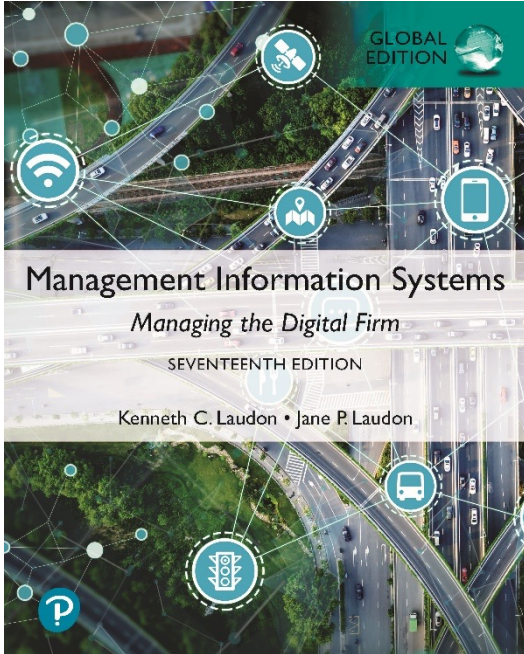


# Management Information Systems: Managing the Digital Firm

Seventeenth Edition, Global Edition



## Chapter 13

### Building Information Systems

# Learning Objectives

- 13.1** How does building new systems produce organizational change?
- 13.2** What are the core activities in the systems development process?
- 13.3** What are the principal methodologies for modeling and designing systems?
- 13.4** What are alternative methods for building information systems?
- 13.5** What are new approaches for system building in the digital firm era?
- 13.6** How will MIS help my career?

# Video Cases

- Case 1: IBM: Business Process Management in a SaaS Environment
- Case 2: IBM Helps the City of Madrid with Real-Time BPM Software
- [Instructional Video 1: BPM Business Process Management Customer Story](#)
- [Instructional Video 2: Workflow Management Visualized](#)

# Vinci Energies Builds a New Mobile Employee Time Sheet App (1 of 2)

- Problem
  - Inefficient manual processes
  - Geographically dispersed organization
  - Project-based business
  - Rapid growth
- Solutions
  - Select system solution
  - Monitor project
  - Redesign timesheet reporting process
  - SAP S/4 Hana; SAP Cloud Platform
  - Mobile phones, tablets

# Vinci Energies Builds a New Mobile Employee Time Sheet App (2 of 2)

- New MOBTIME app
- Demonstrates steps needed to design and build new information systems
- Illustrates redesigning business processes as a part of system building

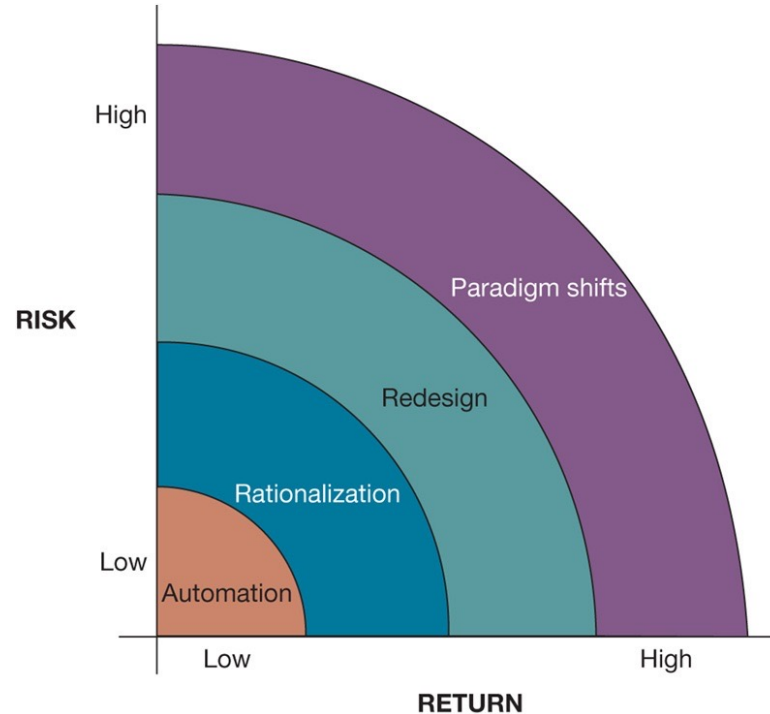
# Systems Development and Organizational Change (1 of 2)

