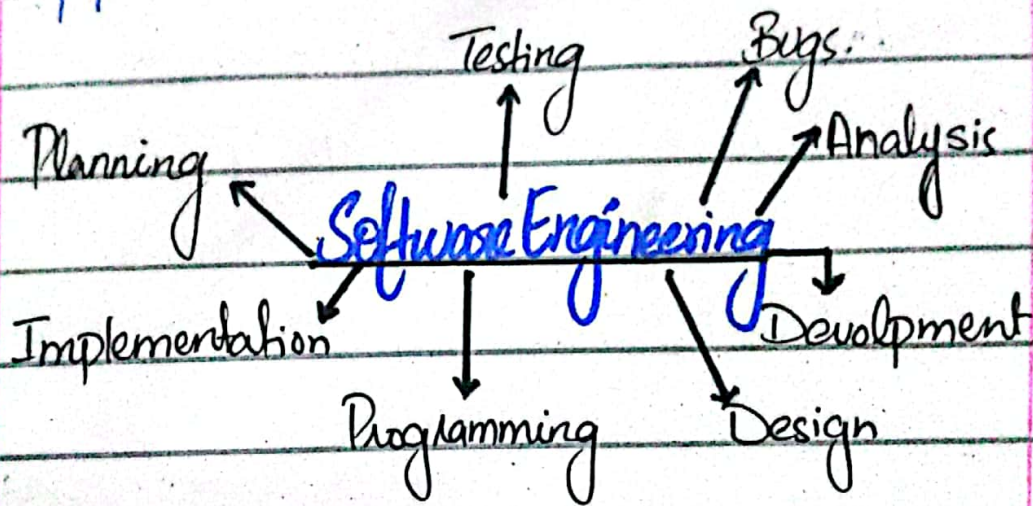


Software Engineering :

It is the branch of computer science that deals with design, development, testing and maintenance of software applications.



Computer Science :

Computer Science is the study of computers and computational systems. It is a broad field which includes everything from the algorithms that make up software to how software interacts with hardware as well to how well software is designed and developed.

Software Development Life Cycle (SDLC)

SDLC is a systematic process of building high quality software in short time and at minimum cost. SDLC consist of a detailed plan which explains how to build and maintain specific software.

Every Phase of the SDLC life cycle has its own phase process and deliverables that feed into next phase.

(Phases)

Phases of SDLC are as followed:

- Requirement gathering and Analysis
- Defining Requirements
- Design
- Coding
- Testing
- Deployment
- Maintenance

(1) → Requirement gathering and Analysis:

In this stage, Senior members and business analyst gather the requirement from customer about what they want.

This is done through interviews, surveys and meetings to gather information and analyze it to define the software requirements.

(2) → Defining Requirements:

Here we define all the requirements which we gather and make a document file which is called SRS and show to user and get feedback and approved to start working for these functionalities.

(3) → Design :
Here we define the design (UML Diagrams, Class Diagrams) of our software is highlevel design and low-level design according to our SRS.

(4) → Coding :
Here developer start building actual software by dividing software into units and modules and start coding according to choosen languages in SRS. Here a developer also perform testing to check code which is called unit testing.

