbanes-Oxley Act (SOX): governs reporting reqmts of publicly held companies*
 - *Prevent corporate frauds*
- *Bill 198: Ontario → Budget Measures Act → increase level of responsibility and accountability of executive management of publicly held Canadian companies traded on TSX, bill is similar to SOX*
- *Both bills require internal controls that can produce reliable financial statements*
- *Also need to protect assets*
 - *Assets= client names, credit card numbers, etc*
- *Computer-based systems need to have appropriate controls, and management must assert that those controls are reliable*
 - *Places more pressure on development and use of information systems*
- *Make sure that personal information (credit cards, names) cant be stolen*
- *IN SUMMARY: IT department cannot be an unknown black box/department in organization to external stakeholders*

WHAT IS AN INFORMATION SYSTEM AUDIT, AND WHY SHOULD YOU CARE ABOUT IT?

- *Audit: examination and verification of a company financial and accounting records and supporting documents by an accredited professional*
- *Information systems audit: examination and verification of a company's information resources that are used to collect, store, process, retrieve info.*
 - *There are standards for information systems*
- *ISACA and CISA, organizations to audit newly developed computer systems.*
- *COBIT → development provided by ISACA*
 - *Framework of best practices designed for IT management*
 - *Provides board members, managers, auditors, IT users w/ accepted measures, indicators, processes*
 - *Establishes links between strategic objectives and business requirements*
 - *Provides process through which alignment between IT and business objectives is developed*

Why Should You Care About Information Systems Governance and Information Systems Audits?

- *Increased exposure to IT issues should improve ability of org's to use IT more effectively and efficiently*

- *As a senior manager, you will need to make assertions about the controls on information systems that will expose you to financial AND criminal penalties*
 - *When that day arrives, you need to know how to make the right choice by knowing the fundamentals of information systems*

WHAT IS INFORMATION SYSTEMS ETHICS?

- *Some use of IT may be against the law*
 - *This has legal consequences*
- *Actions may not be illegal but could be unethical*
- *Information systems ethics: about the PEOPLE who use our private information to create threats*
 - *About us understanding our own behavior → how it affects others*
- *Advances in IT bring new opportunities as well as new risks to individuals and orgs*
- *Concern should be placed for people whose lives can be affected by our actions*

WHAT IS GREEN IT, AND WHY SHOULD YOU CARE ABOUT IT?

- *Green IT: provides a good example of importance of understanding the choices an organization makes and the impact of those choices*
 - *Using IT resources to better support the **triple bottom line** for organizations*
 - *Triple bottom line: includes measures of traditional profit along with ecological and social performance*
 - *Considers financial, people and environmental effects*
- *Energy star → international government-industry partnership intended to produce equipment that meets high-energy efficiency specifications or promotes the use of such equipment*

MODULE 11

WHAT IS IDENTITY THEFT?

- *Identity theft: vital info such as your name, address, DOB, SIN are used for impersonation.*
 - *Can take over financial accounts, open bank accounts, etc*
 - *One of the fastest growing crimes because it is easy to do*

WHAT IS PIPEDA?

- *Personal Information Protection and Electronic Documents Act (PIPEDA)*
 - *Individuals right to privacy of his personal info which companies collect, use, share for business purposes*
 - *Governs how data are collected/used*
 - *Organizations should not use info for any other reason than we agreed for them to use it*

- Cannot sell info to other company unless they tell you initially that they will
- However, PIPEDA does not facilitate individuals suing companies
- Individual has to file a complaint against an org themselves

WHAT TYPES OF SECURITY THREATS DO ORGANIZATIONS FACE?

