Chapter 6 – Systems Development

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Learning Objectives

• Know the characteristics of systems development.
• Understand what professional systems analysts do.
• Understand how program development and system development differ.
• Learn the major challenges of systems development.

Learning Objectives (Continued)

• Know the nature and phases of the classical systems development cycle (SDLC).
• Know the nature and development tools used for rapid application development (RAD).
• Know the nature and phases of object-oriented development (OOD) using unified process (UP).
• Understand the nature and advantages of extreme programming (XP).

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

• Many students are new to the systems development process due to working with personal computer tools.
• The scope of work is large with large-scale corporate information systems and may be global with different languages and cultures.
• 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. 

Figure 6-1 System Development vs. Program Development

Computer programming concerned with programs, some data

Hardware Software Data Procedures People

Scope of Systems Development
• 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.
• You must construct or adapt procedures to fit your business and people.
• It does not matter how you obtain the computer programs.

• 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 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

• 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.
Systems Development Life Cycle

- The numbers of phases used by organizations vary. We use 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.
Obtain User Approval

• 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.

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.

Figure 6-5 SDLC: Component Design Phase

Hardware Design

• The team determines specifications for the hardware that they would want to acquire.
• The team is not designing hardware.
• Typically, a large scale company will have some sort of networking infrastructure.

Program Design

• Depends on the source of the programs
• Off-the-self-the team must determine candidate products and evaluate them against requirements
• Off-the-shelf with alteration programs-the team identifies products to be acquired off-the-shelf and then determines the alterations required.
• Custom-design programs-the team produces specifications (documentation) for writing program code

Database Design

• When constructing a database:
  – Convert the database design to a data model
  – If off-the-shelf database, little design is needed
Procedure Design

- Procedures must be developed for system users and operations personnel to follow.
- These procedures typically address:
  - Normal operations
  - Backup of transactions and data
  - System failure recovery

Design of Job Descriptions

- Job descriptions are needed for both users and operations personnel.
- New information systems may require new jobs.
- Organizations may have to add new duties and responsibilities due to information systems changes and enhancements.

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.
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.

Maintenance Phase Tasks

- Record requests for change
  - System failures
  - Enhancement requests
- Prioritize requests
- Failure fixing
  - Patches
  - Service packs
- Enhancements
  - New releases

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
Joint Application Design
- JAD is another key element of RAD.
- JAD came about because development wanted to incorporate feedback and testing earlier in the development process.
- A JAD session is a design meeting of short duration, perhaps an afternoon or a day or two at most.
- The goal is to keep the scope of the component small enough that the design can be completed in a short period.

CASE and Visual Tools
- A CASE tool is a computer system to aid in the development of computer programs or systems.
- CASE tools vary in their features and functions.
- CASE tools have a repository that contains documents, data, prototypes, and program code for the software or system under development.

Figure 6-13a Visual Web Page Development

Figure 6-14 Visual Programming Tool Example

Object-Oriented Systems Development
- 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.

Unified Process Phases
- Three of the five phases are similar to the SDLC phases.
  - The inception phase is similar to the first part of the SDLC definition phase.
  - The transition phase is similar to the conversion step in SDLC implementation.
  - The maintenance phase is similar to maintenance in the SDLC.
Unified Process Elaboration Phase

- The elaboration phase is where developers construct and test the framework and architecture of the new system.

- This phase addresses the aspects of the system that have the most risk and uncertainty.

Unified Process Construction Phase

- The construction phase is where developers design, implement, and test the easier, lower-risk features and functions that were not addressed during elaboration.

- After all features and functions have been completed in the construction phase, the system is ready for deployment.

Figure 6-15 Stages in the Unified Process

Figure 6-16 Use Case Example

Figure 6-17 Unified Process Principles

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
Figures 6-18 Comparison of Development Techniques

<table>
<thead>
<tr>
<th>System Development Methodology</th>
<th>Scope</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISAC</td>
<td>All five components</td>
<td>• Comprehensive, • Difficult to assess and additional issues. • Trust and tested</td>
<td>• Requirements analysis may lead to enforce process. • Minimal wasted resources.</td>
</tr>
<tr>
<td>RAD</td>
<td>All five components</td>
<td>• Gives the right to test role, • Leverages and assesses design. • Use of prototypes and CASE tools increases productivity</td>
<td>• Requirements analysis may lead to enforce process. • Takes longer to write large projects.</td>
</tr>
<tr>
<td>RAD with JIP</td>
<td>Primary object-oriented programs</td>
<td>• Uses cases as effective requirements documents. • Risk in the process to collaborative phase. • Exit iteration becomes viable in evolving system.</td>
<td>• Less useful for business systems development than for prototype development. • Range of coding in code-based black box tests.</td>
</tr>
<tr>
<td>Graph Programming</td>
<td>Programs</td>
<td>• Customer feedback is always involved, • Parallel programming improves quality and reduces risk. • Most cells when system evolves with accidental development.</td>
<td>• Requires reprogramming, • JF design can require manual changes. • Less certain when system evolves many years before delivery. • Possibly conflicting requirements.</td>
</tr>
</tbody>
</table>