- IT-enabled organizational change
- Automation
  - Increases efficiency
  - Replaces manual tasks
- Rationalization of procedures
  - Streamlines standard operating procedures
  - Often found in programs for making continuous quality improvements
    - Total quality management (TQM)
    - Six Sigma

# Systems Development and Organizational Change (2 of 2)

- Business process redesign
  - Analyze, simplify, and redesign business processes
  - Reorganize workflow, combine steps, eliminate repetition
- Paradigm shifts
  - Rethink nature of business
  - Define new business model
  - Change nature of organization

# Figure 13.1 Organizational Change Carries Risks and Rewards





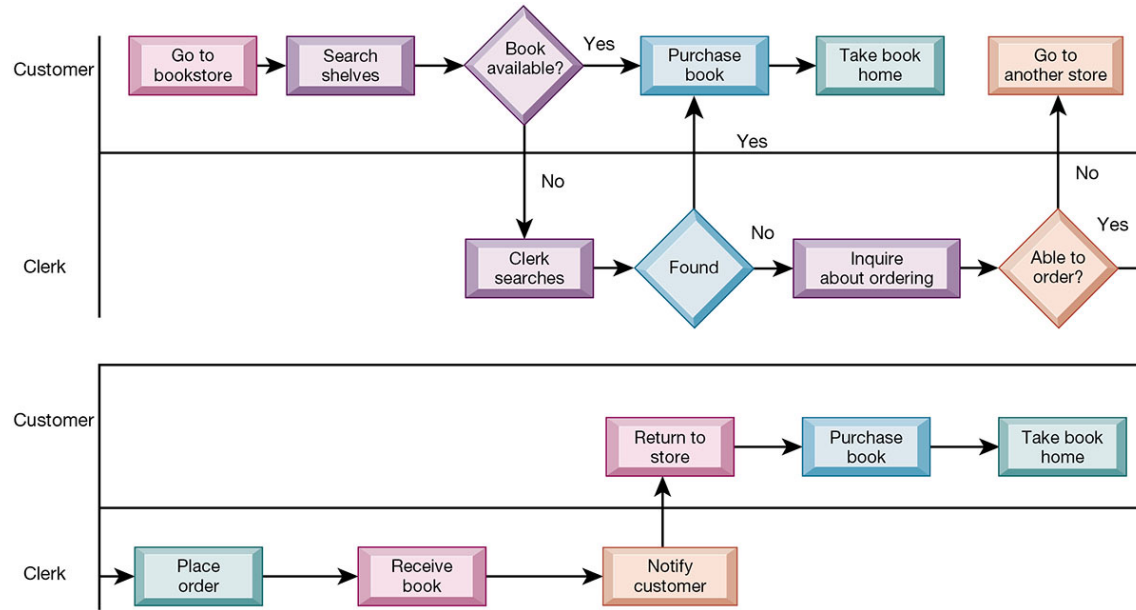
# Interactive Session: Organizations: Business Process Redesign at DP World

- Class discussion
  - How did DP World's previous processes affect its operations?
  - Describe the role of AI and IoT in improving how DP World handles cargo.
  - How would business process redesign enable digitized global trade?

