



# SYSTEMS ANALYSIS & DESIGN

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# Systems Development Lifecycle (SDLC)

- The software development life cycle (SDLC) is a framework defining tasks performed at each step in the software development process.
- SDLC is a structure followed by a development team within the software organization. It consists of a detailed plan describing how to develop, maintain and replace specific software.
- The life cycle defines a methodology for improving the quality of software and the overall development process.

# SDLC

- First, SDLC is a Life Cycle.
- All systems have a life cycle or a series of stages they naturally undergo.
  - The number and name of the stages varies, but the primary stages are conception, development, maturity and decline.
  - The systems development life cycle (SDLC) therefore, refers to the development stage of the system's life cycle.
- Is there a difference between the term SDLC and the term 'methodology'?
- Whereas the SDLC refers to a stage all systems naturally undergo, a methodology refers to an approach invented by humans to manage the events naturally occurring in the SDLC.
- A methodology is, in simple terms, a set of steps, guidelines, activities and/or principles to follow in a particular situation.
  - Most methodologies are comprehensive, multi-step approaches to systems development
  - There are many methodologies out there.

# SDLC vs. Methodology

- It is confusing, but unfortunately, the term SDLC is frequently used synonymously with the waterfall or traditional approach for developing information systems.
  - “The Waterfall approach”
    - This approach essentially refers to a linear sequence of stages to develop a system from planning to analysis to design to implementation.
    - Stages are followed from beginning to end.
    - Revisiting prior stages is not permitted.

# Approaches to Systems Development

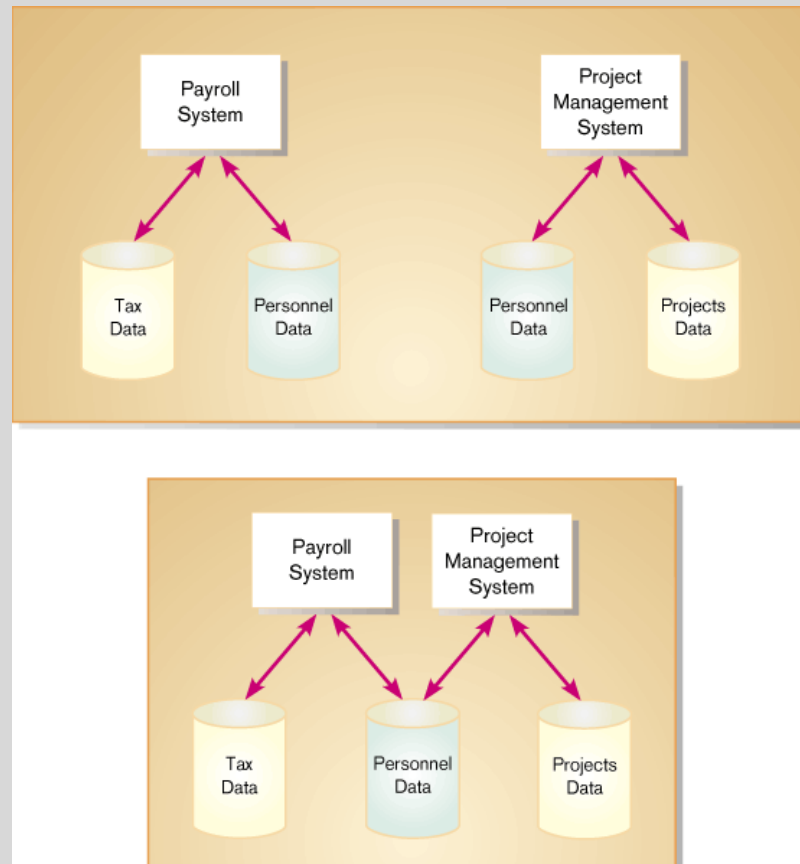
- Process-Oriented Approach
  - Focus is on flow, use and transformation of data in an information system
  - Involves creating graphical representations such as data flow diagrams and charts
  - Data are tracked from sources, through intermediate steps and to final destinations
  - Natural structure of data is not specified

# Approaches to Systems Development

- Data-Oriented Approach
  - Depicts [ideal organization of data](#), independent of where and how data are used
  - Data model describes kinds of data and business relationships among the data
  - Business rules depict how organization captures and processes the data

# Approaches to Systems Development

*Which is better, the Process Approach or the Data Approach?*



**Process Approach:**  
"Let's look at all of our processes. Processes take precedence over data. Get the **processes** correct first. Then we'll address what data is important."