Reflections Guide—Dealing with Uncertainty

- Business users, and IS would take responsibility for the success of new systems.
- Users would actively work with IS Personnel throughout systems development, especially during the requirements phase.
- Users would take an active role in project planning, project management, and project reviews.
- No development phase would be considered complete until the work was reviewed and approved by user representatives and management.
- Users would actively test the new system.
- All future systems would be developed in small increments.
Learning Objectives

• Know the features and purposes of functional information systems for human resources, accounting, sales and marketing, operations, and manufacturing.
• Understand the problems caused by the isolation of functional systems.
• Understand how value chains and business process redesign led to the development of integrated applications.
• Know the features and functions of three types of integrated systems: customer relationship management (CRM), enterprise resource planning (ERP), and enterprise application integration (EAI).

Calculation Systems

• The first information system was the calculation system.
• Its purpose was to relieve workers of tedious, repetitive calculations.
• The first systems computed payroll; applied debits and credits to general ledger, balanced accounting records, and kept track of inventory quantities.
• These systems produced very little information.

Functional Systems

• Functional systems facilitate the work of a single department or function.
• These systems grew as a natural expansion of the capabilities of systems of the first era.
  – Payroll expanded to become human resources.
  – General ledger became financial reporting.
  – Inventory was merged into operations or manufacturing.

Functional Systems (Continued)

• These new functional areas added features and functions to encompass more activities and to provide more value and assistance.
• The problem with functional applications is their isolation.
• Functional applications are sometimes called islands of automation.
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.

Integrated, Cross-Functional Systems (Continued)

- 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

<table>
<thead>
<tr>
<th>Function</th>
<th>Example Information Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human resources</td>
<td>Payroll processing, Compensation, Performance evaluations, Benefits administration</td>
</tr>
<tr>
<td>Accounting and finance</td>
<td>General ledger processing, Cost accounting, Financial planning, Cash management</td>
</tr>
<tr>
<td>Sales &amp; Marketing</td>
<td>Lead tracking, Sales forecasting, Order management, Product management</td>
</tr>
<tr>
<td>Operations</td>
<td>Inventory management, Purchasing, Manufacturing operations</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Inventory management, Purchasing, Manufacturing operations</td>
</tr>
</tbody>
</table>

Human Resources Systems

- Human resources systems support recruitment, compensation, evaluation, and development of the organization’s employees and affiliated personnel.

Accounting and Finance Systems

- Financial reporting applications use the general ledger data to produce financial statements and other reports for management, investors, and federal reporting agencies.
- Cost accounting applications determine the marginal cost and relative profitability of products and product families.
- Budgeting applications allocate and schedule revenues and expenses and compares actual financial results to the plan.
Accounting and Finance Systems (Continued)

- Accounts receivable includes:
  - Recording receivables
  - Recording payments against receivables
  - Account aging and collections management

- Cash management is the process of scheduling payments and receivables and planning the use of cash so as to balance the organization's cash needs against cash availability.

Sales and Marketing Systems

- Sales and marketing systems store data about potential customers, their product interests and contact with them by sales personnel.
- Sales management uses sales forecasting systems to predict future sales.
- Customer management systems maintain customer contact data, credit status, past orders, and other data.

Sales and Marketing Systems (Continued)

- Marketing personnel use product management systems, which include a variety of different functions.
- Marketing staff use the product information to evaluate the success of products and to assess the effectiveness of marketing activities, including promotions, advertising, sales channels, etc.

Operations Systems

- Operations activities concern the management of finished-goods inventory and the movement of goods from that inventory to the customer.
- Operations systems are especially prominent for non-manufacturers, such as distributors, wholesalers, and retailers.
- Order entry systems record customer purchases.
Operations Systems (Continued)
• Order management systems
  – track orders
  – arrange and schedule shipping
  – process exceptions (out of stock)
  – inform customers of order status and schedule delivery dates
• Customer service allows customers to call and ask questions about products, order status, problems, and make complaints.

