ITEC 116 (IT ELECTIVE 4 (Systems Integration and Architecture 2)) MIDTERMS REVIEWER

LESSON 1: SYSTEM INTEGRATION

What is System Integration?

- is the process of combining different subsystems or components of a larger system into a unified whole.

- In the context of technology and software development, system integration involves making different software systems and hardware devices work together as a coordinated and cohesive unit.

Some key aspects of system integration

•Connectivity

•Data Flow

•Functionality

•Interoperability

•Testing

•Scalability

Connectivity

- System integration ensures the seamless flow of data between different subsystems.

Data Flow

- Integration involves establishing connections and communication pathways between different systems or components.

Functionality

- The integrated system should perform functions that may not be achievable by individual components alone.

Interoperability

- Components from different vendors or developers may have different specifications or standards.

Testing

- Rigorous testing is a crucial part of system integration to identify and resolve any issues that may arise during the combination of subsystems.

Scalability

- Integrated systems should be designed to be scalable, allowing for the addition of new components or the expansion of existing ones without significant disruptions.

Integrated program planning

are the specific kind of enterprise systems to integrate data across and be comprehensive in supporting all the major functions of the organization.

Enterprise Resource Planning (ERP) system

- Integration is a cornerstone of today's enterprise environments with their multitude of enterprise resource planning (ERP) systems.

Evolution of ERP

• **1960 -** INVENTORY MANAGEMENT AND CONTROL

• **1970-** MATERIAL REQUIREMENTS PLANNING (MRP)

• **1980 -** MANUFACTURING REQUIREMENTS PLANNING (MRP II)

• **1990 -** ENTERPRISE RESOURCE PLANNING (ERP)

• **2000 -** EXTENDED ENTERPRISE RESOURCE

PLANNING (ERP II)

Five (5) Key Questions in the Planning Stage

1. What is the data that the target system requires to complete the integration task?

2. Where is the data required by the target system located in the source system, and what transformations are needed?

3. What is considered a transaction within the integration task and are there any dependencies between the transactions?

4. How will you connect to the target system (domain name, IP, etc.) and what security constraints apply (certificates, credentials, etc.)?

5. What interface options do you have available (REST, SOAP, Custom, etc.)?

Can be simply to…

1. Data Requirements

2.Data Mapping and Transformations

3.Transaction Definition and Dependencies

4.Connection and Security

5.Interface Options

Data Requirement

What is the data that the target system requires to complete the integration task?

- Understanding the specific data requirements of the target system is fundamental. It defines what objects or tables need to be accessed, and the rules the data needs to comply to

Data Mapping and Transformations

- Identifying the location of required data in the source system is crucial for mapping and transformation processes.

- It also prompts consideration of any necessary data transformations to ensure compatibility between systems.

Transaction Definition and Dependencies

- Defining a transaction and understanding dependencies is essential for maintaining data integrity during integration.

- It helps in designing processes that ensure consistency and reliability, especially in scenarios involving multiple steps or systems.

Connection and Security

- Addressing connectivity and security considerations is paramount.

- Knowing how to establish a secure connection and understanding the required credentials or certificates ensures the confidentiality and integrity of the integrated data.

Interface Options

- The choice of interface plays a significant role in determining how systems communicate.

- Understanding available options, whether RESTful APIs, SOAP services, or custom interfaces, guides the selection of integration technologies and tools.

LESSON 2: PROGRAM EXECUTION

LOGICAL SYSTEM INTEGRATION

Logical integration allows organizations to share data with all of its stakeholder based on their need and authorization.

PHYSICAL SYSTEM INTEGRATION

Physical integration provides seamless connectivity between heterogeneous systems.

MIDDLEWARE

This software provides the appearance of seamless data presentation to the end user and maintains data integrity and synchronization within each application system database.

PROGRAM INTEGRATION

The inability to meet the market demand effectively can have unfortunate consequences.

STEPS IN INTEGRATION SYSTEM

In conjunction with systems integration, management must work with the information technology group to produce an approach for the seamless integration of data and services to support the new organizational structure and business processes.

