WHAT /WHO /WHY IS PROCESS MODELS?

- **What:** Go through a series of predictable steps- a road map that helps you create a timely, high-quality results.
- **Who:** Software engineers and their managers, clients also. People adapt the process to their needs and follow it.
- **Why:** Provides stability, control, and organization to an activity that can if left uncontrolled, become quite chaotic. However, modern software engineering approaches must be agile and demand ONLY those activities, controls and work products that are appropriate.
- **What Work products:** Programs, documents, and data

PRESCRIPTIVE PROCESS MODELS

- Process model as an abstract representation of process.
- They define a prescribed set of process elements and a predictable
- process work flow (following some rules for correct usage.)

  The Waterfall Model

  -Incremental Process Models

    Incremental Model

    RAD Model

  -Evolutionary Process Models

    Prototyping

    Spiral

    Concurrent Development

  -The Unified Process Model

  -Concurrent Models 1-57

PREDICTIVE vs ADAPTIVE

- **Predictive:** a pretty good understanding of the requirements of the software or the product that you are building.
- **client or the analyst or the customer** have a very high confidence of the requirements or what they're looking for, then the team goes through this design implementation and testing phase, or the process that you have learned.
- Get the product **in one shot** in the end.
- **Adaptive models:** The client or the customer generally has an idea of what they want to build, but not quite there, right?
- They have an idea but they are **not 100% sure** what they want to build.
- The team that is working on it, they actually build something like a really small version of it or like **a low fidelity** version of it.Then they build the next version based on the feedback.

PROCESS MODELS

- Need:

  -Systematic software product development

  -Definiteness and discipline in overall process

  -Transition of product in each phase is definite(Move from one step to next)

  -To monitor overall progress of software product

- Selection Criteria:

  -The nature of the project and application.

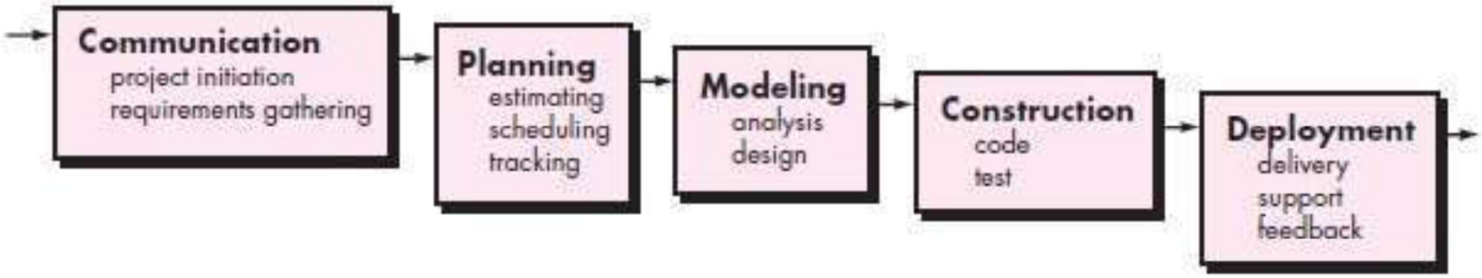
  -The methods and tools to be used.

  -The controls (rules)and deliverables(documents, features) that are required.

- Requirement Elicitation,Analysis, Specification(detailed plan)
- System Design
- Program Implementation
- Test

- **Phases and Output:**
- Requirement Analysis: Software Requirement Specification, Use Cases
- Design: Design Document, Design Classes (HLD,LLD)
- Implementation : Code
- Test :Test Reports, Change Request (Quality assured Docs)

