



# Chapter 13



## Building Systems



# Management Information Systems

## Chapter 13 Building Systems

### LEARNING OBJECTIVES

- **Demonstrate how building new systems produces organizational change.**
- **Identify and describe the core activities in the systems development process.**
- **Evaluate alternative methods for building information systems.**
- **Compare alternative methodologies for modeling systems.**
- **Identify and describe new approaches for system-building in the digital firm era.**



# Management Information Systems

## Chapter 13 Building Systems

### A New Ordering System for Girl Scout Cookies

- **Problem:** Inefficient manual procedures, high error rate.
- **Solutions:** Eliminate manual procedures, design new ordering process, and implement database building software to batch and track orders automatically and schedule order pickups.
- **QuickBase for Corporate Workgroups software service** increased efficiency and reduced errors.
- Demonstrates IT's role in updating traditional business processes.
- Illustrates digital technology as the focus of designing and building new information systems.



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Four kinds of structural organizational change enabled by IT**
  - 1. Automation**
    - Increase efficiency, replace manual tasks
  - 2. Rationalization**
    - Streamline standard operating procedures
  - 3. Business process reengineering**
    - Analyze, simplify, and redesign business processes
  - 4. Paradigm shifts**
    - Rethink nature of business, define new business model, change nature of organization

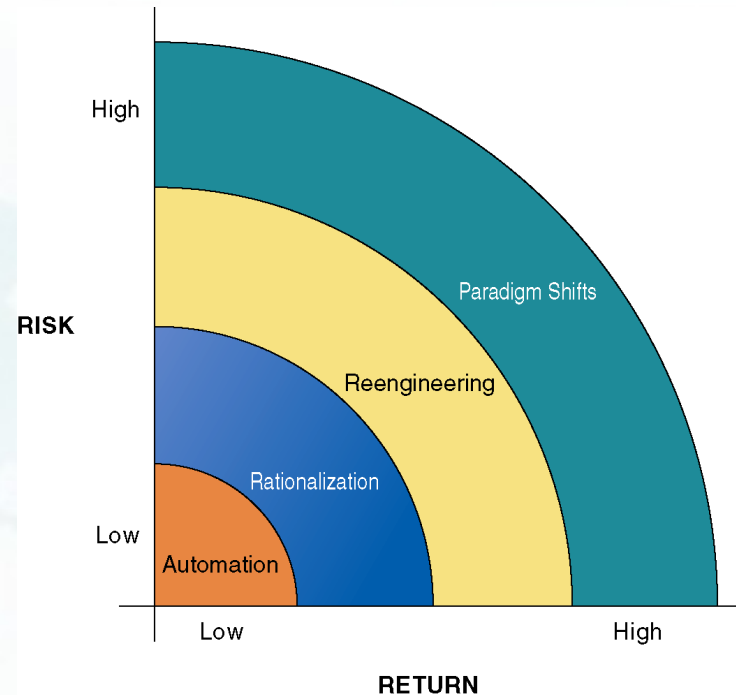


# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

## Organizational Change Carries Risks and Rewards



The most common forms of organizational change are automation and rationalization. These relatively slow-moving and slow-changing strategies present modest returns but little risk. Faster and more comprehensive change—such as reengineering and paradigm shifts—carries high rewards but offers substantial chances of failure.

**Figure 13-1**



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Business process reengineering (BPR)**
  - Large payoffs can result from redesigning business processes
    - E.g. Home mortgage industry used IT to redesign mortgage application process costing \$3000 and taking 6-8 weeks to 1-week process costing \$1000
    - Replaced sequential tasks with “work cell” or team approach
  - **Work flow management:** Process of streamlining business procedures so documents can be moved easily and efficiently