Most IT a Windows and flavor of UNIX. A database can be Oracle or organizations today support MS SQL and even MySQL. Most important is the support of a development environment. This area continues to grow. At one point in time, C or C++ with SQL was the key development tool. That has somewhat given way to Java and SOAP with SQL. Integrating and supporting multiple platforms require planning.

STEP 1: RESOURCE CATEGORIZATION

Take an inventory of the various hardware and software resources focusing on vendors, operating systems platform, IS architecture used in these resources.

STEP 2: COMPLIANCE AND STANDARDS

Check whether the databased and other technologies used in various applications are such supporting standards as JDBC/ODBC compliance for databases

STEP 3: LEGACY SYSTEMS SUPPORT

Develop a policy in support of older legacy applications.

STEP 4: MIDDLEWARE TOOLS

Think of middleware tools because most organization will not dispose of their old system right away for systems integration. Middleware tools are essential for integration in the short term – if existing application must be used by the organization.

STEP 5: AUTHENTICATION AND AUTHORIZATION POLICIES

Develop a single sign-on policy for application and data access because all employees and external partners will need access to an integrated system from anywhere, anytime.

STEP 6: CENTRALIZED IT SERVICES AND HELP DESK SUPPORT

Instituting IT support for an integrated systems environment is necessary to avoid support and maintenance problems with the integrated system. Centralization does not mean that they are all physically in one location. The IT staff can be all over the organization, but they need to be able to support all application and platforms with a centralized IT help desk supports.

STEP 7: BACKUP, RECOVERY AND SECURITY POLICIES

Planning data and disaster recovery for organization's data in an integrated system IT is crucial for building the trust and confidence for the new system. A good backup and recovery system is essential if there is a system failure or a major disaster.

STEP 8: HARDWARE AND SOFTWARE STANDARDIZATION POLICIES

Develop organization standards and policy on acquisition of new hardware and software which are aligned with organization IT strategy.

BENEFITS AND LIMITATION OF SYSTEM INTEGRATION

TABLE 2-2 Benefits and Limitations of Systems Integration

Benefits of System Integration	Limitations of Systems Integration
Increased revenue and growth	High initial setup costs
Leveling the competitive environment	Power and interdepartmental conflicts
Enhanced information visibility	Long-term and intangible ROIs
Increased standardization	Creativity limitations

[10] Kempfer, L. (September 12, 2005). Integration Improves Throughput. *Materials Handling Management.*

LESSON 3: PROGRAM MANAGEMENT

Program Management Information

- The Project Management Office (PMO) is responsible for ensuring that project teams are working well together and addressing the functionality issues in a timely, open, and efficient manner. The PMO needs to make certain that team activities stay synchronized and that progress is made. If teams become fragmented, it will often slow down an entire project, especially if teams are dependent on each other for decisions

CRITICAL SUCCESS FACTORS

➢Decision-Making Process

➢Project Scope

➢Teamwork

➢Change Management

CRITICAL SUCCESS FACTORS

A. DECISION-MAKING PROCESS

➢ A well-defined decision-making process will minimize a number of issues related to scope, efficiency, and productivity throughout the project implementation cycle

B. PROJECT SCOPE

➢The project manager has many responsibilities. One of the most critical is the management of project scope.

➢ "Scope defines what needs to be delivered by the project, and a changing scope means the project will have difficulty in achieving project goals."

➢Scope creep is defined as constant changes to the parameters outlined in the original project goals. It was stated earlier that one of the roles of project management is to make sure the project meets its goals in relation to cost, quality, and time.

