教育部改善師資經費補助
正修科技大學

99年度教師編纂教材成果報告

*Lecture Note:
Introduction to Information Management*

團體 □ 個人 ■

單位：資訊管理系所
單位主管：林哲宏 (簽章)
職稱：副教授
姓名：鮑永誠

執行期間：100年04月01日至04月30日
教評會審查期間：學年度第 次 ( 年 月 日)
This Could Happen to You

- Marketing Director needs an information system
  - Lack of knowledge will impede progress
  - Uncertainty will cause delays
  - Ignorance about technology leaves her at a disadvantage
Study Questions

- What is an information system?
- What is MIS?
- How does IS differ from IT?
- How do successful business people use IS?
- What new opportunities for IS are developing today?
- How can you create a strong password?
- What is this class about?
- How does the knowledge in this chapter help Dee?

What Is an Information System?

- Group of components that interact to produce information
- Five fundamental components of computer-based information systems:
  - Computer hardware
  - Software
  - Data
  - Procedures
  - People
Components of Computer-Based Information System

**Figure 1-1**

Components of Computer-Based Information System

- Hardware
- Software
- Data
- Procedures
- People

**MIS**

- Management information systems
- Development and use of information systems that help businesses achieve goals and objectives
- Key elements:
  - Development and use
  - Information systems
  - Business goals and objectives
Development and Use

- You need to:
  - Take an active role in order to insure that system will meet your needs
  - Understand how they are constructed
  - Consider the user’s needs during development
  - Learn how to employ the system
  - Take into account ancillary functions
    - Security
    - Backup

Achieving Business Goals

- MIS aids businesses in achieving objectives
  - Businesses themselves don’t do anything
  - People within the business act
- MIS empowers users to reach goals
  - Exist to assist business people
  - Need to be developed for right reason
Ask Questions

- What will system do for you?
- What is the purpose?
- What will using it enable us to do?
- What goal can we accomplish through its use?
- Will it aid us in reaching our objectives?

IT

- Information technology
  - Methods
  - Inventions
  - Standards
  - Products
- Raw technology
  - Hardware
  - Software
  - Data components
**How Does IT Differ from IS?**

- IT alone will not help an organization achieve goals
- IT must be embedded into an IS to help accomplish objectives
  - Technology must be combined with people and procedure components
  - IS will make IT useful

**Business Uses of IS**

- E-mail
- Accessing Web pages
- Instant messages
- Blogs
Gaining a Competitive Advantage

- Think about IT and IS when you consider opportunities and problems
- Create innovative applications using emerging technology
- Do not need to be a technology developer

New Opportunities

- Free data storage and free data transmission
  - Getty Images sells electronic pictures over the Internet.
    - Variable cost of production is zero
    - Revenue goes straight to bottom line
  - Media Partners produces automated online training and testing systems.
    - Variable cost of producing program essentially zero
    - Revenue goes straight to bottom line
Moore’s Law

- “The number of transistors per square inch on an integrated chip doubles every 18 months.”
- The speed of a computer chip doubles every 18 months
- Price/performance ratio of computers has fallen dramatically
  - Computers are smaller
  - Computers are less expensive

Security Is Vital

- Security is important in information systems
- Passwords are necessary
  - Should be a strong password
  - Protect password from others
  - Practice proper etiquette
This Class

Focus is on:
- Learning to use tools to accomplish a business purpose
- Understanding both business and technology
- Relating business to technology
- Using technology to gain a competitive advantage

Applying IS to Help the Marketing Director

Look for innovative applications of emerging technology
Work can be guided by the five components:
- Computer
- Software
- Data
- Procedures
- People
Applying IS, continued

- Technology will continue to develop
- Need to consider how technology can be used in other systems to accomplish goals
  - Stop unauthorized access
  - Disseminate news
  - Security

Ethics Guide

- You overhear a conversation between a real estate agent and the couple competing with you to purchase a condo
  - Should you listen?
  - Should you use the information you hear?
- You receive the same information through an e-mail accidentally sent to your inbox
  - Should you read the e-mail?
  - Should you use the information to your advantage?
Ethics Guide, continued

- You sell computer software. A customer mistakenly sends you an internal e-mail that contains the maximum amount they can pay
  - Do you read the e-mail?
  - Do you use the information?

- A friend inadvertently e-mails you personal medical data. You read the e-mail and learn embarrassing information about the friend
  - How do you respond when the friend asks if you read the e-mail?

- You are a network administrator with unrestricted access to mailing lists. You insert your e-mail address into several lists and receive confidential information. One e-mail shows that your best friend’s department is going to be eliminated
  - Do you warn him?
Active Review

- What is an information system?
- What is MIS?
- How does IS differ from IT?
- How do successful business people use IS?
- What new opportunities for IS are developing today?
- How can you create a strong password?
- What is this class about?
- How does the knowledge in this chapter help Dee?

This Could Happen to You

- In order to get a budget approved for the blog:
  - Needs specifics
  - Needs answers
    - How will this blog impact the sales process?
    - How will the salespeople use it?
    - How will it help us gain sales?
Study Questions

- How did this stuff get here?
- What is a business process?
- What are the components of the business process?
- What is information?
- What role does information play in business processes?
- How do information systems support business processes?
- How does the knowledge in this chapter help Dee?

