

MIS, 11e

Module 10: Building Successful Information Systems

Module Objectives

By the end of this module, you should be able to:

- 10.1 Apply the systems development life cycle (SDLC) as a method for developing information systems.
- 10.2 Explain the tasks involved in the planning phase.
- 10.3 Explain the tasks involved in the requirements-gathering and analysis phase.
- 10.4 Explain the tasks involved in the design phase.
- 10.5 Explain the tasks involved in the implementation.
- 10.6 Explain the tasks involved in the maintenance phase.
- 10.7 Describe new trends in systems analysis and design, including service-oriented architecture, rapid application development, extreme programming, and agile methodology.

Systems Development Life Cycle: An Overview

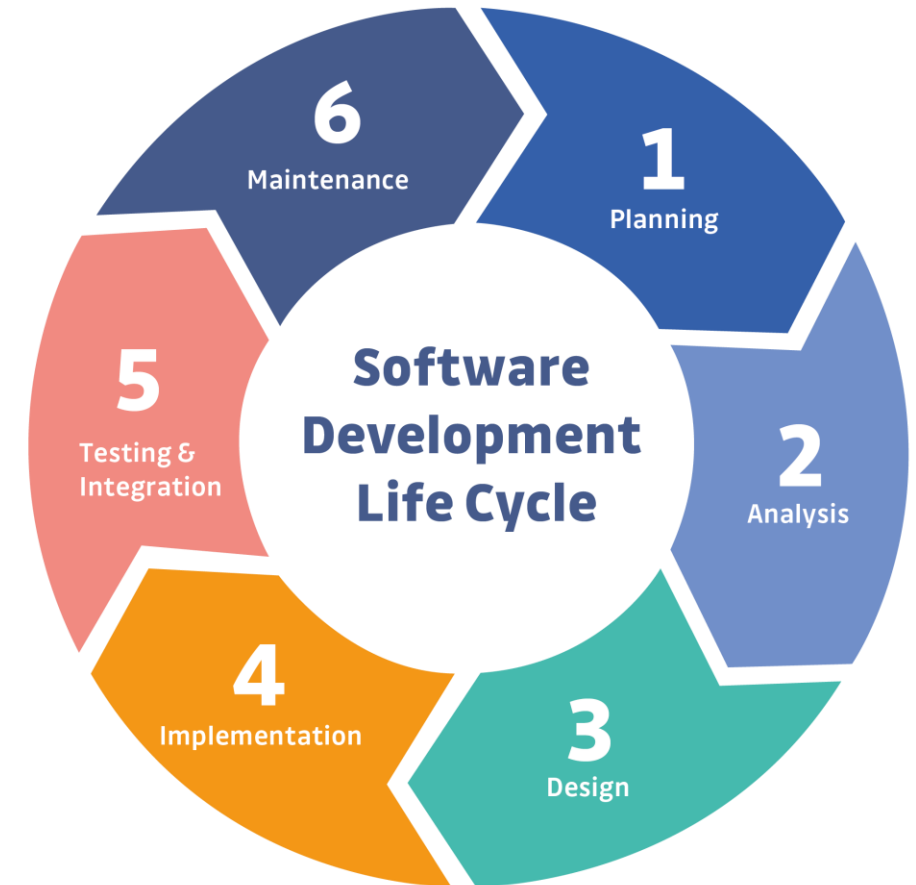
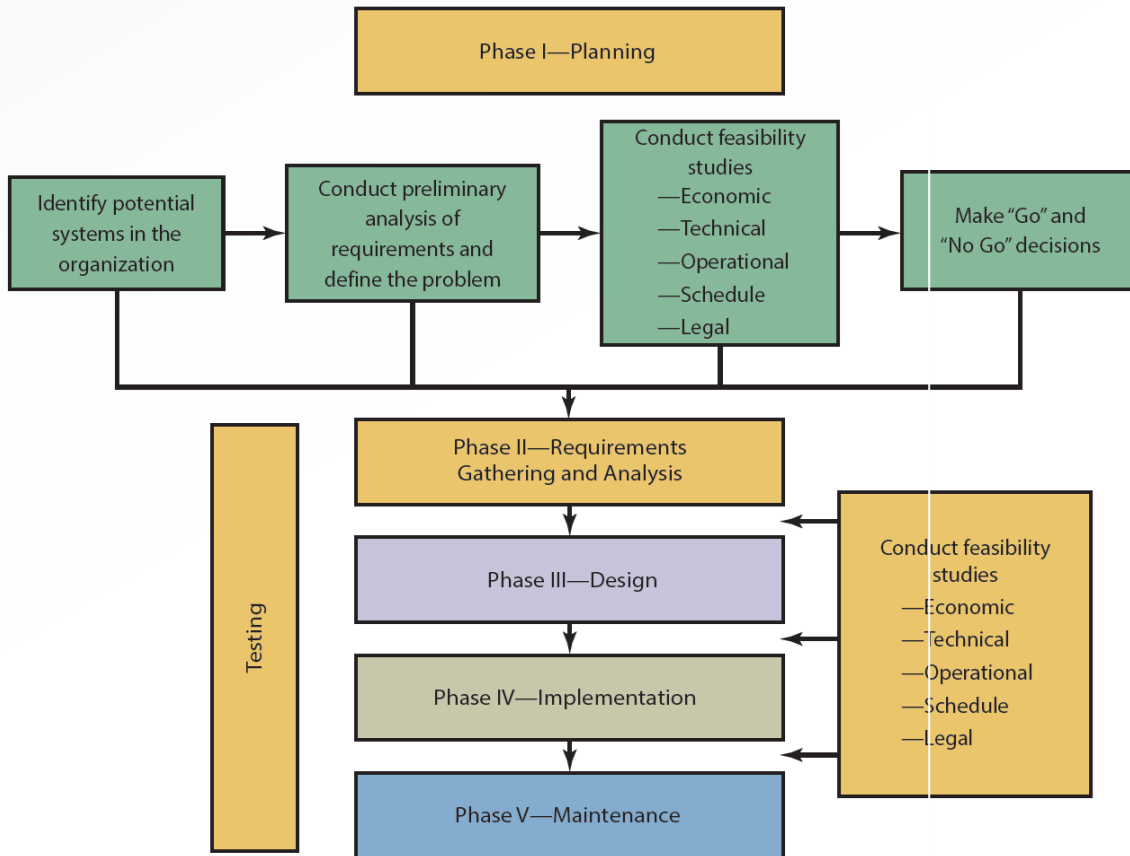
Systems development life cycle (SDLC): series of well-defined phases performed in sequence