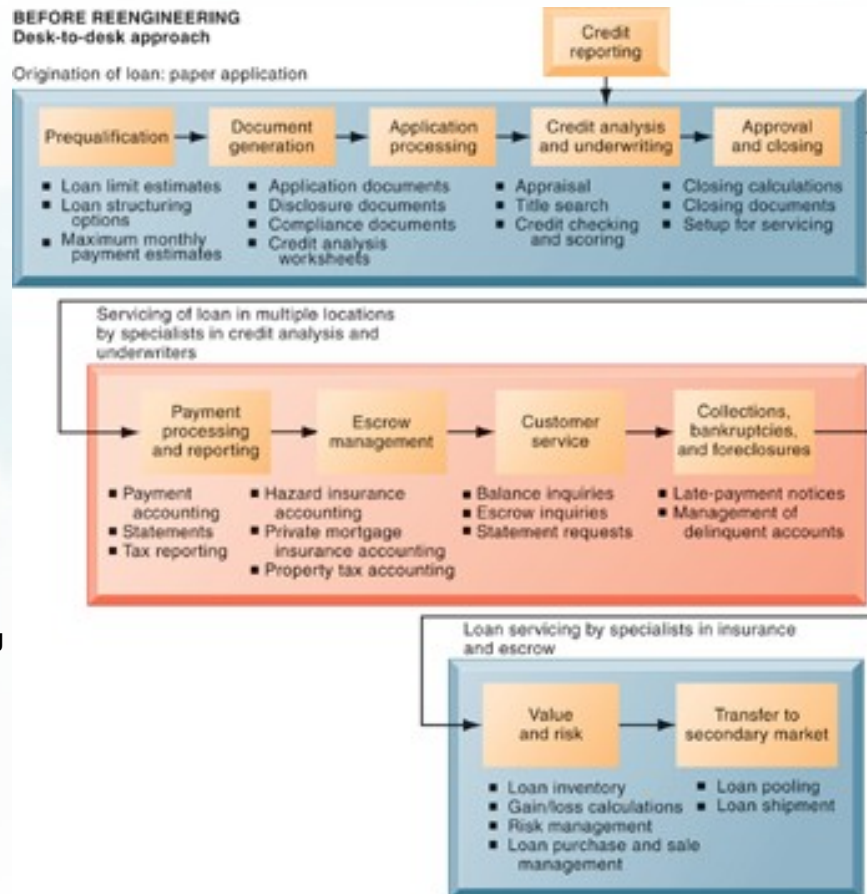


# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

## Redesigning Mortgage Processing in the United States



**Figure 13-2A**

By redesigning their mortgage processing systems and the mortgage application process, mortgage banks have been able to reduce the costs of processing the average mortgage from \$3,000 to \$1,000 and reduce the time of approval from six weeks to one week or less. Some banks are even preapproving mortgages and locking interest rates on the same day the customer applies.



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

## Redesigning Mortgage Processing in the United States

AFTER REENGINEERING  
Team approach

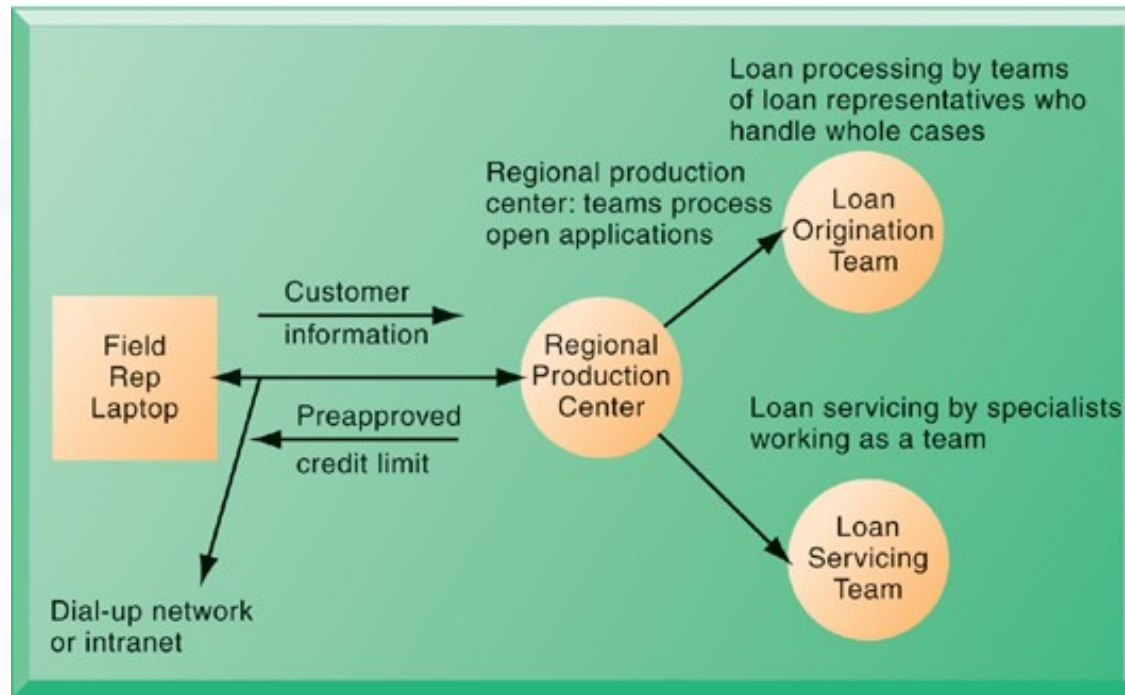


Figure 13-2B





# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

## **Business Process Redesign at the Small Business Administration**

- **Read the Interactive Session: Organizations, and then discuss the following questions:**
  - **What was wrong with the existing computer system (ALCS) and why did SBA decide to replace it?**
  - **What was the purpose of re-organizing the ODA and centralizing IT in a single office, and centralizing other functions like the call center in a single office?**
  - **In what other ways could the agency use information systems to improve the process of loan application, approval, and maintenance?**