C. TEAM WORK

TABLE 8-1 Business Skills Importance to E-Business/E-Commerce (n = 27)

Skills	Mean Rating	Standard Deviation	Respondent Level
Teamwork	4.6	0.9	4.5
Deliver Business Solutions	4.3	0.7	3.1
Meet Deadlines	4.3	0.8	4.0
Project Management	4.3	1.1	3.2
Change Management	4.2	1.0	3.9
Client Consulting	4.1	0.9	3.6
Personal Communications	4.1	1.0	3.4
Client Negotiating	3.9	1.1	3.3
Internal Business Politics	3.4	1.2	3.3
Sales and Marketing Skills	2.8	1.5	2.4

D. CHANGE MANAGEMENT

➢ management is another critical factor that must be addressed by the project manager (i.e., managing change). Communication and training are the keys to a successful change management effort.

TECHNICAL PERFORMACE AND MEASUREMENT TECHNIQUE

A. IMPLEMENTATION TEAM AND EXECUTIVE TEAM

➢There are typically three options in choosing an implementation team: the internal IT organization, consulting organizations, and the package software vendors' client professional service group. A critical element in choosing what combination of the three will be used largely depends on what type of resources the organization has within its own walls and how quickly the implementation must take place.

IMPLEMENTATION TEAM AND EXECUTIVE TEAM

TABLE 8-2 Executive Sponsor Speaks to the Organization

1. Impact of the product on the business	All departments were represented
Cost savings	Vendors considered
Cost avoidance	Preparation of the RFP
Efficiencies to be gained	Site visitations and demos
Competitive advantage	**3. Long-Term Impact of a Successful Project**
2. Description of Selection Process	Sustainability
Who was on the selection committee	Growth

B. MANAGING SCOPE CREEP

➢A well-thought-out process to manage changes to scope is critical to a project's success.

➢ "Change Control" is managing these changes through a change process and governance. There must be a clear understanding around the decision‐making process. When changes are made in the scope of the project, the options, costs, and time frame must be documented for the project to evaluate and decide a direction.

➢A "white paper" consists of a description of the issue or new functionality, including the options available with advantages and disadvantages. A white paper should also list the implications to the project, including a time frame and budget considerations and a recommendation

C. IMPLICATION FOR MANAGEMENT

➢The success or failure of a project often rests with the skills and abilities of the PMO, project staff continuity, and a well-defined communications process. Well-managed projects are those where the scope is well understood and the project team is motivated to see the project through to Go-live. On the other hand, many projects fail due to a lack of open and honest communications and staff continuity throughout the project.

BOX 8-1 Sample Change Control Document

Date:
Issue Number: xxxx
Description of issue or new functionality:

Option 1:

- Description of option
- Technical implications
- User implications
- Advantages
- Disadvantages
- Amount of additional functional and technical staff time
- Cost
- Additional project time frame

Option n:

- Description of option
- Technical implications
- User implications
- Advantages
- Disadvantages
- Amount of additional function and technical staff time
- Cost
- Additional project time frame

Recommendation

➢The PMO must monitor a number of activities and issues throughout the length of the implementation. Hiring and selecting skilled and competent staff from the beginning will ensure that the Go-live is smooth and the system is sustainable.

LESSON 4: GENERIC PROGRAM PREPARATION

GENERIC PROGRAM PREPARATION & CONTINUOUS PROCESS IMPROVEMENT

➢The ERP implementation's success depends significantly on redesigning processes rather than **customizing** the technology to fit that process.

➢**Customization is expensive.** Overall, it increases the support fees paid for upgrades and prevents organizations from taking advantage of rapid implementations.

➢In general, there are various technical and organizational challenges in implementing ERP depending on the **organization, scope of implementation, business processes, and skill level of the people using these applications.**

SYSTEM DEVELOPMENT LIFE CYCLE (SLDC)

➢The process of developing new information systems is often called the system development life cycle. It basically includes a systematic process of planning, designing, and creating an information system for organizations.

➢SDLC uses a systems approach for problem solving that basically states that complex problems need to be broken up into smaller manageable problems using a systems' hierarchy, and then developing a solution for each problem within the hierarchy

➢It provides a structured top-down problem identification and bottom-up solution process for managing complex problems.

➢The SDLC process requires both technical and nontechnical problem-solving skills; therefore, the development team must understand technology, as well as the organization's business processes, culture, and people (or potential end users of this system).

