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# Redesigning The Organization With Information Systems

# Objectives

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- Demonstrate how building new systems produces organizational change
- Explain how a company can develop information systems that fit its business plan
- Identify and describe the core activities in the systems development process

# Objectives

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- Evaluate alternative methods for building information systems and alternative methodologies for modeling systems
- Assess the challenges of building information systems and management solutions

# Management Challenges

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- Major risks and uncertainties in systems development
- Determining when new systems and business processes can have the greatest strategic impact

# Linking Information Systems to the Business Plan

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- Organizations need to develop an information systems plan that supports their overall business plan and in which strategic systems are incorporated into top-level planning
- Information systems plan
  - Identifies the direction of systems development, the rationale, the current situation, the management strategy, the implementation plan, and the budget

# Information Systems Plan

1. Purpose of the Plan
  - Overview of plan contents
  - Current business organization and future organization
  - Key business processes
  - Management strategy
2. Strategic Business Plan Rationale
  - Current situation
  - Current business organization
  - Changing environments
  - Major goals of the business plan
  - Firm's strategic plan
3. Current Systems
  - Major systems supporting business functions and processes
  - Current infrastructure capabilities
    - Hardware
    - Software
    - Database
    - Telecommunications and Internet
  - Difficulties meeting business requirements
  - Anticipated future demands
4. New Developments
  - New system projects
    - Project descriptions
    - Business rationale
    - Applications' role in strategy
  - New infrastructure capabilities required
    - Hardware
    - Software
    - Database
    - Telecommunications and Internet
5. Management Strategy
  - Acquisition plans
  - Milestones and timing
  - Organizational realignment
  - Internal reorganization
  - Management controls
  - Major training initiatives
  - Personnel strategy
6. Implementation Plan
  - Anticipated difficulties in implementation
  - Progress reports
7. Budget Requirements
  - Requirements
  - Potential savings
  - Financing
  - Acquisition cycle

# Establishing Organizational Info. Requirements

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- Two principal methodologies for establishing the information requirements of the organization as a whole:
  - Enterprise analysis
  - Critical success factors

# Enterprise Analysis (Business Systems Planning)

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- Examines the entire organization in terms of organizational units, functions, processes, and data elements; helps identify the key entities and attributes in the organization's data
- The central method used in the enterprise analysis approach is to take a large sample of managers and ask them :
  - how they use information,
  - where they get their information,
  - what their objectives are,
  - how they make decisions, and
  - what their data needs are.
- The results of this large survey of managers are aggregated into subunits, functions, processes, and data matrices.
- Data elements are organized into logical application groups (groups of data elements that support related sets of organizational processes. )



# Disadvantages of Enterprise Analysis

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- Produces an enormous amount of data that is expensive to collect and difficult to analyze.
- The questions frequently focus not on management's critical objectives and where information is needed but rather on what existing information is used.
- The result is a tendency to automate whatever exists
- But in many cases, entirely new approaches to how business is conducted are needed, and these needs are not addressed.

# Strategic Analysis or Critical Success Factors (CSFs):

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- The strategic analysis, or critical success factors, approach argues that an organization's information requirements are determined by a small number of critical success factors (CSFs) of managers.
- If these goals can be attained, success of the firm or organization is assured (Rockart 1979; Rockart and Treacy, 1982).
- CSFs: Operational goals shaped by the industry, the firm, the manager, and the broader environment that are believed to assure the success of an organization
- The CSF approach relies on interviews with key managers to identify their CSFs. Individual CSFs are aggregated to develop CSFs for the entire firm. Systems can then be built to deliver information on these CSFs.

