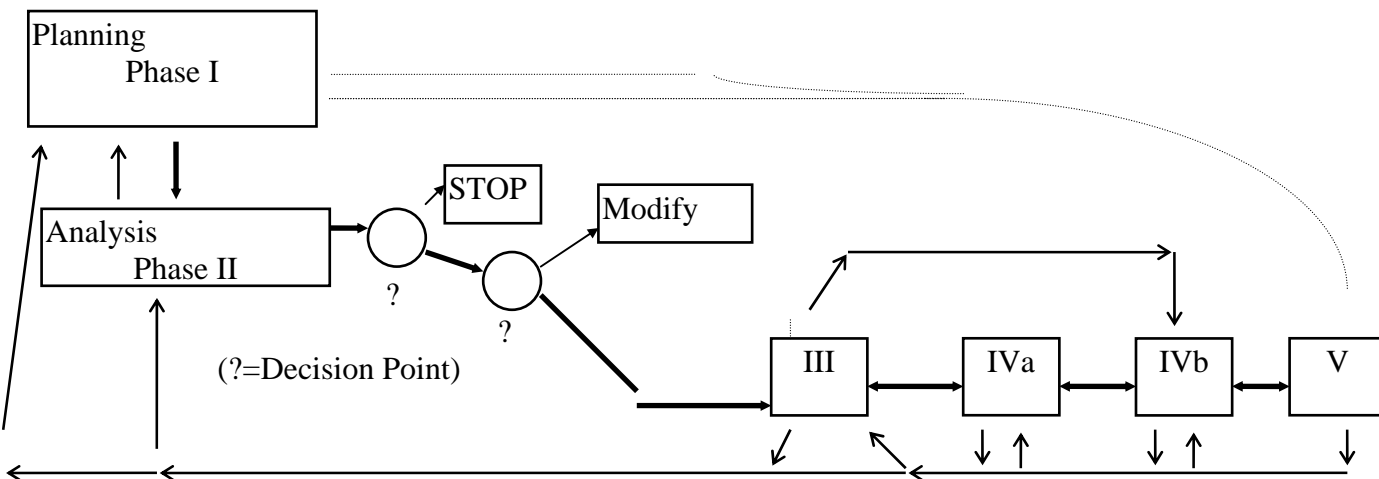


Chap-08, Systems Development

Principles and Learning Objectives

- Effective systems development requires a team effort of stakeholders, users, managers, systems development specialists, and various support personnel, and it starts with careful planning.
- Systems development often uses different approaches and tools such as traditional development, prototyping, rapid application development, end-user development, computer-aided software engineering, and object-oriented development to select, implement, and monitor projects.
- Systems development starts with investigation and analysis of existing systems.
- Designing new systems or modifying existing ones should always be aimed at helping an organization achieve its goals.
- The primary emphasis of systems implementation is to make sure that the right information is delivered to the right person in the right format at the right time.
- Maintenance and review add to the useful life of a system but can consume large amounts of resources.



I- Planning (Preliminary investigation)	IVa- Dev IVa- Development (Acquisition)
II- Analysis	IVb- Implementation
III- Design	V- Maintenance (Audit & Evaluate)

An Overview of Systems Development: Participants in Systems Development

•Development team

- Responsible for determining the objectives of and delivering a system that meets these objectives
- Consists of stakeholders, users, managers, systems development specialists, and support personnel

•Information Systems Planning and Aligning Corporate and IS Goals

- Planning: translating strategic and organizational goals into systems development initiatives
- Aligning goals and IS goals is critical for any successful systems development effort
- Determining whether organizational and IS goals are aligned can be difficult

Importance of IS Planning

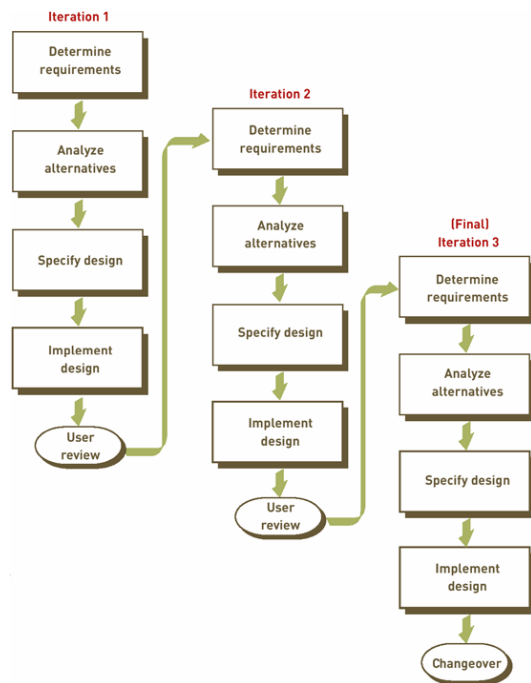
Systems Development Life Cycle:

The systems development process is also called a systems development life cycle (SDLC)

The Traditional Systems Development Life Cycle

- Systems **investigation**: problems and opportunities are identified and considered in light of the goals of the business
- Systems **analysis**: study of existing systems and work processes to identify strengths, weaknesses, and opportunities for improvement
- Systems **design**: defines how the information system will do what it must do to obtain the problem's solution
- Systems **implementation**: the creation or acquiring of various system components detailed in the systems design, assembling them, and placing the new or modified system into operation
- Systems **maintenance and review**: ensures that the system operates, and modifies the system so that it continues to meet changing business needs

Prototyping Try something, test it & improve upon it. Try the improved method, test it improve, etc etc until a satisfactory result is finally accepted.



Rapid application development (RAD): a systems development approach that employs tools, techniques, and methodologies designed to speed application development

- RAD makes extensive use of the joint application development (JAD) process for data collection and requirements analysis

The End-User Systems Development Life Cycle

- Any systems development project in which the primary effort is undertaken by a combination of business managers and users
- End-user-developed systems can be structured as complementary to, rather than in conflict with, existing and emerging information systems

Outsourcing and On Demand Computing

- An outside consulting firm or computer company that specializes in systems development can be hired to take over some or all of the development and operations activities
- Outsourcing can involve a large number of countries

and companies in bringing new products and services to market

Use of Computer-Aided Software Engineering (CASE) Tools (Standardized procedures)

Object-Oriented Systems Development

- Object-oriented systems development typically involves:
 - Identifying potential problems and opportunities within the organization that would be appropriate for the OO approach
 - Defining the kind of system users require
 - Programming or modifying modules
 - Periodic review and modification
 - Designing the system:
 - Evaluation by users

{I} Systems Investigation

- What primary problems might a new or enhanced system solve?
- What opportunities might a new or enhanced system provide?
- What new hardware, software, databases, telecommunications, personnel, or procedures will improve an existing system or are required in a new system?
- What are the potential costs (variable and fixed)?
- What are the associated risks?

Feasibility Analysis

•Technical feasibility	•Economic feasibility	•Schedule feasibility
•Legal feasibility	•Operational feasibility	•

Object-Oriented Systems Investigation

- Key objects can be identified during systems investigation
- System objects can be diagrammed in a use case diagram

The Systems Investigation Report

- Summarizes the results of systems investigation and the process of feasibility analysis
- Recommends a course of action: continue systems analysis, modify the project, or drop it

{II} Systems Analysis

Answers the question “What must the information system do to solve the problem?”

- Primary outcome:** a prioritized list of system requirements

Data Collection

- Identifying sources of data
 - Internal sources
 - External sources
- Collecting data
 - Interviews
 - Direct observation
 - Questionnaires

Data Analysis

- Data modeling
 - Entity-relationship (ER) diagrams
- Activity modeling
 - Data-flow diagrams (DFDs)

Requirements Analysis

Asking directly (What do managers want.)

Critical success factors (What’s important.)

The IS plan (Merging needs with corporate goals)

Object-Oriented Systems Analysis

- Identifying problems or potential opportunities
- Identifying key participants and collecting data
- Instead of analyzing the existing system using data-flow diagrams and flowcharts, an object-oriented approach is used. (Diagrams of what is needed & showing interactions of these.)

The Systems Analysis Report

- The systems analysis report should cover:
 - The strengths and weaknesses of the existing system from a stakeholder’s perspective
 - The user/stakeholder requirements for the new system (also called the functional requirements)
 - The organizational requirements for the new system
 - A description of what the new information system should do to solve the problem

{III} Systems Design

- Answers the question “How will the information system do what it must do to solve a problem?”
- Has two dimensions: **logical and physical**
 - Logical design:** description of the functional requirements of a system. What will it do.

•Output requirements	•Input requirements	•Process requirements
•Telecommunications needs	•Procedures requirements	•Controls and security needs
•Personnel and job requirements		

•**Physical design:** specification of components necessary to put the logical design into action.