How Did This Stuff Get Here?

- Business processes must work together
- Each business must
  - Obtain payment
  - Cover costs
  - Make profit
Business Processes

- Network of:
  - Activities
  - Resources
  - Facilities
  - Information
  - Interact to achieve business function

Business Processes, continued

- Business systems
- Examples:
  - Inventory management processes
  - Manufacturing processes
  - Sales and support processes
Business System

- Activities
- Facility
- Information
- Resource

Inventory Management Business System

- Purchasing(activity) queries Inventory Database(facility) obtains QuantityOnHand(information)
- If reorder needed, Purchasing generates Order(information) to Supplier(resource)
- Order Placement(activity) sends copy to Receiving(activity)
- Receiving puts goods into Inventory(facility)
- Record sent to Inventory Database and Payment(activity)
Inventory Management Business System, continued

- Supplier sends ShippingInvoice (information) to Payment
- ShippingInvoice compared to Order, generates Check (information and resource)
- Counter Sales (activity) interacts with Customer (resource), Inventory (resource), and Inventory Database

Portion of Inventory Management Business System
What Are the Components of a Business Process?

- Activities
- Resources
- Facilities
- Information

Activities

- Transforms resources and information from one type into another
- Follows rules and procedures
- Can be manual, automated, or combination
- Example:
  - Payment(activity) transforms QuantityReceived(information) and ShippingInvoice(information) into PaymentToSupplier(resource)
Resources
- Items of value
- External to organization
- Examples:
  - Customers
  - Suppliers

Facilities
- Structures used within business process
- Examples:
  - Inventories
  - Databases
  - Factories
  - Equipment
Information

- Used by activities
- Determine how to transform inputs into outputs
- Difficult to define

What is Information?

- Knowledge derived from data
- Data presented in meaningful context
- Processed data
- Data processed by summing, ordering, averaging, grouping, comparing
- A difference that makes a difference
Data

- Recorded facts or figures
- Not meaningful on its own

Good Information

- Accurate
  - Correct and complete
  - Crucial for management
  - Cross-check information to ensure accuracy
- Timely
  - Produced in time for intended use
- Relevant
  - Context
  - Subject
Good Information, continued

- **Just Barely Sufficient**
  - Sufficient for purpose for which generated
  - Do not need additional, extraneous information

- **Worth Its Cost**
  - Relationship between cost and value
  - Information systems cost money to develop, maintain, and use
  - Must be worth the cost

What Is the Role of Information in Business Processes?

- **Business processes generate information:**
  - Brings together items of data in a context
  - May be higher level
    - Useful for management and strategy decisions
How Do Information Systems Support Business Processes?

- Used by activities in a business process
  - Several activities may use one system
  - Activity may have own system
  - Activity may use several systems
- Systems designers determine relationship of activities to information systems
  - Relationship determined during systems development

What Does It Mean to Automate a Process Activity?

- Automation moves work from human side to computer side.
Automation of Process Activity

- Automation of processes
  - Transfer work done by people to computers
  - People follow procedures
  - Computers follow software instructions

Information System Supporting Counter Sales

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
<th>Data</th>
<th>Procedures</th>
<th>People</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cash register</td>
<td>- Sales-recording</td>
<td>- Sales data</td>
<td>- Operate cash register</td>
<td>- Cashier</td>
</tr>
<tr>
<td>- computer</td>
<td>program on cash register</td>
<td>- Inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Database</td>
<td></td>
<td>database</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- host computer</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Mostly an automated system. Almost all work is done by computers and software.
Information System Supporting Counter Sales, continued

- Fully automated
  - Cashiers do not require extensive training
  - Cashiers do not work directly with programs on computer
- Computer in cash register communicates with computer that hosts Inventory Database
- Programs record sales and makes changes

Information System to Support Payment

<table>
<thead>
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<th>Data</th>
<th>Procedures</th>
<th>People</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Personal computer</td>
<td>- Adobe Acrobat Reader</td>
<td>- Quantity/Received - Shipping Invoice</td>
<td>- Accounts payable</td>
</tr>
<tr>
<td></td>
<td>- Email</td>
<td></td>
<td>- Reconcile receipt document with invoice.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Issue payment authorization, if appropriate.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Process exceptions.</td>
<td></td>
</tr>
</tbody>
</table>

Mostly a manual system. Little work is done by computers and software. Most work is done by Accounts Payable clerk.
Information System to Support Payment, continued

- Payment receives QuantityReceived and ShippingInvoice and produces SupplierPayment
- Mostly manual
  - Accounts Payable Clerk reads documents and issues payment or investigates discrepancies
  - Processing exceptions complicated
    - Programming expensive
    - Probably not effective

Information System to Support Purchasing

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
<th>Data</th>
<th>Procedures</th>
<th>People</th>
</tr>
</thead>
</table>
| - Personal computer
  - Database host computer | - Inventory application program
  - Purchasing program | - Inventory database | - Issue PurchaseOrder according to Inventory management practices and guidelines. | - Purchasing clerk |

Balance between computer and human work.
Information System to Support Purchasing, continued

- Purchasing clerk computer runs program that queries database and identifies stock levels and generates PurchaseOrder
- Designers balanced work between automation and manual activity
  - Searching database is repetitive
    - Automated process
  - Selecting suppliers is complicated
    - Manual process

Your Role in Information System

- You are part of system (people)
- Most important component
  - Must be able to use system
  - Quality of thinking
Applying Chapter to Obtain Budget

- Diagram sales process
  - Show actors, information, and facility
- A difference that makes a difference
  - Use blog to publish successful strategies
- Create diagrams to summarize five components used when:
  - Representatives access blog
  - Marketing Director creates blog

Ethics Guide

- A problem is a perceived difference between what is and what ought to be
- Information system development team must have common definition and understanding of the problem
Ethics Guide, continued

- **Egocentric thinking**
  - Centers on self
  - “Real view”
  - “What really is”

- **Empathetic thinking**
  - View is one possible interpretation
  - Learn what others are thinking

“Professor Jones, I couldn’t come to class last Monday. Did we do anything important?”