TRADITIONAL SLDC

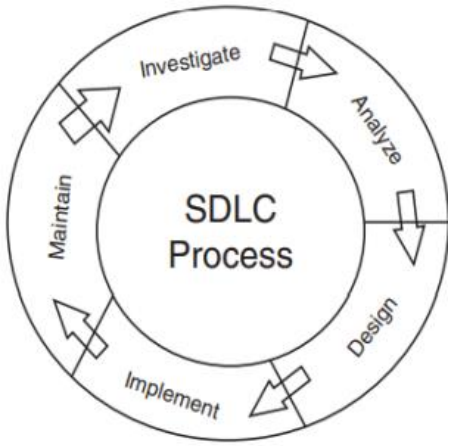


FIGURE 4-1 Traditional SDLC Methodology

➢In the early days of systems development, very few of these projects were successful in the first attempt. There were many reasons for the early failures, chief among them being lack of experience. This led to the systems approach, which we described earlier, and a structured SDLC methodology.

➢The SDLC consists of tasks that are divided into **phases or stages.**

TRADITIONAL SLDC

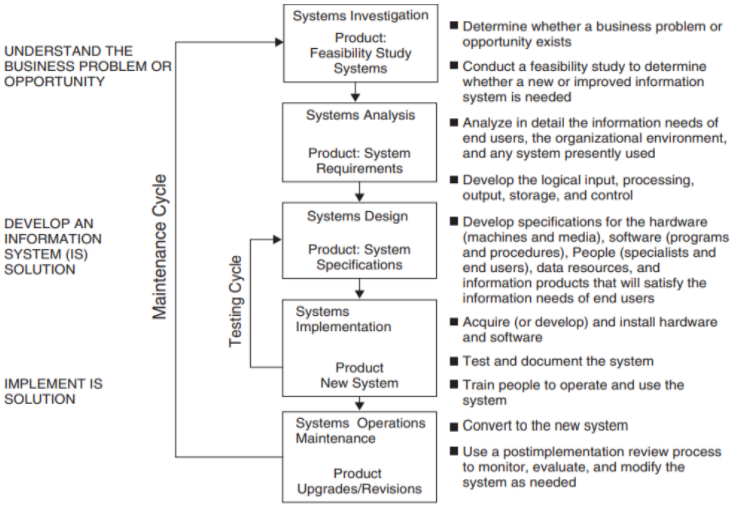


FIGURE 4-2 SDLC Approach

ERP IMPLEMENTATION LIFE CYCLE

ERP Implementation Stages

ERP applications are prepackaged software developed by commercial software vendors and custom installed for organizations to automate and integrate the various business processes. Although an ERP is packaged software, it is very different from PC-based software packages (e.g., Microsoft Office or other software) that you may have purchased for personal use.

TABLE 4-1 Differences Between ERP and Other Software Packages

	ERP Software	Other Packaged Software
Software Cost Significance to Organization	Millions of dollars Mission critical	Hundreds to thousands Support or productivity improvement
Installation Time	One to several years	Almost instantly
Change Management Strategy	Requires significant change management strategy from beginning to end for success; business process change, training, communications, etc.	Requires some training and support
Implementation Costs	Requires in-house employee time, consultants, and vendor support in millions of dollars	Requires little or no consulting support or vendor technical support

ERP IMPLEMENTATION PLAN

THREE MAJOR IMPLEMENTATION PLAN CHOICES:

1. COMPREHENSIVE

2. MIDDLE OF THE ROAD

3. VANILLA

COMPREHENSIVE ERP INTEGRATION PLAN

➢is the most expensive, lengthy, and costly approach. It involves implementation of the full functionality of the ERP software in addition to industry-specific modules. Implementing the full functionality requires a high level of business process reengineering (BPR) with major changes in the business processes and customization of legacy systems

MIDDLE OF THE ROAD ERP INTEGRATION PLAN

➢A middle-of-the-road ERP implementation plan involves some changes in the core ERP modules and a significant amount of BPR. The middle-of-the-road approach is not as expensive as the comprehensive approach or as straightforward as the vanilla approach