- Serves as a framework for developing a system or project
- Each phase's output becomes the input for the next phase
- Suitable for an information system that needs to be designed from scratch

SDLC in 5 minutes: https://www.youtube.com/watch?v=Fi3_BjVzpqk

SDLC in 10 minutes: <https://www.youtube.com/watch?v=i-QyW8D3ei0>

Exhibit 10.1 Phases of the SDLC



Phase 1: Planning

- Systems designer must define the problem the organization faces
 - Problem can be identified internally and externally
- Analysts assess needs of the organization or a specific group of users
 - Organization's strategic goals
 - How proposed system can support goals
 - Factors critical to the system's success
 - Criteria for evaluating performance
- Analysts must get feedback from users on the problem
 - At the end of the phase, users and top management should have a clear view of the why, who, when, and what of the problem

Formation of the Task Force

- Should consist of representatives from:
 - Different departments
 - Systems analysts
 - Technical advisors
 - Top management
- Involves collecting user feedback and working toward getting users involved from the beginning
 - Internal users: employees who use the system regularly
 - Offer feedback on the system's strengths and weaknesses
 - External users: not employees but do use the system
 - Customers, contractors, suppliers, and other business partners
 - Not part of the task force but their input is essential
- **Joint application design (JAD)**
 - Collective activity involving users, top management, and IT professionals
 - Centered on a structured workshop where users and system professionals unite to develop an application
 - Helps ensure that collected requirements are not narrow and one-dimensional in focus