- **Egocentric**
  - Doesn’t take into account professor’s view
  - Implies professor lectured on nothing important
“I couldn’t come to class, but I got the class notes from Mary. I read through them, and I have a question…Oh by the way, I’m sorry to trouble you with my problem.”
- Empathetic thinking
- Minimize impact of absence on your professor
- Consider situation from professor’s side
- Professor must do something extra to help you recover

Suppose you buy a new laptop and it fails within a few days. Repeated calls to customer support produce short-term fixes, but your problem continues

Three different views:
- Customer service does not have data about prior customer contacts
- Customer support recommended a solution that did not work
- Company is shipping too many defective laptops
Ethics Guide, continued

- What happens if you are meeting with the three people who have these views and they are engaging in:
  - Egocentric thinking?
  - Empathetic thinking?

Active Review

- How did this stuff get here?
- What is a business process?
- What are the components of the business process?
- What is information?
- What role does information play in business processes?
- How do information systems support business processes?
- How does the knowledge in this chapter help Dee?
Study Questions

- How does organizational strategy determine information systems structure?
- What five forces determine industry structure?
- What is competitive strategy?
- What is a value chain?
- How do value chains determine business processes?
- How do information systems provide competitive advantages?
- How does the knowledge in this chapter help Dee?

This Could Happen to You

- Marketing Director needs to write memo to her boss
  - Explain how blog would provide a competitive advantage
  - Will be used to justify expense to his manager
Study Questions

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Organizational Strategy

- Determines organization’s goal and objectives
- Developed from organizational structure
- Creates the value chain for organization
- Establishes the structure, features, and functions of information systems
What Five Forces Determine Industry Structure?

- Porter's five competitive forces:
  - Bargaining power of customers
  - Threat of substitution
  - Bargaining power of suppliers
  - Threat of new entrants
  - Rivalry among existing firms
What Is Competitive Strategy?

- Organization's response to structure of its industry
- Porter identified four competitive strategies:
  - Cost leadership across industry
  - Cost leadership focused on particular industry segment
  - Differentiation across industry
  - Differentiation focused on particular industry segment
- Porter says goals, objectives, culture, and activities must be consistent with strategy
What Is a Value Chain?

- Network of value-creating activities
- Primary activities
- Support activities
- Linkages
Primary Activities

- Five activities
  - Inbound logistics
  - Operations
  - Outbound logistics
  - Marketing and sales
  - Service
- Stages accumulate costs and add value to product
  - Net result is total margin of chain

Support Activities

- Four activities
  - Firm infrastructure
  - Human resources
  - Technological development
  - Procurement
- Contribute indirectly to production, sale, and service
- Add value and costs
  - Produce margin that is difficult to calculate
Linkages

- Interactions across value activities
- Sources of efficiencies
- Readily supported by information systems
- Reduce inventory costs

Business Process Design

- Porter’s idea
  - Create integrated, cross-departmental business systems
  - Do not automate or improve existing systems
  - Instead, create new processes
    - Integrate activities of all departments
    - Across entire value chain
Business Processes

- Network of activities, resources, facilities, and information
- Accomplish a business function
- Implement value chains or portions of value chains

Organizational Strategy Determines Information Systems
Competitive Advantage via Products

Organizations gain a competitive advantage by:
- Creating new products or services
- Enhancing existing products or services
- Differentiating their products or services

Competitive Advantage via Business Processes

Organizations can gain a competitive advantage by implementing business systems
- Locking in customers
  - High switching costs
- Locking in suppliers
  - Making it easy to connect to and work with organization
Competitive Advantage via Business Processes, continued

- Create entry barriers
  - Making it expensive for new competition to enter market
- Establish alliances
  - Establish standards
  - Promote product awareness
- Reducing costs
  - Increased profitability

ABC’s Information System

- Uses information systems to maintain customer account data
- Collects information for ABC
- Saves customers time by automatically filling in part of form
- Package and information delivery system
  - Customer can select delivery address and generate shipping labels
Applying Knowledge of Industry Structure

- Knowledge of industry structure gives background and perspective
- Makes it easier to talk with management
- Enables Dee to:
  - Understand the organization’s competitive advantage
  - Translate strategy into her project
  - Build a better blog

Applying Knowledge of Industry Structure, continued

- Dee’s memo should incorporate:
  - List of competitive advantage factors
  - Help sales team differentiate themselves
  - Lock in customers
  - Raise barriers to market entry
ABC’s Information System Created a Competitive Advantage

