

## Computer Sciences Midterm Review Notes

### Chapter 1

- A system is a group of components that interact to achieve some purpose
  - o Thus, an information system is a group of components that interact to produce information
- The Five components of an information system are:
  - o Computer Hardware (mouse, keyboard, monitor)
  - o Software (strictly computer programs)
  - o Data (things entered in programs; words, sentences)
  - o Procedures (methods used to start report, end it, open program)
  - o People (you, people used to create and operate networks, etc)
- Other information systems exist absent of a computer, however in computer sciences we'll interchange the terms *computer-based information system* and *information system*
- Management Information System is the development and use of information systems that help businesses achieve their goals and objectives
- 3 Key Elements of MIS:
  - o Development and Use of Information Systems
  - o Information Systems
  - o Achieving Business Goals and Objectives
    - Businesses themselves don't do anything: people who sell, buy, design, produce, finance, market, account and manage. Info systems exist to help people who work achieve their goals
- IT vs. IS
  - o Information Technology refers to methods, inventions, standards, and products. IT refers to raw technology and it concerns only the hardware, software and data components of an IS.
  - o In contrast, an information system includes the 5 elements listed above
- IS are an increasingly important part of the Canadian economy, closest related industry to the development and use of information systems is: *Information and Communications Technology Sector (ICT)*
- To gain a competitive business advantage from IS and IT you need to apply new technology to your business needs and consider IT and IS when confronted with problems or opportunities in your department of organization
- Moore's Law: The number of transistors per square inch on an integrated chip doubles every 18 months
- As a result of Moore's Law the price/performance ratio of computers has fallen dramatically. 1963 – Multimillion-dollar room filling machine, 2009 \$300 desktop.
  - o Principal reason why data storage and data transmission are essentially free today

## Chapter 2

- A Business Process is a network of activities, resources, facilities, and information that interact to achieve some business function. A business process is a system, and sometimes business processes are also referred to as business systems.
- Examples of business processes are: inventory management processes, manufacturing processes and sales and support processes.
- Refer to diagram 2-1 in Exp. MIS textbook for Business Process Diagram
- Components of a Business Process:
  - Activities
    - Transform resources and information of one type into ones of another type. Ex: payment activities transform *Quantity Received* and *Shipping Invoice* information into a *Supplier Payment* (resource)
  - Resource
    - Items of value, ex: a case of wine, a cheque, the customer's cash
  - Facility
    - Are structures used within the business process: typical facilities are inventories and databases. Other examples are factories or pieces of equipment
  - Information
    - Knowledge derived from data
    - Data presented in meaningful context
    - Data organized & processed to provide meaning
    - Data processed by summing, ordering, averaging, grouping, comparing
    - A difference that makes a difference
- Good Information is:
  - Accurate (based on correct and complete data, and its been processed correctly)
  - Timely (produced in time for its intended use)
  - Relevant (relevant to both context and subject considered)
  - Just Sufficient (just barely enough, so much info today that we need to ignore some)
  - Worth its cost (must be an appropriate relationship between the cost of information and its value)
- Business process generates information by bringing together important items of data in a context. At a higher level, overtime, the business process will generate info that will be useful for management and strategy decisions
- An automated system replaces people in a business process with computers that perform activities and procedures through the use of software.
- IS support decision making by providing the information- the raw material for many decisions
- Operational Decisions concern day to day activities

- Transaction Processing Systems (TPS) are ISs that support operational decision making
- Managerial decisions concern the allocation and utilization of resources
  - MIS are ISs that support Managerial Decision making
- Strategic decisions concern broader-scope organizational issues (ex. Should we start new product line? Should we acquire a company?)
  - Executive Information Systems (EIS) support Strategic decision making
- Unstructured decision-making: process for which there is no agreed on decision-making method.
  - Ex: Predicting the future direction of economy or choosing an employee for a job. Different people use different methods.
- Structured decision-making: process for which there is an understood and accepted method for making the decision
  - Ex: formula for computing the reorder quantity of an item in inventory

