Review: Chapter 6 – Systems Development

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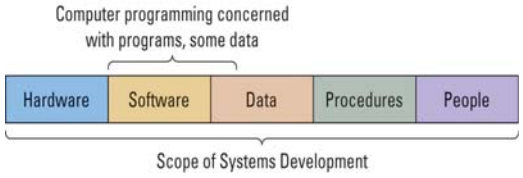
Systems Development Fundamentals

- Systems development is defined as a process for creating and maintaining information systems.
- Developing an information system involves all five components: hardware, software, data, procedures, and people.



Thinking Big About Systems Development

- Management of resources is a critical success factor.
- Comprehensive processes are required for project staff to follow and adhere to in order to successfully meet project and systems objectives.
- The scope of work is large with large-scale corporate information systems and may be global with different languages and cultures.
- You must construct or adapt procedures to fit your business and people.

Thinking Big About Systems Development (Continued)

- Three sources for software are:
  - Off-the-self
  - Off-the shelf-with adaptation
  - Tailor-made
- Information systems are never off-the-shelf due to the involvement of company's people and resources.
- For information systems, maintenance means:
  - Either fixing a system to make it do what is expected
  - Or adapting the system to a changing requirement.

Systems Development Challenges

- Systems development is difficult and risky.
- Many projects are never finished, Some projects finish 200 or 300 percent over budget;
- Some projects finish on schedule and within budget but do not meet their goals.
- Difficulties in determining requirements
- Changes in requirements
- Scheduling and budgeting difficulties
- Changing technology
- Diseconomies of scale

Systems Development Processes or Methodologies

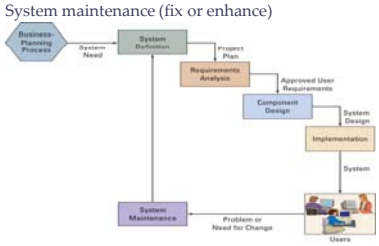
- There are however many systems development processes we are concerned with:
  - Systems development life cycle (SDLC)
  - Rapid application development (RAD)
  - Object-oriented systems development (OOD)
  - Extreme programming (XP)
- Information systems differ, no single process works for all situations.

Scales of Information Systems

System Type	Description
Personal	Supports one person with limited set of requirements
Workgroup	Supports a group of people normally with a single application
Enterprise	Supports many workgroups with many different applications
Interenterprise	Supports many different organizations with many different cultures, different countries and heritages

Systems Development Life Cycle

- five phases.
  - System definition
  - Requirements analysis
  - Component design
  - Implementation
  - System maintenance (fix or enhance)



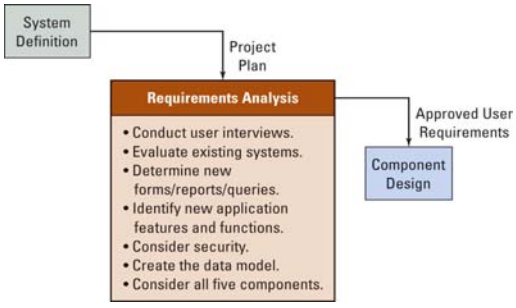
System Definition Phase Tasks

- Define project
  - Goals and objectives
  - Scope–statement of work
- Assess feasibility
  - Cost (budget)
  - Schedule
  - Technical
  - Organizational feasibility
- Form a project team
  - Project manager
  - In-house IT staff
  - Outside consultants and staff (as needed)
  - User representatives (management and staff)

Requirement Analysis Phase Tasks

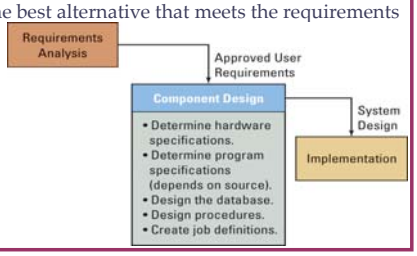
- The most important phase in the system development process is determining system requirements.
- If the requirements are wrong, the system will be wrong.
- If the requirements are determined completely and correctly, then the design and implementation will be easier and more likely to result in success.
- Seasoned and experienced system analysts know how to conduct interviews to bring such requirements to light.
- Once the requirements have been specified, the users must review and approve them before the project continues.
- The easiest and cheapest time to alter the information system is in the requirements phase.
- Changing a requirement in the implementation phase may require weeks of reworking applications components and the database.

Figure 6-4 SDLC Requirements Analysis Phase



Component Design Phase

- Each of the five components is designed in this stage.
- The team designs each of the five components by developing alternatives.
- Each alternative is evaluated against the requirements.
- Typically the best alternative that meets the requirements is selected.



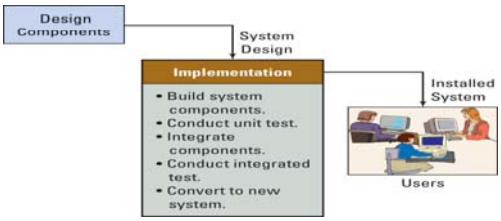
Procedure Design

- Procedures must be developed for system users and operations personnel to follow.

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

Implementation Phase

- Tasks in this phase are to build, test, and convert the users to the new system.
- System user training and procedures are verified.



