

**Assignment 3:** Research and compare SDLC models suitable for engineering projects. Present findings on Waterfall, Agile, Spiral, and V-Model approaches, emphasizing their advantages, disadvantages, and applicability in different engineering contexts.

## **1. Waterfall Model:**

### **Advantages:**

- Simple and easy to understand and use.
- Well suited for projects with clearly defined requirements and stable scope.
- Each phase has distinct deliverables, making it easy to measure progress.
- Documentation is comprehensive and created at each stage, aiding in maintenance and future updates.

### **Disadvantages:**

- Little flexibility for changes once a phase is completed.
- Late detection of defects, as testing occurs after development is complete.
- Limited stakeholder involvement until the end of the project.
- Not suitable for projects where requirements are uncertain or evolving.

**Applicability:** Waterfall is best suited for projects with well-defined requirements and a stable scope, such as construction projects, manufacturing, or projects with strict regulatory compliance.

## **2. Agile Model:**

### **Advantages:**

- Highly flexible and adaptive to changing requirements.
- Encourages continuous stakeholder involvement and feedback throughout the development process.
- Iterative approach allows for early and frequent delivery of working software.
- Emphasizes collaboration and teamwork among cross-functional teams.
- Rapid identification and resolution of issues through regular review and adaptation.

### **Disadvantages:**

- Requires a high level of customer involvement, which may not always be feasible.
- Lack of comprehensive documentation may lead to knowledge gaps and difficulties in maintenance.
- May be challenging to scale for large or complex projects without proper organization and coordination.
- Initial setup and adoption may require significant cultural and organizational changes.

**Applicability:** Agile is suitable for projects with evolving or unclear requirements, rapid development cycles, and where customer feedback is crucial. It is commonly used in software development, IT projects, and startups.

### **3. Spiral Model:**

#### **Advantages:**

- Incorporates risk management throughout the development lifecycle.
- Flexibility to accommodate changes and adjustments at each iteration.
- Suitable for large-scale, complex projects with high levels of uncertainty.
- Allows for early prototypes and proof-of-concepts to validate requirements and design decisions.

#### **Disadvantages:**

- Complex and time-consuming due to the iterative nature and extensive risk analysis.
- Requires a high level of expertise in risk management and software engineering.
- May lead to scope creep if risks are not managed effectively.
- Difficult to estimate project timelines and budgets accurately.

**Applicability:** Spiral model is best suited for projects with high levels of risk and uncertainty, such as research and development projects, innovative product development, or projects with evolving requirements.

### **4. V-Model:**

#### **Advantages:**

- Emphasizes the relationship between development phases and corresponding testing activities.
- Provides early feedback on requirements through verification and validation activities.
- Well suited for projects with strict regulatory compliance or quality standards.
- Encourages thorough testing and validation of each deliverable before moving to the next phase.

#### **Disadvantages:**

- Can be rigid and inflexible, especially when changes are required late in the development cycle.
- May lead to delays if testing activities are not adequately planned or resourced.
- Limited stakeholder involvement until testing and validation stages.
- Documentation-heavy approach may slow down the development process.

**Applicability:** V-Model is suitable for projects with well-defined requirements and a focus on quality assurance, such as government projects, healthcare, and safety-critical systems development.