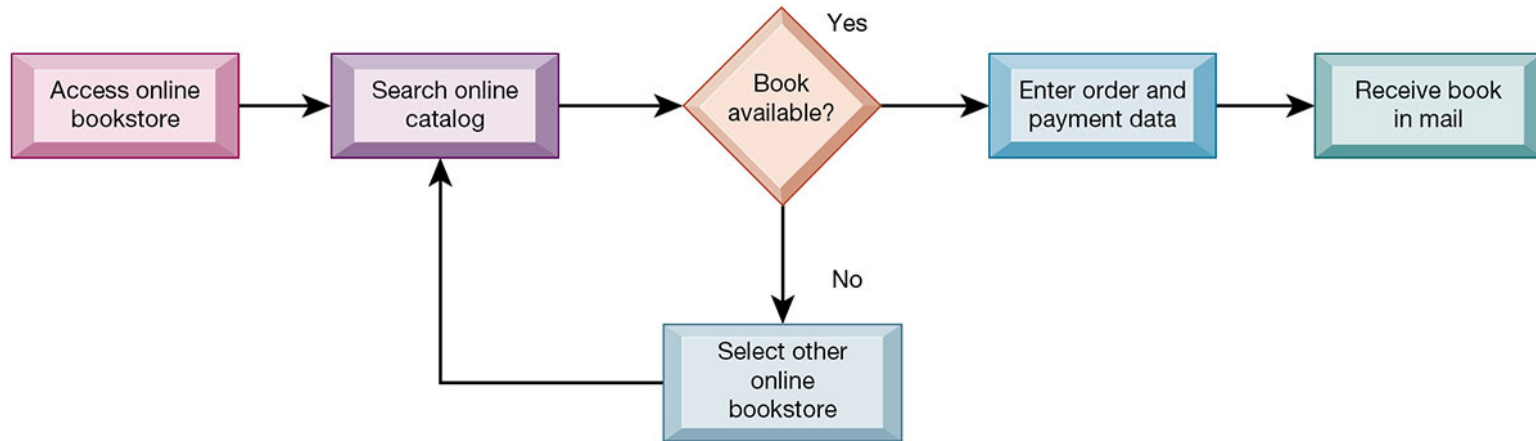
# Business Process Redesign

- Business process management (BPM)
  - Variety of tools, methodologies to analyze, design, optimize processes
  - Used by firms to manage business process redesign
- Steps in BPM
  1. Identify processes for change
  2. Analyze existing processes
  3. Design the new process
  4. Implement the new process
  5. Continuous measurement

# Figure 13.2 As-is Business Process for Purchasing a Book from a Physical Bookstore



# Figure 13.3 Redesigned Process for Purchasing a Book Online



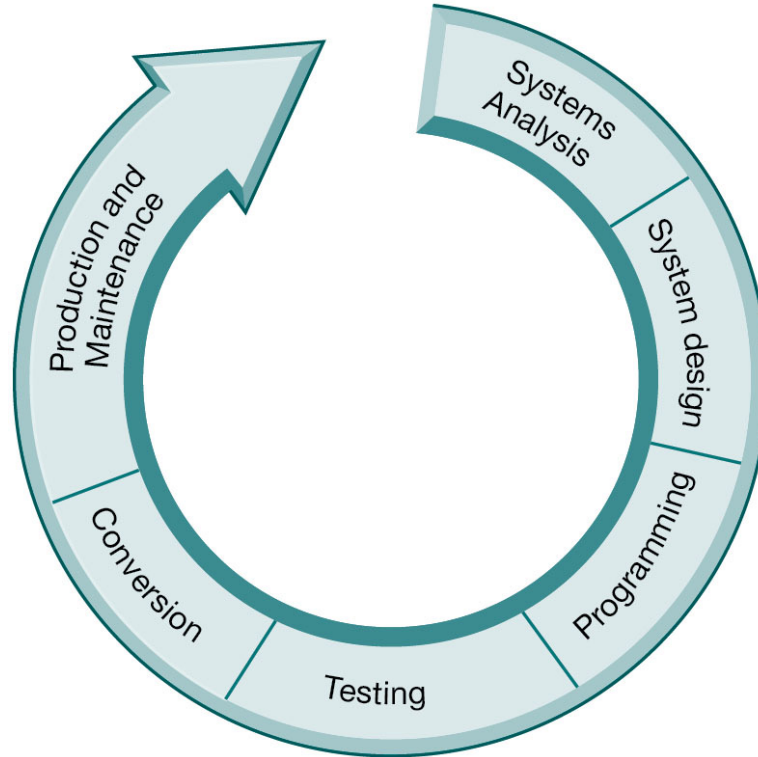
# Tools for Business Process Management

- Identify and document existing processes
  - Identify inefficiencies
- Create models of improved processes
- Capture and enforce business rules for performing, automating processes
- Integrate existing systems to support process improvements
- Verify that new processes have improved
- Measure impact of process changes on key business performance indicators