Feasibility Study

- Measure of how beneficial or practical an information system will be to an organization
 - Analysts investigate a proposed solutions feasibility
 - Determine how best to present the solution to management
 - Dimensions: economic, technical, operational, scheduling, and legal

Economic Feasibility

- Assesses a system's costs and benefits
 - Tangible development and operating costs for the system have to be itemized
 - Leads to the creation of a budget
 - Tangible and intangible benefits have to be identified and measured
 - Challenge: accurately assessing intangible costs and benefits
- Cost-effectiveness analysis has to be conducted
 - Methods: payback, net present value (NPV), return on investment (ROI), and internal rate of return (IRR)
- Cost-benefit analysis (CBA) report
 - Used to sell the system to top management

Technical Feasibility

- Assessing whether the technology to support the new system is available or feasible to implement
 - Organizations that lack the expertise, time, or personnel to implement the new system might lack technical feasibility
 - Steps should be taken to address shortcomings and consider the new system

Operational Feasibility

- Measure of how well the proposed solution will work in the organization and how internal and external customers will react to it
 - Requires assessing the worth of implementing the information system

Legal Feasibility

- Concerned with legal issues
 - Addresses questions such as:
 - Will the system violate any legal issues in the country where it will be used?
 - Are there any political repercussions?
 - Is there any conflict between the proposed system and legal requirements?

Scheduling Feasibility

- Concerned with whether the new system can be completed on time
 - Failure to deliver in time leads to loss of customers
 - Problem can be minimized by using project management tools

Phase 2: Requirements-Gathering and Analysis

- Analysts define the problem and generate alternatives for solving it
 - Team attempts to understand the requirements for the system
 - Analyzes requirements to determine the main problem with the current system or processes
 - Looks for ways to solve problems by designing the new system
- Analysis and design approaches
 - Structured systems analysis and design (SSAD)
 - Sequential approach that treats process and data independently
 - Object-oriented
 - Combines process and data analysis
- Models created during the analysis phase constitute design specifications