Manufacturing Systems
• Manufacturing systems facilitate the production of goods.
• Manufacturing systems include inventory, planning, scheduling, and manufacturing operations.

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.
• Inventory management applications use past data to compute stocking levels, reorder levels, and reorder quantities in accordance with inventory policy.

Inventory Systems (Continued)
• 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 Planning Systems

- In order to plan materials for manufacturing, it is first necessary to record the components of the manufactured items.
- A bill of material (BOM) is a list of the materials that comprise a product.
- The materials that comprise a product can be subassemblies that need to be manufactured.
- The BOM is a list of materials, and materials within materials, and materials within materials, and so forth.

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.

The Problems of Functional Systems

- Functional systems provide tremendous benefits to the departments that use them; however, they are limited due to operating in isolation.
- With isolated systems:
  - Data are duplicated because each application has its own database
  - Business processes are disjointed
  - Lack of integrated enterprise data
  - Inefficiency
Competitive Strategy and Value Chains

- When Michael Porter wrote the now-classic *Competitive Advantage* in the mid-1980's his ideas laid the groundwork for solving the problems of isolated information systems.
- Porter defined and described value chains, which are networks of business activity that exist within an organization.
- Porter also developed a model of competitive strategies that helps organizations choose which information systems to develop.

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

<table>
<thead>
<tr>
<th>Primary Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inbound logistics</td>
<td>Receiving, storing, and disseminating inputs to the product</td>
</tr>
<tr>
<td>Operations</td>
<td>Transforming inputs into the final product</td>
</tr>
<tr>
<td>Outbound logistics</td>
<td>Collecting, storing, and physically distributing the product to buyers</td>
</tr>
<tr>
<td>Marketing and sales</td>
<td>Inducing buyers to purchase the product and providing a means for them to do so</td>
</tr>
<tr>
<td>Service</td>
<td>Assisting customer’s use of the product and thus maintaining and enhancing the product’s value</td>
</tr>
</tbody>
</table>

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 in the Value Chain
- 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.
- The new information systems are developed to implement those new business processes.

Challenges of a Business Process Design (Continued)
- 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.
- Some businesses were successful in their process design activities, but many others failed.
Benefits of Inherent Processes

• When an organization acquires, say, a business application from Siebel Systems, the processes for using the software are built-in or inherent processes.
• In most cases, the organization must conform its activities to those processes.
• If the software is designed well, the inherent processes will save the organization the substantial, sometimes staggering, cost of designing new processes itself.

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.

Customer Relationship Management (Continued)

• The components for each stage of the customer life cycle are:
  – Solicitation
  – Lead Tracking (presale)
  – Relationship management (postsale)

• Information systems that support solicitation include email applications and organizational Web sites.

• Additionally, some information systems support traditional direct mail, catalog, and other solicitations.
Customer Relationship Management (Continued)

- Organizational Web site is an increasingly important solicitation tool.
  - Web addresses are easy to promote and remember.
  - Once a target prospect is on the Web site, product descriptions, use cases, success stories, and other solicitation materials can be provided easily.
  - The cost of distributing these materials via the Web is substantially less than the cost of creating and distributing printed materials.
  - Many Web sites require customer name and contact information before releasing high-value promotional material.

Customer Relationship Management (Continued)

- Lead tracking (presale) is particularly important when multiple salespeople call on the same customer.
  - Often salespeople may join forces to work out a strategy for sales calls and follow-ups.
  - Consolidated lead tracking can keep sales personnel from duplicating efforts and from interfering with one another.
- Relationship management (postsale)
  - There are two types of applications:
    - Sales management applications
    - Customer support applications

Customer Relationship Management (Continued)

- Sales management applications
  - Support sales to existing customers
  - Contain features to prioritize customers according to their purchase history
  - Salespeople can increase sales to existing customers by focusing on customers who have already made large purchases, by focusing on large organizations that have the potential to make large purchases, or both.
  - The goal of such applications is to ensure that sales management has sufficient information to prioritize and allocate sales time and effort.

Customer Relationship Management (Continued)

- Customer support applications
  - Order management applications help the customer to determine the status of an order, how and when it was shipped, the status of returns, etc.
  - Other customer support applications track customer problems and resolutions and ensure that customers need not repeat their problem history to each new support representative.
  - Customer support has an important linkage to product marketing and development; it knows more that any other group what customers are doing with the product and what problems they are having with it.

Figure 7-18 CRM Centered on Integrated Customer Database

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.
- The first and most successful vendor of ERP software is SAP (SAP AG Corp., headquartered in Germany).
Enterprise Application Integration

• 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.