# 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

# Figure 13.4 The Systems Development Process



# Systems Analysis

- Analysis of problem to be solved by new system
  - Defining the problem
  - Identifying causes
  - Specifying solutions
  - Identifying information requirements
- Feasibility study
- Systems proposal report
- Information requirements
  - Faulty requirements analysis is a leading cause of systems failure and high systems development costs



# Systems Design

- Describes 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 system reflects their business priorities and information needs
  - Insufficient user involvement in design effort is major cause of system failure

# Table 13.1 System Design Specifications (1 of 2)

Category	Specifications
Output	Medium, Content, Timing
Input	Origins, Flow, Data entry
User Interface	Simplicity, Efficiency, Logic, Feedback, Errors
Database Design	Logical data model, Volume and speed requirements, File organization and design, Record specifications
Processing	Computations, Program modules, Required reports, Timing of outputs
Manual Procedures	What activities, Who performs them, When, How, Where
Controls	Input controls (characters, limit, reasonableness), Processing controls (consistency, record counts), Output controls (totals, samples of output), Procedural controls (passwords, special forms)

## Table 13.1 System Design Specifications (2 of 2)

Category	Specifications
Security	Access controls, Catastrophe plans, Audit trails
Documentation	Operations documentation, Systems documents, User documentation
Conversion	Transfer files, Initiate new procedures, Select testing method Cut over to new system
Training	Select training techniques, Develop training modules, Identify training facilities
Organizational Changes	Task redesign, Job redesign, Process design, Organization structure design, Reporting relationships

# Completing the Systems Development Process (1 of 3)

- Programming
  - System specifications from design stage are translated into software program code
- Testing
  - Ensures system produces right results
  - Unit testing: Tests each program in system separately
  - System testing: Test functioning of system as a whole
  - Acceptance testing: Makes sure system is ready to be used in production setting
  - Test plan: All preparations for series of tests

# Figure 13.5 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
2.0	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

# Completing the Systems Development Process (2 of 3)

- 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

# Completing the Systems Development Process (3 of 3)

- Production and maintenance
  - System reviewed to determine if revisions needed
  - May include 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

# Table 13.2 Systems Development

Core Activity	Core Activity
Systems analysis	Identify problem(s), Specify solutions, Establish information requirements
Systems design	Create design specifications
Programming	Translate design specifications into program code
Testing	Perform unit testing, Perform systems testing, Perform acceptance testing
Conversion	Plan conversion, Prepare documentation, Train users and technical staff
Production and maintenance	Operate the system, Evaluate the system, Modify the system