Exhibit 10.2 Data Flow Diagram for ABC's Inventory Management System

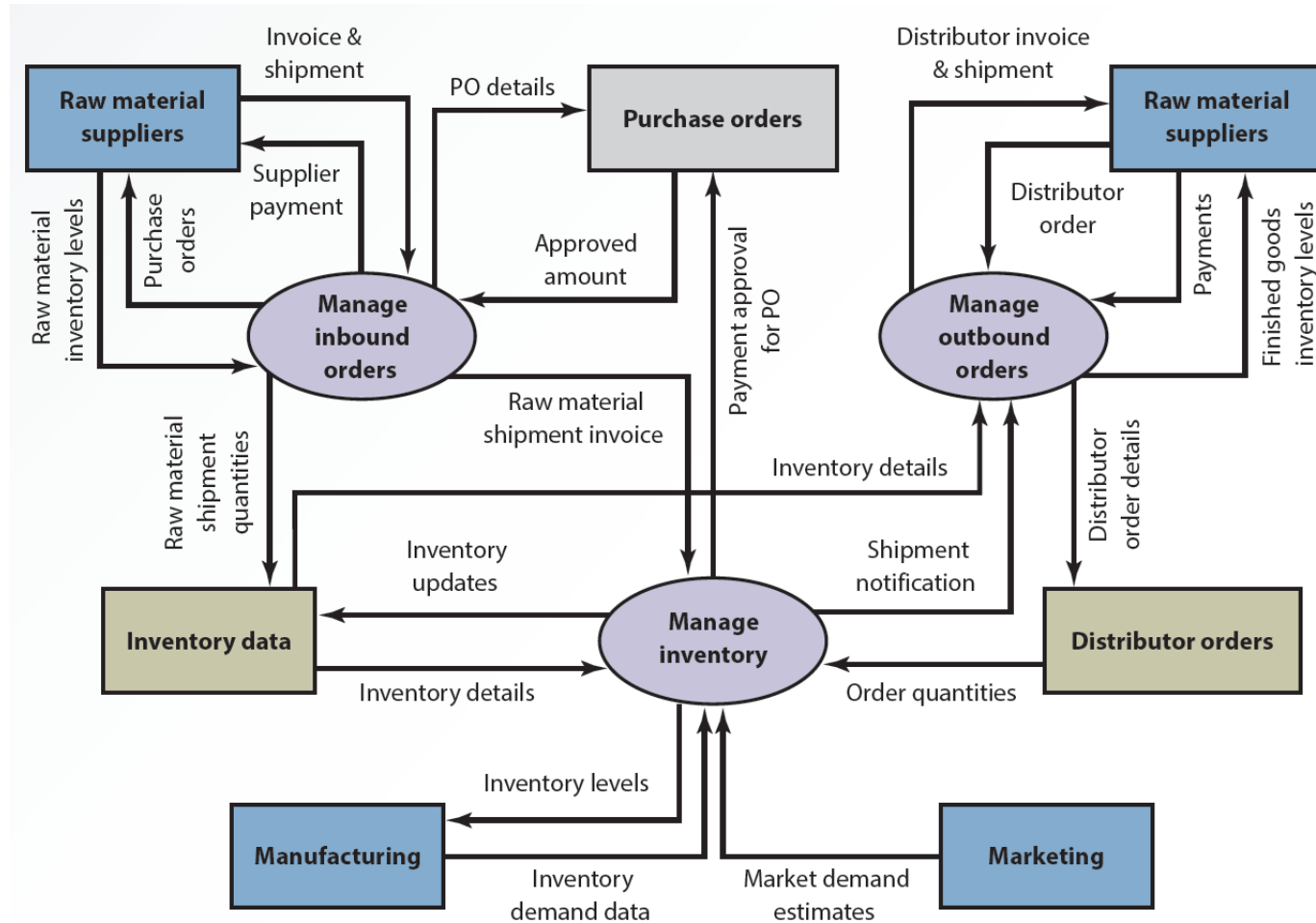
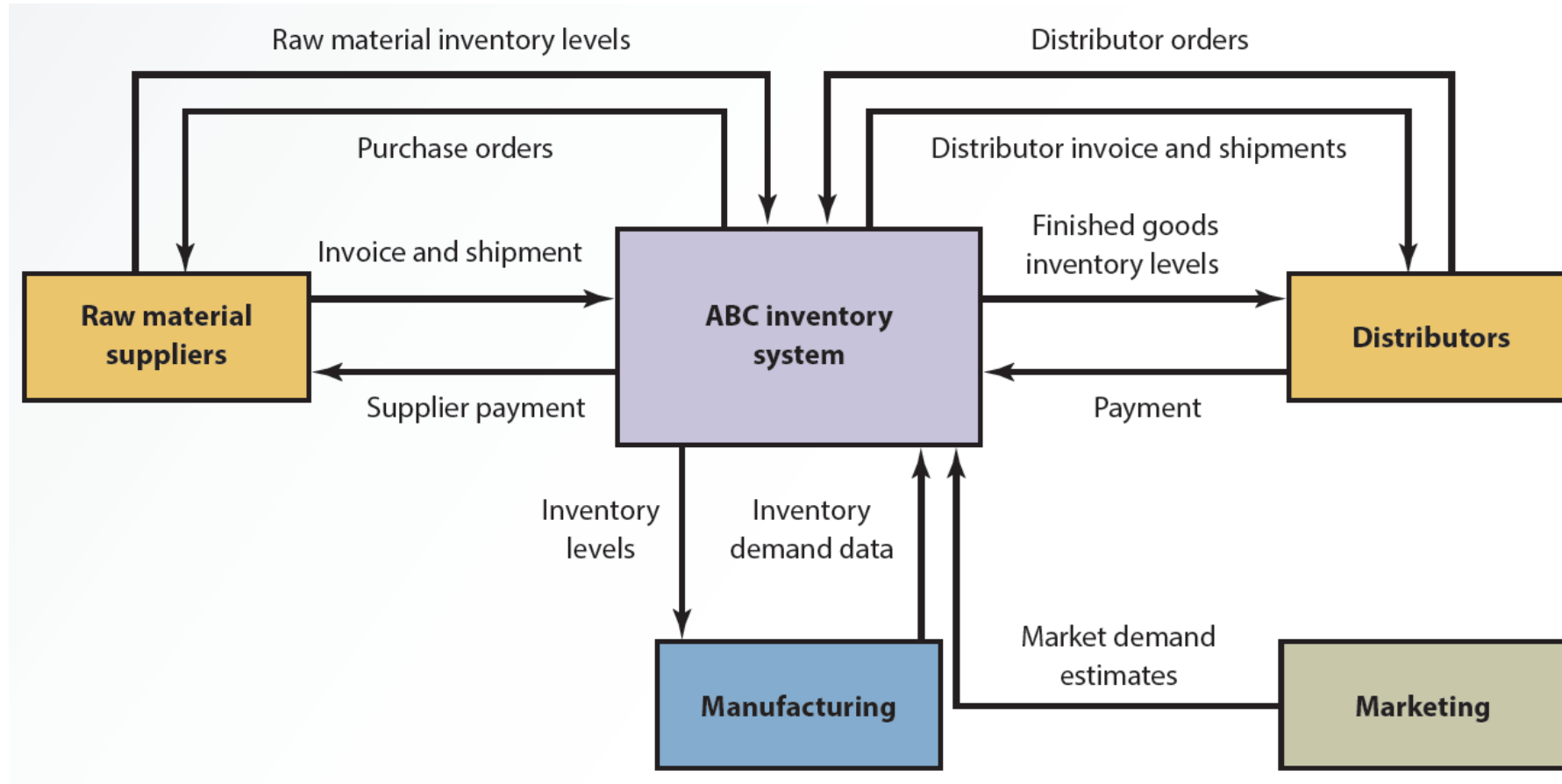