# Using CSFs to Develop Systems

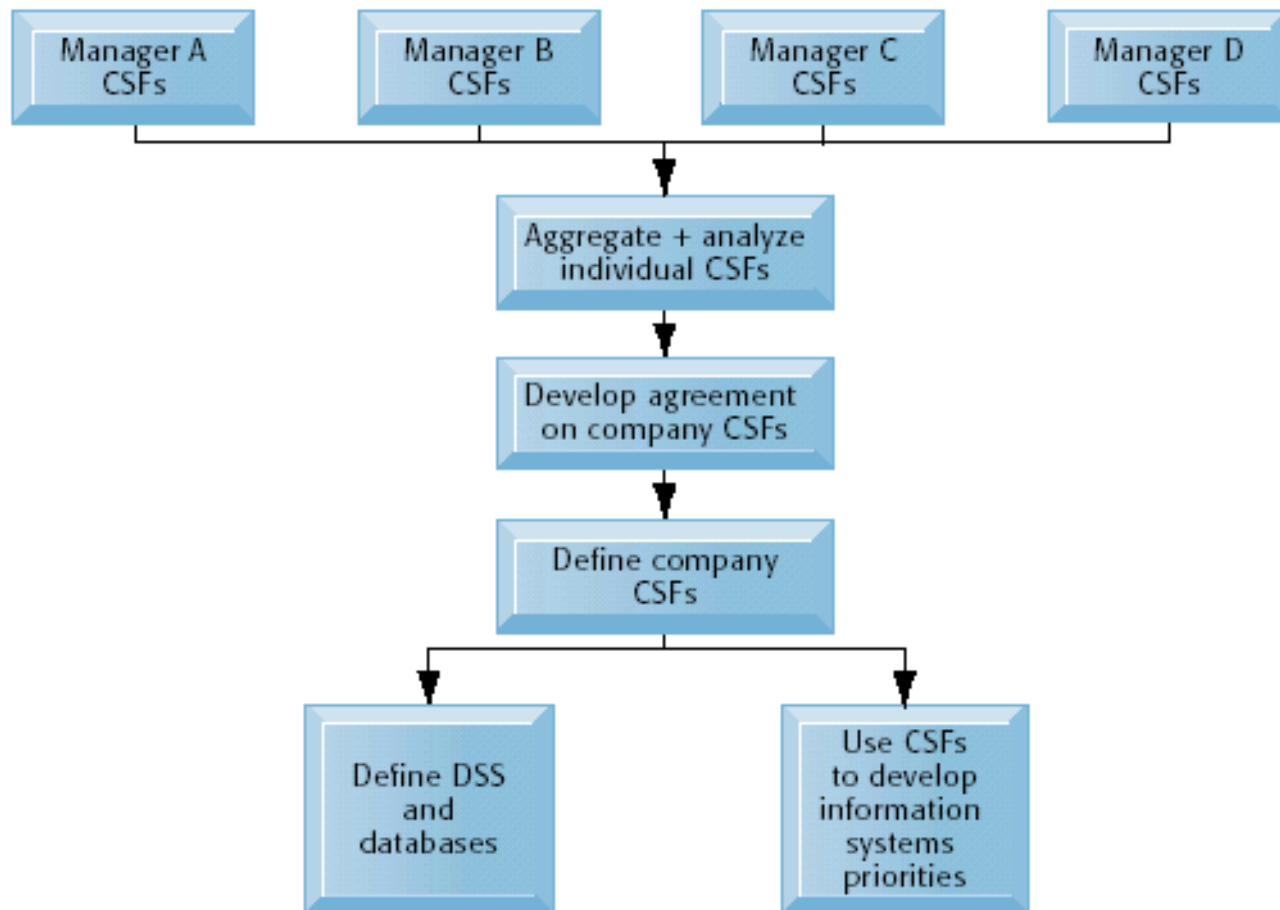


Figure 14-2

# Disadvantages of Strategic Analysis

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- What may be considered critical to a manager may not be important for the organization as a whole.
- This method is clearly biased toward top managers, although it could be extended to elicit ideas for promising new systems from lower-level members of the organization

# The Spectrum of Organizational Change

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- **Automation:** Mechanizing procedures to speed up the performance of existing tasks
- **Rationalization of procedures:** The streamlining of standard operating procedures
- **Business process reengineering:** Analysis and redesign of business processes to reorganize workflows and reduce waste and repetitive tasks
- **Paradigm shift:** Radical reconceptualization of the nature of the business and the nature of the organization

# Organizational Change Carries Risks and Rewards

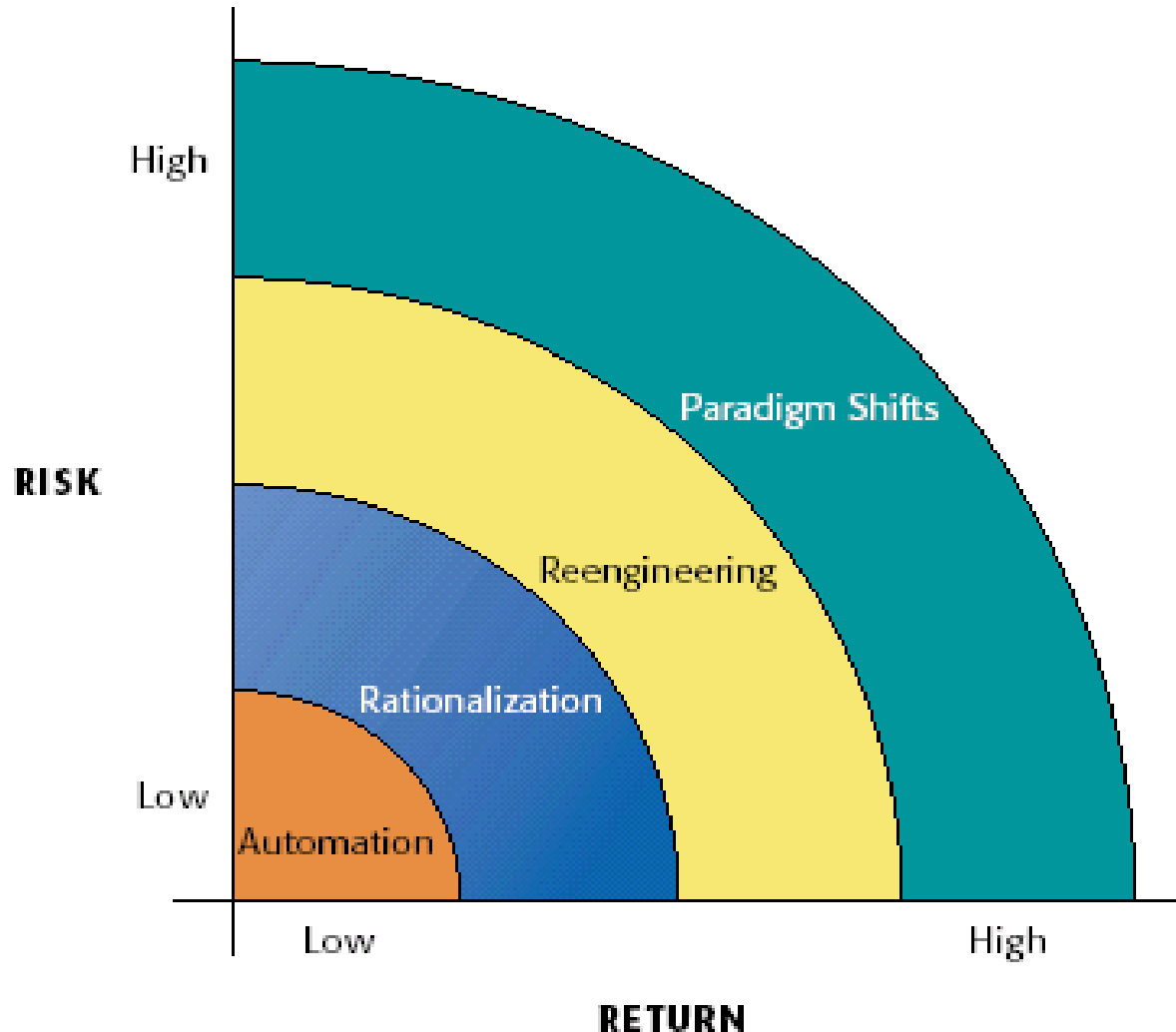


Figure 14-3

# Business Process Reengineering

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- Business Process Reengineering
  - Reorganizes work flows, combining steps to eliminate redundant paper-intensive tasks
  - Large payoff from IT investment if processes are redesigned before applying technology