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Steps in effective reengineering**
  - Determine which business processes should be improved
    - Strategic analysis
    - Pain points
  - Identify and describe existing process
    - Identify inputs and outputs, flow of products, network of activities and buffers, resources, information structure and flow, process owners, process actors and decision makers
  - Understand how much process costs and how long to perform
    - Process cost, process time, process quality, process flexibility



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Steps in effective reengineering (cont.)**
  - Determine which methods can improve process
    - Replace sequential steps with parallel
    - Enrich jobs by enhancing decision making and concentrating information
    - Enable information sharing throughout to all participants
    - Eliminate buffers (decision delays and inventories)
    - Transform batch processing and decision making into continuous flow processes
    - Automate decision tasks wherever possible



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Business process management (BPM)**
  - Helps firms manage process changes through use of process-mapping tools to:
    - Identify and document existing processes
    - Create models of improved processes that can be translated into software systems



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Business process management (cont.)**
  - Includes:
    - Work flow management
    - Business process modeling notation
    - Quality measurement and management
    - Change management
    - Tools for standardizing business processes so they can be continually manipulated
    - Process monitoring and analytics
      - To verify process performance has improved and measure impact of process changes on key business performance indicators



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Quality management:**
  - Fine-tuning business processes to improve quality in their products, services, and operations
  - The earlier in the business cycle a problem is eliminated, the less it costs the company
  - Quality improvements raise level of product and service quality as well as lower costs
- **Total Quality Management (TQM):**
  - Achievement of quality control is end in itself
  - Everyone is expected to contribute to improvement of quality
- **Six sigma:**
  - Specific measure of quality
  - 3.4 defects per million opportunities



# Management Information Systems

## Chapter 13 Building Systems

### Systems as Planned Organizational Change

- **Information systems support quality improvements by helping firms:**
  - Simplify products or processes
  - Make improvements based on customer demands
  - Reduce cycle time
  - Improve quality and precision of design and production
  - Meet **benchmarking** standards
    - **Benchmarking:** Setting strict standards for products, services, and other activities, and then measuring performance against those standards



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Systems development:** Activities that go into producing an information system solution to an organizational problem or opportunity
  - Systems analysis
  - Systems design
  - Programming
  - Testing
  - Conversion
  - Production and maintenance



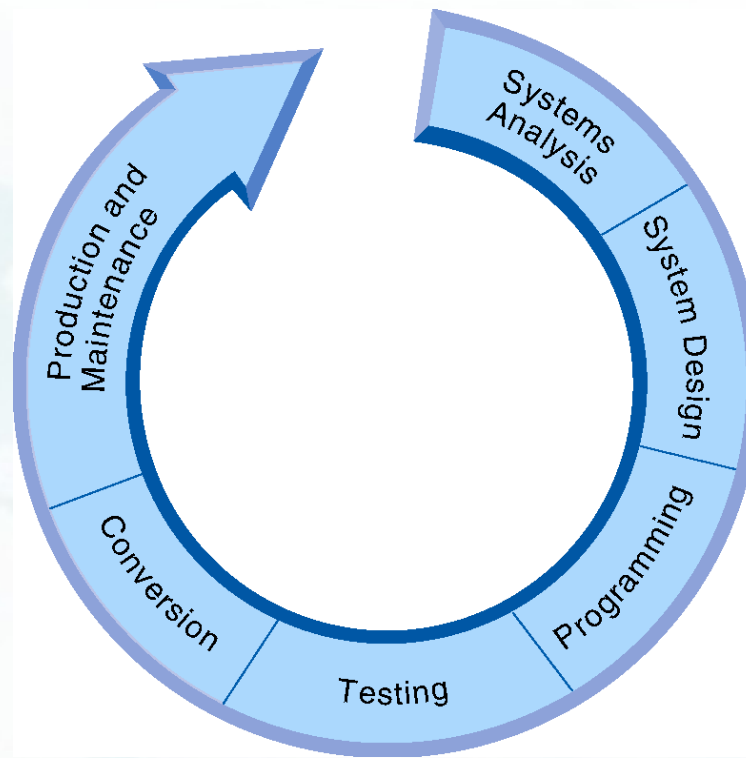


# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## The Systems Development Process



Building a system can be broken down into six core activities.

