Chapter 7

Redesigning the Organization with Information Systems
OBJECTIVES

• 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
• Evaluate alternative methods for building information systems and alternative methodologies for modeling systems

• Assess the challenges of building information systems and management solutions
• **Challenge:** develop systems to coordinate 63,000 volunteers, 1,200 fire stations, and 850 permanent staff providing emergency services

• **Solutions:** Web site Brigades Online to coordinate volunteers

• Locality information system for coordinating emergency responders and describing geographic locations

• Illustrates the importance of understanding business requirements as a prerequisite for building new systems
Information systems plan:

- Identifies the direction of systems development, the rationale, the current situation, the management strategy, the implementation plan, and the budget

Enterprise analysis (business systems planning):

- 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
Strategic Analysis or Critical Success Factors (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
# Process/Data Class Matrix

**Figure 7-1**

<table>
<thead>
<tr>
<th>LOGICAL APPLICATION GROUPS</th>
<th>PROCESS MANAGEMENT</th>
<th>DATABASE MANAGEMENT</th>
<th>BUSINESS DOCUMENTATION</th>
<th>OPERATIONAL PROCESSES</th>
<th>OTHER DATA MANAGEMENT</th>
<th>SUPPORT SERVICES</th>
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<tbody>
<tr>
<td><strong>PROCESSES</strong></td>
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<tr>
<td>Develop agency plans</td>
<td>C</td>
<td>C</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
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<tr>
<td>Administers agency budget</td>
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<td>U</td>
<td>C</td>
<td>U</td>
<td>U</td>
<td>U</td>
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<td>Formulate programs policies</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>U</td>
<td>U</td>
<td>U</td>
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<tr>
<td>Formulate administrative policies</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>U</td>
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<td>U</td>
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<td>Formulate data policies</td>
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<td>U</td>
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<td>U</td>
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<td>Design workflow</td>
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<td>U</td>
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<td>Manage public affairs</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>U</td>
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<td>Manage intergovernment affairs</td>
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<td>Maintain administration accounts</td>
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<td>C</td>
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<tr>
<td>Maintain program accounts</td>
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<td>U</td>
<td>C</td>
<td>U</td>
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<td>U</td>
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<td>Conduct audits</td>
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<td>U</td>
<td>C</td>
<td>U</td>
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<td>U</td>
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<td>Establish organization</td>
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<td>Manage human resources</td>
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<td>C</td>
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<tr>
<td>Provide security</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>C</td>
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<td>U</td>
</tr>
<tr>
<td>Manage equipment</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>U</td>
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<tr>
<td>Manage facilities</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>U</td>
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<tr>
<td>Manage supplies</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>U</td>
</tr>
<tr>
<td>Manage overhead</td>
<td>U</td>
<td>C</td>
<td>U</td>
<td>C</td>
<td>C</td>
<td>U</td>
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<tr>
<td>Issue Social Security numbers</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>C</td>
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<td>Maintain earnings</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>U</td>
</tr>
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<td>Collect claim information</td>
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<td>C</td>
<td>C</td>
<td>C</td>
<td>U</td>
</tr>
<tr>
<td>Determine eligibility/entitlement</td>
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<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>C</td>
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<td>Generate payments</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>U</td>
<td>U</td>
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<td>Administer debt management</td>
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<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
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<td>Generate notices</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Respond to program inquiries</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td>Provide quality assessment</td>
<td>U</td>
<td>U</td>
<td>C</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>

**KEY:** C = creation of data - U = use of data.
Using CSFs to Develop Systems

Manager A CSFs
Manager B CSFs
Manager C CSFs
Manager D CSFs

Aggregate + analyze individual CSFs

Develop agreement on company CSFs

Define company CSFs

Define DSS and databases

Use CSFs to develop information systems priorities

Figure 7-2
Four Kinds of Structural Change:

• **Automation**: Mechanizing procedures to speed up the performance of existing tasks

• **Rationalization of procedures**: The streamlining of standard operating procedures
Four Kinds of Structural Change: (Continued)

- **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 7-3
Business Process Reengineering

- Leading mortgage banks reduced time to obtain a mortgage from 6-8 weeks to one week, by radically changing the workflow and document management procedures.

**Workflow management:**

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

- 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 7-4

Business Process Management (BPM):

- 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
BPM and BPM software tools include: (Continued)

- 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
Total Quality Management and Six Sigma

Total Quality Management (TQM):

- Sees achievement of quality control as an end in itself with responsibility shared by all people in an organization
- Focuses on a series of continuous improvements rather than large change
Total Quality Management and Six Sigma

Six Sigma:

- A specific measure of quality, representing 3.4 defects per million opportunities
- Designates a set of methodologies and techniques for improving quality and reducing costs
- Uses statistical analysis to detect process flaws and make minor adjustments
Benchmarking:

Setting strict standards for products, services, or activities and measuring organizational performance against those standards
OVERVIEW OF SYSTEMS DEVELOPMENT

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

- **Systems analysis**: The analysis of a problem that the organization will try to solve with an information system

- **Feasibility study**: As part of the systems analysis process, the way to determine whether the solution is achievable, given the organization’s resources and constraints
The Systems Development Process

Figure 7-5
Establishing Information Requirements

Information requirements:

• A detailed statement of the information needs that a new system must satisfy

• Identifies who needs what information, and when, where, and how the information is needed
Establishing Information Requirements (Continued)

Systems design:

- Details how a system will meet the information requirements as determined by the systems analysis
- Includes creating design specifications
Establishing Information Requirements (Continued)

The role of end users:

- Users must have sufficient control over the design process to ensure that the system reflects their business priorities and information needs.
- Working on design increases users’ understanding and acceptance of the system.
Completing the Systems Development Process