- Information systems create advantage by:
  - Enhancing existing products
  - Differentiating products
  - Locking in customers
  - Raising barriers to entry
  - Delivering net savings

Ethics Guide

- Searching the Internet is a matter of knowledge and access
- Digital divide between those who have access and those who don’t
  - Divide continues to deepen
  - Internet access available at public places
    - Not everyone served
    - Not as convenient
  - Advantages accrue to those with access
Ethics Guide, continued

- Intellectual capital resides on Internet
- Savings for businesses
  - Product support
  - Warehousing
  - Mailings
- Digital divide segregates haves and have-nots

Do organizations have a responsibility to address this matter?
If most have access, do we have to supply the few without printed materials?
Is it the government’s responsibility to supply Internet service?
How can any economy compete with an Internet-based economy in the global arena?
Active Review

- How does organizational strategy determine information systems structure?
- What five forces determine industry structure?
- What is competitive strategy?
- What is a value chain?
- How do value chains determine business processes?
- How do information systems provide competitive advantages?
- How does the knowledge in this chapter help Dee?
This Could Happen to You

- Dee hired consultant
  - Specializes in software setting up systems
- Consultant needs answers:
  - Where will blog be hosted?
  - What type of server will be used?
  - Which blog software will be employed?
  - How will the blog be coded?
  - What browsers need to be supported?
  - What if the blog does not render perfectly with all browsers?
- What knowledge does she need as a manager?
Study Questions

- What does a manager need to know about computer hardware?
- What's the difference between a client and a server?
- What does a manager need to know about software?
- What buying decisions do I make?
- What are viruses, Trojan horses, and worms?
- How does the knowledge in this chapter help Dee?

A Day Made of Glass Made possible by Corning
**Computer Hardware**

- **Basic hardware categories:**
  - **Input**
    - Keyboard, mouse, document scanners, bar-code scanners, microphones, magnetic ink readers
  - **Processing**
    - CPU, main memory, special function cards
  - **Output**
    - Video displays, printers, audio speakers, overhead projectors, plotters
  - **Storage**
    - Magnetic disks, optical disks, magnetic tapes
Computer Data

- **Binary digits (bits)**
  - Used to represent data
  - Represented as either zero or one

- **Bytes**
  - Bits grouped in 8-bit chunks
  - Specifications for size of memory
    - K – kilobytes, 1024 bytes
    - MB – megabyte, 1024K bytes
    - GB – gigabyte, 1024 MB bytes
    - TB – terabyte, 1024 GB

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**Component** | **Performance Factors** | **Beneficial For** | **Example Application**
--- | --- | --- | ---
CPU and data bus | - CPU speed | - Fast processing of data once the data made in main memory | - Repetitive calculations of formulas in a complicated spreadsheet
 | - Data bus speed | | - Manipulation of large picture images
Main memory | - Size | - Holding multiple programs at one time, lots of data | - Running Excel, Word, Paint Shop Pro, Adobe Acrobat, Lotus 1-2-3, and various other large applications
 | - Speed | - Instant retrieval of data | - Instant access to large data sets
Magnetic disk | - Size | - Storing many large programs, data mining | - Large data spreadsheets, large database, detailed maps of countries in the United States
 | - Channel type and speed | - Storing large files | - Large data downloads from the Internet
 | - Average read time | - Searching files in and out of memory | - Party throwers for too little main memory
Optical disk—CD | - Bits to 700 MB | - Reading CDs | - Install new programs, play music
 | - CD-ROM | - CD-R, CD-RW erasable | - Install software
 | - CD-RW rewritable | | - CD being replaced by DVD
Optical disk—DVD | - Bits to 4.7 GB | - Reading DVDs | - Install programs, play music
 | - DVD-RAM | - Write once, read many times | - Install software, play music
 | - DVD-RW rewritable | | - Back up data
Monitor—CRT | - Viewing size | - Resolution | - Monochrome displays, such as word processors
 | - Resolution | - Color displays | - Data used computers
Monitor—LCD | - Viewing size | - Resolution | - Color displays, sharp images, and no display
 | - Resolution | | - More than one monitor in use
 | - Contrast setting | | - Less crosstalk to be pronounced
 | - Controllable size | | - Controllable size
How does a Computer Work

CPU
- Transfers program or data from disk to main memory
- Moves instruction from main memory via data channel or bus
- Has small amount of fast memory called cache
  - Keeps frequently used instructions
  - Large cache makes computer fast, but is expensive

Main memory
- Contains program instructions
- Contains operating system instructions

Memory Swapping (1)
- Main memory is too small to hold all data
- CPU loads programs from memory in chunks
  - Places new program into unused memory
  - If none available, the operating system will remove chunk being used and replace with requested data
Main memory
- Too little means constant memory swapping
  - Slows processing
  - Needs more memory if processing many programs

CPU
- Expressed in hertz
- Needs more CPU if handling complex tasks

Cache and main memory are volatile
- Contents lost when power is off

Magnetic and optical disks are nonvolatile
- Saved contents survive after power is turned off

Ethics Guide (1): Churn and Burn
- Mark suggests that there is a conspiracy between hardware and software vendors
  - Hardware vendors create new, faster computers
  - Software vendors create products with more features
    - Time consuming to learn
    - Features only needed by some of the users
    - Because it’s a connected world, if one uses the feature, then others will have to use it
Ethics Guide (2)

- Viruses are an example
  - Products have defects
    - Vendors turn these into a sales advantage
      - Focus is on hole, not product
- Should users accept these problems?
- Should they rise up in protest?
- What should the vendors do?