**Figure 13-3**



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Systems analysis**
  - Analysis of problem
    - Defining the problem and identifying causes
    - Specifying solutions
      - Written systems proposal report describes costs and benefits of each alternative solution
    - Identifying **information requirements** to be met
      - Who needs what information where, when, and how
  - Includes **feasibility study**
    - Is solution a good investment?
    - Is required technology, skill available?



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Systems design**
  - Describe system specifications that will deliver functions identified during systems analysis
  - Should address all managerial, organizational, and technological components of system solution
  - **Role of end users**
    - User information requirements drive system-building
    - Users must have sufficient control over design process to ensure that system reflects their business priorities and information needs
    - Insufficient user involvement in design effort is major cause of system failure



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## Design Specifications

<p><b>OUTPUT</b> Medium Content Timing</p> <p><b>INPUT</b> Origins Flow Data entry</p> <p><b>USER INTERFACE</b> Simplicity Efficiency Logic Feedback Errors</p> <p><b>DATABASE DESIGN</b> Logical data model Volume and speed requirements File organization and design Record specifications</p>	<p><b>PROCESSING</b> Computations Program modules Required reports Timing of outputs</p> <p><b>MANUAL PROCEDURES</b> What activities Who performs them When How Where</p> <p><b>CONTROLS</b> Input controls (characters, limit, reasonableness) Processing controls (consistency, record counts) Output controls (totals, samples of output) Procedural controls (passwords, special forms)</p> <p><b>SECURITY</b> Access controls Catastrophe plans Audit trails</p>	<p><b>DOCUMENTATION</b> Operations documentation Systems documents User documentation</p> <p><b>CONVERSION</b> Transfer files Initiate new procedures Select testing method Cut over to new system</p> <p><b>TRAINING</b> Select training techniques Develop training modules Identify training facilities</p> <p><b>ORGANIZATIONAL CHANGES</b> Task redesign Job redesign Process design Organization structure design Reporting relationships</p>
---	---	---



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Programming:**
  - System specifications from design stage are translated into software program code
  - Software may be purchased, leased, or outsourced instead
- **Testing**
  - To ensure system produces right results
  - **Test plan:** All preparations for series of tests
  - **Unit testing:** Tests each program in system separately
  - **System testing:** Tests functioning of system as a whole
  - **Acceptance testing:** Makes sure system is ready to be used in production setting



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## A Sample Test Plan to Test a Record Change

Procedure		Address and Maintenance "Record Change Series"		Test Series 2		
Test Ref.		Condition Tested	Special Requirements	Expected Results	Output On	Next Screen
		Prepared By:		Date:	Version:	
2.0	Change records					
2.1	Change existing record	Key field		Not allowed		
2.2	Change nonexistent record	Other fields		"Invalid key" message		
2.3	Change deleted record	Deleted record must be available		"Deleted" message		
2.4	Make second record	Change 2.1 above		OK if valid	Transaction file	V45
2.5	Insert record			OK if valid	Transaction file	V45
2.6	Abort during change	Abort 2.5		No change	Transaction file	V45

When developing a test plan, it is imperative to include the various conditions to be tested, the requirements for each condition tested, and the expected results. Test plans require input from both end users and information systems specialists.

Figure 13-4



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Conversion**

- Process of changing from old system to new system
- Four main strategies
  - Parallel strategy
  - Direct cutover
  - Pilot study
  - Phased approach
- Requires end-user training
- Finalization of detailed documentation showing how system works from technical and end-user standpoint



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Production and maintenance**
  - System reviewed to determine if any revisions needed
  - May prepare formal **postimplementation audit** document
  - **Maintenance**
    - Changes in hardware, software, documentation, or procedures to a production system to correct errors, meet new requirements, or improve processing efficiency
    - 60 percent of maintenance work:
      - User enhancements
      - Improving documentation
      - Recoding system components for greater processing efficiency





# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## Summary of Systems Development Activities

CORE ACTIVITY	DESCRIPTION
<b>Systems analysis</b>	Identify problem(s) Specify solutions Establish information requirements
<b>Systems design</b>	Create design specifications
<b>Programming</b>	Translate design specifications into code
<b>Testing</b>	Unit test Systems test Acceptance test
<b>Conversion</b>	Plan conversion Prepare documentation Train users and technical staff
<b>Production and maintenance</b>	Operate the system Evaluate the system Modify the system