# Workflow Management

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- The process of streamlining business procedures so that documents can be moved easily and efficiently from one location to another

# Steps in Effective Reengineering

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- Understanding which processes need improvement
- Measuring performance of existing processes as a baseline
- Allowing IT to influence process design from the start

# Redesigning Mortgage Processing in the United States

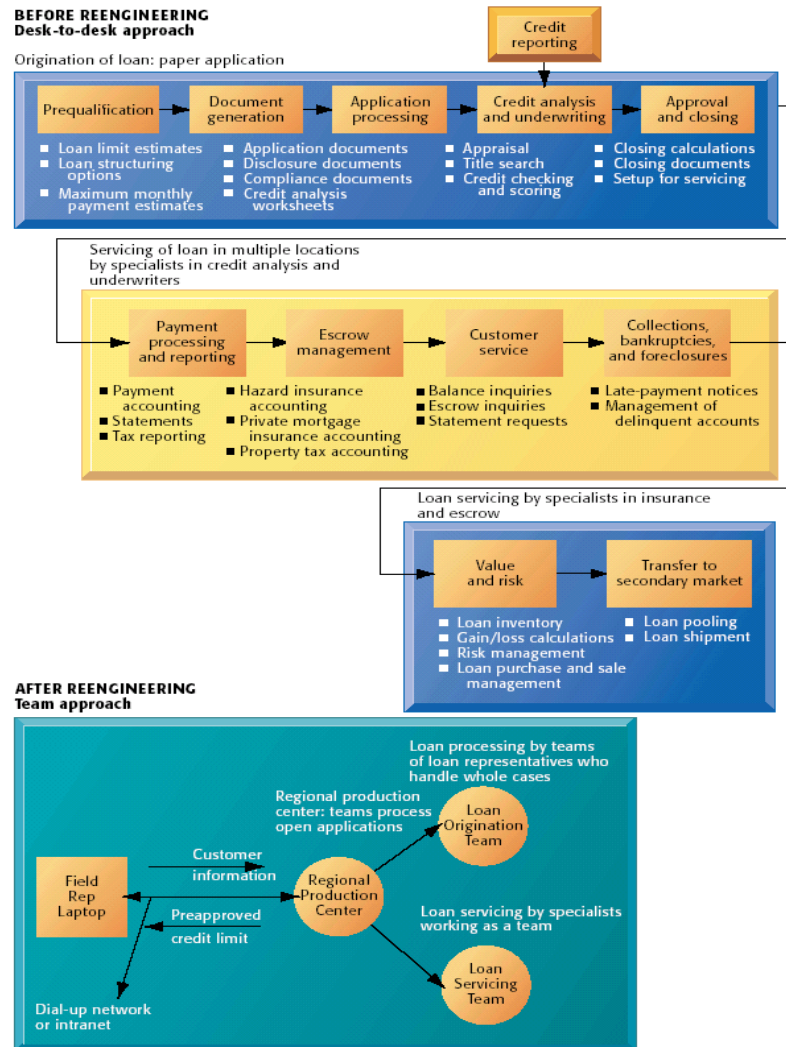


Figure 14-4

# Business Process Management (BPM):

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- Methodology and tools for revising the organization's business processes enabling continual improvements
- BPM and BPM software tools include:
  - Workflow management
  - Business process modeling
  - Quality management
  - Change management
  - Tools for recasting processes into standardized forms that can be continually manipulated
  - Process mapping tools to document existing processes and create new models
  - Process monitoring and analytics

# Overview Of Systems Development

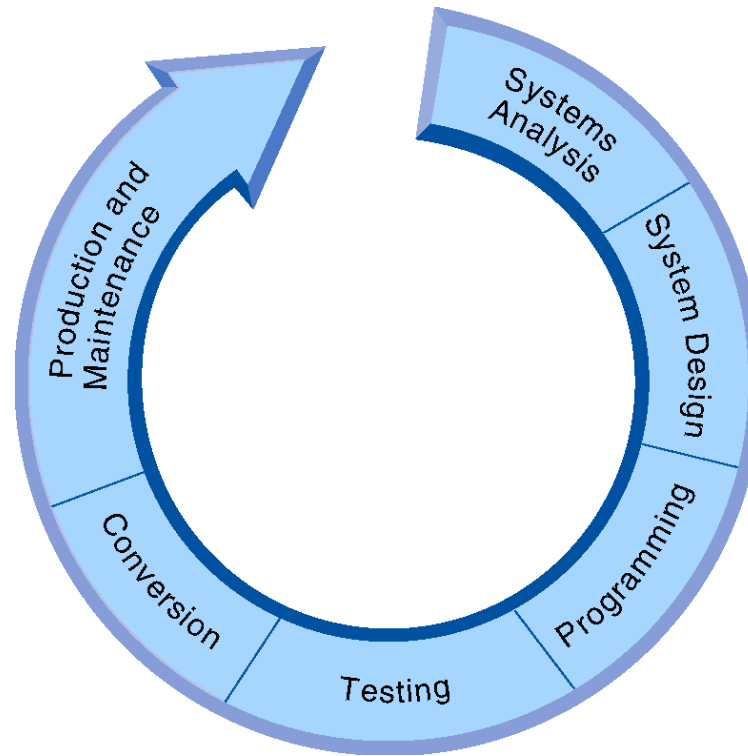
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- Systems development

- The activities that go into producing an information system solution to an organizational problem or opportunity

# The Systems Development Process

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# The Systems Development Process

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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

# The Systems Development Process

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## □ 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?

