Software Development Life Cycle (SDLC)

A Comprehensive Guide for Students

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BSc Computer Science

Contents

1 Introduction to SDLC

The Software Development Life Cycle (SDLC) is a structured process that enables the production of high-quality software in a systematic and efficient manner. It provides a framework for planning, creating, testing, and deploying software systems.

1.1 Why SDLC Matters

- Provides a structured approach to software development
- Ensures quality and reduces risks
- Facilitates better project management
- Improves communication among team members
- Helps meet deadlines and budget constraints

2 SDLC Phases

2.1 Phase 1: Planning

Objective: Define project goals, scope, and feasibility.

Key Activities:

1. Identify project objectives
2. Conduct feasibility study (technical, economic, operational)
3. Define project scope and boundaries
4. Create project timeline and milestones
5. Allocate resources and budget

Deliverables:

- Project Charter
- Feasibility Study Report
- Project Plan

2.2 Phase 2: Requirements Analysis

Objective: Gather and document what the software should do.

Key Activities:

1. Stakeholder interviews and workshops
2. Document functional requirements
3. Document non-functional requirements

4. Create user stories and use cases
5. Prioritize requirements

Deliverables:

- Software Requirements Specification (SRS)
- User Stories
- Use Case Diagrams

2.3 Phase 3: Design

Objective: Plan how the software will be built.

Key Activities:

1. Create system architecture
2. Design database schema
3. Design user interface mockups
4. Define API specifications
5. Select technology stack

Deliverables:

- System Design Document
- Database Design
- UI/UX Mockups
- API Documentation

2.4 Phase 4: Implementation (Coding)

Objective: Write the actual code.

Key Activities:

1. Set up development environment
2. Write code following coding standards
3. Conduct code reviews
4. Version control with Git
5. Unit testing

Deliverables:

- Source Code
- Code Documentation
- Unit Tests

2.5 Phase 5: Testing

Objective: Verify the software works correctly.

Key Activities:

1. Create test plans and test cases
2. Perform integration testing
3. Conduct system testing
4. User acceptance testing (UAT)
5. Bug tracking and fixing

Deliverables:

- Test Plan
- Test Cases
- Bug Reports
- Test Summary Report

2.6 Phase 6: Deployment

Objective: Release the software to users.

Key Activities:

1. Prepare deployment environment
2. Create deployment scripts
3. Deploy to production
4. User training
5. Documentation handover

Deliverables:

- Deployed Application
- User Manual
- Training Materials

2.7 Phase 7: Maintenance

Objective: Keep the software running and improve it.

Key Activities:

1. Monitor system performance
2. Fix bugs and issues
3. Implement enhancements
4. Security updates
5. Performance optimization

3 SDLC Models

3.1 Waterfall Model

Sequential phases, each must complete before the next begins.

- Best for: Well-defined requirements
- Drawback: Inflexible to changes

3.2 Agile Model

Iterative development with frequent deliveries.

- Best for: Projects with evolving requirements
- Popular frameworks: Scrum, Kanban

3.3 V-Model

Testing phase for each development phase.

- Best for: Projects requiring high reliability
- Emphasis on verification and validation

3.4 Spiral Model

Risk-driven iterative development.

- Best for: Large, complex projects
- Focus on risk assessment

4 Best Practices

1. **Documentation:** Keep all phases well-documented
2. **Communication:** Regular team meetings and updates
3. **Version Control:** Use Git for all code and documents
4. **Testing:** Test early and test often
5. **Review:** Conduct regular code and design reviews
6. **Feedback:** Incorporate stakeholder feedback continuously

5 Student Project Checklist

Project Charter completed

Requirements documented

Design documents created

Code repository set up

Regular commits and pull requests

Test cases written and executed

Application deployed

User documentation completed

Final presentation prepared