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Most prominent methodologies for modeling and designing systems:**
  - Structured methodologies
  - Object-oriented development
- **Structured methodologies**
  - **Structured:** Techniques are step-by-step, progressive
  - **Process-oriented:** Focusing on modeling processes or actions that manipulate data
  - Separate data from processes



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Data flow diagram:**
  - Primary tool for representing system's component processes and flow of data between them
  - Offers logical graphic model of information flow
  - High-level and lower-level diagrams can be used to break processes down into successive layers of detail
- **Data dictionary:** Defines contents of data flows and data stores
- **Process specifications:** Describe transformation occurring within lowest level of data flow diagrams
- **Structure chart:** Top-down chart, showing each level of design, relationship to other levels, and place in overall design structure

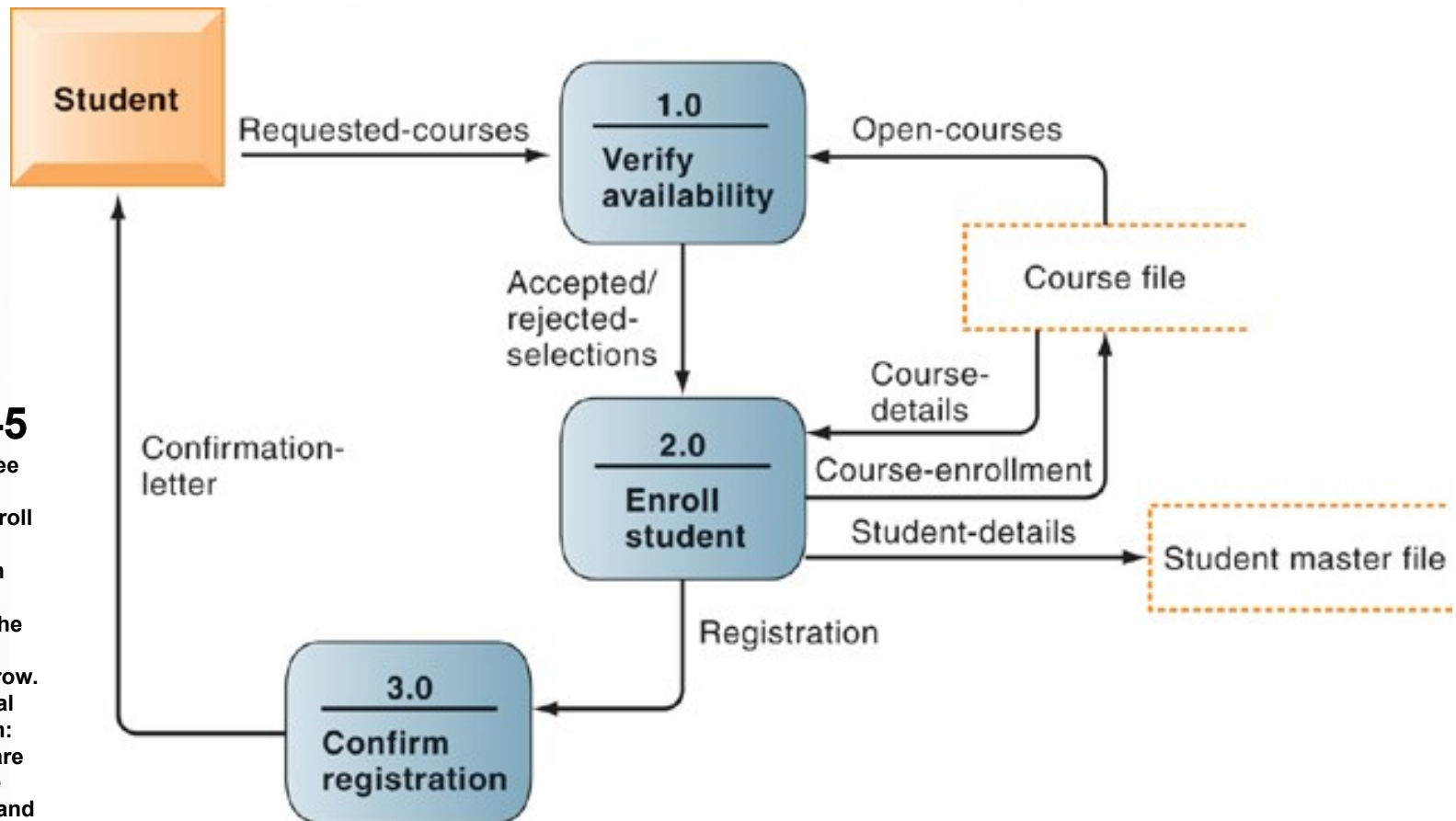


# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## Data Flow Diagram for Mail-In University Registration System



**Figure 13-5**

The system has three processes: Verify availability (1.0), Enroll student (2.0), and Confirm registration (3.0). The name and content of each of the data flows appear adjacent to each arrow. There is one external entity in this system: the student. There are two data stores: the student master file and the course file.