Exhibit 10.3 Context Diagram for ABC's Inventory Management System



Phase 3: Design

- Analysts choose the most realistic solution that offers the highest payoff for the organization
 - Details of the proposed solution are outlined
- Output is a document with exact specifications for implementing the system
 - Files and databases
 - Forms and reports
 - Documentation and procedures
 - Hardware and software
 - Networking components
 - General system specification
- Design phase consists of three parts
 - Conceptual design: overview of the system and does not include hardware or software choices
 - Logical design: makes conceptual design specific by indicating hardware and software
 - Physical design: created for specific platforms

Computer-Aided Systems Engineering

- Computer-Aided Systems Engineering (CASE) tools automate parts of the application development process
 - Helpful for investigation and analysis in large-scale projects
- Help analysts:
 - Keep models consistent with each other
 - Document models with explanations and annotations
 - Ensure that models are created according to specific rules
 - Create a single repository of all models related to a single system
 - Track and manage design changes
 - Create multiple versions of the design
- CASE tools are similar to computer-aided design (CAD) tools
 - Capabilities vary; depend on the product
- Create output in the form of:
 - Specifications documents
 - Documentation of the analysis
 - Design specifications
 - Logical and physical design documents
 - Code modules

Prototyping

- Small-scale version of the system is developed
 - Illustrates system benefits and allows users to offer feedback
- Purposes
 - Helps in gathering system requirements
 - Helps to determine system requirements
 - Determines a system's technical feasibility
 - Sells the proposed system to users and management using a selling prototype
- Steps in prototyping
 - Define initial requirements
 - Develop the prototype
 - Review and evaluate the prototype
 - Revise the prototype