What is the Difference between a Client and Server

- Client computers used for word processing, spreadsheets, database access
  - Connect to servers for Web, e-mail, database
- Servers provide service
  - Faster, larger, more powerful
  - May have no video display
## Computer Software

- **Two types:**
  - Operating system
    - Program that controls computer's resources
  - Application programs
    - Perform specific user tasks

- **Constraints**
  - Particular version of operating system is written for particular type of hardware
  - Must conform to instruction set from CPU
  - Application programs written to use particular operating system

### Two Types of Computer Software

<table>
<thead>
<tr>
<th>Category</th>
<th>Operating System (OS)</th>
<th>Instruction Set</th>
<th>Common Applications</th>
<th>Typical User</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Client</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>Intel</td>
<td>Microsoft Office, Word, Excel, Access, PowerPoint, many other applications</td>
<td>Business, Home</td>
</tr>
<tr>
<td></td>
<td>Mac OS (pre-2006)</td>
<td>Power PC</td>
<td>Macintosh applications plus Word and Excel</td>
<td>Graphic artists, Arts community</td>
</tr>
<tr>
<td></td>
<td>Mac OS (post-2006)</td>
<td>Intel</td>
<td>Macintosh applications plus Word and Excel, Can also run Windows on Macintosh hardware</td>
<td>Graphic artists, Arts community</td>
</tr>
<tr>
<td></td>
<td>Unix</td>
<td>Sun and others</td>
<td>Engineering, computer-assisted design, architecture</td>
<td>Difficult for the typical client, but popular with some engineers and computer scientists</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
<td>Just about anything</td>
<td>Open Office (Microsoft Office, Novell, etc.)</td>
<td>Rare—used where budget is very tight</td>
</tr>
<tr>
<td><strong>Server</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>Intel</td>
<td>Windows server applications</td>
<td>Business with commitment to Microsoft</td>
</tr>
<tr>
<td></td>
<td>Unix</td>
<td>Sun and others</td>
<td>Unix server applications</td>
<td>Fading...Linux taking its market</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
<td>Just about anything</td>
<td>Linux &amp; Unix server applications</td>
<td>Very popular—promulgated by IBM</td>
</tr>
</tbody>
</table>
Four Major Operating Systems

- **Windows**
  - Used by 85% of the world’s desktops
  - 95% of business users
  - Microsoft developed
  - Many different versions

- **Mac OS**
  - Apple Computer, Inc. developed for Macintosh computers
  - Easy-to-use interfaces
  - Used primarily by graphic artists and art community

Operating Systems, continued

- **Unix**
  - Developed by Bell Labs
  - Workhorse of scientific and engineering community
  - Sun Microsystems is a major vendor of computers employing this operating system

- **Linux**
  - Developed by open-source community
  - Version of Unix
  - IBM is a primary proponent
Own v.s. License

- Users buy license to use program
- Ownership remains with development company
- Linux owned by open source community
  - No license fee
  - Companies make money by offering support

Application Software

- Programs that perform a business function
  - Some are general purpose
  - Some are specific
- Application Software Acquisition
  - Buy off-the-shelf
    - May not be a good fit
    - May need alterations
  - Custom-developed software
    - Tailor-made for organization
Categories of Application Program (1)

- **Horizontal-market application software**
  - Provides capabilities common across all organizations and industries
  - Examples: Word, Excel, PowerPoint, Acrobat, Photoshop, Paint Shop Pro

- **Vertical-market application software**
  - Serves need of specific community
  - Usually altered or customized
  - Examples: appointment scheduling software, tracking system for mechanics

Categories of Application Program (2)

- **One-of-a-kind application software**
  - Designed for specific need
  - Example: IRS software

- **Other application software**
  - Example: CRM software

- **Custom developed software**
  - Difficult and risky
  - May be developed in-house or by outside developer
What Is Firmware

- Computer software installed into devices
  - Printers, print servers, communication devices
  - Coded like other software
  - Installed into read-only memory
    - Becomes part of device’s memory
    - Can be changed and upgraded

Reflections Guide (1): Keeping up to Speed

- Technology continues to change
- If you don’t keep up, you might not gain a competitive advantage
  - Managers need to understand what technology is needed
    - Don’t depend solely on experts
  - Develop a competitive advantage in non-technology areas to compensate
- Other extreme is those who are technophiles
Reflections Guide (2)

What can a manager do:
- Don’t ignore technology
- Take seminars
- Read articles, ads
- Attend professional events
- Get involved as a user representative in technology committees

Thin and Thick Client Applications

- Thin client applications
  - Require nothing more than browser
  - Do not require installation and administration of client software
- Thick client applications
  - Requires more code to run on client computer
What Buying Decisions Do I Make

Manager’s role depends on organization’s policies

- Large organizations usually have IS department that sets specifications
- Medium to small organizations less formal
  - Managers take more active role
  - Usually standardized to single client operating systems