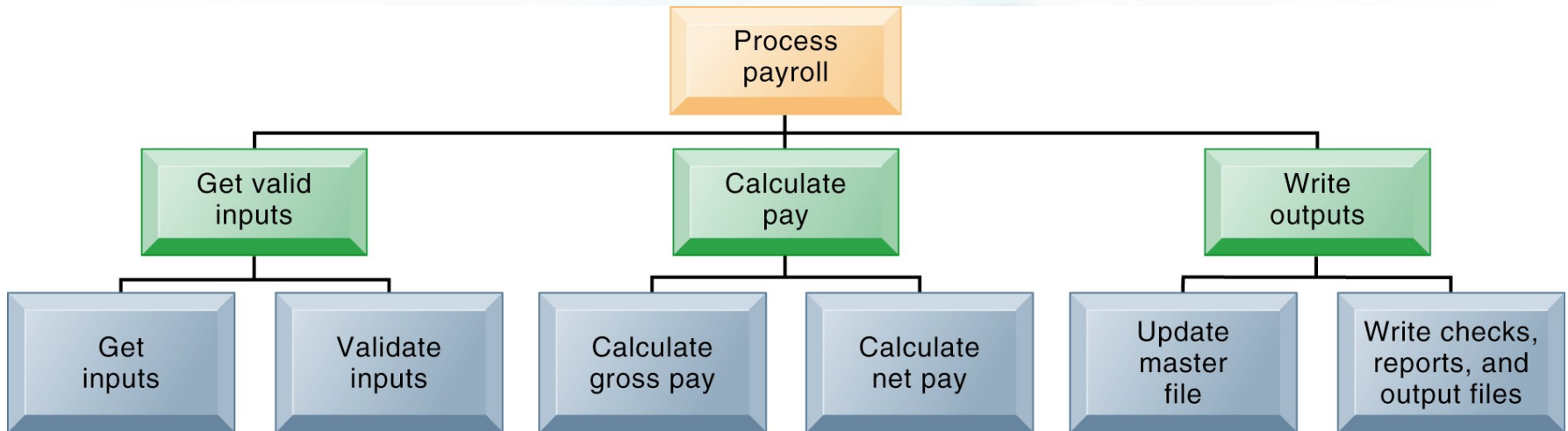


# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## High-Level Structure Chart for a Payroll System



This structure chart shows the highest or most abstract level of design for a payroll system, providing an overview of the entire system.

Figure 13-6



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Object-oriented development**
  - Uses **object** as basic unit of systems analysis and design
    - **Object:**
      - Combines data and the specific processes that operate on those data
      - Data encapsulated in object can be accessed and modified only by operations, or methods, associated with that object
  - Object-oriented modeling based on concepts of class and inheritance
    - Objects belong to a certain class and have features of that class
    - May inherit structures and behaviors of a more general, ancestor class