# The Systems Development Process

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## □ 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

# 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>
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# The Systems Development Process

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## □ 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

# A Sample Test Plan to Test a Record Change

Procedure		Address and Maintenance "Record Change Series"		Test Series 2		
Prepared By:		Date:		Version:		
Test Ref.	Condition Tested	Special Requirements	Expected Results	Output On	Next Screen	
2	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	

# The Systems Development Process

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## □ 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**

# The Systems Development Process

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## □ Production and maintenance

- **System reviewed to determine if any revisions needed**
- **May prepare formal post-implementation 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

# Structured Methodologies:

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- Process-oriented development and modeling methods
- Top-down, progressing from the highest (most abstract) level to the lowest (most specific) level of detail
- Separates data from processes
- Separate programming procedures written for each new action taken on a piece of data

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- **Data Flow Diagram (DFD):** Logical graphic model of information flow, partitioning system into modules that show manageable levels of detail
  - **Structure charts:** Hierarchical charts showing each level of design, its relationship to other levels, and its place in the overall design structure
  - **Process Specifications:** Describe the transformation occurring within the lowest level of the data flow diagrams. They express the logic for each process

# Data Flow Diagram for Mail-in University Registration System

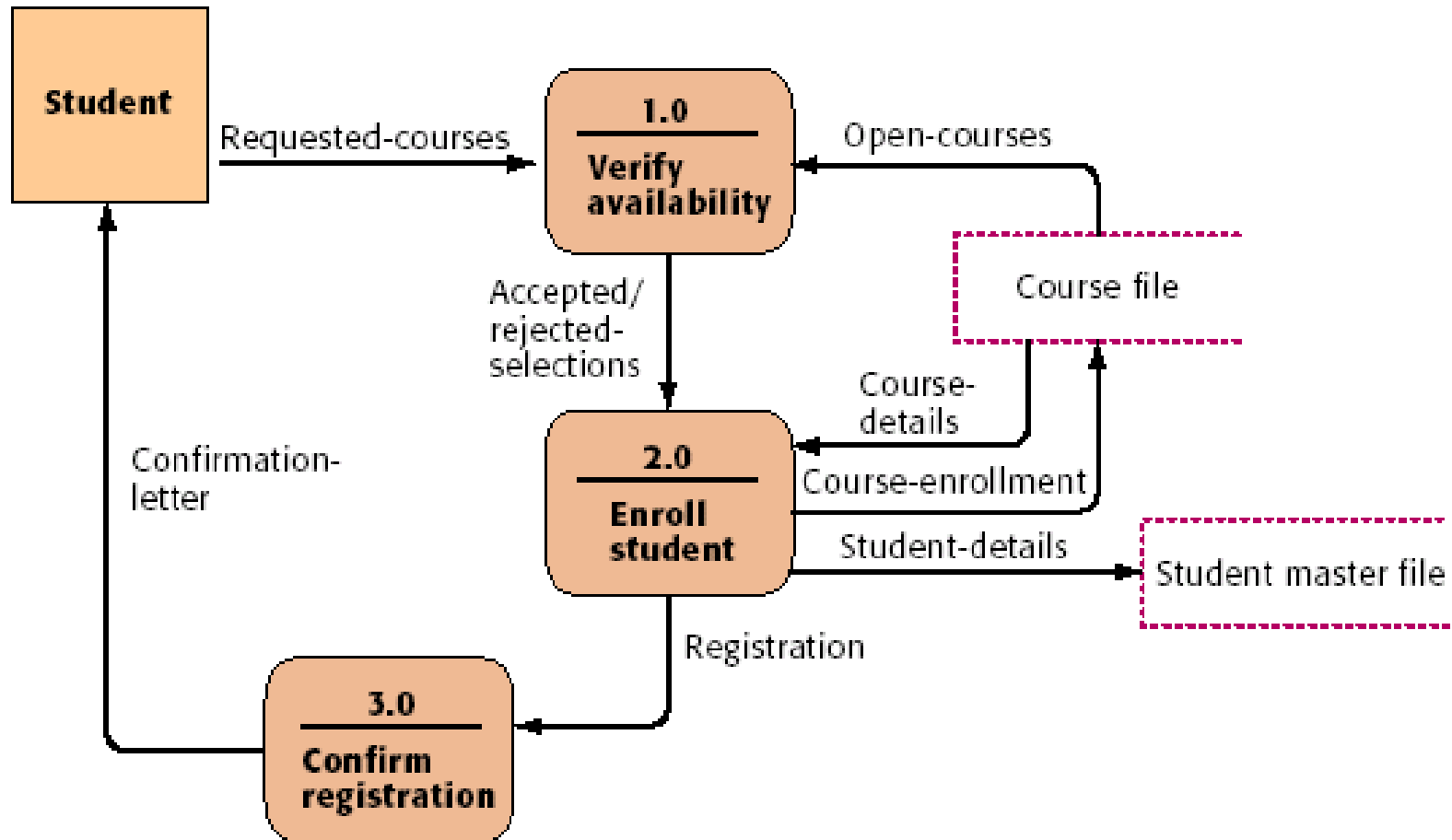


Figure 14-7

# High-level Structure Chart for a Payroll System

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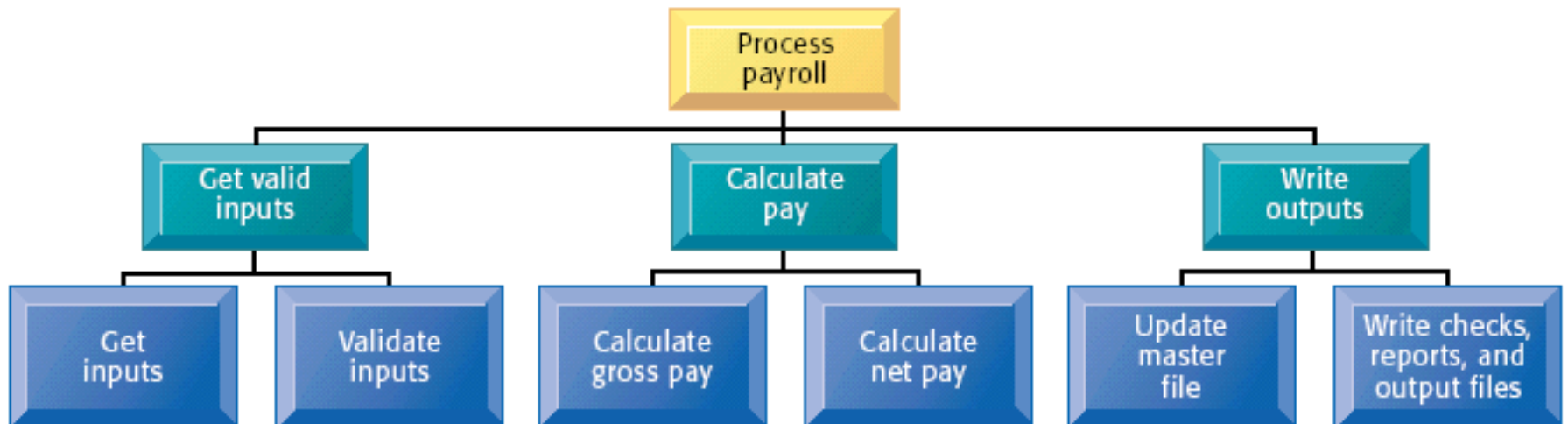


Figure 14-8

# Object-Oriented Development:

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- Uses the object as the basic unit of systems analysis and design
- Objects combine data and processes use on the data
- Use class and inheritance to group objects and apply common embedded procedures
- Development is more iterative and incremental than structured development.
- Analysis identifies objects, classes of objects, and behavior of objects.

# Class and Inheritance

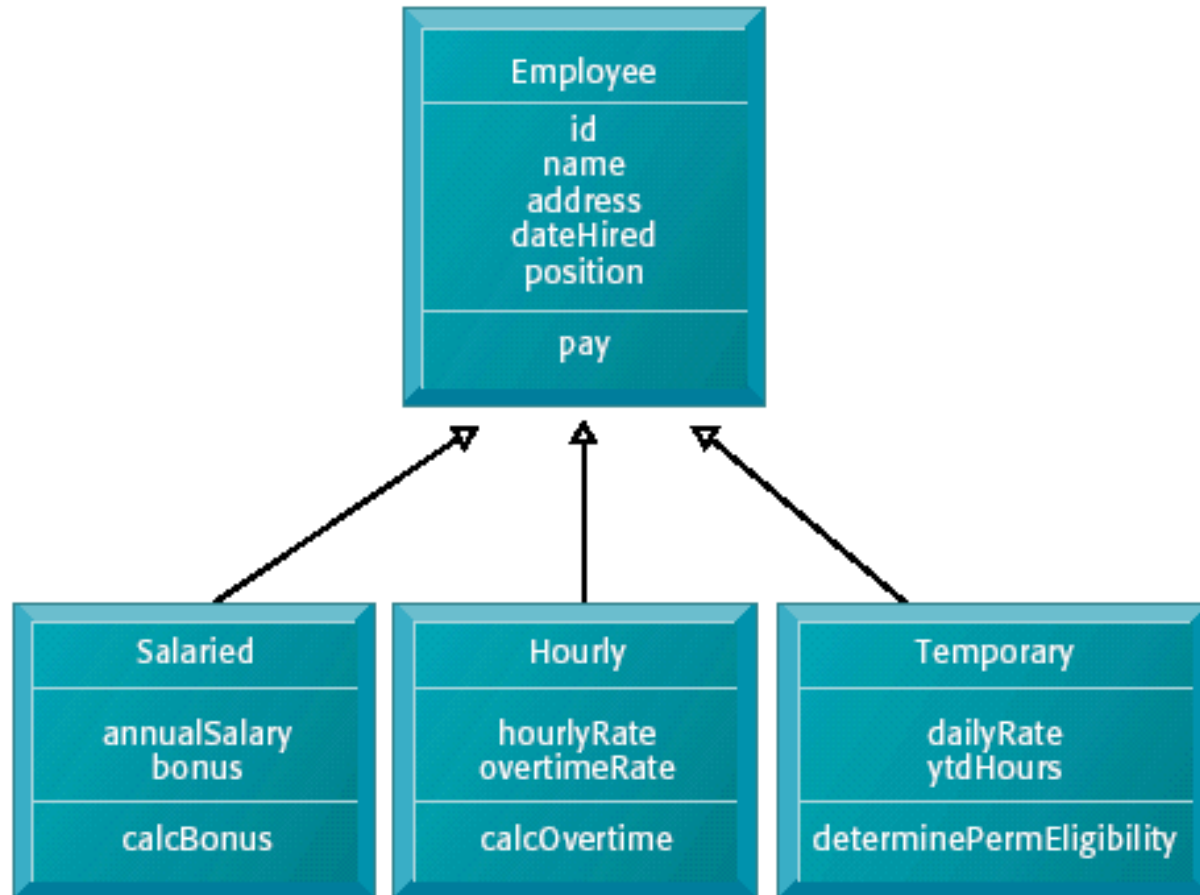


Figure 14-9

# Unified Modeling Language (UML):

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- Industry standard for representing various views of an object-oriented system using a series of graphical diagrams
- Two principal types of diagrams
  - Structural diagrams: Describe the relationship between classes
  - Behavioral diagrams: Describe interactions in an object-oriented system