Implementation System Phase Testing

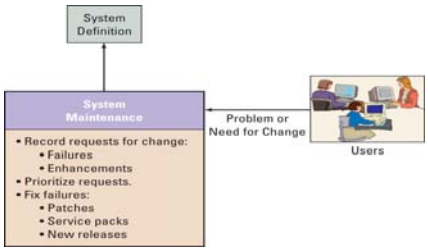
- System testing consists of testing the integrated components of the system as a complete working system.
- Test plans are developed based on system requirements and are used to verify that the system works as expected.
- Testing and retesting consumes huge amounts of labor.
- Automated testing is used to reduce testing labor and reduces testing time.
- Beta testing allows future system users to try out the new system on their own.
- Normally products in the beta test are complete and fully functioning with few errors.

Implementation Phase System Conversion

- There are four ways to implement system conversion:
  - Pilot–Implement the entire system on a limited portion of the business
  - Phase–New system is installed in pieces across the organization
  - Parallel–New system runs in parallel with the old system for a while
  - Plunge–The old system is turned off and the new system is turned on immediately

Maintenance Phase

- Work done in this phase is to fix the system to work correctly or adapt the system to changes in requirements.

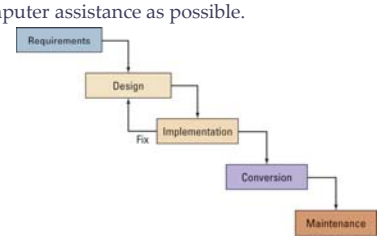


Problems with the SDLC

- Systems development seldom works so smooth.
- There is sometimes a need to crawl back up the waterfall.
- Difficulty of documenting requirements in a usable way.
- Scheduling and budgeting is difficult especially for large projects with large SDLC phases.

Rapid Application Process (RAD)

- Basic idea is to break up the design and implementation phases of the SDLC into smaller pieces.
- Design and implement the pieces using as much computer assistance as possible.



RAD Characteristics

- Design / implement / fix development process
- Continuous user involvement throughout
- Extensive use of prototypes
- Joint Application Design (JAD)
- CASE Tools

Prototypes

- Another RAD characteristic is the use of prototypes.
- A prototype is a mock-up of an aspect of the new system. A prototype could be one of the following:
  - Form
  - Report
  - Database query
  - Other elements of the user interface

Object-Oriented Systems Development

- Object-Oriented Development (OOD) came about from the discipline of object-oriented programming.
- Object-Oriented Programming (OOP) is a discipline for designing and writing programs.
- Unified Modeling Language (UML) is a series of diagramming techniques that facilitates OOP development.
- UML does not require or promote any particular process.
- Unified Process (UP) was designed for use with UML.

Extreme Programming

- An emerging technique for developing computer programs
- Not useful for large scale development systems that require business processes and procedures
- Iterative style and distinguished by:
  - Customer centric
  - Just-in-time-design
  - Paired programming

Figure 6-18 Comparison of Development Techniques

Systems Development Methodology	Scope	Advantages	Disadvantages
SDLC	All five components	• Comprehensive. • Addresses both business and technical issues. • Tried and tested.	• Requirements analysis may lead to analysis paralysis. • Waterfall nature unrealistic.
RAD	All five components	• Iterative nature reduces risk. • JAD improves design. • Use of prototypes and CASE tools increases productivity.	• Requirements analysis may lead to analysis paralysis. • Less suited to very large projects.
OOD with UP	Primarily object-oriented programs	• Use cases are effective requirements documents. • Risk moved forward to elaboration phase. • Each iteration terminates with a working system.	• Less useful for business systems development than for program development. • Danger of sinking into elaboration black hole.
Extreme Programming	Programs	• Customer (user) is always involved. • Paired programming improves quality and reduces risk. • Most useful when requirements evolve with systems development.	• Focus is on programming. • JIT design can require wasteful redesign. • Less useful when system involves many users having different, possibly conflicting, requirements.

Review: Chapter 7 – Information Systems Within Organizations

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Figure 7-1 History of IS Within Organizations

Name	Era	Scope	Perspective	Example	Technology Symbols
Calculation systems	1950–1980 (Your grandfather)	Single purpose	Eliminate tedious human calculations. "Just make it work!"	Payroll General ledger Inventory	Mainframe Punch card
Functional systems	1975–20?? (Your mother)	Business function	Use computer to improve operation and management of individual departments.	Human resources Financial reporting Order entry Manufacturing (MRP and MRP II)	Mainframe Stand-alone PCs Networks and LANs
Integrated systems (also cross-functional or process-based systems)	2000 ... (You)	Business process	Develop IS to integrate separate departments into organization-wide business processes.	Customer relationship management (CRM) Enterprise resource planning (ERP)	Networked PCs Client-servers The Internet Intranets

Integrated, Cross-Functional Systems

- In this era, systems are designed not to facilitate the work of a single department or function.The objective is to integrate the activities in an entire business process.
- Since these business activities cross department boundaries, they are referred to as cross-departmental or cross-functional systems.
- The transition from functional systems to integrated systems is difficult. Integrated processing requires many departments to coordinate their activities.
- Most organizations today are a mixture of functional and integrated systems.
- To successfully compete internationally, organizations must achieve the efficiencies of integrated cross-department process-based systems

