

Experiment No. 2: Literature Survey on Software Development Methodology

❖ Aim:

To conduct a literature survey on various software development models and select the most suitable model for the project based on its requirements, constraints, and desired outcomes.

❖ Theory:

The selection of an appropriate software development model is crucial to the success of a software project. Various models provide structured approaches to plan, execute, and manage projects effectively.

1. Popular Software Development Models:

- Waterfall Model: Sequential and phase-based approach.
- Iterative Model: Repeated refinement of software prototypes.
- Agile Model: Focus on incremental delivery and adaptability.
- Spiral Model: Emphasis on risk management with iterative cycles.
- V-Model: Testing and development occur simultaneously.

2. Criteria for Selecting a Model:

- Project Type and Size: Small vs. large-scale projects.
- Flexibility and Risk: Dynamic requirements and risk mitigation.
- Stakeholder Involvement: Frequency and depth of collaboration.
- Timeline and Budget: Strict deadlines and resource constraints.

The literature survey allows teams to understand these models and select the one that aligns best with their project's objectives and constraints.

❖ Literature survey:

Journal Name and Year	Paper Title	Methodology	Key Finding	Research Gap
International Journal of Research and Applied Technology (2022)	The Systematic Literature Review of the Spiral Development Model: Topics, Trends, and Application Areas	Systematic Literature Review (SLR) from 2012-2022, analyzing 36 papers across various fields	The study shows that the spiral model is primarily applied in software development (19 papers) and education (17 papers), with notable peaks in usage during 2016 and 2021 . This indicates a trend where the model is favored for its iterative approach and risk management capabilities. However, the effectiveness of the spiral model may vary significantly across different sectors, suggesting that tailored applications are necessary for optimal results.	The study highlights a significant research gap in the understanding of the spiral model's applicability across various industries beyond software and education. While the model has been extensively studied in these areas, its potential in sectors like healthcare , manufacturing , and service industries remains largely unexplored. This gap indicates a need for comprehensive research to identify how the spiral model can be adapted and implemented effectively in these diverse contexts. Additionally, there is a scarcity of empirical studies that assess the real-world effectiveness and outcomes of the spiral model, which could provide critical insights into best practices and areas for improvement.
International Journal of Advanced Multidisciplinary Research and Studies (2022)	Critical Evaluation of Waterfall Project Management Methodology: A Case Study of Digital Management Conference Project	Case study analyzing the application of waterfall methodology in a digital management conference project.	The case study demonstrates that the waterfall methodology is effective in achieving project goals when requirements are clearly defined. However, it reveals critical limitations in flexibility, making it challenging to adapt to unforeseen changes during project execution. This highlights the need for further research comparing waterfall with agile methodologies to enhance adaptability and responsiveness in project management.	The research identifies a notable gap in the waterfall methodology's ability to accommodate changes during project execution. While it performs well with well-defined requirements, its rigidity poses challenges in dynamic environments where adaptability is crucial. This limitation suggests a need for further comparative research between waterfall and agile methodologies to explore how traditional project management frameworks can evolve to better handle unforeseen changes. Moreover, there is a lack of studies focusing on hybrid approaches that could integrate the strengths of both methodologies to enhance flexibility and responsiveness in project management practices.

Journal Name and Year	Paper Title	Methodology	Key Finding	Research Gap
Conference on AI Engineering Software Engineering for AI (CAIN 2024) (2024)	An Exploratory Study of V-Model in Building ML-Enabled Software: A Systems Engineering Perspective	Qualitative study involving interviews with 11 practitioners from multiple software companies to explore the application of V-Model for ML-enabled systems.	The qualitative study indicates that the V-Model effectively addresses collaboration challenges in developing machine learning (ML) systems by emphasizing system decomposition, validation, and verification. Despite its strengths, implementing the V-Model requires significant effort. The findings suggest a need for further exploration of process models that integrate V-Model characteristics to improve interdisciplinary collaboration in ML projects.	The study points out a significant gap in the exploration of new process models that leverage V-Model characteristics for managing interdisciplinary collaborations effectively within machine learning (ML) projects. Although the V-Model addresses several collaboration challenges, its implementation requires considerable effort, indicating that there may be opportunities to refine or adapt it for better efficiency. Future research should focus on developing innovative methodologies that combine V-Model principles with other frameworks to enhance collaboration and streamline processes in complex software development environments. Furthermore, there is a need for empirical studies to validate these new models and assess their effectiveness in real-world applications.

❖ Summary Literature survey:

The literature survey examines three important papers on software development methodologies. The first paper, from the *International Journal of Research and Applied Technology* (2022), reviews the spiral model's use primarily in software and education, noting a lack of understanding of its application in other sectors. The second paper, published in the *International Journal of Advanced Multidisciplinary Research and Studies* (2022), critiques the waterfall methodology through a case study, highlighting its effectiveness for defined projects but its rigidity in adapting to changes, advocating for comparisons with agile methods. Lastly, an exploratory study presented at CAIN 2024 investigates the V-Model in developing machine learning-enabled software, proposing eight propositions for its effective use and calling for further research into enhancing interdisciplinary collaboration. Together, these papers shed light on the strengths and limitations of various software development approaches.

❖ **Learning Objective:**

- To understand different software development models and their characteristics.
- To analyze the pros and cons of various models.
- To select the most suitable model for the project based on the findings.

❖ **Learning Outcome:**

At the end of this experiment, students will be able to:

1. Identify and describe various software development models.
2. Evaluate the suitability of each model for specific project scenarios.
3. Select and justify the choice of a model for their project.

❖ **Course Outcomes (COs):**

- CO1: Understand and explain the fundamentals of software engineering, the software process frameworks, and umbrella activities to manage and improve software development.
- CO2: Analyze and compare traditional and agile software development models, including their applicability to various project scenarios.

❖ **Cognitive Levels of Attainment as per Bloom's Taxonomy:**

- L1 (Remember): Identify and list various software development models.
- L2 (Understand): **Explain the characteristics and advantages of different models.**
- L4 (Analyze): **Evaluate the strengths and weaknesses of models to select the most suitable one for the project.**

❖ **Programme Outcome (PO) Attainment:**

- PO1: Engineering Knowledge: Apply knowledge of engineering fundamentals to understand software development models.
- PO2: Problem Analysis: Analyze the characteristics of various models to solve complex problems.
- PO5: Engineering Tool Usage: Utilize research tools and resources to perform a detailed literature survey.

- PO11: Life-Long Learning: Develop the ability to explore and evaluate emerging software engineering models.

❖ **Programme Specific Outcome (PSO) Attainment:**

- PSO1: Apply software engineering knowledge to select sustainable and efficient development models for IT projects.

❖ **Result & Discussion:**

- **Result:**

1. Identified and documented the characteristics of various software development models.
2. Evaluated each model's applicability to the project scenario.
3. Selected the most suitable model for the project and justified the choice.

- **Discussion:**

The literature survey emphasized the importance of understanding different software development models to ensure their proper alignment with project requirements. The selected model balances flexibility, risk, and development speed.

❖ **Conclusion:**

A systematic literature survey provides a comprehensive understanding of software development models. Selecting the appropriate model ensures that the project adheres to timelines, meets stakeholder expectations, and mitigates potential risks effectively.