# Computer-Aided Software Engineering

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- Software tools to automate development and modeling methodologies
- Enforce a standard development methodology and design discipline
- Improve communication between users and technical specialists
- Organize and correlate design components and provide rapid access to them using a design repository
- Automate tedious and error-prone portions of analysis and design
- Automate code generation and testing and control rollout

# Alternative Systems-building Approaches

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- Systems life cycle:
  - Traditional methodology with sequential, formal stages and a formal division of labor between end users and information systems specialists
- Prototyping / Iterative processes:
  - Building an experimental system quickly and inexpensively for demonstration and evaluation and used as a template for the final system

# Prototyping

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## ■ Prototyping

- Process of building experimental system quickly and inexpensively for demonstration and evaluation

## ■ Prototype

- Preliminary working version of information system for demonstration and evaluation

# Prototyping

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- Iterative

- A process of repeating over and over again the steps to build system

# The Prototyping Processes

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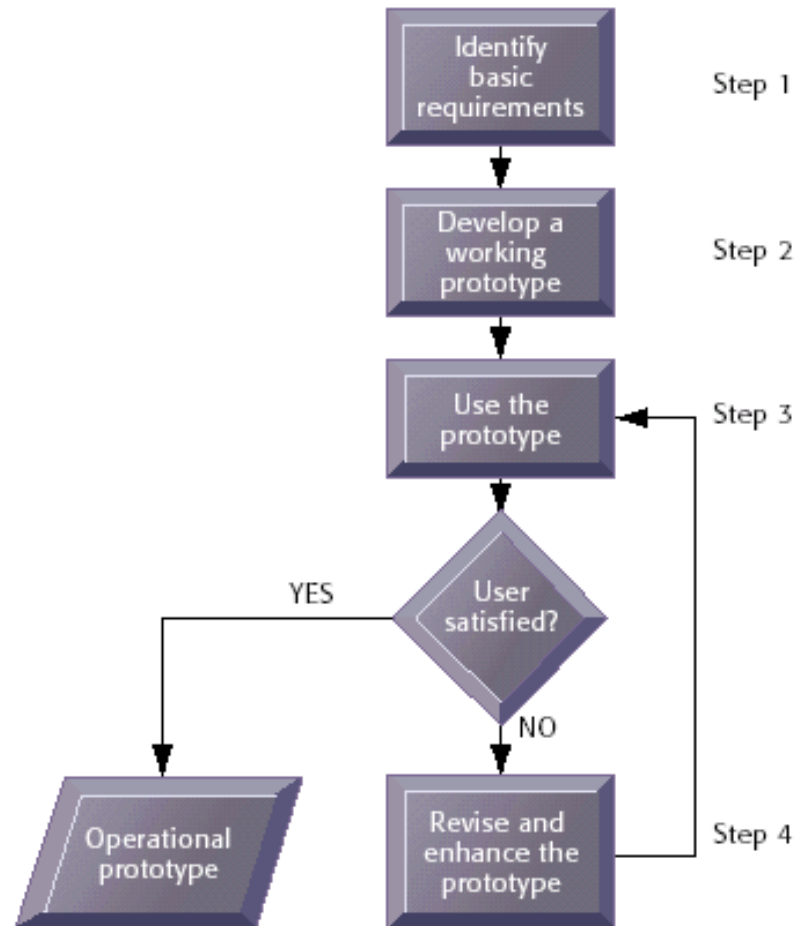


Figure 14-11

# Steps in Prototyping

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- 1) Identifying user's basic requirements
- 2) Developing initial prototype
- 3) Using prototype
- 4) Revising and enhancing prototype