Managers and employees may have role in specifying application software

Usually has no role in server specifications

Manager’s Role in Hardware and Software Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
</table>
| Client     | Specify:
- CPU speed
- Size of main memory
- Size of magnetic disk
- CD or DVD and type
- Monitor type and size                                                   | Specify:
- Windows, Mac, or Linux OS. May be dictated by organizational standard.
- PC applications such as Microsoft Office
- Adobe Acrobat, Photoshop, Paint Shop Pro. may be dictated by organizational standard.
- Browser such as Internet Explorer, Firefox, or Netscape Navigator.
- Requirements for the client side of client-server applications.
- Need for thin or thick client.                                           |
| Server     | In most cases, a business manager has no role in the specification of server hardware (except possibly a budgetary one). | Specify requirements for the server side of client-server applications.
- Work with technical personnel to test and accept software.              |
MIS in Use: Using IS in Hurricane Katrina Recovery

- Information systems played a vital role
  - GPS coordinates produced from computer-based information and maps
  - Business information systems provided support for victims
  - Laptops donated for use by agencies tracking air and water quality
  - Web sites used to keep employees informed
- Backup and recovery facilities need to be placed well away from damaged areas

Security Guide (1): Viruses, Trojan Horses, and Worms

- Virus
  - Computer program that replicates itself
  - Consumes computer resources
    - Payload causes unwanted activity
- Trojan horses
  - Viruses that masquerade as useful programs or files
- Macro viruses
  - Attached to documents
  - When document opened, virus placed in startup file for application
  - Virus infects every file the application creates or processes
Security Guide (2)

Worm
- Virus that propagates using Internet or network
- Specifically programmed to spread
- Choke networks

Prevention
- Patch security holes
  - Check vendors regularly
- Never download from unknown sites
- Don't open attachments from strangers
- Don't open unexpected attachments

Security Guide (3)

Don't rely on file extensions
- Purchase licenses for products that detect and eliminate viruses

If you have a virus
- Follow instructions to remove it
- May need to delete by reformatting and reinstall clean
Active Review

- What does a manager need to know about computer hardware?
- What’s the difference between a client and a server?
- What does a manager need to know about software?
- What buying decisions do I make?
- What are viruses, Trojan horses, and worms?
What is Cloud Computing and what are the benefits

What can Cloud Computing do for me?
and what it all mean for portals, mashups and forms solutions?
The Buzz

The Internet Industry Is on a Cloud – Whatever That May Mean
Wall Street Journal, March 26, 2009, A1

Federal CIO Scrutinizes Spending And Eyes Cloud Computing
Information Week, March 14, 2009

“Cloud Computing ‘Something We Absolutely Have to Do’”
- John Garing, CIO, DISA

“I had a customer tell me there’s a rainstorm coming, that there will be all
these clouds and none are going to talk to each other.”
- Susan Adams, Chief Technology Officer, Microsoft Federal Civilian
Practice

Basic Cloud Computing
Our World Today

Changes in the underlying platform enable Web 2.0 – blogs, wikis, social networking

- Agility/flexibility of technology – implying a power shift
- Always on – ubiquitous
- Real time information and immediate feedback
- Provides
  - New distribution channels
  - Early warning through the blogosphere
  - Radical transparency
  - Dynamic, ad hoc sharing and collaboration

Cloud Computing World Forum 2010
Congruent and Converging Forces …that compete

- If you accept...
  - There is an unquenchable thirst for collaboration and sharing
  - We can work anywhere at any time – highly mobile workforce
  - You can work wherever you are – at home, traveling, etc.

Then...
- How do we achieve mission assurance on the same network?
- How do we ensure the network is there when we need it?
- What approach should we take?

The Cloud

A style of computing where massively scalable (and elastic) IT-related capabilities are provided “as a service” to external customers using Internet technologies.

What’s new?

Acquisition Model: Based on purchasing of services
Business Model: Based on pay for use
Access Model: Over the Internet to ANY device
Technical Model: Scalable, elastic, dynamic, multi-tenant, & sharable

Source: Gartner
Changes In Consumption Patterns

Warfighters

Developers

On Demand Commodity Flexibility Security

Service Providers

Customers

Enabling the Cloud Environment

Infrastructure
- Consolidation
- Global Information Grid
- Capacity Services
- Virtualization
- Rapid Provisioning
- Facility Analysis

Software
- Network-Centric Services
- SAAS
- Forge.mil

Processes
- ITIL
- Security (Certification & Accreditation (C&A))
- Computing Service Provider (CSP) Analysis
Why to Do It

- Support faster application development/deployment
  - Reduce hardware provisioning from months to hours
  - Provide standard platforms to encourage standardization
  - Developing under security guidelines reduces implementation delays to retrofit security
- Reduce development and operating cost
  - Self-service model reduces costs
  - Standardization reduces support costs
  - Centralizing resources in the cloud
- Improve overall security posture
  - No servers under desks
  - Secure facilities
  - Uniform application of security guidelines

The Solution

**Increased Speed**
- 24 hour provisioning
- Online self service
- Credit card acquisition

**Increased Scalability**
- Increase capacity ~ 24 hours
- “Turn On / Turn Off” monthly
- Capacity on demand

**Reduced Risk**
- No capital $ needed
- DECC Infrastructure
- Develop under DoD IA standards

**Reduced Cost**
- Pay only for what you need
- Month-to-month service
- No annual maintenance fees
**How It Works - User Self-Service**

**Challenges and Barriers**

**Current**
- Balancing Security and Usability
  - User Validation
  - Virtualization; servers, firewalls, networks
  - Access
- Business processes
  - Flexible funding; credit cards, speeding MIPR process
- Cultural inertia
  - Sharing the vision
  - Convincing “Box Huggers”
  - Controlling expectations
  - “Why can’t it.....”