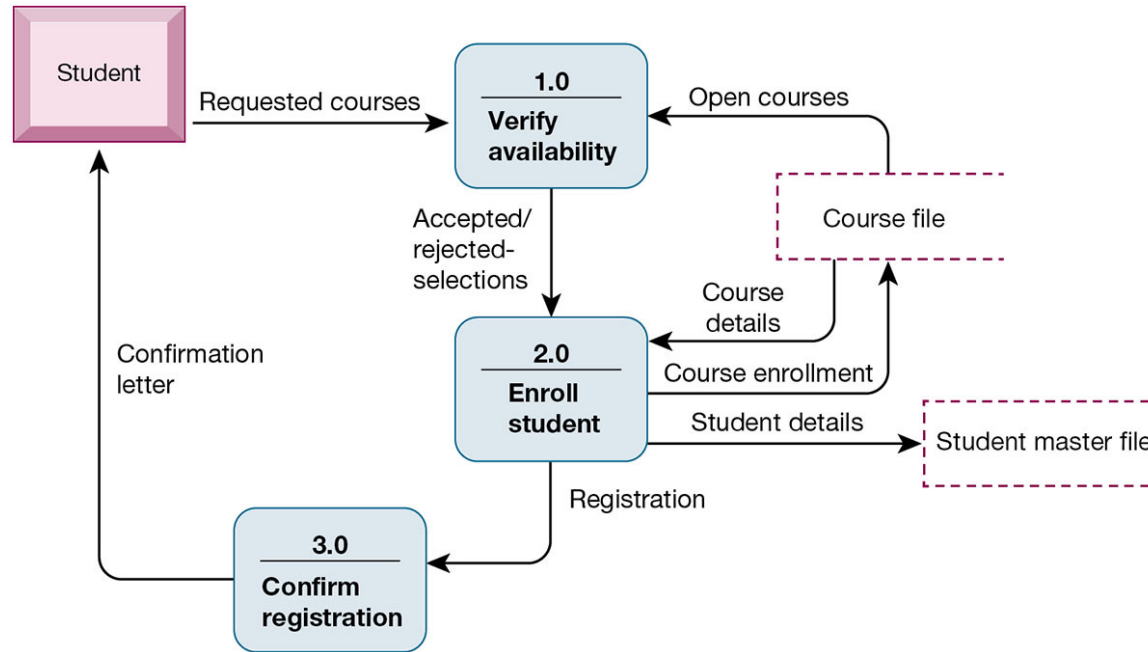
# Structured Methodologies (1 of 3)

- Structured: Techniques are step-by-step, progressive
- Process-oriented: Focusing on modeling processes or actions that manipulate data
- Separate data from processes

# Structured Methodologies (2 of 3)

- Data flow diagram
  - Represents system's component processes and flow of data between them
  - Logical graphic model of information flow
- Data dictionary
  - Defines contents of data flows and data stores

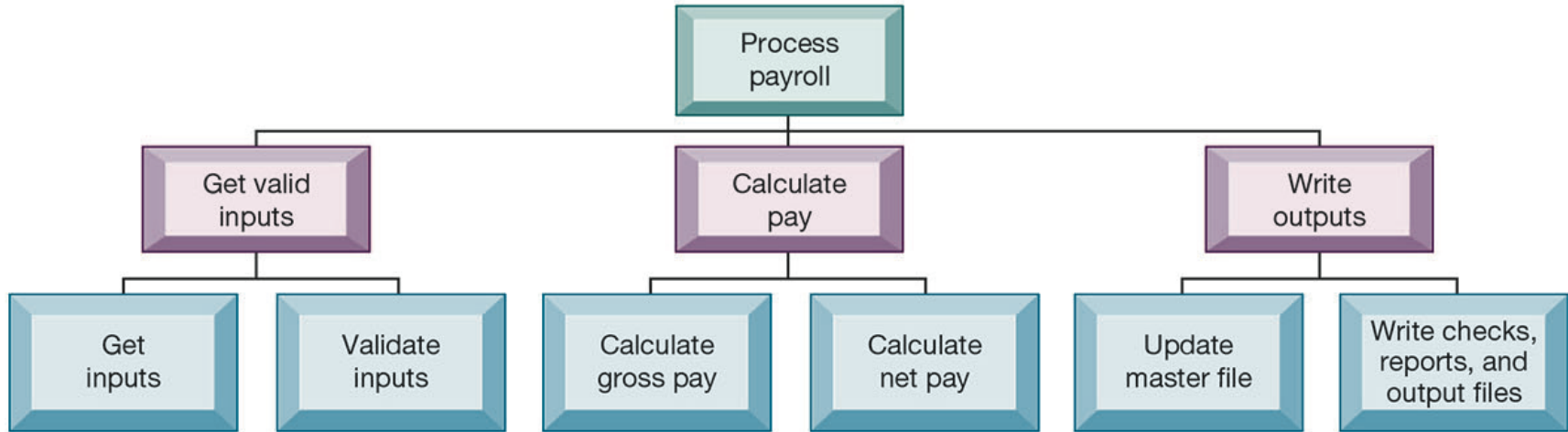
# Figure 13.6 Data Flow Diagram for Mail-in University Registration System