# Advantages and Disadvantages of Prototyping

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## ■ Advantage

- Useful in designing information system's end-user interface

## ■ Disadvantage

- Rapid prototyping can gloss over essential steps in systems development

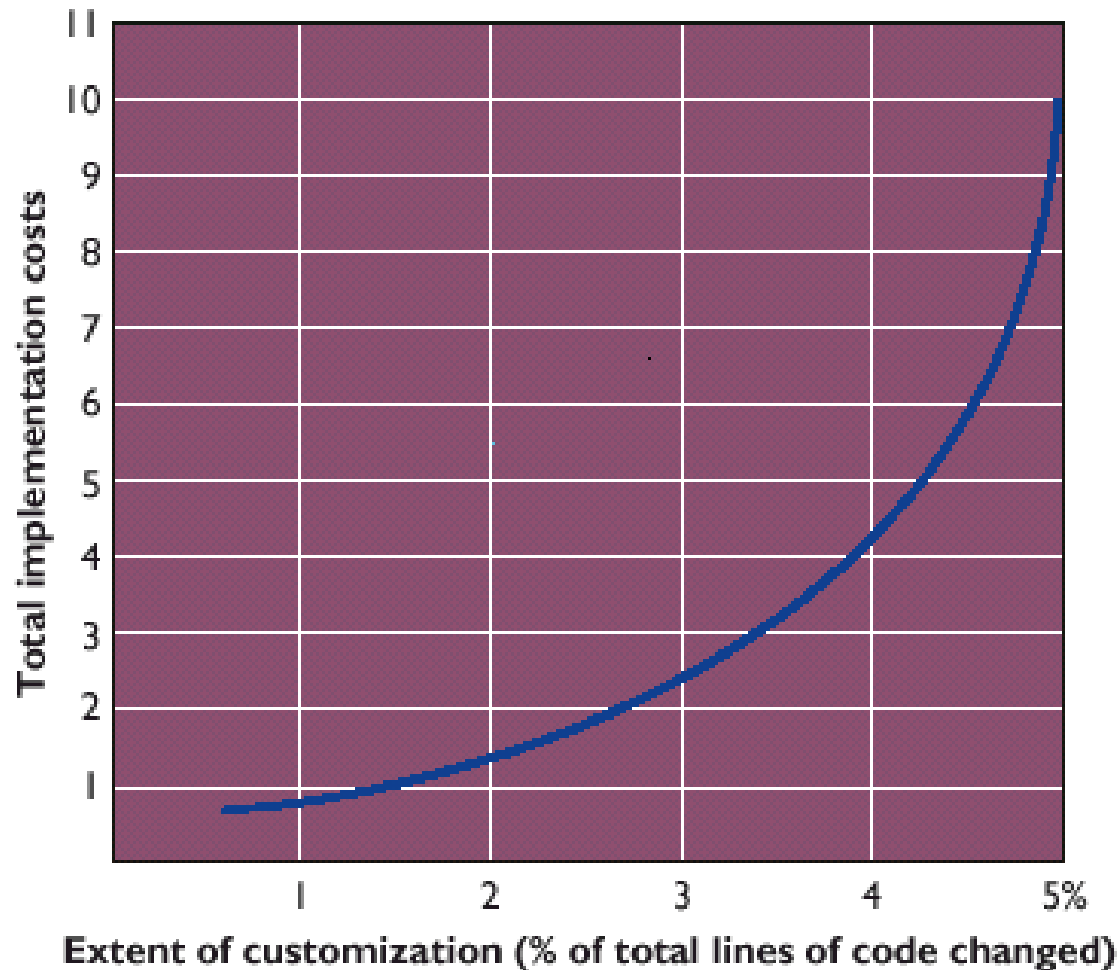
# Application Software Packages

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- Application software packages
- **Prewritten, precoded application software programs that are commercially available for sale or lease**
- **May include customization features allowing the software to be modified for an organization's unique requirements**

# The Effects of Customizing a Software Package on Total Implementation Costs

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# Application Software Packages

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- Package evaluation criteria:
  - Functions, flexibility, user friendliness, hardware and software resources, database requirements, installation and maintenance efforts, documentation, vendor quality, cost
- Request for Proposal (RFP)
  - A detailed list of questions submitted to vendors of software or other services to determine how well the vendor's product will meet the organization's specific requirements

# End-User Development

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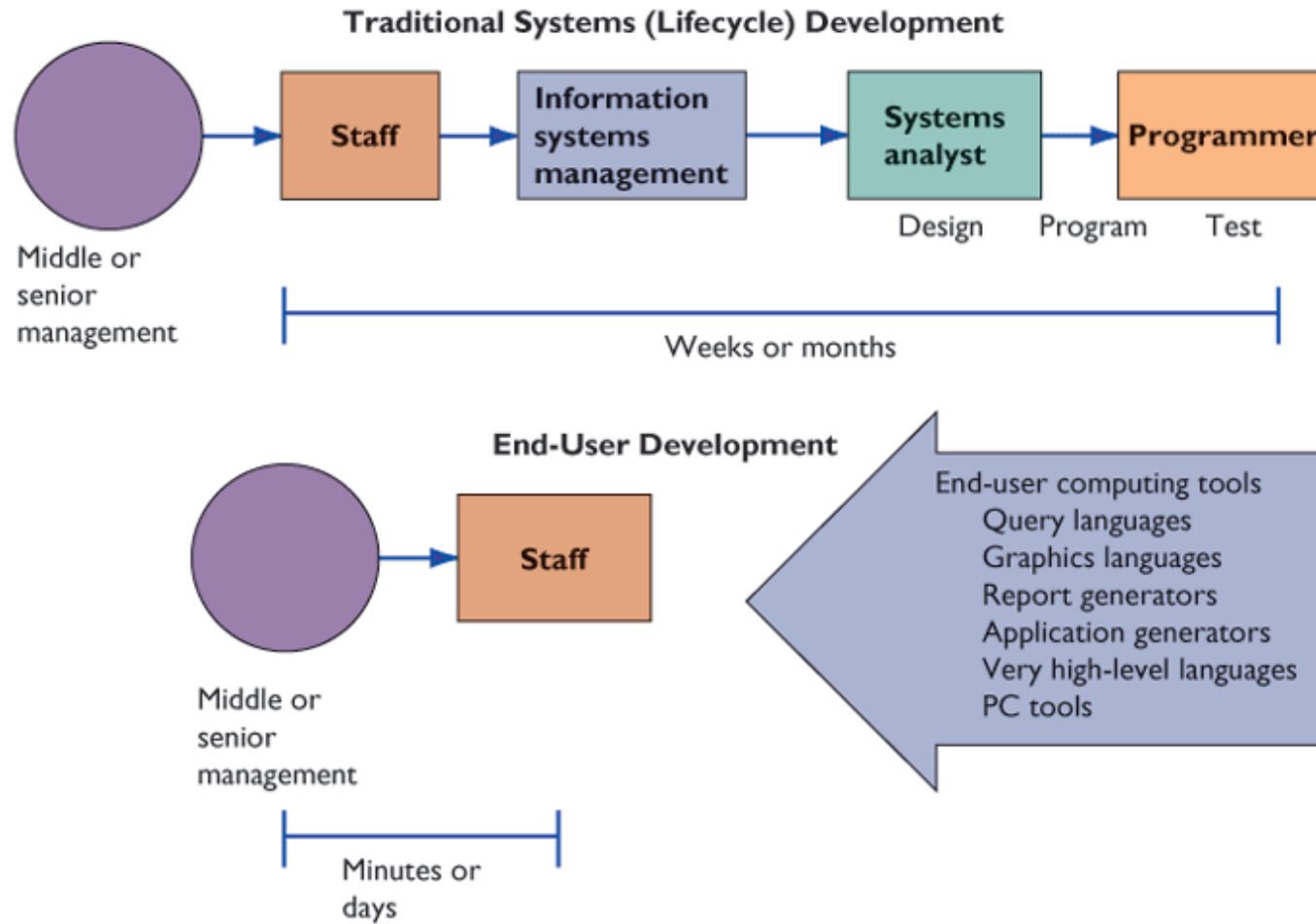
- Development of information systems by end users with little or no formal assistance from technical specialists
- Allows users to specify their own business needs

# Managing End-User Development

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- Information Center: A special facility within an organization that provides training and support for end-user computing

# End-User Versus System Lifecycle Development



**Source:** From *Application Development Without Programmers*, by James Martin, © 1982. Reprinted by permission of Prentice Hall Inc., Upper Saddle River, NJ.