VANILLA ERP INTEGRATION PLAN

➢A vanilla ERP implementation plan **utilizes core ERP functionality and exploits the best practice business processes** built into the software. A company following a vanilla implementation will have to simply align their business processes to the ERP system, rather than modify the software. By eliminating or minimizing the required BPR, the project's costs and time required for the implementation are minimized

ERP LIFE CYCLE VS SDLC

➢Like the traditional SDLC, which we discussed earlier, the traditional ERP life cycle approach has a deliverable at the end of each stage (e.g., a report with supporting documents) that is reviewed by management and upon which a decision is made either to continue withthe projectornot.

➢End-user or people involvement is critical in both SDLC and ERPLC; however, there are other variations tothe traditional SDLC process.

➢The emphasis in **ERP implementation is on customizing the software** as well as on **changing the organization's business processes,** rather than determining the **user requirements for developing new applications** (as in the traditional SDLC). This may seem like a small deviation, but it requires a major change in the thinking process as well as team composition and skill level of people involved in the development process

TRADITIONAL ERP LIFE CYCLE

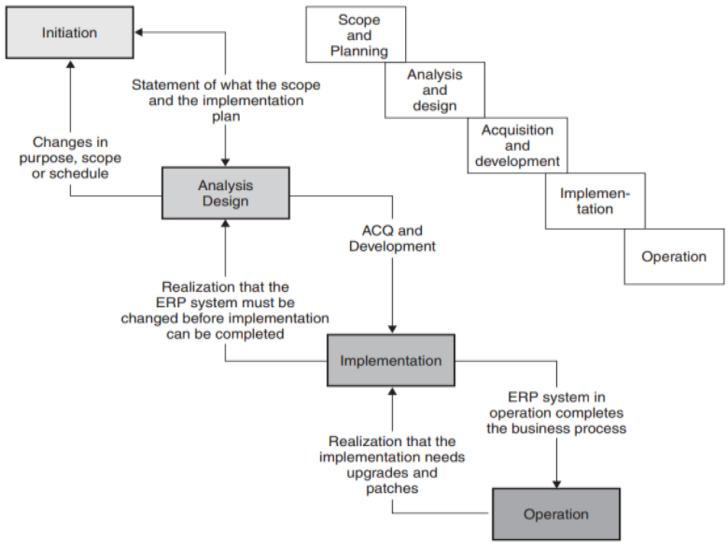


FIGURE 4-5 Traditional ERP Life Cycle

TRADITIONAL ERP LIFE CYCLE

STAGE 1**: SCOPE AND COMMITMENT STAGE**

STAGE 2: **ANALYSIS AND DESIGN STAGE**

STAGE 3: **ACQUISITION AND DEVELOPMENT STAGE**

STAGE 4**: IMPLEMENTATION STAGE**

STAGE 5**: OPERATION STAGE**

STAGE 1: SCOPE AND COMMITMENT STAGE

➢one of the first steps is to **develop a scope of ERP implementation** within the resource and time requirement.

➢A number of task parameters or characteristics of the ERP implementation need to be defined at the planning stage:

➢How large will the ERP system scope be in terms of **departmental or functional coverage?**

➢ Develop **a long-term vision for the new system and a short-term implementation plan and top management's commitment for both the vision and implementation plan.**

➢ The composition and the structure of the implementation team, the role of external consultants both in terms of time and scope, and the role of internal employees, including the subject matter experts (SMEs) who will provide the knowledge to embed business rules and input for interface and report design, are other key factors to be considered at this stage.