THE WATERFALL MODEL

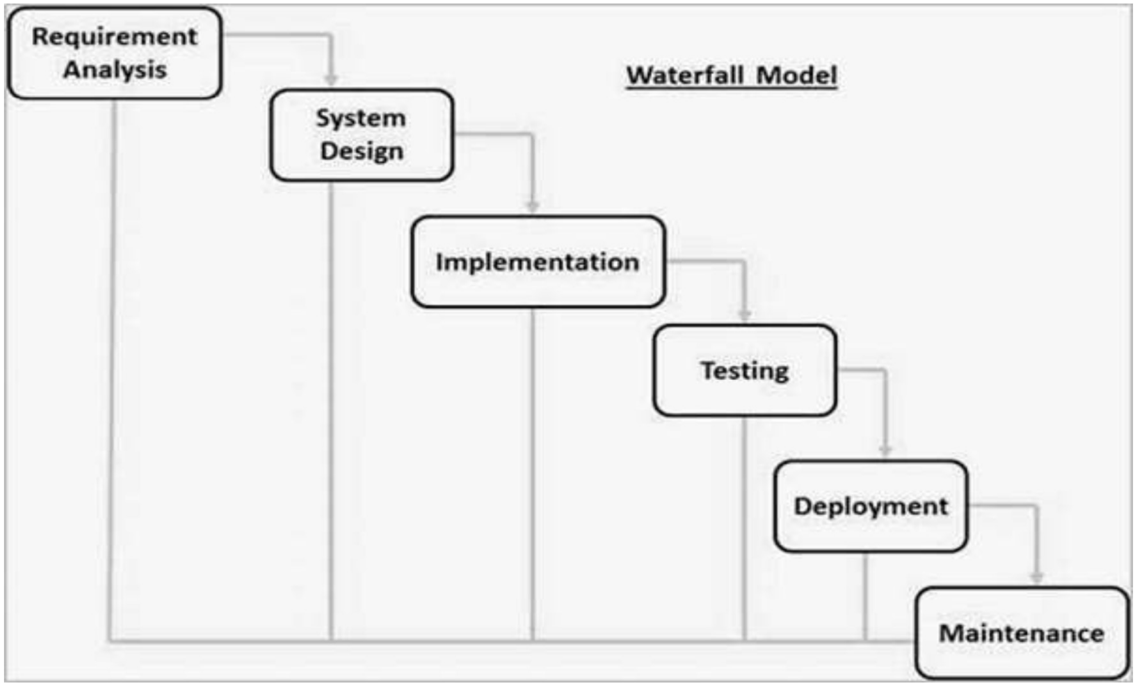


- Feasibility Study (Financial /Technical)
- Requirement Analysis and Specification (SRS - Functional / Non- Functional, Goals of Implementation)
- Design (Software Architecture derived from SRS)
- Coding and Unit Testing (Modules or Units)
- Integration and System Testing (Alpha(α), Beta(β) and Acceptance)
- Maintenance(Corrective, Perfective,Adaptive

Waterfall Model

-It is the first approach used in software development process.
-It is also called as classical life cycle model or linear sequential model.
-In waterfall model any phase of development process begins only if previous phase is completed.

1) Requirement Analysis
2) Design
3) Implementation
4) Verification/ Testing
5) maintenance



Advantages of Waterfall Model

- It is very simple to understand and easy to use.
- Phases of waterfall model do not overlap with each other.
- It is useful for small projects in which requirements are clear at the beginning.
- Since development is linear it is easy to manage development process.