Figure 7-2 Typical Functional Systems

Function	Example Information Systems
Human resources	Recruiting Compensation Assessment Development and training Human resources planning
Accounting and finance	General ledger Financial reporting Cost accounting Budgeting Accounts receivable Accounts payable Cash management Treasury management
Sales & marketing	Lead tracking Sales forecasting Customer management Product management
Operations	Order entry Order management Finished-goods inventory management Customer service
Manufacturing	Inventory Planning Scheduling Manufacturing operations

Figure 7-3 Functions Supported by Human Resources System

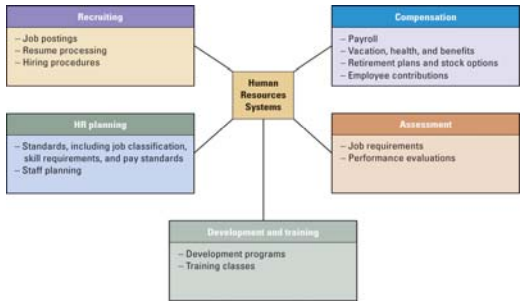


Figure 7-4 Accounting and Finance Systems

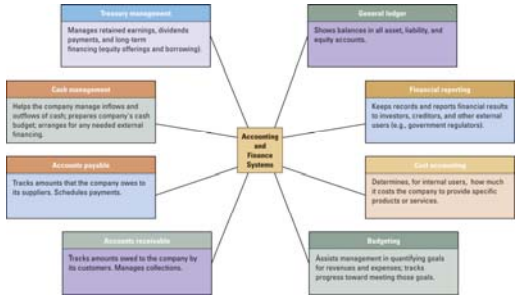


Figure 7-5 Sales and Marketing System

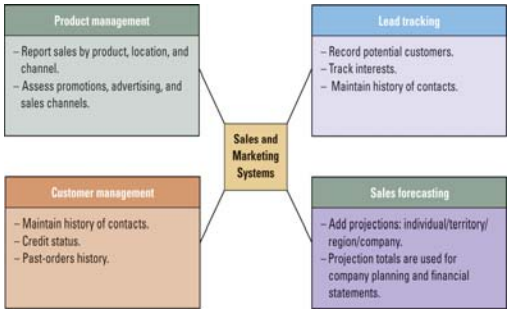


Figure 7-6 Operations Systems

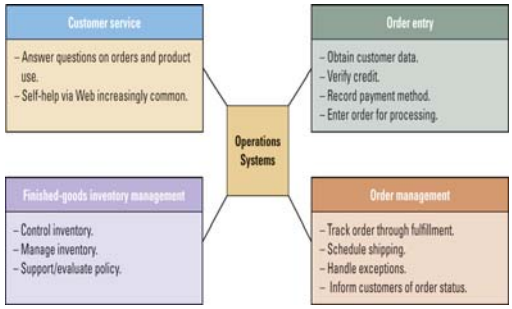
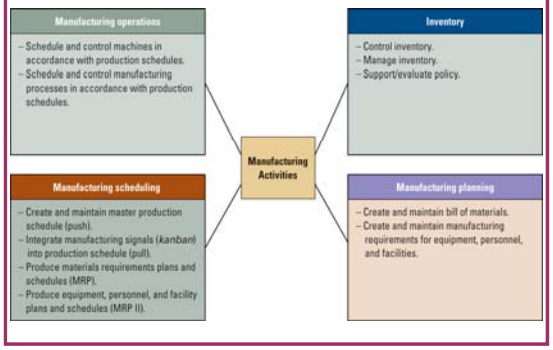


Figure 7-7 Manufacturing Activities Supported by Information Systems



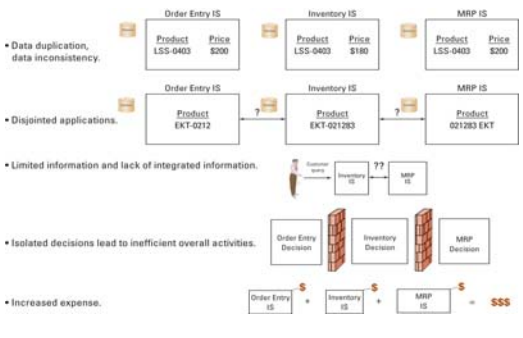
Inventory Systems

- Information systems facilitate inventory control, management, and policy.
- Inventory applications track goods and materials into, out of, and between inventories.
- Today most systems use UPC bar codes to scan product numbers as items move in and out of inventories. In the future, radio frequency identification tags (RFID) will be in widespread use.
- An RFID is a computer chip that transmits data about the container or product to which it is attached.
- Inventory management applications use past data to compute stocking levels, reorder levels, and reorder quantities in accordance with inventory policy.
- Just-in-time (JIT) inventory policy seeks to have production inputs (both raw materials and work in process) delivered to the manufacturing site just as they are needed. By using JIT policy, companies are able to reduce inventories to a minimum.