➢**Vendor selection** is another key activity toward the end of this stage. Although no decisions should be made on the ERP software,

➢Vendor information must be reviewed and choices could be narrowed by testing alternative software and developing a business case for the project. A number of items need to be assessed and established to create the boundaries and scope

TABLE 4-2 List of Scopes and Commitments

Scope Type	Description/Key Decision Points
Gap Analysis	Gap analysis is the evaluation of the functions provided by the ERP system compared with the operational processes necessary to run your business
Physical Scope	Establishes which sites will be addressed, the geographical locations of the sites, and the number of users.
BPR Scope	Will the current processes be refined, replaced, or eliminated. What users, departments, sites will be affected?
Technical Scope	How much modification will be done to the ERP software? What processes will be utilized as is and which will be customized?
Resource Scope	How much time and budget is allocated for the project?
Implementation Scope	Which modules should be implemented? How should the modules be connected to the existing system?

STAGE 2: ANALYSIS AND DESIGN STAGE

➢In addition to analysis of user requirements, the ERP team has first to make a decision on the software and decide on consultants and SMEs. ➢Another key activity is to map the differences between the **current business process** and the **embedded process in the ERP software or gap analysis** and to develop a long-term plan on whether to change the business processes of the organization or to customize the ERP software to support existing processes. ➢Using the gap analysis, the team must develop a design that among other things includes a change management plan, a list of embedded processes, user interface screens, and reports in the ERP software that will need customization, design of these changes, and a process of involving subject matter experts in the design. ➢Other activities include creating plans for data conversion, system conversion, and training. For a system to be successful, the team must develop a detailed change management strategy and plan for the release of the new system. By the end of this stage, the team usually has a sandbox or prototype of the ERP software installed that is accessible to the entire implementation team, consultants, and SMEs.

STAGE 3: ACQUISITION AND DEVELOPMENT STAGE

➢This stage is similar to the acquisition and testing stage of traditional SDLC.

➢The entire production platform must be configured and built with the necessary hardware, **network, security, software, database, and real production data**.

➢The tasks identified in the gap analysis are executed at this stage. These include customization **of embedded software rules, data in the database tables, input screens, and reports** that come with the ERP system.

➢ While the technical team is working on the installation, the change management team works with end users on implementing the changes in business processes and preliminary training with the sandbox version of the software.

➢The data team similarly works on migrating data from the old system to the new system. This can be an extremely difficult task when the old system is a legacy application using a nonrelational database. Data mapping, missing data, and data dictionary design are the major tasks for data conversion.

➢Finally, the ERP system needs to be configured with proper security, implement the authentication and authorization policy for accessing the system, and contain other modifications as recommended by the design plan

STAGE 4: IMPLEMENTATION STAGE

➢The focus for this stage is on installing and releasing the system to the end users (i.e., "Go-Live") and on monitoring the system release to the end users. This production platform is a mirror of the development version of the system. Errors found in the production version have to go through the help desk or support staff. Any changes made to the development version are then retested and migrated to the production system as regularly scheduled updates. System conversion is a major activity for the new system and needs to be managed carefully.

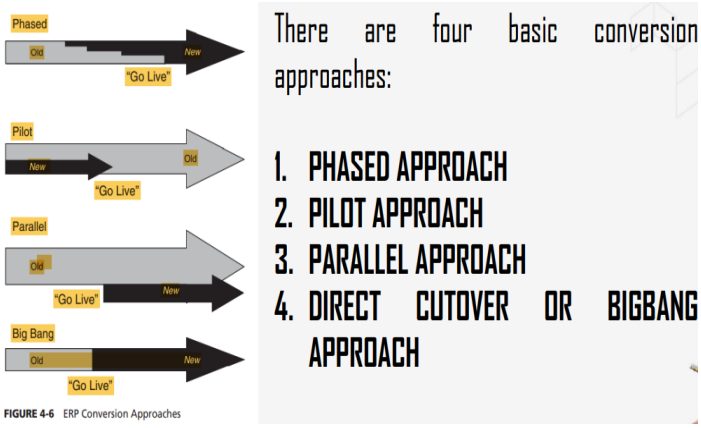
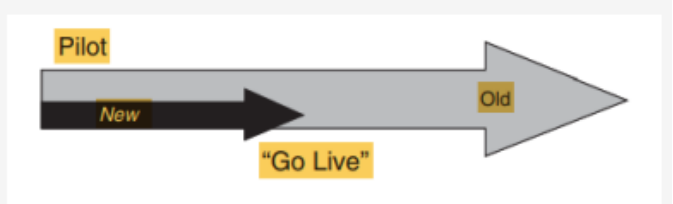
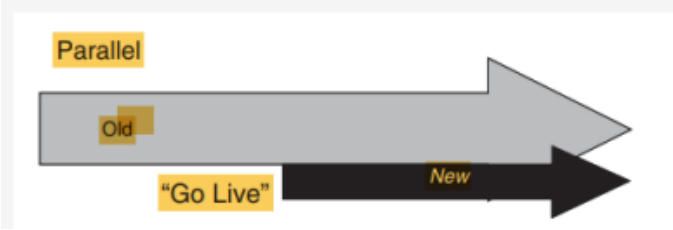