# Structured Methodologies (3 of 3)

- 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

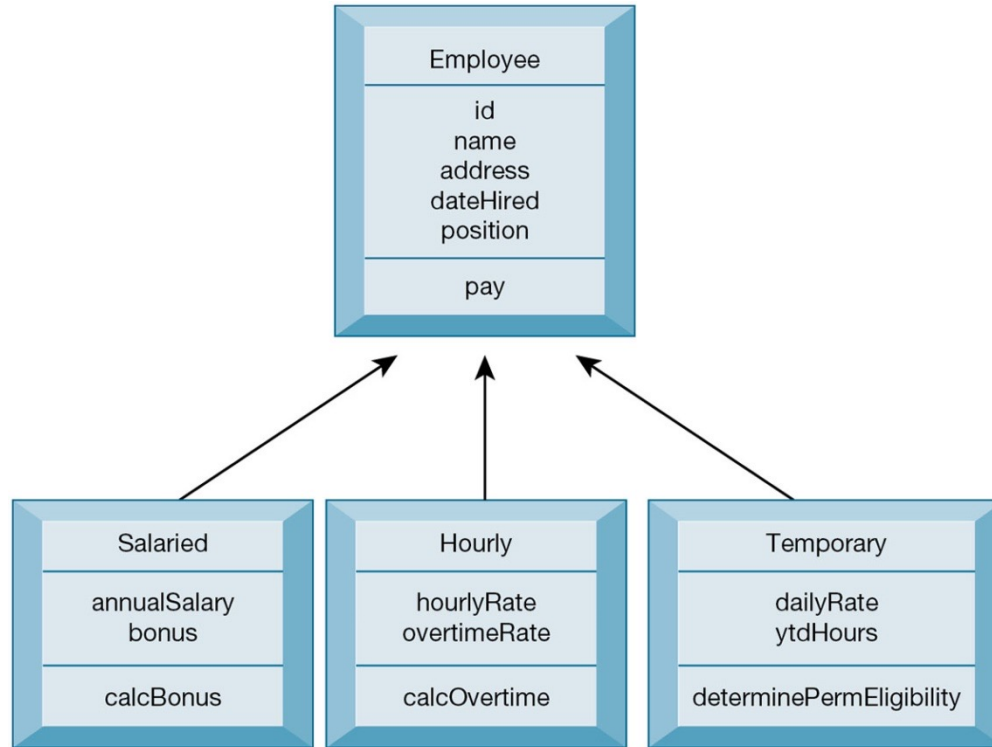
# Figure 13.7 High-level Structure Chart for a Payroll System



# Object-Oriented Development (1 of 2)

- Object
  - Basic unit of systems analysis and design
  - Combines data and the processes that operate on those data
  - Data in object can be accessed only by operations 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