### Chapter 3

- Robert Solow: “We see computers everywhere except in productivity statistics” - Productivity Paradox
- Productivity Paradox: Productivity growth has slowed while investments in information technology have grown dramatically
  - Some take this as proof that technology doesn’t affect productivity
- Info Techs impact on business: 3 different ways:
  - Productivity: Investment in IT and IS can make company more effective: produce more output with same input
  - Structure of Competition: IT alters way companies compete, ex: accounting firms battling for better softer for better efficiency
  - By the End Customer: See cheaper better goods due to advancements in IT that improve productivity, stiffen competition and thus decrease prices
- Productivity for organizations can be increased either through increased efficiency or effectiveness
- Increasing efficiency = Quicker production w/ fewer resource or facilities
  - Doing things right
- Increasing effectiveness = Company offers new or improved goods valued by customers
  - Doing the right thing
- A Value chain is a network of activities that improve the effectiveness (or value) of a good or service
  - Ex: blob of rubber has no value, when shipped to a factory has a little more value, turned into a tire, more value, shipped to a store near customer, more value, mechanic installs tire, more value

- Each business process added =more value, called a value chain
- Margin: the difference between price customer is willing to pay, and cost the company incurs in moving goods or services through the value chain
  - Greater margin = greater profit (per unit) for company
- Two types of activities support value chain:
  - Primary Activities: are activities where value is added directly to the product
  - Support activities support primary activities
- Primary Activities Task Description:
  - In-Bound Logistics: receiving, storing, and disseminating inputs to the product
  - Operations: Transforming inputs into the final product
  - Out-Bound Logistics: Collecting, storing, and physically distributing the product to buyers
  - Marketing and sales: Inducing buyers to purchase the product and providing a means for them to do so
  - Service: Assisting customer's use of the product and thus maintaining and enhancing the product's value
- Support Activities Include:
  - Firm Infrastructure
  - Human Resources
  - Technology Development
  - Procurement
- Primary Activities: accumulate costs, add value to product and net result is total margin of chain
- Secondary Activities: contribute indirectly to production, sales and services and add value and costs (can't calculate directly though)
- An organization responds to the structure of its industry by choosing a competitive strategy. Porter's model of Industry Structure and the 5 forces that determine the competitive landscape of that industry are:
  - Bargaining Power of Customers
  - Threat of Substitution
  - Bargaining power of suppliers
  - Threat of New Entrants
  - Rivalry among existing firms
- Porter's 4 Competitive Strategies are:
  - Cost – develop business as economic as possible
  - Differentiation – ex: providing wide range of high quality cars, by having the best reservations system, by having the fastest check in time, etc.
  - Industry-wide – across the industry
  - Focus – in particular segments
- Sustaining Technologies are changes in technology that maintain the rate of improvement in customer value
  - Ex: enhancing tire production improved driving experience and thus helped sustain the original innovation

- Disruptive Technologies: introduce a very new package of attributes to the accepted mainstream products.
  - Ex: MP3 players were disruptive technology because people stopped buying CDs and tapes and started listening to their iPods or Walkmen
- Competitive advantage can be gained through Product and System implementations
  - Product Implementation
    - Create new product or service
    - Enhance product or service
    - Differentiate product or service
  - System Implementation
    - Lock in customers and buyers
    - Lock in suppliers
    - Raise barriers to market entry
    - Establish alliances
    - Reduce Costs
- System implementation has to do with gaining a competitive advantage through the business process

#### Chapter 4

- Early Computers (1939-1952)
  - Digital computer, complex and expensive, housed at university, low public access, first Canadian computer at U of T in 1952
- Mainframes (1952-Present)
  - Mainframes were first digital computers used in business and government, costs between 200-400\$ thousand
  - 2<sup>nd</sup> generation used transistors, smaller, more reliable
  - 1<sup>st</sup> and 2<sup>nd</sup> gens sold without software
  - 3<sup>rd</sup> gen introduced in mid 60s, multiprocessing (more than one user could use it), cost millions, came with software
  - Model today not too different from 60s
- Microcomputers (1975-Present)
  - People found mainframes too large, microcomputers developed by TI and Intel in mid 70s
  - First microcomputers had no monitors, users developed own software
  - Hardware developed, companies like Microsoft started writing programming that could be used by microcomputers
  - 1981 development of microcomputer into personal computer (PC), manufactured by IBM, Apple, Compaq, etc.
  - PCs included software, monitor, keyboard, mouse, etc.
- Networking Personal Computers (1985-Present)

