

Assignment-3

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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.

SDLC Models:

1. Waterfall Model

- **Description:**
 - A linear, sequential approach where each phase (Requirements, Design, Implementation, Testing, Deployment, Maintenance) must be completed before moving to the next.
 - **Advantages:**
 - Simple and easy to understand.
 - Well-suited for projects with clear and fixed requirements.
 - Easier to manage due to a structured process.
 - **Disadvantages:**
 - Inflexible to changes once a phase is completed.
 - Not suitable for complex or evolving requirements.
 - Late discovery of issues due to limited feedback until testing.
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2. Agile Model

- **Description:**
 - An iterative and incremental approach focused on collaboration, adaptability, and delivering working software in shorter cycles (sprints).
 - **Advantages:**
 - Highly flexible and adaptive to changing requirements.
 - Frequent delivery of usable components provides early value to stakeholders.
 - Encourages close collaboration between cross-functional teams.
 - **Disadvantages:**
 - Requires a highly skilled and collaborative team.
 - Difficult to predict timelines and costs in evolving projects.
 - Documentation may be less detailed due to focus on rapid development.
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3. Spiral Model

- **Description:**
 - A risk-driven model that combines iterative development with systematic risk management. Each phase includes planning, risk analysis, engineering, and evaluation.
 - **Advantages:**
 - Excellent for projects with high levels of risk or uncertainty.
 - Early detection and mitigation of risks reduce project failures.
 - Iterative nature ensures flexibility and continuous improvement.
 - **Disadvantages:**
 - Complex and expensive due to extensive risk analysis.
 - Not suitable for small projects with limited budgets or low-risk factors.
 - Requires expert risk management capabilities.
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4. V-Model (Verification and Validation Model)

- **Description:**
 - A structured model emphasizing rigorous validation and verification at every development phase, forming a “V” shape.
- **Advantages:**
 - High level of testing ensures reliability and quality.
 - Clear and well-defined stages make it easy to manage.
 - Ideal for projects requiring strict compliance with standards.
- **Disadvantages:**
 - Inflexible to changes once development begins.
 - Testing is highly dependent on earlier phases, making error correction costly.
 - Not suitable for projects with evolving requirements.

Comparison Table

Model	Advantages	Disadvantages	Best Fit
Waterfall	Simple, structured, predictable	Inflexible, late issue detection	Small projects with clear requirements
Agile	Flexible, collaborative, adaptive	Less documentation, unpredictable	Dynamic software and evolving product designs
Spiral	Risk-focused, iterative	Expensive, complex	High-risk projects (e.g., aerospace, defense)
V-Model	Reliable, quality-focused	Inflexible, costly error fixes	Safety-critical projects with strict standards