Manufacturing-Scheduling Systems

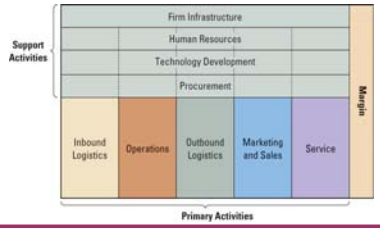
- Companies use three philosophies to create a manufacturing schedule:
  - Push Manufacturing process
  - Pull Manufacturing process
  - Material Requirements Planning (MRP)
- Manufacturing resource planning (MRP II) is a follow-on to MRP that includes the planning of materials, personnel, and machinery.

Figure 7-10 Major Problems of Isolated Functional Systems



The Value Chain

- Value in the Porter model is the total revenue that a customer is willing to spend for a product or service.
- Value is stressed rather than cost because an organization that has a differentiation strategy may intentionally raise costs in order to create value.
- Margin is the difference between cost and value.



Value Chain Model–Primary Activities

- Each stage of the generic chain primary activities accumulates costs and adds value to the product.
- The net result is the total margin of the chain that is the difference between the total value added and the total costs incurred.
- The generic value chain must be adopted to specific business (for example, your university or place where you work).

Figure 7-14 Task Descriptions for Primary Activities of the Value Chain

Primary Activity	Description
Inbound logistics	Receiving, storing, and disseminating inputs to the product
Operations	Transforming inputs into the final product
Outbound 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

Value Chain Model–Support Activities

- The support activities in the generic value chain contribute indirectly to production, sale, and service of the product which includes:
  - Procurement
  - Technology
  - Research
  - Firm infrastructure
- Linkages are interactions across value activities.
- Linkages are important sources of efficiencies and are readily supported by information systems.
- MRP and MRP II are functional systems that use linkages to reduce inventory costs.

Business Process Design

- The idea of the value chain as a network of value-creating activities became the foundation of a movement called business process design, or sometimes business process redesign.
- The central idea is that organizations should not automate or improve existing functional systems.
- Rather they should create new, more efficient, business processes that integrate the activities of all departments involved in a value chain.
- The goal was to take advantage of as many activities of all departments involved in a value chain.

Challenges of a Business Process Design

- Process design projects are expensive and difficult.
- Highly trained systems analysts interview key personnel from many departments and document the existing system as well as one or more systems alternatives.
- Managers review the results of the analysts' activity, usually many times, and attempt to develop new, improved processes.
- Changes in process design may have to take place before the new system (project) is completed.
- Greater challenges can occur such as employees resistance to change.
- An organization that embarks on a business process design project does not know ahead of time how effective the ultimate outcome will be.

Benefits of Inherent Processes

- If the software is designed well, the inherent processes will save the organization the substantial, sometimes staggering, cost of designing new processes itself.
- Licenses
  - To some, when business licenses cross-departmental software, the primary benefit is not the software, but the inherent processes in the software.
  - Licensing an integrated application not only saves the organization the time, expense, and agony of process design, it also enables the organization to benefit immediately from the tried and tested cross-departmental processes.

Disadvantages of Inherent Processes

- The inherent processes may be very different from existing processes and thus require the organization to change substantially.
- Such change will be disruptive to ongoing operations and very disturbing to employees.

Customer Relationship Management

- Customer relationship management (CRM) is the set of business processes for attracting, selling, managing, and supporting customers.
- The difference between CRM systems and traditional functional applications is that CRM addresses all activities and events that touch the customer and provides a single repository for data about all customer interactions.
- CRM systems store all customer data in one place and thus make it possible to access all data about the customer.
- Some CRM systems include activities that occur at the customer's site.

Figure 7-16 The Customer Life Cycles

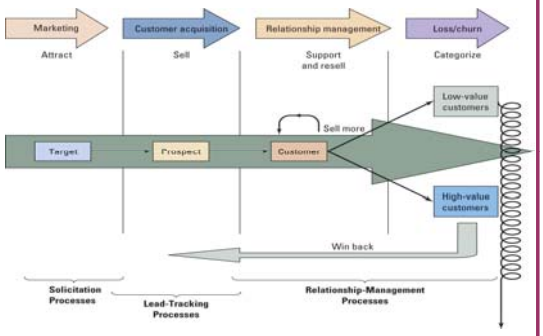
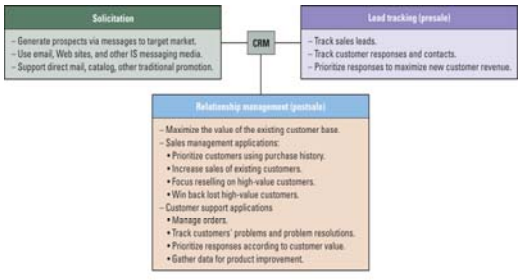


Figure 7-17 CRM Components



Enterprise Resource Planning

- Enterprise resource planning (ERP) integrates all of the organization's principal processes.
- ERP is an outgrowth of MRP II manufacturing systems, and the primary ERP users are manufacturing companies.
- ERP Characteristics
  - ERP takes a cross-functional, process view of the entire organization.
  - With ERP, the entire organization is considered a collection of interrelated activities.
  - ERP is a formal approach that is based on documented, tested business models.
  - ERP applications include a comprehensive set of inherent processes for all organizational activities.
  - SAP defines this set as the process blueprint and documents each process with diagrams that use a set of standardized symbols.
  - ERP is based on formally defined procedures, organizations must adapt their processing to the ERP blueprint.