**Future**
- Security optimization
  - “Shared” accreditation
  - Validation of customer applications
  - Integrating Software as a Service
  - Accessing federated and shared services
  - Varying interpretations of security guidelines
- Business streamlining
  - Each Service and Agency has unique processes
  - Funding hurdles; Procurement $ verses Operating $
Two Technologies for Agility

- **Virtualization**
  
  *The ability to run multiple operating systems on a single physical system and share the underlying hardware resources*

- **Cloud Computing**
  
  “The provisioning of services in a timely (near on instant), on-demand manner, to allow the scaling up and down of resources”**

* VMware white paper, Virtualization Overview

** Alan Williamson, quoted in Cloud BootCamp March 2009

The Traditional Server Concept

<table>
<thead>
<tr>
<th>Application</th>
<th>OS</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Server</td>
<td>Windows</td>
<td>IIS</td>
</tr>
<tr>
<td>App Server</td>
<td>Linux</td>
<td>Glassfish</td>
</tr>
<tr>
<td>DB Server</td>
<td>Linux</td>
<td>MySQL</td>
</tr>
<tr>
<td>EMail</td>
<td>Windows</td>
<td>Exchange</td>
</tr>
</tbody>
</table>
And if something goes wrong ...

The Traditional Server Concept (1)

- System Administrators often talk about servers as a whole unit that includes the hardware, the OS, the storage, and the applications.
- Servers are often referred to by their function i.e. the Exchange server, the SQL server, the File server, etc.
- If the File server fills up, or the Exchange server becomes overtaxed, then the System Administrators must add in a new server.
The Traditional Server Concept (2)

- Unless there are multiple servers, if a service experiences a hardware failure, then the service is down.
- System Admins can implement clusters of servers to make them more fault tolerant. However, even clusters have limits on their scalability, and not all applications work in a clustered environment.

The Traditional Server Concept (3)

**Pros**
- Easy to conceptualize
- Fairly easy to deploy
- Easy to backup
- Virtually any application/service can be run from this type of setup

**Cons**
- Expensive to acquire and maintain hardware
- Not very scalable
- Difficult to replicate
- Redundancy is difficult to implement
- Vulnerable to hardware outages
- In many cases, processor is under-utilized
The Virtual Server Concept (1)

Virtual Machine Monitor (VMM) layer between Guest OS and hardware

Close-up*

* adapted from a diagram in VMware white paper, Virtualization Overview
The Virtual Server Concept (2)

- Virtual servers seek to encapsulate the server software away from the hardware
  - This includes the OS, the applications, and the storage for that server
  - Servers end up as mere files stored on a physical box, or in enterprise storage
  - A virtual server can be serviced by one or more hosts, and one host may house more than one virtual server

The Virtual Server Concept (3)

- Virtual servers can still be referred to by their function i.e. email server, database server, etc
- If the environment is built correctly, virtual servers will not be affected by the loss of a host
- Hosts may be removed and introduced almost at will to accommodate maintenance
The Virtual Server Concept (4)

- Virtual servers can be scaled out easily
  - If the administrators find that the resources supporting a virtual server are being taxed too much, they can adjust the amount of resources allocated to that virtual server
- Server templates can be created in a virtual environment to be used to create multiple, identical virtual servers
- Virtual servers themselves can be migrated from host to host almost at will

The Virtual Server Concept (5)

- Pros
  - Resource pooling
  - Highly redundant
  - Highly available
  - Rapidly deploy new servers
  - Easy to deploy
  - Reconfigurable while services are running
  - Optimizes physical resources by doing more with less
- Cons
  - Slightly harder to conceptualize
  - Slightly more costly (must buy hardware, OS, Apps, and now the abstraction layer)
Virtualization Status

- Offerings from many companies
  - e.g. VMware, Microsoft, Sun, ...
- Hardware support
  - Fits well with the move to 64 bit (very large memories) multi-core (concurrency) processors.
  - Intel VT (Virtualization Technology) provides hardware to support the Virtual Machine Monitor layer

Virtualization is now a well-established technology

Cloud Service

- Web Email
- 線上掃毒
- YouTube
- 線上文件
- 部落格
- ...

Cloud Service
Evolution of Cloud Computing (1)

Super Computer

Evolution of Cloud Computing (2)

叢集運算

- 通過一組鬆散集成的計算機
  軟體和/或硬體連接起來，
  緊密地協作完成計算工作
- PVM 、MPI
- 1960～
- 相對於超級電腦有高的性價比
把需要進行大量計算的工程數據分割成小塊，由多台計算機分別計算，在上傳運算結果後，將結果統一合併得出數據結論的科學。

- Remote procedure calls
- SETI@Home, Einstein@Home

大量異構計算機（通常為桌面）的未用資源（CPU週期和磁盤存儲），將其作爲嵌入在分佈式電信基礎設施中的一個虛擬的計算機集群，為解決大規模的計算問題提供了一個模型。

- Globus
- 1990~
**Evolution of Cloud Computing (5)**

- **Public Computing (公用運算)**
  - 主要提倡一種理想的企業資訊架構，讓IT服務模仿公用服務的方式進行，如供應水、電力、瓦斯。“用多少付多少”以及“隨需即用”
  - From IBM