- 3 security threat sources
 - Human error and mistakes: accidentally deleting consumer records
 - Malicious human activity: intentionally destroy data or other components
 - Hackers, spammers
 - Natural events and disasters: natural disasters that cause loss of service, capability, etc
- 5 types of security problems
 - Unauthorized data disclosure: releasing data in violation of policy (student names, numbers, grades are publicly released by mistake)
 - This is covered by PIPEDA in Canada
 - Incorrect data modification
 - Faulty service
 - Denial of service
 - Loss of infrastructure
- Search engines can cause inadvertent disclosure → employees may place restricted data on websites that can be uncovered by search engines

Pretexting: someone deceives by pretending to be someone else

- Telephone caller who pretends to be from credit card company
- Phishing: claiming to be legitimate company, send e-mail requesting confidential data (account numbers, SIN, passwords)
 - Similar technique for obtaining unauthorized data
- Spoofing: term for someone pretending to be someone else
 - IP spoofing: when an intruder uses another site's IP as if it were that site
 - E-mail spoofing: synonym for **phishing**
 - If you pretended to be your professor, you are **spoofing your professor**
- Sniffing: technique for intercepting computer communications → requires physical connection for a wired network, but for wireless, no physical connection is needed
 - Spyware and Ad-ware are sniffing techniques
 - Drive-by sniffers: take computers with wireless connections through an area and search for unprotected wireless networks

Incorrect Data Modification

- Incorrect data modification: incorrectly increasing customer's discount, incorrectly modifying employee's salary
 - Happens when you don't follow procedures, or procedure's are incorrectly designed
- A type of incorrect data modification caused by human error is **system errors**
 - Example: lost-update problem

- *Hacking: occurs when person gains unauthorized access to a computer system*
 - *Some do it for pleasure, others to steal/modify data*

Faulty Service

- *Faulty service: problems that result because of incorrect system operation*
 - *Could include incorrect data modification*
 - *Could also include systems that work incorrectly by sending wrong goods to consumer or ordered goods to the wrong consumer*
 - *System developers can write programs/code incorrectly*

Denial of Service

- *Denial of Service (DoS): website cannot respond to legitimate requests because of a flood of requests, system error, or other false requests that are being made*
- *Employees can do this by mistake by launching a large application*
- *Denial of Service Attacks: done maliciously*
 - *Flood web server with bogus requests so it cannot respond to legitimate requests*
 - *Computer worms can infiltrate a network with so much artificial traffic that legitimate traffic cannot get through*
- *Natural disasters may cause systems to fail, resulting in DoS*

Loss of Infrastructure

- *Bulldozer cutting fibre-optic cables*
- *Floor polisher crashing into rack of web servers*
- *Thiefs/terrorists can steal or damage equipment → disgruntled employees*
- *Fire, flood, earthquake can cause this too*
- *Viruses do NOT cause loss of infrastructure → not physical, it is a technique*

Elements of a Security Program

- *Security program has 3 components:*
 - *Senior management involvement: establish security policy, manage risk by balancing costs/benefits of security program*
 - *Safeguards of various kinds: protect against threats*
 - *Technical safeguards → hardware and software*
 - *Data safeguards → data*
 - *Human safeguards → People and procedures*
 - *Incident response: to be discussed later in chapter*

HOW CAN TECHNICAL SAFEGUARDS PROTECT AGAINST SECURITY THREATS?

- *Technical safeguards: hardware and software components of an information system*
 - *Identification and authentication, encryption, firewalls, malware protection, design for secure applications, etc*

Identification and Authentication

- *Identification → user name*

- *Authentication → password authenticates user*
- *Authentication methods fall into 3 categories:*
 - *What you know (Password or PIN)*
 - *What you have (Smart card)*
 - *What you are (Biometric)*
- *Weaknesses of passwords:*
 - *Users tend to be careless in their use*
 - *Users tend to be free in sharing same passwords for many systems*
- *Smart card: plastic card like a credit card, has a microchip*
 - *Needs a PIN to operate*
- *Biometric Authentication: uses physical characteristics, like fingerprints*
 - *Very secure and strong, but expensive*
 - *People feel like it is invasive*
- *Single Sign-on for Multiple systems: Sign onto local comp and provide authentication data, then your OS authenticates you to another network, which authenticates you to another network/server, and it goes on*
- *Encryption and firewalls*
- *Malware Protection*
 - *Malware: viruses, worms, Trojan horses, spyware, adware*
- *Spyware: programs installed on user's comp without users knowledge*
 - *Resides in background, tracks actions, keystrokes, comp activity, reports it*
- *Adware: similar to spyware because it is installed without user's knowledge*
 - *Most do not perform malicious acts or steal data, but produces pop-ups*
- *Avoid malware by using the following:*
 - *Install antivirus and anti spyware*
 - *Set up anti-malware programs to scan computer frequently*
 - *Update malware definitions (patterns that exist in malware code)*
 - *Open email attachments only from known sources*
 - *Install software updates from legitimate sources*
 - *Browse only in reputable Internet neighbourhoods*