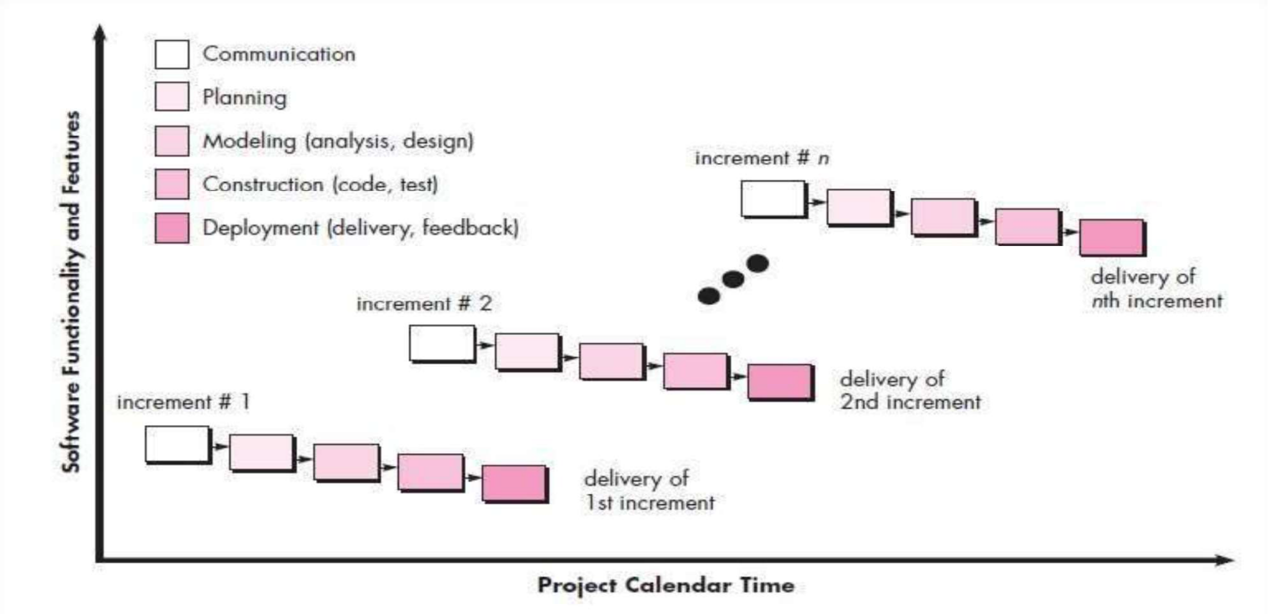
Disadvantages of Waterfall Model

- It is not useful for large projects.
- Not suitable for projects in which requirement are not clear initially.
- Product is available only at the end of development process.
- It is very difficult to modify system requirement in the middle of development process.

Incremental Process Model

-Incremental Model is a process of software development where requirements divided into multiple standalone modules of the software development cycle.

- In this model, each module goes through the requirements, design, implementation and testing phases.
- Every subsequent release of the module adds function to the previous release. The process continues until the complete system achieved.
- The Incremental philosophy is also used in the agile process model.


Communication
Planning
Modeling (analysis, design)
Construction (code, test)
Deployment (delivery, feedback)
increment # n
delivery of nth increment
increment # 2
delivery of 2nd increment
increment # 1
delivery of 1st increment
Software Functionality and Features
Project Calendar Time

When we use the Incremental Model?

- When the requirements are superior.
- 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.

- Advantage of Incremental Model

  -Errors are easy to be recognized.

  -Easier to test and debug

  -More flexible.

  -Simple to manage risk because it handled during its iteration.

  -The Client gets important functionality early.

- Disadvantage of Incremental Model

  -Need for good planning

  -Total Cost is high.

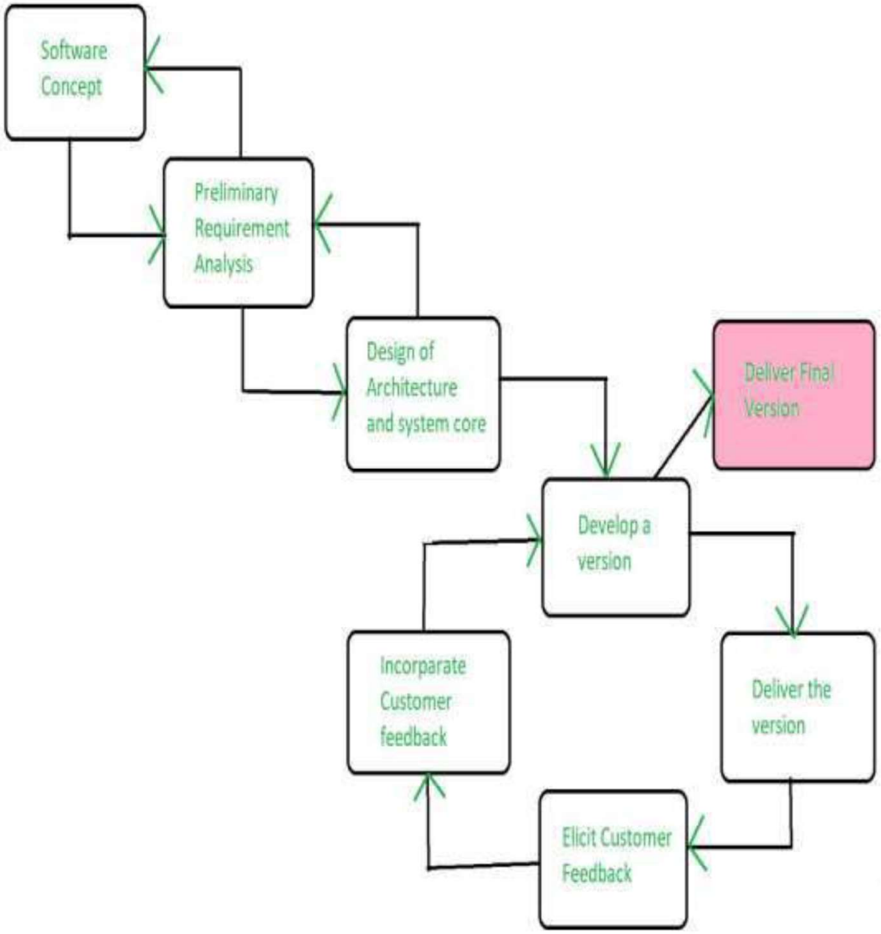
  -Well defined module interfaces are needed.