Advantages and Disadvantages of Prototyping

- Advantages
 - Method for investigating an environment
 - Reduces the need to train information system users and costs
 - Increases the system's chance of success by encouraging users' involvement
 - Allows easy modification
 - Improves documentation and communication
- Disadvantages
 - Requires excessive support and assistance from users and top management
 - May not reflect the final system's actual operation
 - Misleading; working prototype may convince team the final system will work

Phase 4: Implementation (1 of 2)

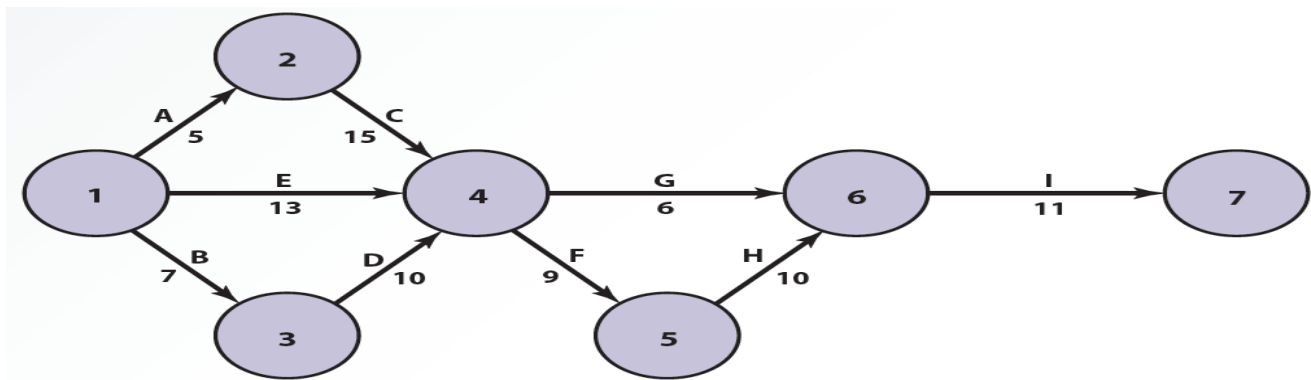
- Team configures the system and procures components for it
 - Tasks involved
 - Acquiring new equipment
 - Hiring and training new employees
 - Planning and designing physical layout
 - Coding and testing
 - Designing security measures and safeguards
 - Creating a disaster recovery plan

Phase 4: Implementation (2 of 2)

- Conversion options
 - Parallel: old and new systems run simultaneously for a short time to ensure the new system works correctly
 - Phased-in-phased-out: as each module of the new system is converted, the corresponding part of the old system is retired
 - Process continues until the entire system is operational
 - Plunge (direct cutover): old system is stopped and the new system is implemented
 - Pilot: analyst introduces the system in a limited area of the organization
 - Implemented in the rest of the organization in stages or all at once if the system works correctly

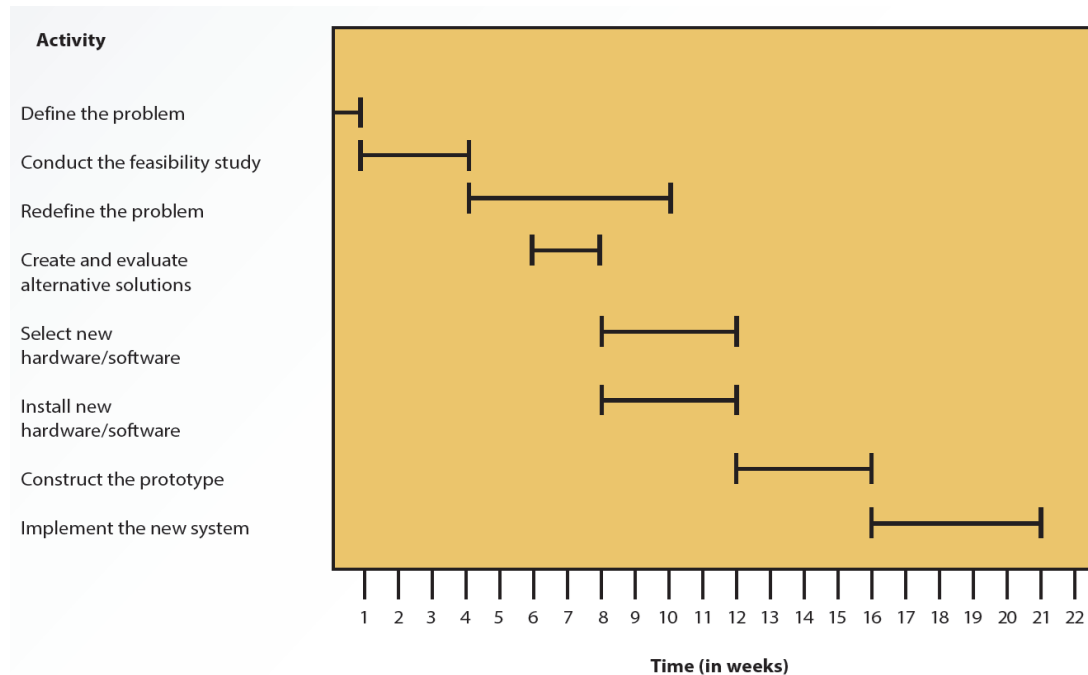
IT Project Management (1 of 2)