- Development of Local Area Network (LAN) allowed data sharing between computers in same network, along with easy access to communal printers in large companies and much more
- Wide Area Networks (WAN) established in later 1980s and early 1990s. With this came internet, email and more
- Hardware: Input, process, output, and store data according to instructions encoded in computer software
- CPU (Central Processing Unit) – “brain of computer”, beneficial for fast processing of data. Works in conjunction with main memory
- Computers represent data using binary digits, called bits. A bit is either a zero or one
- Bits are grouped into 8-bit chunks called bytes, kilo byte – 1024 bytes, etc
- Instructions are moved from main memory into the CPU via the data channel or bus
- CPU has a small amount of very fast memory called cache (more cache = faster CPU, but cache is very expensive)
- Process of removing a program or data and then replacing the vacated space with a running program is called memory swapping
- Volatile memory (cache and main memory): contents are lost when power is off
- Nonvolatile memory (Magnetic and Optical Disk): contents survive when power is off
- Users use client computers and run software on them. Servers provide some service to client computers (ex: share or file transfer)
  - Thin Client: requires nothing more than a browser to run an application
  - Thick Client: requires programs other than a browser on the user’s computer to run the application
- Operating System controls use of computer’s resources
- Application software are programs that perform specific user tasks
- Instruction Set: Commands that a CPU can process
- 4 Major Operating Systems:
  - Windows: Instruction Set: Intel, Typical Users: Home and Business
  - Mac: Instruction Set: Power PC (pre-2006), Intel. Typical Users: Arts
  - Unix: Instruction Set: Sun and Others, Typical Users: Engineers
  - Linux: Instruction Set: Anything, Typical Users: Limited Budget
- Software:
  - Users buy license to use software, Company still owns product
  - Application Software: consist of programs that perform a business function
    - Horizontal-market application: provides capabilities common across all organizations & industries. Example: Microsoft word
    - Vertical-market application: software serves the needs of a specific industry. Example: Dental appointment scheduling software

- Firmware is computer software that is installed into devices like computers, print servers and various types of communication devices
  - Installed into special, read-only memory. This way it's part of the device's memory
  - Basic Input/Output System (BIOS) is a part of firmware: Instructions maintained in ROM, then loaded into volatile memory when booted
- Virus:
  - Computer program that replicates itself, consumes computer's resources
  - Payload: program code that causes unwanted activity
  - Macro viruses attach to specific documents and when opened the virus infects every file that the application creates or processes
  - Worm: Virus that is propagates using the Internet or other computer networks. Spread faster because they're programmed to spread.

## Chapter 6

- A computer network is a collection of computers that communicate with one another over transmission media
- 3 Basic types of networks:
  - Local Area Network (LAN) – One single location
  - Wide Area Network (WAN) – connected between two or more site
  - Internet – network of networks
- Internet uses variety of communications methods and conventions and data must flow seamlessly across them.
  - Layered protocol provides a set of rules that two communicating devices follow to allow the seamless flow
- Internet was an issue in the 60s because of different operating systems, hardware and primitive communications technology
  - 1969 US department of defense requested funding for research (ARPANET), this spawned the internet
- Switch is a special-purpose computer that receives and transmits messages
- Network Interface Card (NIC) connects the device's circuitry to the network cable. It's a piece of hardware built into the computer
- Each NIC has a unique identifier called a media access control (MAC) address
- Connections are made in a LAN using unshielded twisted pair (UTP) cable
- IEEE (institute for electrical and electronics engineers) create and publish protocols
  - Most popular protocol for LANs is the IEEE 802.3 protocol, also called Ethernet. Specifies hardware characteristics, and describes how messages are to be packaged and processed for transmission over LAN

- Most PCs have onboard NICs that support 10/100/1000 Ethernet (numbers refer to transmission rate in Mb/s)
- Wireless NIC (WINC) cards let users connect to LANs wirelessly
- Wireless LAN protocols are: "802.11" and "Wi-Fi"
- WNICs connect to an AP (access point) which processes both standards
- A router is an important part of a WAN, they implement the protocols
- Router connects computer to computers owned and operated by ISPs (Internet service provider)
- ISP has three important functions:
  - o Provides computer with Internet Address
  - o Serves as gateway to internet: receives communications from your router and passes them on to the internet
  - o Collect money from customers and pay access fees
- Programs that implement HTTP protocol are called browsers
- Names and Addresses
  - o TLD (top-level domain) ex: .org, .ca, .com
  - o Address on internet is URL (uniform resource locator)
  - o Logical address is the IP address