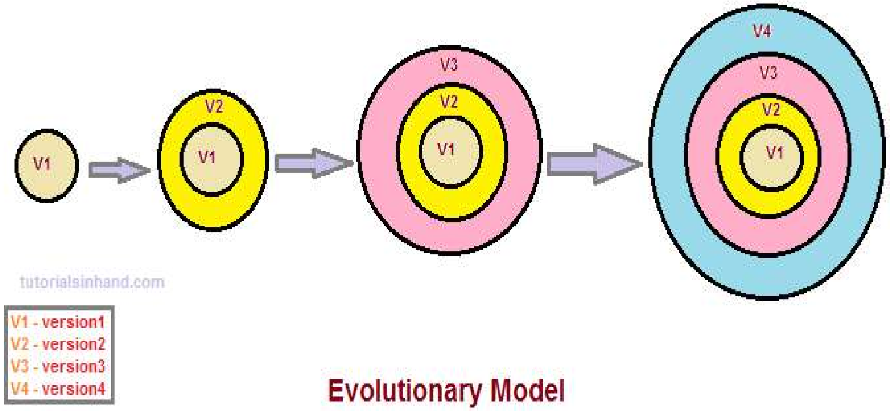
EVOLUTIONARY PROCESS MODELS

- Evolutionary models are iterative and incremental model.
- According to the business need and changing nature of the market there are lot of improvements required in the software product over a time.
- Due to this lot of improvement is required in the product hence this model is iterative in nature.
- In evolutionary model, the software requirement is first broken down into several modules.
- That can be incrementally constructed means it take customer feedback of each module.
- Delivered product module by module to the customer.
- There are two types

  -Prototyping

  -Spiral model


Software Concept
Preliminary Requirement Analysis
Design of Architecture and system core
Develop a version
Deliver Final Version
Deliver the version
Elicit Customer Feedback
Incorparate Customer feedback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V3 - version3
V4 - version4
Evolutionary Model

When to use evolutionary process model

- This is commonly used when the customer wants to starts using the core features instead of waiting for the full software
- It is used in large projects because of step by step development
- Customer requirement are not fixed. But clear concept.
- Small changes required in separate modules.
- Useful in object oriented software development because all the development is divided into different units.