Enterprise Application Integration (Continued)

- ERP Characteristics (continued)
  - If they do not, the system cannot operate effectively, or even correctly.
  - With ERP systems, organizational data are processed in a centralized database.
  - The process of moving from separated, functional applications to an ERP system is difficult, fraught with challenge, and can be slow.
- ERP Characteristics (continued)
  - The switch to an ERP system is very costly, not only because of the need for new hardware and software, but also due to the costs of:
    - Developing new procedures
    - Training employees
    - Converting data
    - Other developmental expenses

Figure 7-20 Potential Benefits of ERP

- Efficient business processes
- Inventory reduction
- Lead-time reduction
- Improved customer service
- Greater, real-time insight into organization
- Higher profitability

Implementing an ERP System

- The first task is to model the current business processes.
- Managers and analysts compare these processes to the ERP blueprint processes and note the differences.
- The company must then find ways to eliminate the differences by either:
  - Changing the existing business process to match the ERP process
  - Altering the ERP system
- SAP blueprint contains over a thousand process models.
- Organizations that are adopting ERP must review those models and determine which ones are appropriate to them.
- The organizations compare the ERP models to the models developed based on their current practices.

Implementing an ERP System (Continued)

- Once the differences between the as-is processes and the blueprint have been reconciled, the next step is to implement the system.
- Before implementation starts, users must be trained on the new processes, procedures, and use of the ERP system features and functions.
- The company needs to conduct a simulation test of the new system to identify problems.
- The organization must convert its data, procedures, and personnel to the new ERP system.
- Because so much organizational change is required, all ERP projects must have full support of the CEO and executive staff.

Review: Chapter 10 – Information Systems Management

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The Information Systems Department

- The main functions of the information systems department are as follows:
  - Plan the use of IT to accomplish organizational goals and strategy.
  - Develop, operate, and maintain the organization's computing infrastructure.
  - Develop, operate, and maintain enterprise applications.
  - Protect information assets.
  - Manage outsourcing relationships.

The Information Systems Department (Continued)

- The last IS department is *outsourcing relations*.
  - This group exists in organizations that have negotiated outsourcing agreements with other companies to provide equipment, applications, or other services.
- There is also a *data administration* staff function.
  - The purpose of this group is to protect data and information assets by establishing data standards and data management practices and polices.
- Keep the distinction between IS and IT.
  - Information systems (IS) exist to help the organization achieve its goals and objectives.
  - Information technology (IT) is just technology.
    - It concerns the products, techniques, procedures, and designs of computer-based technology.
    - IT must be placed into the structure of an IS before an organization can use it.

Align Information Systems with Organizational Strategy

- Information systems must be aligned with organizational strategy.
- The purpose of an information system is to help the organization accomplish its goals and objectives.

- Align information systems with organizational strategy; maintain alignment as organization changes.
- Communicate IS/IT issues to executive group.
- Develop/enforce IS priorities within the IS department.
- Sponsor steering committee.

Develop Priorities and Enforce Within the IS Department

- The CIO must evaluate every proposal, at the earliest stage possible, as to whether it is consistent with the goals of the organization and aligned with its strategy.
- No organization can afford to implement every good idea.
- Projects that are aligned with the organization's strategy must be prioritized.
- The IS department must develop the most appropriate systems possible, given constraints on time and money.

Align Infrastructure Design with Organizational Structure

- The structure of the IS infrastructure must mirror the structure of the organization.
- A highly controlled and centralized organization needs highly controlled and centralized information systems.
- A decentralized organization with autonomous operating units requires decentralized information systems that facilitate autonomous activity.

Track Problems and Monitor Resolutions

- The IS department provides the computing infrastructure as a service to users.
- The system is used to record user problems and monitor their resolution.
- When a user reports a problem the department assigns a tracking number, and the problem enters a queue for service.
- Problems are prioritized on the basis of how critical they are to the user's work.
- Higher-priority items are serviced first.
- The user is told its priority and given an approximate date for resolution.

Figure 10-7 Managing Enterprise Applications

- Manage development of new applications.
- Maintain legacy systems.
- Adapt systems to changing requirements.
- Track user problems and monitor fixes.
- Integrate applications.
- Manage development staff.

Maintain Systems

- The IS department has the responsibility for system maintenance.
- *Maintenance* means either to fix the system to do what it is supposed to do in the first place or to adapt the system to changed requirements.
- The IS department must have a means to track user issues and problems, prioritize them, and record their resolution.
- Companies need special maintenance activities to support legacy systems.
- **A legacy information system** is one that has outdated technologies and techniques but is still used, despite its age.
  - Legacy system maintenance entails adapting those systems to new tax laws, accounting procedures, or other requirements that must be implemented for the legacy system to be relevant and useful.

Figure 10-9 Data Administration

Enterprise-wide function to:

- Define data standards.
- Maintain data dictionary.
- Define data policies.
- Establish disaster-recovery plan.

Outsourcing

- Outsourcing is the process of hiring another organization to perform a service.
- Outsourcing is done to save costs, to gain expertise, and to free up management time.