**Evolution of Cloud Computing (6)**

- **Cloud Computing (雲端運算)**
  - 透過網路將龐大的運算處理程序自動分拆成無數個較小的子程序，再交由多部伺服器所組成的龐大系統經搜尋、運算分析之後將處理結果回傳給用戶
  - 雲～＝網路
  - Google：MapReduce、GFS及BigTable
Characteristics of Cloud Computing

- Very Large Scale (超大規模)
- Visualization (虛擬化)
- High Resolution (高可靠度)
- Payment by User (使用者付費)
- Commonly (高通用性)
- High Extension (高擴充性)
- Lower Cost (成本低)

http://baike.baidu.com/view/1316082.htm
Architecture of Cloud Computing

**User Level**
- Application
  - Social Computing, Enterprise, ISV, etc.

**User-Level Middleware**
- Program Language
  - Web 2.0 Interface, Mashups, Workflows, etc.

**Core Middleware**
- Control
  - QoS Negotiation, Admission Control, Pricing, SLA Management, Metering, etc.
- Visualization
  - VM, VM management and Deployment

**System Level**

---

Cloud Service

- Windows
- Google
- Amazon
- Yahoo
- .....

---
Amazon: Web Service

- AWS
  - Virtualization: Amazon EC2
    - Small (Default) $0.10 per hour $0.125 per hour
    - All Data Transfer $0.10 per GB
  - Storage Service: Amazon S3
    - $0.150 per GB – first 50 TB / month of storage used
    - $0.100 per GB – all data transfer in
    - $0.01 per 1,000 PUT, COPY, POST, or LIST requests
- Concept: Paying for What You Use


Google: App Engine

- Network platform, allowing developers to build web applications on the Google platform.
- Provides:
  - 500MB of storage
  - Up to 5 million page views a month
  - 10 applications per developer account
- Limit:
  - Language: Python, Java
  - Web applications
Windows: Azure

- Windows Azure 是一套雲端服務作業系統。作為 Azure 服務平台的開發、服務代管及服務管理環境。
  - .Net services
  - SQL services
  - Live services

http://tech.cipper.com/index.php/archives/332

Yahoo: Hadoop

- Apache 項目，Yahoo 資助，開發與運用
  - 2006年開始參與開源的雲端運算框架Hadoop，並將其使用在內部服務中。
  - 2008年2：目前最大的Hadoop應用
    - 2千台伺服器
    - 執行超過1萬個Hadoop虛擬機器
    - 5 Petabytes的網頁內容
    - 分析1兆個網路連結
Industry on Cloud Computing (1)

STaaS

SaaS
Software as a Service

PaaS
Platform as a Service

IaaS
Infrastructure as a Service


Industry on Cloud Computing (2)

架構即服務
提供了核心計算資源和網絡架構的服務
infrastructure stack:
  Full OS access
  Firewalls
  Routers
  Load balancing

IaaS
Industry on Cloud Computing (3)

Examples
Flexiscale
AWS: EC2 (Amazon Elastic Compute Cloud)

IaaS

Industry on Cloud Computing (4)

PaaS
IaaS

Popular services
Storage
Database
Scalability
Examples
Google App Engine
AWS: S3 (Simple Storage Service)
Microsoft Azure
Industry on Cloud Computing (7)

- **IaaS**
  - Pay per use
  - Instant Scalability
  - Security
  - Reliability

- **PaaS**
  - 不用管理硬體與軟體
  - 操作簡單（瀏覽器）
  - Pay per use
  - Instant Scalability
  - Security
  - Reliability

- **SaaS**
  - 軟體即服務
  - 不用管理硬體與軟體
  - 操作簡單（瀏覽器）

Industry on Cloud Computing (8)

**Examples**
- Google Docs
- CRM
- Financial Planning
- Human Resources
- Word processing
- Salesforce.com
## Comparisons

<table>
<thead>
<tr>
<th>Service Att.</th>
<th>Amazon EC2</th>
<th>Google App Engine</th>
<th>Microsoft Azure</th>
<th>Yahoo Hadoop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>IaaS/PaaS</td>
<td>Paas</td>
<td>Paas</td>
<td>Software</td>
</tr>
<tr>
<td>Type of Service</td>
<td>Compute/Storage</td>
<td>Web application</td>
<td>Web and non-web</td>
<td>Software</td>
</tr>
<tr>
<td>Mag. Skill</td>
<td>OS on Xen hypervisor</td>
<td>Application container</td>
<td>OS through Fabric controller</td>
<td>Map / Reduce Architecture</td>
</tr>
<tr>
<td>UI</td>
<td>EC2 Command-line tools</td>
<td>Web-based Administration console</td>
<td>Windows Azure portal</td>
<td>Command line and web</td>
</tr>
<tr>
<td>APIs</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Fee</td>
<td>yes</td>
<td>maybe</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Program Language</td>
<td>AMI (Amazon Machine Image)</td>
<td>Python</td>
<td>.NET framework</td>
<td>Java, HSS</td>
</tr>
</tbody>
</table>