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# Software Engineering Assignment 2: Library Management System (AUCA)

## 1. Predictive and Adaptive Software Development Models

### A. Predictive Models (Sequential)

1. Waterfall Model

Description: “Oldest and most well-known SDLC model. Follows a sequential step-by-step process from requirements analysis to maintenance. Systems that have well-defined and understood requirements are a good fit for the Waterfall Model.”  
(AUCA Lecture Notes, Lecture 2, 2025)

Advantages: Easy to understand, clear milestones, suitable for stable requirements.  
Disadvantages: Hard to change once started; no overlapping phases.  
Example use: Banking systems or library management systems with well-defined features.

2. V-Model (Verification and Validation Model)

Description: An extension of the Waterfall model where each development stage has a corresponding testing stage.  
Advantages: Early detection of defects; structured.  
Disadvantages: Expensive for complex projects; rigid structure.

### B. Adaptive Models

### 1.Iterative and Incremental

a. Incremental

Description: “An approach in which the project is divided into smaller, deliverable portions called increments. Each increment is completed and delivered one at a time, gradually building up to the final product. Each piece is fully functional, adding new capabilities or features to the previous work.”  
(AUCA Lecture Notes, Lecture 3, 2025)

b. Iterative

Description.” Focuses on refining the product through repeated cycles (iterations). Rather than completing one feature at a time, each cycle improves or modifies an earlier version of the product until the final requirements are met. This approach is especially useful when requirements are unclear or may change over time.”

(AUCA Lecture Notes, Lecture 3, 2025)

2. Agile Model

Description.” Agile SDLC model is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. An agile SDLC model defines a software process which follows the Agile Principles and applies an Agile Software Development Method.”

(AUCA Lecture Notes, Lecture 3, 2025)

Advantages: Flexible to changing requirements; encourages teamwork.  
Disadvantages: Requires skilled teams; less documentation.

## 2. Risks and Their Mitigation (Using Spiral Model Reference)

|  |  |  |
| --- | --- | --- |
| Model | Risks | Mitigation |
| Waterfall | Misunderstood requirements, late discovery of defects | Add early prototype or mini iterations in requirement phase |
| V-Model | High cost of fixing late-stage bugs | Conduct validation and verification after every phase |
| Iteration/Increment | |  | | --- | | Integration errors between increments | | |  | | --- | | Following the Spiral approach, review and test each increment before proceeding to the next cycle. | |
| Agile | Lack of documentation, scope creep | Regular sprint reviews, maintain definition of done |

## 3. Model Selection Justification (Example Scenario)

Chosen Model: Agile  
  
Environment**:** Mobile-based Library Management System with frequent updates.  
  
Reason:  
- The project requires user feedback from students and librarians.  
- Agile allows regular updates and testing of features like:  
 - Book reservation  
 - Notifications  
 - Borrow/return tracking  
- Each sprint delivers a usable feature.  
- Easier to integrate security and scalability features gradually.  
  
Example: In the first sprint, implement user login; in the second, add book borrowing features, etc.

## 4. Merits of the Waterfall Model in Large Software Projects

- Structured Process: Ideal for projects with well-defined requirements.  
- Clear Documentation: Useful for maintenance and onboarding new developers.  
- Control & Monitoring: Progress can be tracked phase by phase.  
- Cost Management: Budget estimation is straightforward.

## References

* GASHEMA, G. (2025). Lecture 2 & Lecture 3: Software Process and Software Process Models.
* Boehm, B. (1988). A Spiral Model of Software Development and Enhancement.