**Data Approach:**  
"Forget the processes, let's look at the data. Data comes first. Get the **data** correct, then see how the processes actually use the data."

# SDLC Goals

- Deliver quality systems that meet or exceed customer expectations when promised and within cost estimates.
- Provide a framework for developing quality systems using an identifiable, measurable, and repeatable process.
- Establish a project management structure to ensure that each system development project is effectively managed throughout its life cycle.
- Identify and assign the roles and responsibilities of all involved parties, including functional and technical managers, throughout the system development life cycle.
- Ensure that system development requirements are well defined and subsequently satisfied.



# SDLC Phases

## Preliminary Investigation

- Assesses feasibility and practicality of system

## System Analysis

- Study old system and identify new requirements
- Defines system from user's view

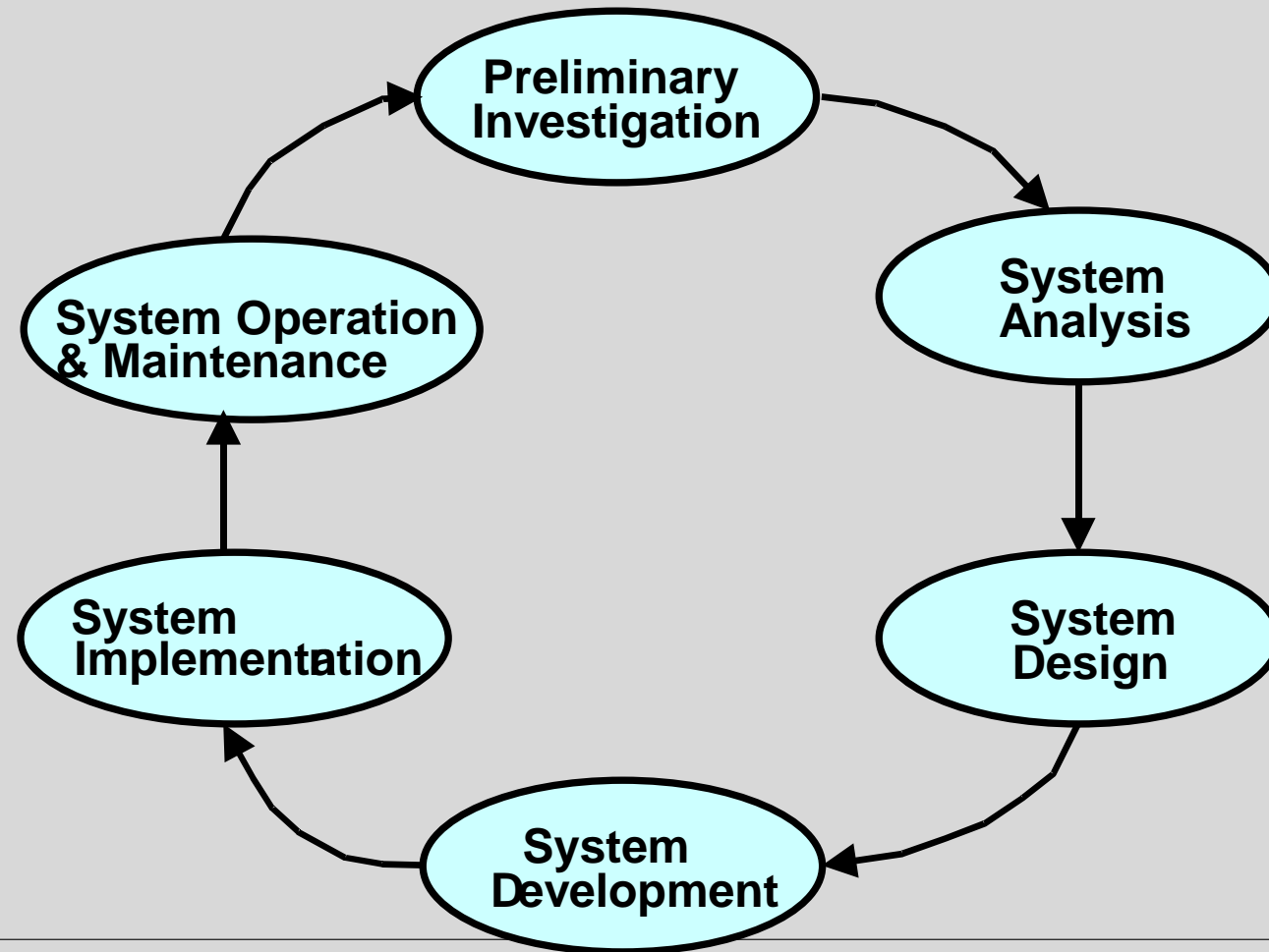
## System Design

- Design new/alternative system
- Defines system from technical view

# Six Phases of the System Development Life Cycle

- System Development
  - New hardware and software is acquired, developed, and tested
- System Implementation
  - System installation and training
- System Operation & Maintenance
  - Daily operation
  - Periodic evaluation and updating

# SDLC Phases



# Phase 1: Preliminary Investigation

- Determine if a new system is needed
- Three primary tasks:
  - Define the problem
    - By observation and interview, determine what information is needed by whom, when, where and why
  - Suggest alternative solutions
  - Prepare a short report

# Phase 2: System Analysis

- In depth study of the existing system to determine what the new system should do.
  - Expand on data gathered in Phase 1
- In addition to observation and interviews, examine:
  - Formal lines of authority (org chart)
  - Standard operating procedures
  - How information flows
  - Reasons for any inefficiencies

# Phase 2: System Analysis

## Tools Used

- Checklists - list of questions
- Top-down analysis - start with top level components, break down into smaller parts through each successive level
- Grid charts - to show relationship between inputs and outputs