Advantages of Evolutionary model

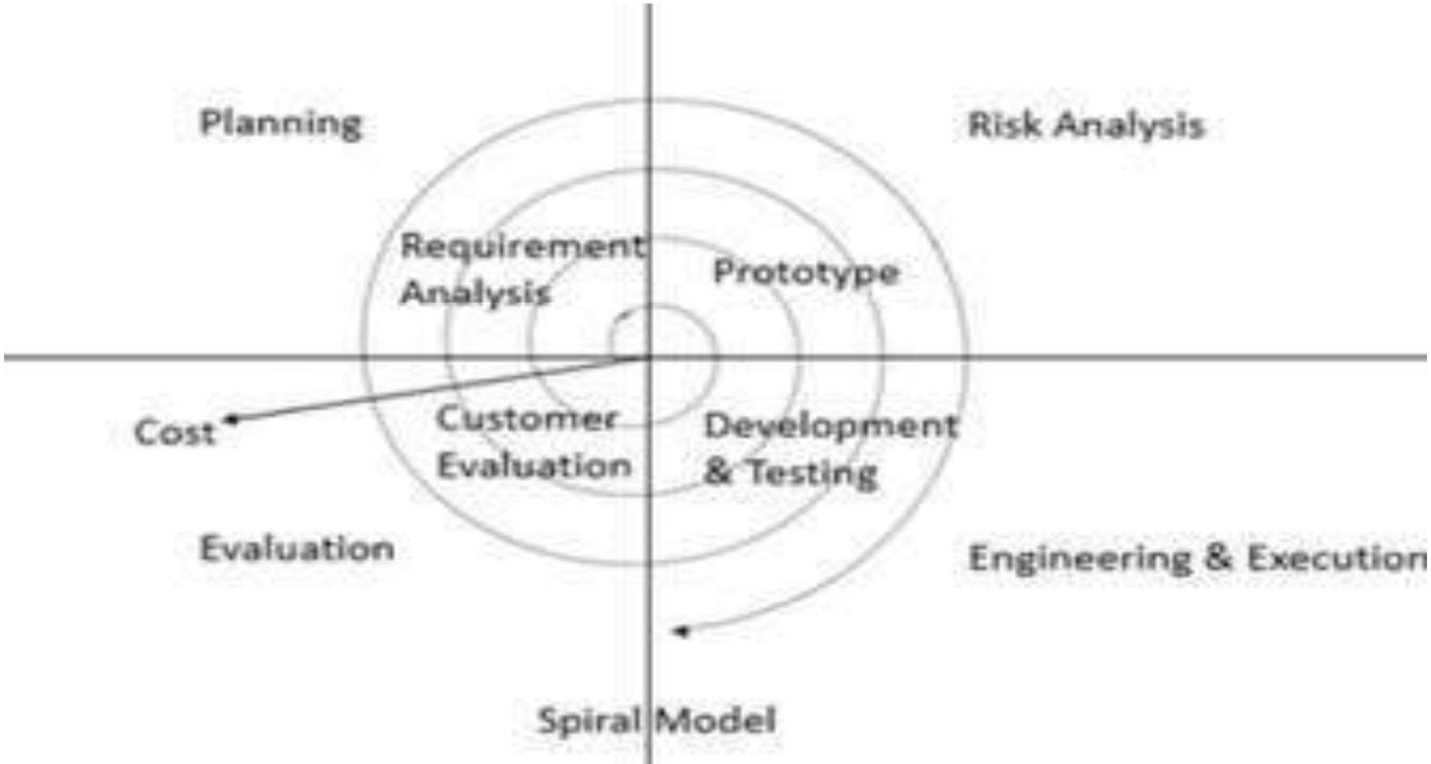
- It is useful for very large project.
- User has checked every stage during the development and it is helpful in achieving customer confidence.
- User gets a chance to experiment with a partially developed software much before the complete version of the system is released.
- It reduces the error because the core modules get tested thoroughly
- It reduces the cost of development

Disadvantages of Evolutionary model

- The delivery of full software can be late due to different changes by customers during development.
- Constant and clear interaction between the development team members is required.

Spiral model

- Initially proposed by Boehm in 1986.
- It is a risk driven software development model and prototyping model.
- It is combination of waterfall model, Iterative model and prototyping model.
- Software is developed in a series of incremental releases as per each spiral.
- Example: Microsoft, gaming industry
- Also called as meta model.



Spiral Model

SPIRAL MODEL IN SOFTWARE ENGINEERING

1) Planning:(Requirement gathering and project head)

   - Communication between customers and project head
   - Collect all the requirements from customers.
   - Analysis estimated cost, schedule and required resource.

2) Risk analysis:

   - Identification of all the potentials risks.
   - Risk mitigation strategy is planned for solving risks.
   - Design a prototype of model.(replica of actual s/w development)

3) Engineering and Execution:

- Actual development start
- Designer design the product as per final prototype.
- Developer perform actual coding or implementation
- Tester perform all testing methods
- deploy product to the customer environment.

4) Evaluation:

- take a feedback from customer
- if iteration want any changes,goes to next planning or next spiral iteration

When to use Spiral model?

- When the project is large and high budget.
- When requirement are unclear and complex.
- When changes may require at any time
- When the software needs continuous risk evaluation.

Advantages of Spiral Model

- High amount of risk analysis.
- Risky part can be developed earlier which help in better rik management.
- Useful for large and mission-critical project.
- Allows extensive use of prototype(solve all error in prototype).
- There is always a space for customer feedback.
- Changing the requirement can be accommodated.
- Development is fast

Disadvantages of Spiral Model

- Risk analysis needed highly particular expertise.
- Can be a costly model to use.
- Doesn’t work for smaller projects.
- Spiral process is complex sometimes because spiral may be infinitely.
- Large number of spiral stages required excessive documentation.