•Hardware specifications	•Software specifications	•Database specifications
•Telecommunications needs	•Personnel specifications	•Procedures specifications
•Control specifications		

Object-Oriented Design

- Design key objects and classes of objects in the new or updated system
- Consideration of the problem domain, the operating environment, and the user interface
- Consideration of the sequence of events that must happen for the system to function correctly
- A sequence of events is often called a scenario
- A scenario can be diagrammed in a sequence diagram

Generating Systems Design Alternatives

•Request for proposal (RFP): a document that specifies in detail required resources such as hardware and software

- Financial options
- Purchasing
- Leasing (Long term)
- Renting (Short term)

Evaluating and Selecting a Systems Design

•Preliminary evaluation	•To dismiss the unwanted proposals
•Begins after all proposals have been submitted	•Final evaluation
•A detailed investigation of the proposals offered by the vendors remaining after the preliminary evaluation	

The Design Report (the result of systems design)

•A technical description of: outputs, inputs, user interfaces, hardware, software, databases, telecommunications, personnel, and procedures and how these components are related

{ IVa & IVb} Systems Development & Implementation

•**Acquiring Hardware from an IS Vendor**

An IS vendor is a company that offers hardware, software, telecommunications systems, databases, IS personnel, and/or other computer-related resources

- Buying, Leasing or Renting computer hardware
- “Pay as you go,” “on demand,” or “utility” computing

•**Acquiring Software:**

- :Make or Buy?
- Externally developed software
- In-house developed software
- Blend of external and in-house software
- Renting software
- Reusing existing internal software

•**Acquiring Database and Telecommunications Systems**

- Databases are a blend of hardware and software
- Telecommunications systems require a blend of hardware and software

User Preparation

- Readying managers, decision makers, employees, other users, and stakeholders for new systems
- Training users

IS Personnel: Hiring and Training

- IS manager
- Systems analysts
- Computer programmers
- Data-entry operators

Site Preparation

- Preparation of the location of a new system
- Making room for a computer in an office
- Special wiring and air conditioning
- Special flooring
- Additional power circuits

Data Preparation

- Also called data conversion
- Ensuring all files and databases are ready to be used with new computer software and systems
- The process of physically placing the computer equipment on the site and making it operational
- Normally the manufacturer is responsible for installing computer equipment
- Someone from the organization (usually the IS manager) should oversee the process

Testing (Run new & old with same data to see if results are the same)

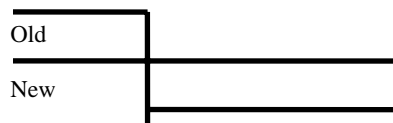
- Unit testing: testing of individual programs
- System testing: testing the entire system of programs
- Volume testing: testing the application with a large amount of data
- Integration testing: testing all related systems together
- Acceptance testing: conducting any tests required by the user

Start-Up

Entire System Direct	Phase-in with Direct	Pilot with Direct
Entire System Parallel	Phase-in with Parallel	Pilot with Parallel

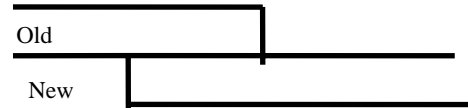
A – Direct (Crash, Plunge)

not recommended but it is the cheapest



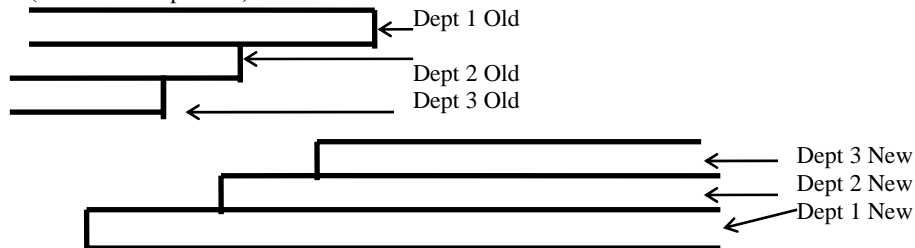
B - Parallel

overlap & duplication are safety factors



C – Phase-in

Parallel or direct but application by application. (Or Dept by dept)
(Illustration is parallel)



D – Pilot

A, B or C but on one part of the organization then another. Can be Direct or Parallel
'Part' could be by customer type, geographic area, etc.

User Acceptance

- User-acceptance document: formal agreement signed by the user that states that a phase of the installation or the complete system is approved

{V.} Systems Operation and Maintenance

- Systems operation: use of a new or modified system
- Systems maintenance: checking, changing, and enhancing the system to make it more useful in achieving user and organizational goals

Systems Review

- Process of analyzing systems to make sure that they are operating as intended
- Often compares the performance and benefits of the system as it was designed with the actual performance and benefits of the system in operation (cont'd on next page →)

- Event-driven review: review triggered by a problem or opportunity, such as an error, a corporate merger, or a new market for products
 - Time-driven review: review performed after a specified amount of time
-

Summary

- Information systems planning is the translation of strategic and organizational goals into systems development initiatives
- Common systems development life cycles are traditional, prototyping, rapid application development (RAD), and end-user development
- Phases of the traditional systems development life cycle: systems investigation, systems analysis, systems design, systems implementation, and systems maintenance and review
- During systems investigation, problems and opportunities are identified and considered in light of the goals of the business
- Systems analysis involves the study of existing systems and work processes to identify strengths, weaknesses, and opportunities for improvement
- Systems design defines how the information system will do what it must do to obtain the problem's solution
- Systems implementation involves creating or acquiring the various system components detailed in the systems design, assembling them, and placing the new or modified system into operation
- Systems maintenance and review ensures that the system operates, and modifies the system so that it continues to meet changing business needs