Enterprise Application Integration (Continued)

• 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

Enterprise Application Integration

• ERP Benefits
  – The processes in the business blueprint have been tried and tested over hundreds of organizations.
  – The processes are always effective and often very efficient.
  – Organizations that convert to ERP do not need to reinvent business processes.
  – By taking an organization-wide view, many organizations find they can reduce their inventory dramatically.
  – With better planning, it is not necessary to maintain large buffer stocks.
Enterprise Application Integration (Continued)
• ERP Benefits (Continued)
  – Items remain in inventory for shorter periods of time, sometimes no longer than a few hours or a day.
  – ERP helps organizations reduce lead times.
  – Data inconsistency problems are not an issue because all ERP data are stored in an integrated database.
  – ERP-based organizations often find that they can produce and sell the same products at lower costs due to:
    • Smaller inventories
    • Reduced lead times
    • Cheaper customer support

Figure 7-21 ERP Implementation

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

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.

Implementing an ERP System (Continued)
• 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)
• 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.
**Problem Solving Guide–Thinking about Change**

- New information systems, especially those that cross departmental boundaries, require employees to change.
- At the very least, they will certainly use new information systems, forms, reports, and other features.
- Many organizations have found that implementing such change is the most difficult part of IS implementation.
- Change management is a blend of business, engineering, sociology, and psychology that strives to understand the dynamics of organizational change and to develop and communicate theories, methods, and techniques that enable successful organizational change.

**Problem Solving Guide–Thinking about Change (Continued)**

- Another reason employees resist change is fear of the unknown.
- The concept of self-efficacy means that people believe that they have the knowledge and skills necessary to be successful at their new job.
- Self-efficacy breeds success: When employees feel confident, they bring more and more of their natural abilities to the problems they face.
- Change, however, threatens self-efficacy.
- Because change is threatening, organizations need to take steps to increase employees’ sense of self-efficacy.

**Security Guide–Centralized Vulnerability**

- With ERP and other multifunction systems, a centralized database enables authorized users to obtain integrated information.
- However, a centralized database also makes it easier for unauthorized users and criminals to obtain the same integrated information.
- Further, in the event of a catastrophic data loss, all of the applications in the ERP suite will be unavailable and the entire organization can become paralyzed.
- Databases that support ERP, and even functional applications that span several business activities, increase organizational vulnerability.

**Security Guide–Centralized Vulnerability (Continued)**

- Because of this increased vulnerability, security, backup, and recovery become critical.
- There are several types of controls and procedures that can be put in place such as:
  - Ensure that appropriate security measures exist to protect the organizational network and organizational databases
  - Ensure that appropriate roles are defined for application users and that permissions and passwords are set to enforce those roles
  - The goal of such controls is to promote appropriate separation of duties and authorities.
  - The organization must protect data assets from loss due to natural disaster or other catastrophic loss.
Reflections Guide–ERP and the Standard Blueprint

- Designing business processes is difficult, time consuming, and very expensive.
- Highly trained experts conduct seemingly countless interviews with users and domain experts to determine business requirements.
- ERP vendors such as SAP have invested millions of labor hours into business blueprints that underlie their ERP solutions.
- These blueprints consist of hundreds or thousands of different business processes.
- Example, processes for hiring employees, acquiring consumable goods, etc.

Reflections Guide–ERP and the Standard, Standard Blueprint (Continued)

- ERP vendors have developed software solutions that fit their business-process blueprints.
- In theory, no software development is required at all if the organization can adapt to the standard blueprint of the ERP vendor.
- Most organizations choose to modify their processes to meet the blueprint, rather than the other way around.
- From a standpoint of cost, effort, risk, and avoidance of future problems, there is a huge incentive for organizations to adapt to the standard ERP blueprint.

Reflections Guide–ERP and the Standard, Standard Blueprint (Continued)

- SAP was the only true ERP vendor, but other companies have developed and acquired ERP solutions as well.
- Because of the competitive pressure across the software industry, all of these products are beginning to have the same sets of features and functions.
- All of this is fine as far as it goes, but it introduces a nagging question:
- If, over time, every organization tends to implement the standard ERP blueprint, and if, over time, every software company develops essentially the same ERP features and functions, then won’t every business come to look just like the other business?

Reflections Guide–ERP and the Standard, Standard Blueprint (Continued)

- All of this is fine as far as it goes, but it introduces a nagging question: (continued)
- How will organizations gain a competitive advantage if they all use the same business processes?
- How will a company distinguish itself?
- Does the use of “commoditized” standard blueprints mean that no company can sustain a competitive advantage?