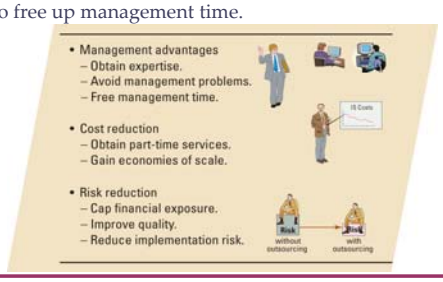
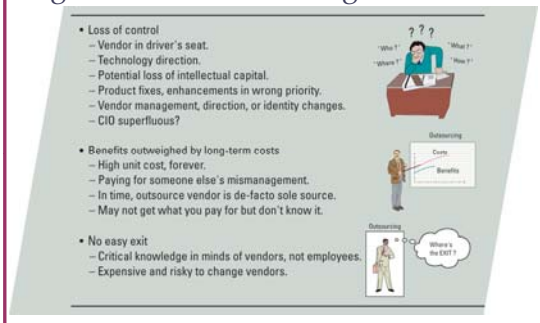


Figure 10-13 Outsourcing Risks



Review: Chapter 11 – Information Security Management

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Figure 11-1 Security Problems and Sources

		Source		
		Human Error	Malicious Activity	Natural Disasters
Problem	Unauthorized data disclosure	Procedural mistakes	Pretexting Phishing Spoofing Sniffing Computer crime	Disclosure during recovery
	Incorrect data modification	Procedural mistakes Incorrect procedures Ineffective accounting controls System errors	Hacking Computer crime	Incorrect data recovery
	Faulty service	Procedural mistakes Development and installation errors	Computer crime Usurpation	Service improperly restored
	Denial of service	Accidents	DOS attacks	Service interruption
	Loss of infrastructure	Accidents	Theft Terrorist activity	Property loss

Unauthorized Data Disclosure

- *Unauthorized data disclosure* can occur by human error when someone inadvertently releases data in violation of a policy.
  - An example at a university would be a new department administrator who posts student names, numbers, and grades in a public place.
- The popularity and efficacy of search engines has created another source of inadvertent disclosure.
- Employees who place restricted data on Web sites that can be reached by search engines may mistakenly publish proprietary or restricted data over the Web.

Incorrect Data Modification

- Incorrect data modification can occur through human error when employees follow procedures incorrectly or when procedures have been incorrectly designed.
  - Examples include incorrectly increasing a customer's discount or incorrectly modifying an employee's salary.
- Hacking occurs when a person gains unauthorized access to a computer system.
  - Examples include reducing account balances or causing the shipment of goods to unauthorized locations and customers.

Faulty Service

- *Faulty service* includes problems that result because of incorrect system operation.
- Faulty service could include incorrect data modification, as previously described.
- It also could include systems that work incorrectly, by sending the wrong goods to the customer or the ordered goods to the wrong customer, incorrectly billing customers, or sending the wrong information to employees.
- **Usurpation** occurs when unauthorized programs invade a computer system and replace legitimate programs.
- Faulty service can also result from mistakes made during the recovery from natural disasters.

Denial of Service

- Human error in following procedures or a lack of procedures can result in **denial of service.**
  - For example, humans can inadvertently shut down a Web server or corporate gateway router by starting a computationally intensive application.
- *Denial-of-service attacks* can be launched maliciously.
  - A malicious hacker can flood a Web server, for example, with of millions of bogus services requests that so occupy the server that it cannot service legitimate requests.
  - Natural disasters may cause systems to fail, resulting in denial of service.

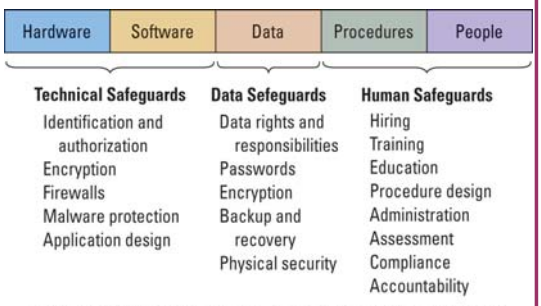
Loss of Infrastructure

- Human accidents can cause *loss of infrastructure.*
  - Examples are a bulldozer cutting a conduit of fiber-optic cables and the floor buffer crashing into a rack of Web servers.
  - Theft and terrorist events also cause loss of infrastructure.
    - A disgruntled, terminated employee can walk off with corporate data servers, routers, or other crucial equipment.
- Natural disasters present the largest risk for infrastructure loss.
  - A fire, flood, earthquake, or similar event can destroy data centers and all they contain.

The Security Program

- A security has three components:
  - Senior management involvement:
    - Senior management must establish the security policy
      - This policy sets the stage for the organization to respond to threats.
    - Senior management must manage risk by balancing the costs and benefits of the security program.
  - Safeguards of various kinds.
    - Safeguards are protections against security threats.
    - Safeguards involve computer hardware and software, data, procedures and people.
  - Incident response
    - A security program consists of the organization's planned response to security incidents.

Figure 11-2 Security Safeguards as They Relate to the Five Components



Effective security requires balanced attention to all five components!