- Activities to plan, manage, and control information system creation and delivery
- Tools and techniques
 - Help solve scheduling problems, plan and set goals, and highlight potential bottlenecks
 - Project management software helps study cost, time, and impact of schedule changes
 - PERT (program evaluation review technique)
 - CPM (critical path method)



IT Project Management (2 of 2)

- Gantt chart
 - Constructed using the critical path
 - Allows the systems analyst to monitor the progress of the project
 - Helps detect delay in the daily operation of the project



Request for Proposal

- Written document with detailed specifications
 - Used to request bids for equipment, supplies, or services from vendors
 - Contains information on functional, technical, and business requirements of the proposed information system
- Advantages
 - All vendors get the same information and requirements, which aid in fair evaluation of bids
 - Useful to narrow down the list of prospective vendors
- Disadvantage
 - Time consuming

Implementation Alternatives

- The SDLC approach is sometimes called insourcing
 - Organization's team develops the system internally
 - Can involve long backlogs in development
- Alternatives include
 - Self-sourcing
 - Outsourcing
 - Crowdsourcing

Self-Sourcing

- End users develop information systems with less or no formal assistance from the information systems (IS) team
 - Use off-the-shelf software to produce custom-built applications
 - Helps reduce the backlog in producing information systems
 - Improves flexibility in responding to users' information needs
- Disadvantages
 - Possible misuse of computing resources
 - Lack of access to crucial data
 - Lack of documentation
 - Inadequate security for the applications and systems
 - Applications may not be up to IS standards
 - Lack of support from top management
 - Lack of training for prospective users
 - Organizations should develop guidelines for end users
 - Criteria for evaluating, approving or rejecting, and prioritizing projects
 - Data administration should be enforced
 - Ensures integrity and reliability of information

Outsourcing

- Organizations hire external vendors or consultants who specializes in providing development services
 - Crowdsourcing: type of outsourcing traditionally performed by employees or contractors to a crowd through an open call
- Outsourcing types
 - Onshore
 - Nearshore
 - Offshore
- Advantages
 - Less expensive
 - Quick delivery
 - Helps organizations concentrate on core functions and other projects
- Disadvantages
 - Loss of control
 - Dependency
 - Vulnerability of strategic information

Phase 5: Maintenance

- Information system is operating
 - Enhancements and modifications to the system have been developed and tested
 - Hardware and software components have been added or replaced
- Performance data and information is gathered and assessed
 - Feedback from users, customers, and other people affected by the new system is collected
- Corrective action is taken if the system's objectives are not being met

New Trends in Systems Analysis and Design

- SDLC model may be inappropriate if:
 - There is a lack of specifications
 - Input-output process cannot be identified completely
 - Problem is “ad hoc”
 - Users’ needs change constantly