# Figure 13.8 Class and Inheritance



# Object-Oriented Development (2 of 2)

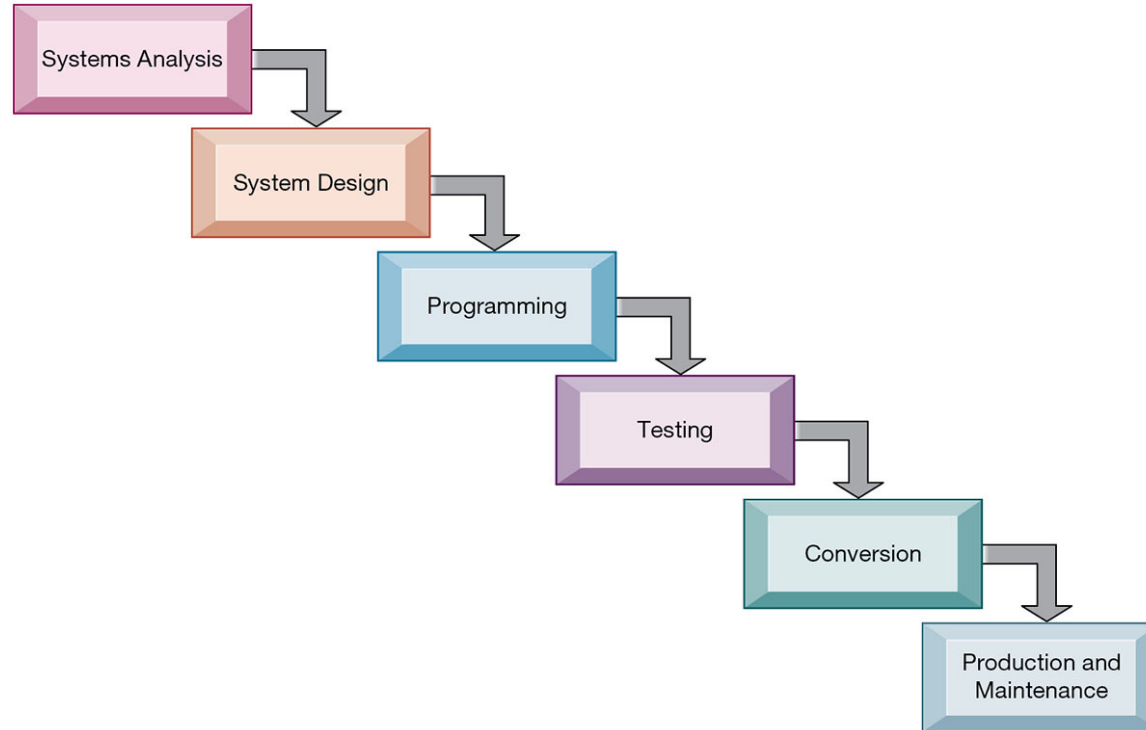
- More iterative and incremental than traditional structured development
  - Systems analysis: Interactions between system and users analyzed to identify objects
  - Design phase: Describes how objects will behave and interact; grouped into classes, subclasses, and hierarchies
  - Implementation: Some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



# Traditional Systems Life Cycle

- Oldest method for building information systems
- Phased approach
  - Development divided into formal stages
  - “Waterfall” approach: One stage finishes before next stage begins
- 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

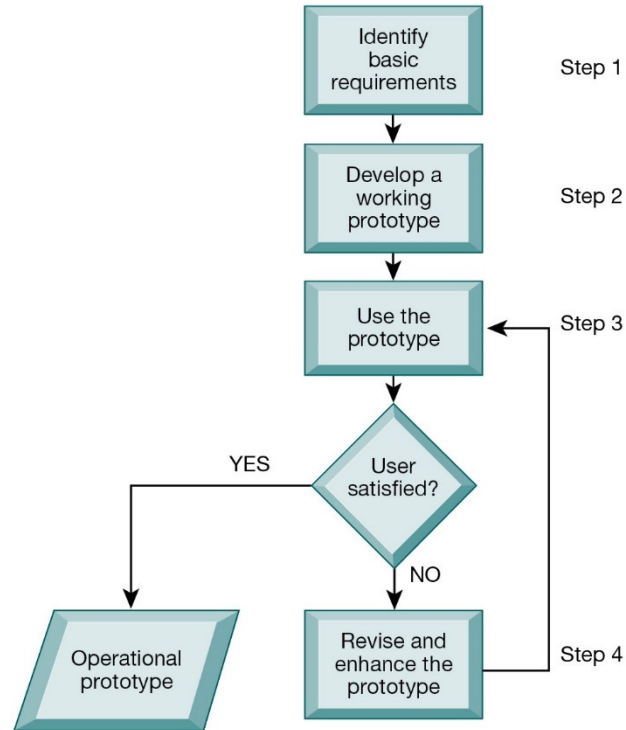
# Figure 13.9 The Traditional Systems Development Life Cycle



# Prototyping (1 of 2)

- 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
  - Identify user requirements
  - Develop initial prototype
  - Use prototype
  - Revise and enhance prototype