Risk Management

- **Risk** is the likelihood of an adverse occurrence.
- Management cannot manage threats directly, but it *can* manage the likelihood that threats will be successful.
- Companies can reduce risks, but always at a cost.
- **Uncertainty** refers to the things we don't know that we don't know.

1. Assets
2. Threats
3. Safeguards
4. Vulnerability
5. Consequences
6. Likelihood
7. Probable loss

Firewalls

- A firewall is a computing device that prevents unauthorized network access. It can be a special-purpose computer or a program on a general-purpose computer or on a router
- Organizations normally use multiple firewalls.
  - A **perimeter firewall** sits outside the organization network; it is the first device that Internet traffic encounters.
  - Some organizations employ **internal firewalls** inside the organizational network in addition to the perimeter firewall.
- A **packet-filtering firewall** examines each packet and determines whether to let the packet pass.
- A firewall has an **access control list (ACL)**, which encodes the rules stating which packets are to be allowed and which are to be prohibited.

Malware Protection

- *malware* is viruses, worms, Trojan horses, spyware, and adware.
- **Spyware** programs are installed on the user's computer without the user's knowledge.
- Spyware resides in the background and, unknown to the user, observes the user's actions and keystrokes, monitors computer activity, and reports the user's activities to sponsoring organizations.
- Adware is similar to spyware in that it is installed without the user's permission and resides in the background and observes user behavior.
- Most adware is benign in that it does not perform malicious acts or steal data.
- Adware produces pop-up ads and can also change the user's default window or modify search results and switch the user's search engine.

Figure 11-9 Spyware and Adware Symptoms

- Slow system start up
- Sluggish system performance
- Many pop-up advertisements
- Suspicious browser homepage changes
- Suspicious changes to the taskbar and other system interfaces
- Unusual hard-disk activity

Data Safeguards

- *Data safeguards* are measures used to protect databases and other organizational data.
- The organization should protect sensitive data by storing it in encrypted form.
  - Such encryption uses one or more keys in ways similar to that described for data communication encryption.
- Backup copies of the database contents should be made periodically.
- The organization should store at least some of the database backup copies off premises, possibly in a remote location.
- IT personnel should periodically practice recovery, to ensure that the backups are valid and that effective recovery procedures exist.
- The computers that run the DBMS and all devices that store database data should reside in locked, controlled-access facilities.

System Monitoring

- Important monitoring functions are activity log analyses, security testing, and investigating and learning from security incidents.
- Many information system programs produce *activity logs*.
  - Firewalls produce logs of their activities, including lists of all dropped packets, infiltration attempts, and unauthorized access attempts from within the firewall.
  - DBMS products produce logs of successful and failed log-ins.
- Web servers produce voluminous logs of Web activities.
- The operating systems in personal computers can produce logs of log-ins and firewall activities.
- An important security function is to analyze activity logs for threats patterns, successful and unsuccessful attacks, and evidence of security vulnerabilities.

Figure 11-15 Disaster Preparedness

- Locate infrastructure in safe location.
- Identify mission-critical systems.
- Identify resources needed to run those systems.
- Prepare remote backup facilities.
- Train and rehearse.

Incident Response

- Every organization should have an incident-response plan as part of the security program.
- No organization should wait until some asset has been lost or compromised before deciding what to do.
- The plan should include how employees are to respond to security problems:
  - Whom they should contact
  - The reports they should make
  - The steps they can take to reduce further loss
- The plan should provide centralized reporting of all security incidents.
- The incident-response plan should identify critical personnel and their off-hours contact information.

Figure 11-16 Factors in incident Response

- Have plan in place
- Centralized reporting
- Specific responses
  - Speed
  - Preparation pays
  - Don't make problem worse
- Practice!

Problem Solving Guide–Testing Security

- The combination of bias and dissimilar worldviews means that security systems cannot be tested by the people who build them, or at least not only by the people who built the system.
- Therefore, many companies hire outsiders to test the security of their systems.
- **White hat hackers** are people who break into networks for the purpose of helping the organization that operates the network.
- White-hat hackers report the problems they find and suggest solutions-or at least they are supposed to.

Review: Chapter 9 Business Intelligence and Knowledge Management

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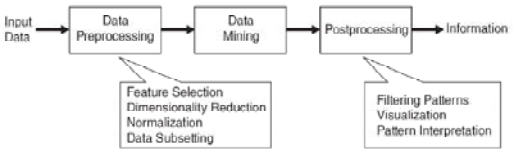
Why Mine Data? Commercial Viewpoint

- Lots of data is being collected and warehoused
  - Web data, e-commerce
  - Bank/Credit Card transactions

- Computers have become cheaper and more powerful
- Competitive Pressure is Strong
  - Provide better, customized services for an *edge* (e.g. in Customer Relationship Management)
- There is often information "hidden" in the data that is not readily evident
- Human analysts may take weeks to discover useful information
- Much of the data is never analyzed at all

What is Data Mining?