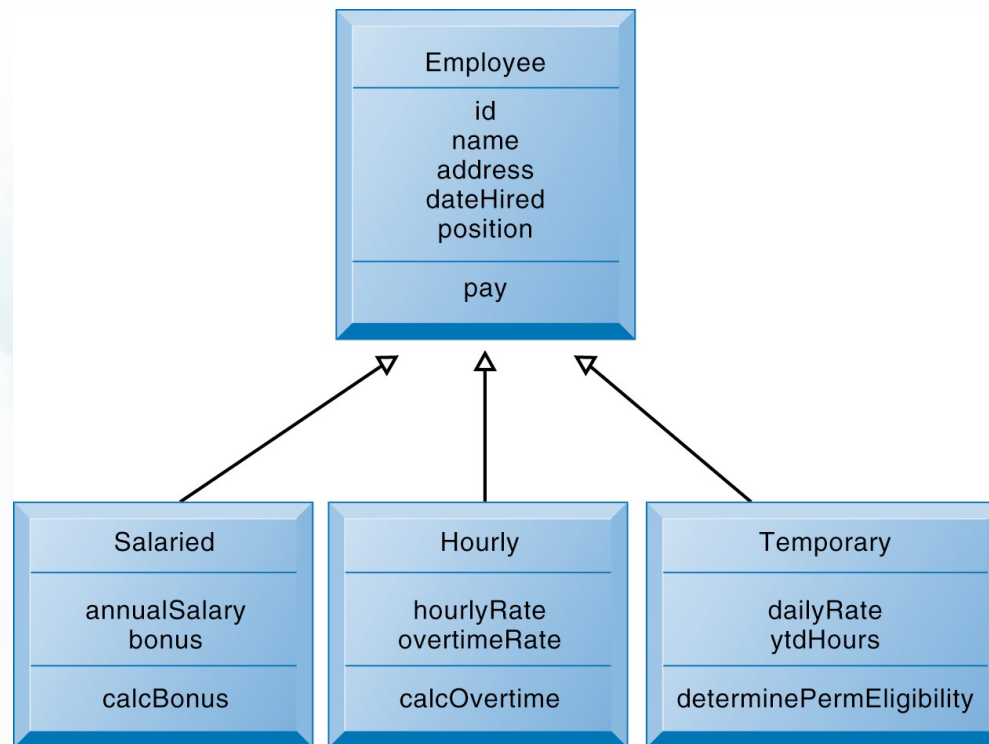


# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

## Class and Inheritance



This figure illustrates how classes inherit the common features of their superclass.

Figure 13-7



# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Object-oriented development**
  - More iterative and incremental than traditional structured development
    - **Systems analysis:** Interactions between system and users analyzed to identify objects
    - **Design phase:** Describes how objects will behave and interact; grouped into classes, subclasses and hierarchies
    - **Implementation:** Some classes may be reused from existing library of classes, others created or inherited
  - Because objects reusable, object-oriented development can potentially reduce time and cost of development





# Management Information Systems

## Chapter 13 Building Systems

### Overview of Systems Development

- **Computer-aided software engineering (CASE)**
  - Software tools to automate development and reduce repetitive work, including
    - Graphics facilities for producing charts and diagrams
    - Screen and report generators, reporting facilities
    - Analysis and checking tools
    - Data dictionaries
    - Code and documentation generators
  - May be front-end or back-end tools
  - Support iterative design by automating revisions and changes and providing prototyping facilities



# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

- **Traditional systems lifecycle:**
  - Oldest method for building information systems
  - Phased approach - divides development into formal stages
    - Follows “waterfall” approach: Tasks in one stage finish before another stage begins
  - Maintains formal division of labor between end users and information systems specialists
  - Emphasizes formal specifications and paperwork
  - Still used for building large complex systems
  - Can be costly, time-consuming, and inflexible



# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

- **Prototyping**
  - Building experimental system rapidly and inexpensively for end users to evaluate
  - **Prototype:** Working but preliminary version of information system
    - Approved prototype serves as template for final system
  - **Steps in prototyping**
    1. Identify user requirements
    2. Develop initial prototype
    3. Use prototype
    4. Revise and enhance prototype