# Figure 13.10 The Prototyping Process



# Prototyping (2 of 2)

- 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

# Application Software Packages, Software Services, and Outsourcing (1 of 3)

- Application software packages and software services
  - Save time and money
  - Many packages offer customization features
- Evaluation criteria for systems analysis include:
  - Functions provided, flexibility, user friendliness, required resources, database requirements, installation and maintenance efforts, documentation, vendor quality, and cost
- Request for Proposal (RFP)
  - Detailed list of questions submitted to software vendors
  - Used to evaluate alternative software packages and cloud software services

# Application Software Packages, Software Services, and Outsourcing (2 of 3)

- Outsourcing: several types
  - Cloud and SaaS providers: subscribing companies use software and hardware provided by vendors
  - External vendors
    - Hired to design, create software
    - Domestic outsourcing
      - Driven by firm's need for additional skills, resources, assets
    - Offshore outsourcing
      - Driven by cost-savings

# Application Software Packages, Software Services, and Outsourcing (3 of 3)

- Outsourcing Advantages/Disadvantages
  - Advantages: Allows organization flexibility in IT needs
  - Disadvantages
    - Hidden costs, for example:
      - Identifying and selecting vendor
      - Transitioning to vendor
    - Opening up proprietary business processes to third party



# Figure 13.11 Total Cost of Offshore Outsourcing

TOTAL COST OF OFFSHORE OUTSOURCING				
Cost of outsourcing contract		\$10,000,000		
Hidden Costs	Best Case	Additional Cost (\$)	Worst Case	Additional Cost (\$)
1. Vendor selection	.02%	20,000	2%	200,000
2. Transition costs	2%	200,000	3%	300,000
3. Layoffs & retention	3%	300,000	5%	500,000
4. Lost productivity/cultural issues	3%	300,000	27%	2,700,000
5. Improving development processes	1%	100,000	10%	1,000,000
6. Managing the contract	6%	600,000	10%	1,000,000
<b>Total additional costs</b>		<b>1,520,000</b>		<b>5,700,000</b>
	Outstanding Contract (\$)	Additional Cost (\$)	Total Cost (\$)	Additional Cost
Total cost of outsourcing (TCO) best case	10,000,000	1,520,000	11,520,000	15.2%
Total cost of outsourcing (TCO) worst case	10,000,000	5,700,000	15,700,000	57.0%

# Rapid Application Development (RAD), Agile Development, Automated Software Testing, and DevOps (1 of 3)

- Rapid application development (RAD)
  - Process of creating workable systems in a very short period of time
- Joint application design (JAD)
  - Used to accelerate generation of information requirements and to develop initial systems design

# Rapid Application Development (RAD), Agile Development, Automated Software Testing, and DevOps (2 of 3)

- Agile development
  - Focuses on rapid delivery of working software by breaking large project into subprojects that can be completed in short periods of time
- Automated software testing
  - Tools to perform examinations of software, report outcomes, compare results with earlier test runs
- DevOps
  - Builds on agile development principles as an organizational strategy

# Interactive Session: Technology: McAfee Turns to Automated Software Testing

- Class discussion
  - Why would a company such as McAfee benefit from automated software testing?
  - What management, organization, and technology factors did McAfee address in moving to automated software testing?
  - Was Worksoft Certify a good solution for McAfee? Why or why not?
  - How did automated software testing change the way McAfee ran its business.

# Rapid Application Development (RAD), Agile Development, Automated Software Testing, and DevOps (3 of 3)

- Low-code development
  - Enables faster development of applications, with minimal hand-coding, using visual modelling in a graphical interface
- No-code development
  - Includes built-in tools that enable user to create apps without any coding
  - Some disadvantages
    - Have limited functionality
    - Users can create applications without proper management oversight

# Mobile Application Development

- Mobile websites
- Mobile web apps
- Native apps
- Special requirements for mobile platform
  - Smaller screens, keyboards, multitouch gestures, saving resources (memory, processing)
- Responsive web design
  - Websites programmed so that layouts change automatically according to user's computing device

# How Will MIS Help My Career?

- The Company: Systems 100 Technology Consultants
- Position Description: Entry-level junior business systems analyst
- Job Requirements
- Interview Questions
- Author Tips

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