FIGURE 4-6 ERP Conversion Approaches

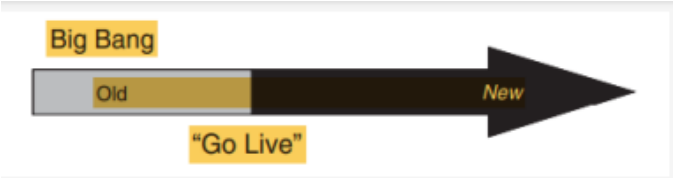
The first approach, phased, is a **gradual movement of the company from the existing legacy system(s) to the ERP implementation**. This approach can take a significant amount of time, but can also be the least disruptive to the company.



The second approach, pilot, **implements a small version of the final system**. This pilot system is used to ensure that the final system is appropriate. It is the equivalent of a test drive in that the system is used, but only by select areas, and its impact can be managed more closely.



The third approach, parallel, has the most up-front cost because the ERP system is **implemented and used in conjunction with the legacy system**. This approach is best used when risk of ERP failure is of significant concern.



➢ The final approach, direct cutover or big bang, is the **highest-risk approach** but the most straightforward and clean. The company moves from the legacy system directly and immediately to ease the ERP system. This approach has the least amount of up-front costs because systems are not duplicated or run concurrently for any length of time.

➢ Training end users on how to use the new system is another important activity. **Training is generally part of the change management strategy** designed to ease the transition to the post-implementation environment.

➢ Feedback received from system usage needs to be funneled to the post-implementation team for ongoing system support, including upgrades and patches, as well as to make adjustments to the change management strategy

STAGE 5: OPERATION STAGE

➢This is often managed by the operation team with assistance from the implementation team. **Knowledge transfer** is the major activity as support for the new system is migrated to the **help desk and support staff**. Some implementation team members are very often hired as support staff.

➢The other major activities are ongoing training of new users to the system as ERP modules are released, as well as to take a fresh look at the change management strategy. The team has to monitor user feedback from training and actual system usage carefully and make the

necessary adjustments to the change management approach.

➢Another key activity is **management of new releases of the software**, installation of patches and upgrades to the system, and managing the software contract with the ERP vender

TABLE 4-3 Comparing and Contrasting SDLC with ERPLC

	SDLC	ERP Life Cycle
Goal	Develop a new system to support the organization requirements	Implement a packaged system to support the organization requirements
Analysis	Evaluate user needs through observations and interviews and create system specifications	Vendor analysis and evaluation of business process changes due to the implementation
Design	Develop new system architecture, user interface, and reporting tools	Installation and customization plan of ERP software, data conversion, and change management strategies
Implementation	Acquire hardware, software, develop applications, installation, testing, training, and conversion	"Go-Live" conversion or releasing the system to the users, training, and support
Consultant Role	Technical support mainly during design and implementation	Change management, process change, and technical support from beginning to end
Management Role	Some oversight and support	Significant oversight and involvement—especially in change management
End-User Role	Focus group providing input during the various stages with most involvement during implementation stage	Multiple groups such as SMEs, advance users, and self-service users are part of implementation team with continuous involvement
Operations	Maintains, updates, and provides technical support	Maintains, updates, upgrades, and monitors change management strategy