- System flowcharts - charts flow of input data, processing, and output which show system elements and interactions

# Phase 2: System Analysis

## Documentation Produced

- Complete description of current system and its problems
- Requirements for new system including:
  - Subject
  - Scope
  - Objectives
  - Benefits
- Possible development schedule

# Phase 3: System Design

- Uses specifications from the systems analysis to design alternative systems
- Evaluate alternatives based upon:
  - Economic feasibility - Do benefits justify costs?
  - Technical feasibility - Is reliable technology and training available?
  - Operational feasibility - Will the managers and users support it?



# Phase 3: System Design

## Tools Used

- Computer-Aided Software Engineering (CASE) tools are software-based products designed to help automate the production of information systems.
- Examples:
  - Diagramming Tools
  - Data Repositories
  - Prototyping Tools
  - Test Data Generators
  - Documentation Tools
  - Project Management Tools

# Phase 3: System Design Documentation Produced

- System Design Report
  - Describe Alternatives including:
    - Inputs/Outputs
    - Processing
    - Storage and Backup
  - Recommend Top Alternative based upon:
    - System Fit into the Organization
    - Flexibility for the future
    - Costs vs. benefits

# Phase 4: System Development

- Build the system to the design specifications
  - Develop the software
    - Purchase off-the-shelf software OR
    - Write custom software
  - Acquire the hardware
  - Test the new system
    - Module (unit) test - tests each part of system
    - Integration testing - tests system as one unit
  - Create manuals for users and operators

# Phase 5: System Implementation

- Convert from old system to new system
- Train users
- Compile final documentation
- Evaluate the new system

# Phase 5: System Implementation

## Types of Conversion

- Direct/plunge/crash approach – entire new system completely replaces entire old system, in one step
- Parallel approach - both systems are operated side by side until the new system proves itself
- Pilot approach - launched new system for only one group within the business -- once new system is operating smoothly, implementation goes company-wide
- Phased/incremental approach - individual parts of new system are gradually phased-in over time, using either crash or parallel for each piece.