Service-Oriented Architecture

- Focuses on development, use, and reuse of small, self-contained blocks of codes
- SOA advocates that the core business functions and the dynamic functions that change all the time should be decoupled.
 - Attempts to solve software development issues by recognizing, accepting, and leveraging existing services

Rapid Application Development

- Concentrates on user involvement and continuous interaction between users and designers: combines the planning and analysis phases to develop a prototype of the system
- Uses an iterative process: Design, development, and testing steps are repeated as needed based on feedback

Agile Methodology

- Focuses on an incremental development process and timely delivery of working software
 - Less emphasis on team coding and more emphasis on limiting the project's scope
 - Sets a minimum number of requirements and turns them into a working product
- Goals of the step-by-step approach
 - Respond to changing needs instead of sticking to a plan
 - Develop working, high-quality software
- Strives to deliver software quickly and better meet customer needs
- Popular frameworks
 - Scrum
 - Kanban : <https://www.youtube.com/watch?v=rlaz-l1Kf8w>
 - Extreme Programming: for more: <https://www.coursera.org/learn/agile-project-management>

Low-Code and No-Code Development

- No-code development
 - Does not require previous knowledge of coding
 - Users can drag and drop application components
- Low-code development
 - Requires some coding knowledge

Knowledge Check Activity 1-1

What are the stages of the systems development lifecycle?

- a. Planning, Requirements-Gathering and Analysis, Design, Implementation, Maintenance
- b. Formation of Task Force, Feasibility Study, Economic Feasibility, Technical Feasibility, Operational Feasibility
- c. Computer-Aided Systems Engineering, Prototyping, Prototyping Development Tools Application
- d. Request for Proposal, Implementation Alternatives Study, Outsourcing

Knowledge Check Activity 1-1: Answer

What are the stages of the systems development lifecycle?

Answer: a. Planning, Requirements-Gathering and Analysis, Design, Implementation, Maintenance

The five stages of systems development lifecycle form a waterfall model that takes into account the possible applications, limitations, maintenance, and longevity of the proposed system.

Polling Activity 1-1

It's time to take a poll! Get your devices ready and open your [Kahoot] app. You can join the poll using this link/PIN: [enter link or PIN]

Which of the following purposes is served by a Gantt chart?

- a. Scheduling of activities in the systems development project
- b. Linking activities with each other according to relevance
- c. Visualizing flow of data in inventory management
- d. Visualizing financial costs at each step in the project

Polling Activity 1-1: Answer

Which of the following purposes is served by a Gantt chart?

Answer: a. Scheduling of activities in the systems development project

A Gantt chart consists of horizontal bars representing activities in the project, where the span of each bar represents the completion time intended for the corresponding activity.

Discussion Activity 1-1

Your system requires each employee to customize the company software extensively to suit the employee's requirements. You are looking for a solution to facilitate employees inexperienced in software customization.

Discuss possible solutions with your classmates.

Discussion Activity 1-1: Answer

Your system requires each employee to customize the company software extensively to suit the employee's requirements. You are looking for a solution to facilitate employees inexperienced in software customization.

Discuss possible solutions with your classmates.

Answer: No-code or low-code development environment

Explanation: Through no-code or low-code development, employees will not require any significant coding experience to be able to customize the software as required, usually by clicking and dragging elements into a customization platform.

Self Assessment

Think of a class or a hobby project that involves application of a software, e.g. software for inventory management of a garage sale.

How would you apply the stages of a systems development lifecycle to your project? Which stages will be relevant to your project? What steps would be involved in these stages and how would you go about implementing them?

Summary

- Systems development life cycle (SDLC) is a series of well-defined phases performed in sequence
 - Planning: forming a task force and conducting a feasibility study
 - Requirements-gathering and analysis: analysts define problem and generate alternative solutions
 - Design: analysts choose a realistic solution that offers highest payoff for the organization
 - Implementation: solution is transferred from paper to action
 - Maintenance: enhancements and modifications are developed and tested