Key Terms

- **Acceptance testing:** Conducting any test required by the user
- **Asking directly:** An approach to gather data that asks users, stakeholders, and other managers about what they want and expect from the new or modified system
- **Computer-aided software engineering (CASE):** Tools that automate many of the tasks required in a systems development effort and enforce adherence to the SDLC
- **Data analysis:** Manipulation of the collected data so that it is usable for the development team members who are participating in systems analysis
- **Data preparation, or data conversion:** The process of ensuring that all files and databases are ready to be used with new computer software and systems
- **Data-flow diagram (DFD):** Models objects, associations, and activities by describing how data can flow between and around various objects
- **Design report:** The result of systems design, reflecting the decisions made for system design and preparing the way for systems implementation
- **Direct conversion (also called plunge or direct cutover):** The process of stopping the old system and starting the new system on a given date
- **Direct observation:** The process of watching the existing system in action by one or more members of the analysis team
- **Economic feasibility:** Determining whether the project makes financial sense and whether predicted benefits offset the cost and time needed to obtain them
- **End-user systems development:** Any systems development project in which the primary effort is undertaken by a combination of business managers and users
- **Event-driven review:** A review triggered by a problem or opportunity, such as an error, a corporate merger, or a new market for products

- **Feasibility analysis:** Assessment of the technical, economic, legal, operational, and schedule feasibility of a project
- **Information systems planning:** The translation of strategic and organizational goals into systems development initiatives
- **Installation:** The process of physically placing the computer equipment on the site and making it operational
- **Joint application development (JAD):** A process for data collection and requirements analysis in which users, stakeholders, and IS professionals work together to analyze existing systems, propose possible solutions, and define the requirements of a new or modified system
- **Legal feasibility:** Determining whether laws or regulations might prevent or limit a systems development project
- **Logical design:** A description of the functional requirements of a system
- **Make-or-buy decision:** The decision of whether to purchase software from external developers or develop it in-house
- **Object-oriented systems development (OOSD):** The approach that combines the logic of the systems development life cycle with the power of object-oriented modeling and programming
- **Operational feasibility:** The measure of whether a project can be put into action or operation
- **Parallel start-up:** The process of running both old and new systems for a period of time, comparing the new system's output closely with the old system's, reconciling any differences, and finally eliminating the old system
- **Phase-in approach, or piecemeal approach:** The process of slowly replacing components of the old system with those of the new one; this process is repeated for each application until the new system is running every application and performing as expected
- **Physical design:** Specification of the characteristics of the system components necessary to put the logical design into action
- **Pilot start-up:** The process of running the new system for one group of users rather than for all users
- **Programmer:** The specialist responsible for modifying or developing programs to satisfy user requirements
- **Prototyping:** An iterative approach to the systems development process
- **Rapid application development (RAD):** A systems development approach that employs tools, techniques, and methodologies designed to speed application development
- **Request for proposal (RFP):** A document that specifies in detail required resources such as hardware and software
- **Requirements analysis:** A determination of user, stakeholder, and organizational needs
- **Schedule feasibility:** Determining whether the project can be completed in a reasonable amount of time
- **Site preparation:** Preparation of the location of the new system
- **Stakeholders:** Individuals who, either themselves or through the organization they represent, ultimately benefit from the systems development project
- **Structured interview:** An interview in which the questions are written in advance
- **Systems analysis:** The systems development phase involving the study of existing systems and work processes to identify strengths, weaknesses, and opportunities for improvement
- **Systems analyst:** A professional who specializes in analyzing and designing business systems
- **Systems design:** The systems development phase that defines how the information system will do what it must do to obtain the problem's solution
- **Systems implementation:** The systems development phase involving the creation or acquiring of various system components detailed in the systems design, assembling them, and placing the new or modified system into operation
- **Systems investigation:** The systems development phase during which problems and opportunities are identified and considered in light of the goals of the business

- **Systems investigation report:** A summary of the results of the systems investigation and the process of feasibility analysis and recommendations for a course of action
- **Systems maintenance and review:** The systems development phase that ensures that the system operates and modifies the system so that it continues to meet changing business needs
- **Technical feasibility:** An assessment of whether the hardware, software, and other system components can be acquired or developed to solve the problem
- **Time-driven review:** A review performed after a specified amount of time
- **Unstructured interview:** An interview in which the questions are not written in advance
- **User-acceptance document:** A formal agreement signed by the user that states that a phase of the installation or the complete system is approved
- **Users:** Individuals who will interact with the system regularly