Programming:
- Translating the system specifications prepared during the design stage into program code

Testing:
- The exhaustive testing to determine whether the system produces the desired results under known conditions
Completing the Systems Development Process (Continued)

Unit testing:

- Testing each program separately in the system (program testing)
- **System testing:** Testing the information system as a whole to determine if discrete modules function together as planned
- **Acceptance testing:** Provides the final certification that the system is ready to be used in a production setting
### A Sample Test Plan to Test a Record Change

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Address and Maintenance “Record Change Series”</th>
<th>Test Series 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared By:</td>
<td>Date:</td>
<td>Version:</td>
</tr>
<tr>
<td>Test Ref.</td>
<td>Condition Tested</td>
<td>Special Requirements</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>2.0</td>
<td>Change records</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Change existing record</td>
<td>Key field</td>
</tr>
<tr>
<td>2.2</td>
<td>Change nonexistent record</td>
<td>Other fields</td>
</tr>
<tr>
<td>2.3</td>
<td>Change deleted record</td>
<td>Deleted record must be available</td>
</tr>
<tr>
<td>2.4</td>
<td>Make second record</td>
<td>Change 2.1 above</td>
</tr>
<tr>
<td>2.5</td>
<td>Insert record</td>
<td>OK if valid</td>
</tr>
<tr>
<td>2.6</td>
<td>Abort during change</td>
<td>Abort 2.5</td>
</tr>
</tbody>
</table>

**Figure 7-6**
Conversion:

- Process of changing from the old system to the new system
- Four main conversion strategies
  1. Parallel strategy
  2. Direct cutover strategy
  3. Pilot study strategy
  4. Phased approach strategy
Production and Maintenance

Production:

• The stage after the new system is installed and the conversion is complete; during this time the system is reviewed by users and technical specialists to determine how well it has met its original goals.

• May implement a post-implementation audit: Formal review process conducted after a system has been placed in production to determine how well the system has met its original objectives.
Production and Maintenance (Continued)

Maintenance:

- Changes in hardware, software, documentation, or procedures to a production system to correct errors, meet new requirements, or improve processing efficiency
Chapter 7 Redesigning the Organization with Information Systems

OVERVIEW OF SYSTEMS DEVELOPMENT

Modeling and Designing Systems: Structured and Object-Oriented Methodologies

Structured Methodologies:

- Process-oriented development and modeling methods
- Top-down, progressing from the highest (most abstract) level to the lowest (most specific) level of detail
Structured Methodologies: (Continued)

• Separates data from processes

• Separate programming procedures written for each new action taken on a piece of data
Structural Methodologies: (Continued)

- **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
Structural Methodologies: (Continued)

- **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 7-7
High-level Structure Chart for a Payroll System

- Process payroll
  - Get valid inputs
    - Get inputs
  - Calculate pay
    - Validate inputs
    - Calculate gross pay
    - Calculate net pay
  - Write outputs
    - Update master file
    - Write checks, reports, and output files
Object-Oriented Development:

• 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
Object-Oriented Development: (Continued)

- Development is more iterative and incremental than structured development.

- Analysis identifies objects, classes of objects, and behavior of objects.
Class and Inheritance

Figure 7-9

Management Information Systems
Chapter 7 Redesigning the Organization with Information Systems

OVERVIEW OF SYSTEMS DEVELOPMENT
Unified Modeling Language (UML):

• Industry standard for representing various views of an object-oriented system using a series of graphical diagrams

• Two principal types of diagrams

  1. **Structural diagrams**: Describe the relationship between classes

  2. **Behavioral diagrams**: Describe interactions in an object-oriented system
A UML Use Case Diagram

Figure 7-10
Computer-Aided Software Engineering

Computer-Aided Software Engineering (CASE) tools:

- Software tools to automate development and modeling methodologies
- Enforce a standard development methodology and design discipline
- Improve communication between users and technical specialists
Computer-Aided Software Engineering (Continued)

- 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
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 / Iterative Processes: (Continued)

- Prototyping is most useful when there is some uncertainty about requirements or design solutions.
- Encourages end-user involvement and is more likely to fulfill end-user requirements.
- Hastily constructed systems, however, may not accommodate large quantities of data or numbers of users.
The Prototyping Process

1. Identify basic requirements
2. Develop a working prototype
3. Use the prototype
4. User satisfied?
   - Yes: Operational prototype
   - No: Revise and enhance the prototype

Figure 7-11
End-User Development

End-User Development:

- The development of information systems by end users with little or no formal assistance from technical specialists

Fourth-Generation Languages:

- Software tools that enable end users to create reports or develop software applications with minimal or no technical assistance
Fourth-Generation Languages: (Continued)

- Allow rapid development but testing and documentation may be inadequate

- Seven categories of fourth-generation languages: PC software tools, query languages, report generator, graphics language, application generator, application software package, very high-level programming language
Application Software Packages and Outsourcing

Application Software Package:

• 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
Application Software Package: (Continued)

- 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
Figure 7-12
The Effects on Total Implementation Costs of Customizing a Software Package
Outsourcing:

- 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
Management Opportunities:

• New information systems enable organizations to redesign their structure, scope, power relationships, workflows, products, and services.

• Building a new system creates an opportunity to redefine how the organization conducts its business, leading to higher levels of productivity and performance.
Management Challenges:

• Changing demands in application development in the digital firm era. Agility and scalability can be critical goals and success factors.

• New interorganizational system requirements, when networks of applications are managed by many different business partners.
Solution Guidelines:

Rapid Application Development (RAD):

- Creating workable systems in a very short period of time

Component-Based Development:

- Building systems by assembling and integrating existing software components
Solution Guidelines: (Continued)

Web Services and Service-Oriented Computing:

• 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.