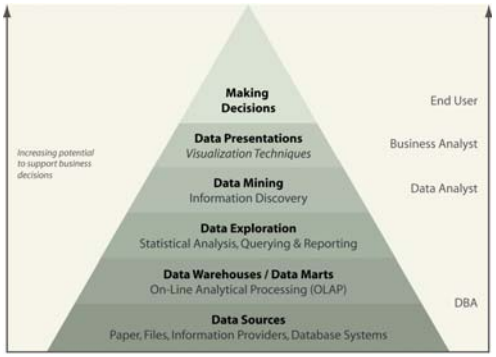
- Many Definitions
  - Non-trivial extraction of implicit, previously unknown and potentially useful information from data
  - Exploration & analysis, by automatic or semi-automatic means, of large quantities of data in order to discover meaningful patterns



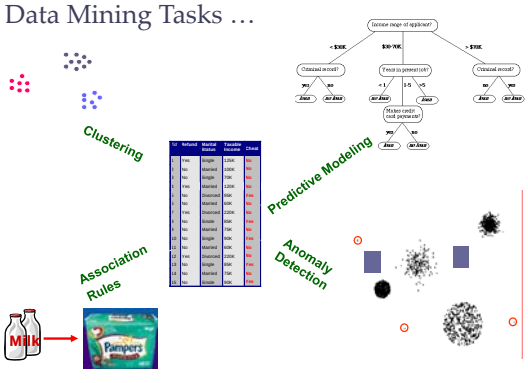
What is (not) Data Mining?

- What is not Data Mining?
  - Look up phone number in phone directory
  - Check the dictionary for the meaning of a word
- What is Data Mining?
  - Certain names are more prevalent in certain US locations (O'Brien, O'Rurke, O'Reilly… in Boston area)
  - Group together similar documents returned by search engine according to their context (e.g. Amazon rainforest, Amazon.com,)

Data Mining and Business Intelligence



Data Mining Tasks …

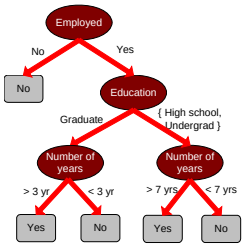


Predictive Modeling: Classification

- Find a model for class attribute as a function of the values of other attributes

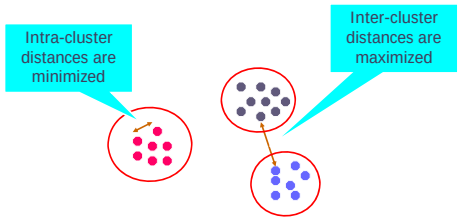
Model for predicting credit worthiness

Tid	Employed	Level of Education	# years at present address	Class: Credit Worthy
1	Yes	Graduate	5	Yes
2	Yes	High School	2	No
3	No	Undergrad	1	No
4	Yes	High School	10	Yes
…	…	…	…	…



Clustering

- Finding groups of objects such that the objects in a group will be similar (or related) to one another and different from (or unrelated to) the objects in other groups



Association Rule Discovery: Definition

- Given a set of records each of which contain some number of items from a given collection
  - Produce dependency rules which will predict occurrence of an item based on occurrences of other items.

TID	Items
1	Bread, Coke, Milk
2	Beer, Bread
3	Beer, Coke, Diaper, Milk
4	Beer, Bread, Diaper, Milk
5	Coke, Diaper, Milk

Rules Discovered:
{Milk} --> {Coke}
{Diaper, Milk} --> {Beer}

Association Analysis: Applications

- Market-basket analysis
  - Rules are used for sales promotion, shelf management, and inventory management
- Telecommunication alarm diagnosis
  - Rules are used to find combination of alarms that occur together frequently in the same time period
- Medical Informatics
  - Rules are used to find combination of patient symptoms and complaints associated with certain diseases

Deviation/Anomaly Detection

- Detect significant deviations from normal behavior
- Applications:
  - Credit Card Fraud Detection
  - Network Intrusion Detection

Review: Web 2.0

Web 2.0 technologies

- Conversation: **Blogs**
- Syndication: **RSS**
- Consensus: **Wikis**
- Sharing: **Social bookmarking**

Conversation: Blogs

- A **blog** is a website where entries are made in journal style and displayed in a reverse chronological order.
- A blog entry typically consists of the following:
  - *Title*, the main title, or headline, of the post.
  - *Body*, main content of the post.
  - *Permalink*, the URL of the full, individual article.
  - *Post Date*, date and time the post was published.
- A blog entry optionally includes the following:
  - *Comments*
  - *Categories* (or tags) - subjects that the entry discusses
  - *Trackback* and or *pingback* - links to other sites that refer to the entry

Syndication: RSS

- RSS stands for "Really Simple Syndication"

Consensus: Wikis

- A type of website that allows the visitors themselves to easily add, remove and otherwise edit and change some available content, sometimes without the need for registration
- Ease of interaction and operation makes a wiki an effective tool for **collaborative authoring**
- The open philosophy of most wikis—of allowing anyone to edit content—does not ensure that editors are well intentioned

Sharing: Social Bookmarking, etc.

Sharing of information takes on many forms

- File sharing and peer-to-peer networks
- Ratings, rankings, opinions (i.e. Amazon or Angieslist.com)
- Friends lists (i.e. MySpace or Friendster)
- Social bookmarking
  - Sharing links (del.icio.us)
  - Sharing lists (LibraryThing, All Consuming)
  - Sharing articles (CiteULike, PennTags)