

# CSE 417: Software Engineering & Design Pattern

## Software Process Models

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# Verification vs Validation

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# Verification vs Validation i

## Verification

- Verification: Process of determining if the software is designed and developed as per the specified requirements.
- Static analysis method (review) is done without executing code.

## Validation

- Validation: Process of checking if the software (end product) has met the client's true needs and expectations.
- Dynamic analysis method (functional, non-functional testing) is done by executing code.

# Verification vs Validation ii

Verification	Validation
Verification is the process of evaluating the artifacts of software development in order to ensure that the product being developed will comply to the standards.	Validation is the process of validating that the developed software product conforms to the specified business requirements.
It is a static process of analysing the documents and not the actual end product.	It involves dynamic testing of a software product by running it.
Verification is a process oriented approach.	Validation is a product-oriented approach.
Answers the question – “Are we building the product right?”	Answers the question – “Are we building the right product?”
Errors found during verification require lesser cost/resources to get fixed as compared to be found during the validation phase.	Errors found during validation require more cost/resources. Later the error is discovered higher is the cost to fix it.
It involves activities like document review, test case review, walk-throughs, inspection etc.	It involves activities like functional testing, automation testing etc.

## V Shaped Model

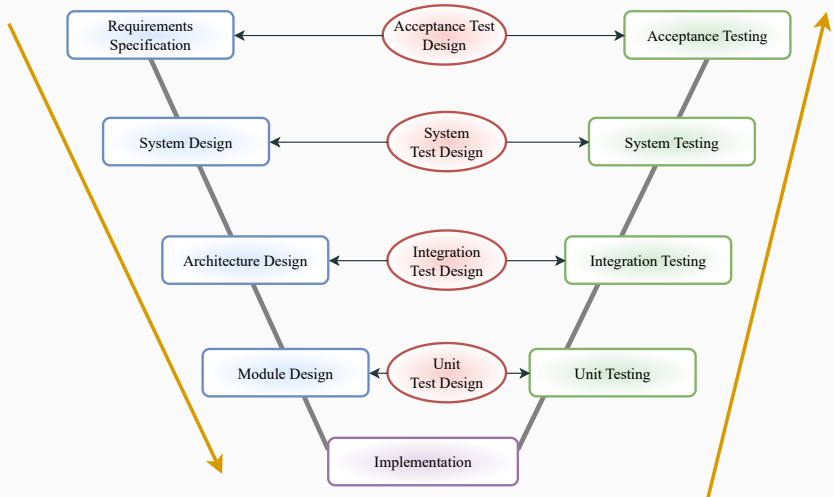
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# V Shaped Model

## V Shaped Model

- Known as Verification and Validation model
- Extension of Waterfall Model
- Linear like Waterfall model: Next phase will start only if the preceding phase is completed
- Testing is associated with every phase of the lifecycle
- Verification Phase: Requirements Analysis, System Design, Architecture Design, Module Design
- Validation: Unit Testing, Integration, System, Acceptance testing
- Testing of s/w is planned in parallel with corresponding phase of development

# V Shaped Model





## Requirements analysis

- Management tries to understand the requirements from customer perspective
- Before closing this phase Plan of acceptance testing should be done
- Once the s/w is ready the user will test for acceptance
- Output: Mutually agreed requirement document

# V Shaped Model

## System Design

- Analyse the documents
- Conduct feasibility study
- Design the overall system
- Example: Design of the whole building (3 storey)
- Output: High level system design
- Design contains high level picture of complete system: user, software, hardware, interfaces and database
- Before closing this phase Plan of system testing should be done
- System testing is done just before the product release

# V Shaped Model

## Architecture Design

- Analyze High level system design
- Generate High level software design
- Example: Design of the each floor of the building
- Take all technical decisions: programming language, communication protocols memory etc
- Before closing this phase Plan of integration testing should be done

## Module Design

- S/w developer design individual modules
- Generate low level design documents
- Before closing this phase Plan of unit testing should be done

## Application of V Shaped Model

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# Application of V Shaped Model

## Application of V Shaped Model

- When the requirement is well defined and not ambiguous.
- Small to medium-sized projects where requirements are clearly defined and fixed.
- Should be chosen when sample technical resources are available with essential technical expertise.

## Advantages of V Shaped Model

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# Advantages of V Shaped Model

## Advantages of V Shaped Model

- Simple and easy to Understand.
- Testing Methods like planning, test designing happens well before coding.
- This saves a lot of time. Hence a higher chance of success over the waterfall model.
- Avoids the downward flow of the defects.
- Works well for small plans where requirements are easily understood.

## Disadvantages of V Shaped Model

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# Disadvantages of V Shaped Model

## Disadvantages of V Shaped Model

- Not suitable for complex and object oriented projects.
- If any changes happen in the midway, then the test documents along with the required documents, has to be updated.
- Need crystal clear Documents.
- Very rigid and least flexible.

# Incremental Model

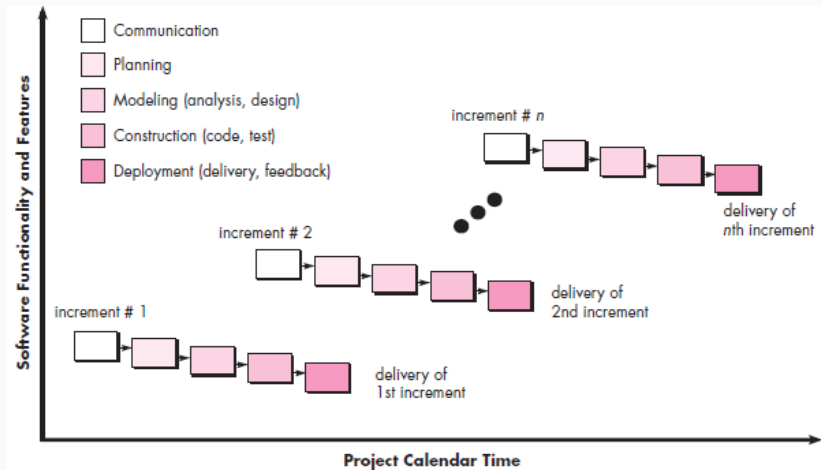
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# Incremental Model

## Incremental Model

- Requirements divided into multiple standalone modules
- Module by module working
- Every subsequent release of the module adds function to the previous release
- Each module goes through the communication, planning, modeling, construction and deployment phases
- First increment is often a core product
- Customer feedback from core system is addressed during later increments
- This process is repeated following the delivery of each increment, until the complete product is produced
- Customer interaction maximum

# Incremental Model



# Application of Incremental Model

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# Application of Incremental Model

## Applications of Incremental Model

- A project has a lengthy development schedule.
- When Software team are not very well skilled or trained.
- When the customer demands a quick release of the product.
- You can develop prioritized requirements first.

## Advantages of Incremental Model

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# Advantages of Incremental Model

## Advantages of Incremental Model

- Errors are easy to be recognized
- Easier to test and debug
- Tolerate changing requirements
- Balance cost and manpower
- Simple to manage risk because it is handled during its iteration
- The client gets important functionality early



## Disadvantages of Incremental Model

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# Disadvantages of Incremental Model

## Disadvantages of Incremental Model

- Need for good planning
- Actual cost may exceed the estimated cost
- A problem in one unit needs to be corrected in all units, which takes a lot of time