# Phase 5: System Implementation

- User Training
  - Ease into system, make them comfortable, and gain their support
  - Most commonly overlooked
  - Can be commenced before equipment delivery
  - Outside trainers sometimes used

# Phase 6: Operations & Maintenance

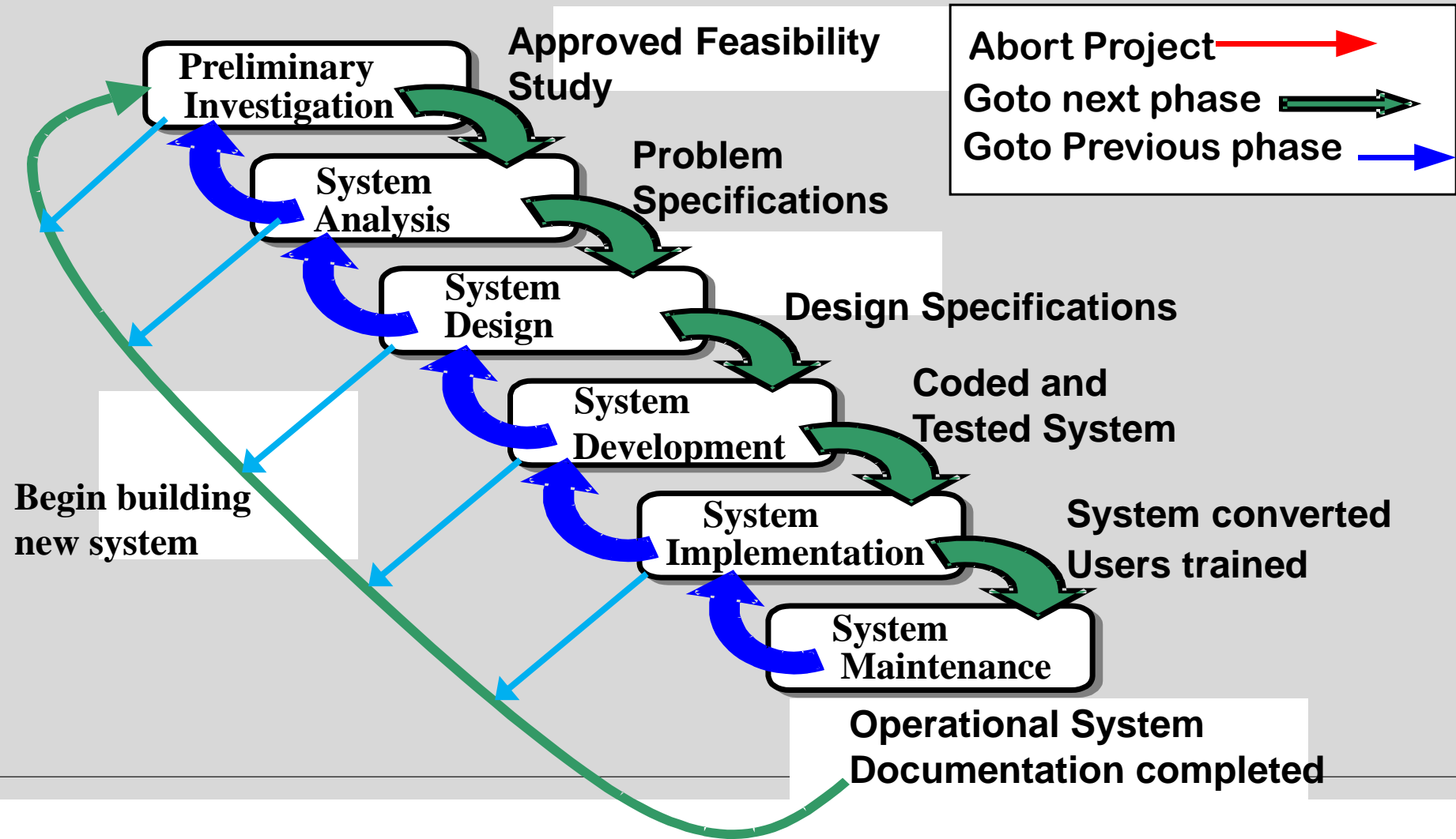
- Types of changes:
  - Physical repair of the system
  - Correction of new bugs found (corrective)
  - System adjustments to environmental changes
  - Adjustments for users' changing needs (adaptive)
  - Changes to user better techniques when they become available (perfective)

# Phase 6: Operations & Maintenance

- Evaluation Methods
  - Systems audit - performance compared to original specifications
  - Periodic evaluation - “checkups” from time to time, modifications if necessary



# Deliverables of the SDLC



# Alternative Approaches

- Prototyping
- Rapid Application Design (RAD)
- Evolutionary or Spiral method
- Agile method