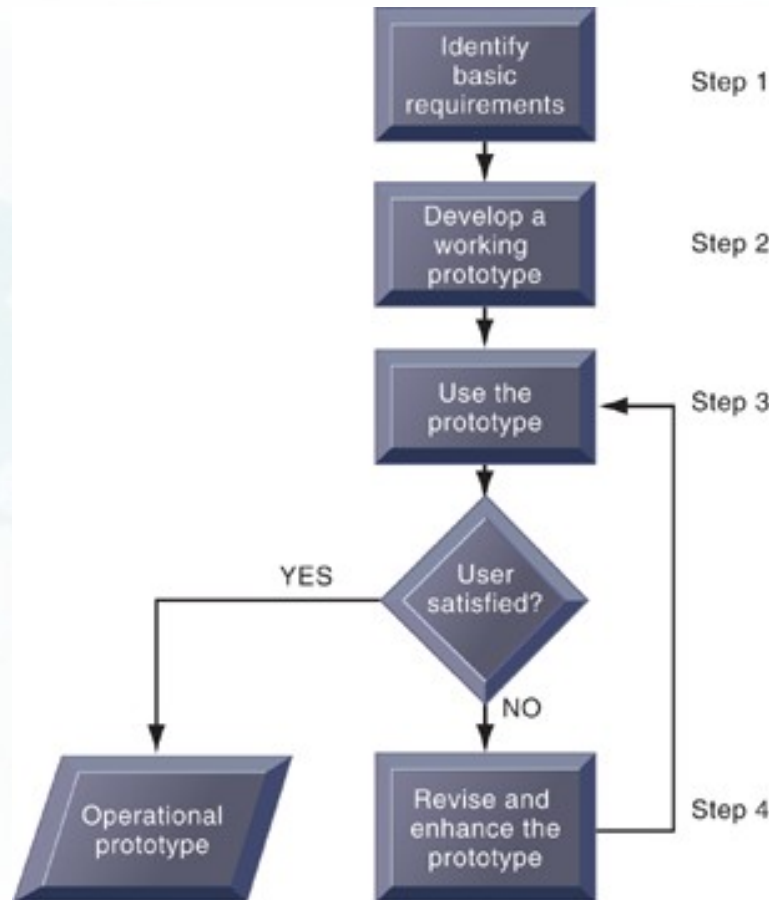


# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

## Class and Inheritance



**Figure 13-8**

The process of developing a prototype can be broken down into four steps. Because a prototype can be developed quickly and inexpensively, systems builders can go through several iterations, repeating steps 3 and 4, to refine and enhance the prototype before arriving at the final operational one.



# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

- **Advantages of prototyping**
  - Useful if some uncertainty in requirements or design solutions
  - Often used for end-user interface design
  - More likely to fulfill end-user requirements
- **Disadvantages**
  - May gloss over essential steps
  - May not accommodate large quantities of data or large number of users
  - May not undergo full testing or documentation



# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

- **End-user development:**
  - Uses **fourth-generation languages** to allow end-users to develop systems with little or no help from technical specialists
  - **Fourth generation languages:**
    - Less procedural than conventional programming languages
    - 7 categories: PC software tools, query languages, report generators, graphics languages, application generators, application software packages, and very high-level programming languages
  - **Advantages:**
    - More rapid completion of projects, high-level of user satisfaction
  - **Disadvantages:**
    - Not designed for processing-intensive applications, inadequate control, testing, documentation, or adherence to standards



# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

- **Application software packages**
  - Save time and money
  - Many packages offer customization features:
    - Allow software package to be modified to meet unique requirements without destroying integrity of package software
  - Evaluation criteria for systems analysis include:
    - Functions provided by the package, flexibility, user friendliness, hardware and software resources, database requirements, installation and maintenance efforts, documentation, vendor quality, and cost
  - **Request for Proposal (RFP)**
    - Detailed list of questions submitted to packaged-software vendors



# Management Information Systems

## Chapter 13 Building Systems

### Alternative Systems-Building Approaches

- **Outsourcing**
  - **Several types**
    - **Application service providers (ASPs)**
      - Subscribing companies use software and computer hardware provided by ASP as technical platform for systems
    - **Domestic or foreign external vendors**
      - Hired to design, create software
  - **Allows organization flexibility in IT needs**
  - **Allows vendors:**
    - Economies of scale
    - Enhance core competencies
  - **Disadvantages**
    - Hidden costs, loss of control





# Management Information Systems

## Chapter 13 Building Systems

### Application Development for the Digital Firm

## How to Get Outsourcing Right: Avoid Getting It Wrong

- **Read the Interactive Session: Management, and then discuss the following questions:**
  - **What is the basis for vendor firms claiming they can provide IT services more economically than a firm's own IT staff?**
  - **Why is it difficult to write iron-clad legal contracts specifying in detail strategic alliance outsourcing relationships?**
  - **Why do joint ventures and co-sourcing outsourcing relationships have a better chance of success?**



# Management Information Systems

## Chapter 13 Building Systems

### Application Development for the Digital Firm

- **Rapid application development (RAD)**
  - Process of creating workable systems in a very short period of time
  - Utilizes techniques such as:
    - Visual programming and other tools for building graphical user interfaces
    - Iterative prototyping of key system elements
    - Automation of program code generation,
    - Close teamwork among end users and information systems specialists



# Management Information Systems

## Chapter 13 Building Systems

### Application Development for the Digital Firm

- **Joint application design (JAD)**
  - Used to accelerate generation of information requirements and to develop initial systems design
  - Brings end users and information systems specialists together in interactive session to discuss system's design
  - Can significantly speed up design phase and involve users at intense level



# Management Information Systems

## Chapter 13 Building Systems

### Application Development for the Digital Firm

- **Component-based development**
  - Groups of objects that provide software for common functions such as online ordering capability and can be combined to create large-scale business applications
  - **Web services**
    - Reusable software components that use open, Internet standards (platform independent)
    - Enable applications to communicate with no custom programming required to share data and services
    - Software components deliverable over Internet
    - Can engage other Web services for more complex transactions, such as checking credit, procurement, or ordering products