HOW CAN DATA SAFEGUARDS PROTECT AGAINST SECURITY THREATS?

- *Data safeguards: protect databases and other organizational data*
 - *Data administration (organization-wide function in charge of dvlp data policy and enforcing standards)*
- *Key escrow: encrypting data*

HOW CAN HUMAN SAFEGUARDS PROTECT AGAINST SECURITY THREATS?

- *Human safeguards: people and procedures components of information systems*
 - *Human safeguards result when authorized users follow appropriate procedures*

Human Safeguards for Employees

Position Definitions

- *Define job tasks and responsibilities*

- *No single person should be allowed to authorize withdrawal AND remove items*
 - *Job descriptions should separate duties and authorities*
- *Should have multiple people doing each stage of each job*
- *Prohibit users from accessing data that their job description does not require*
- *Security sensitivity should be documented for each position*

Hiring and Screening

- *When hiring for high-sensitivity positions, references, extensive interviews and background checks are necessary*
 - *This applies not only to new employees, but employees who are promoted*

Dissemination and Enforcement

- *Employees need to be aware of policies, procedures and responsibilities*
- *Company should not provide passwords until training is done*
- *Enforcement consists of 3 interdependent factors:*
 - *Responsibility*
 - *Accountability*
 - *Compliance*

Termination

- *Companies must establish policies and procedures for termination of employees*
 - *Promotion, retirement, resigning, firing*

Human Safeguards for Non-Employees

- *Temp personnel, vendors, partner personnel, volunteers, public*
 - *Contracts that govern activity should call for security measures appropriate to sensitivity and data and information systems involved*
 - *Hardening: take extraordinary measures to reduce a system's vulnerability*

Account Administration

- *This is the third human safeguard*

Account Management

- *Creation of new user accounts, modification, removal*
- *Existence of accounts that are no longer required/used are security threats*

Password Management

- *Primary means of authentication*
- *Users should immediately change their password when given an account*
 - *They should then change their passwords frequently after*
 - *You should not create 2 passwords and change between them frequently*

Help-Desk Policies

- *Help desk representatives don't know whether they are giving the password to a real legitimate user*
 - *To solve this, help desk rep will ask questions about user that user should know*

System Procedures

- *Procedure types*
 - *Normal operation: complete job tasks*
 - *Backup: prepare for loss of functionality*
 - *Recovery: accomplish job tasks during failure*

Security Monitoring

- *Activity log analyses, security testing, investigation and learning from security incidents*
- *IS programs produce activity logs → infiltration attempts, dropped packets, unauthorized access from within firewall*
- *These logs need to be analyzed for threat patterns*

WHAT IS DISASTER PREPAREDNESS?

- *Place computing centers, web farms, facilities in locations not prone to floods, earthquakes, hurricanes, tornados, avalanches, etc*
- *Hot sites: remote processing centers run by commercial disaster-recovery services*
 - *They provide all equipment needed to continue operations following a disaster*
- *Cold Sites: provide office space but customers themselves provide and install equipment needed to continue operations*

HOW SHOULD ORGANIZATIONS RESPOND TO SECURITY INCIDENTS?

- *Incident response plan should be a part of the security program*
- *No organization should wait until assets are lost to decide what to do*