# End-User Development

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- Improves requirements gathering leading to higher level of user involvement and satisfaction
- Cannot easily handle processing of large numbers of transactions or applications

# Outsourcing

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- Contracting computer center operations, telecommunications networks, or applications development to external vendors
- Benefits from economies of scale and complementary core competencies
- Disadvantages may be hidden costs, loss of control

# Component-Based Development:

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- Building large software systems by combining pre-existing software components

# Comparison of Systems-Development Approaches

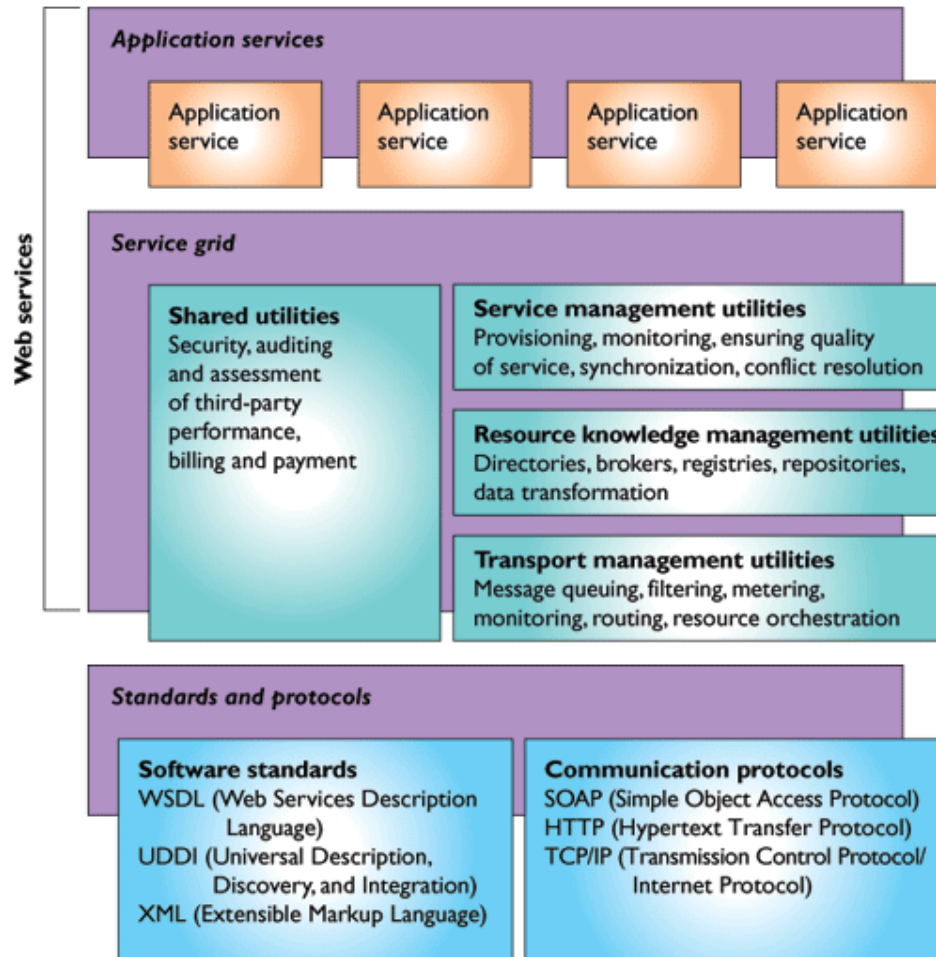
Approach	Features	Advantages	Disadvantages
Systems life cycle	Sequential step-by-step formal process Written specification and approvals Limited role of users	Useful for large, complex systems and projects	Slow and expensive Discourages changes Massive paperwork to manage
Prototyping	Requirements specified dynamically with experimental system Rapid, informal, and iterative process Users continually interact with the prototype	Rapid and relatively inexpensive Useful when requirements uncertain or when end-user interface is very important Promotes user participation	Inappropriate for large, complex systems Can gloss over steps in analysis, documentation, and testing
Application software package	Commercial software eliminates need for internally developed software programs	Design, programming, installation, and maintenance work reduced Can save time and cost when developing common business applications Reduces need for internal information systems resources	May not meet organization's unique requirements May not perform many business functions well Extensive customization raises development costs
End-user development	Systems created by end users using fourth-generation software tools Rapid and informal Minimal role of information systems specialists	Users control systems-building Saves development time and cost Reduces application backlog	Can lead to proliferation of uncontrolled information systems and data Systems do not always meet quality assurance standards
Outsourcing	Systems built and sometimes operated by external vendor	Can reduce or control costs Can produce systems when internal resources are not available or technically deficient	Loss of control over the information systems function Dependence on the technical direction and prosperity of external vendors

# Rapid Application Development (RAD)

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- Process for developing systems in a short time period
- Uses prototyping, fourth-generation tools, and close teamwork among users and systems specialists

# The Web services architecture



Source: "Your Next IT Strategy" by John Hagel, III, and John Seeley Brown, *Harvard Business Review*, October 2001. Reprinted by permission.

# Web Services and Service-Oriented Computing:

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- Web services can be used as tools for building new information system applications or enhancing existing systems.
- Web services can create software components that are deliverable over the Internet and provide new functions for an organization's existing systems or create new systems that link an organization's systems to those of other organizations