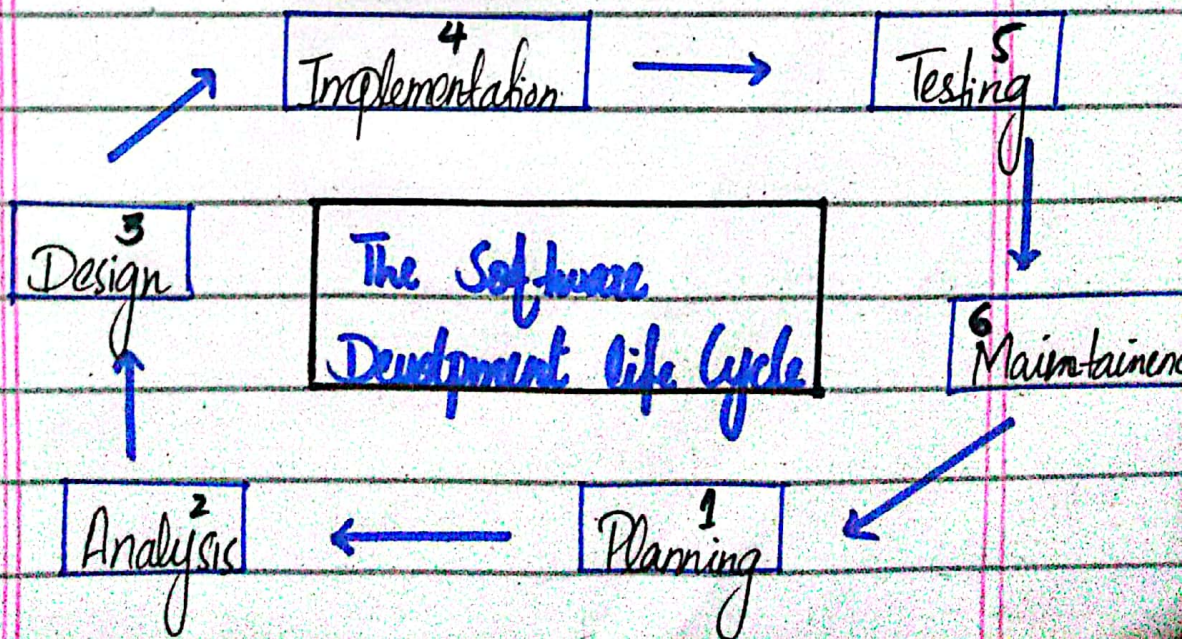
(5) → Testing :
Here QA and testing team may find some bugs when they testing the code - This process is continue until a software is bug-free, stable and working according to user requirements.

6→ Deployment :

Here we deploy or install the software at customer side. The deployment done by project manager but this factor varies companies.

7→ Maintenance :

Once the system is deployed and customer start using the developed system following 3 activities occur
Bug fixing, Upgrade, Enhancement
It helps to keep the software up-to-date and functioning optimally over its lifespan.



SDLC MODELS

- 1- Waterfall Model
- 2- Theravre waterfall Model
- 3- Prototyping Model
- 4- Evolutionary Model
- 5- Incremental Model
- 6- Spiral Model
- 7- RAD
- 8- V-Model
- 9- Big Bang
- 10- Agile

1:- Waterfall Model

"Waterfall model is a sequential model in which we divide our projects into pre-defined phases. Each phase must be completed before next phase with no overlap b/w the phases. The output of one phase is input of another phase."

Steps involved in Classical waterfall model are as follows:-

- (1) ~~Flexi~~ Flexibility Study
- (2) Requirement Analysis and Specification
- (3) Design
- (4) Coding and Unit testing
- (5) System testing and Integration testing
 - Alpha testing
 - Beta testing
- (6) Maintenance

When we use waterfall model

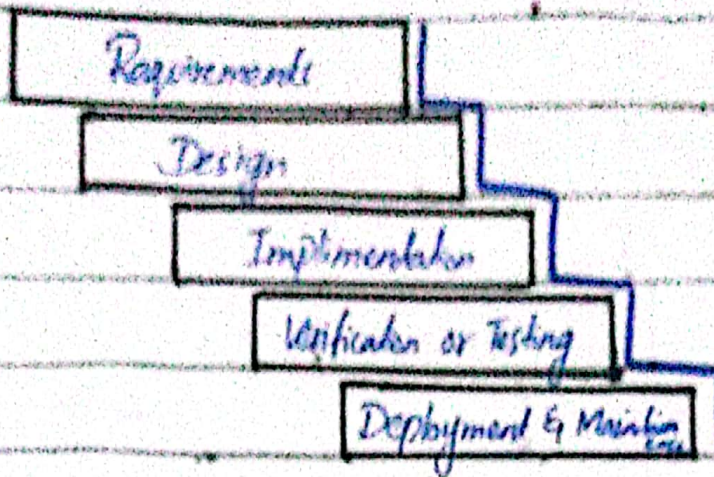
- 1- Requirements are not changing
- 2- Frequently.
- 3- Application is not complicated and Big
- 4- Project is short
- 5- Requirement is clear.

Advantages:

- Base Model
- Simple and Easy Model
- Use for small Projects.

Disadvantages:

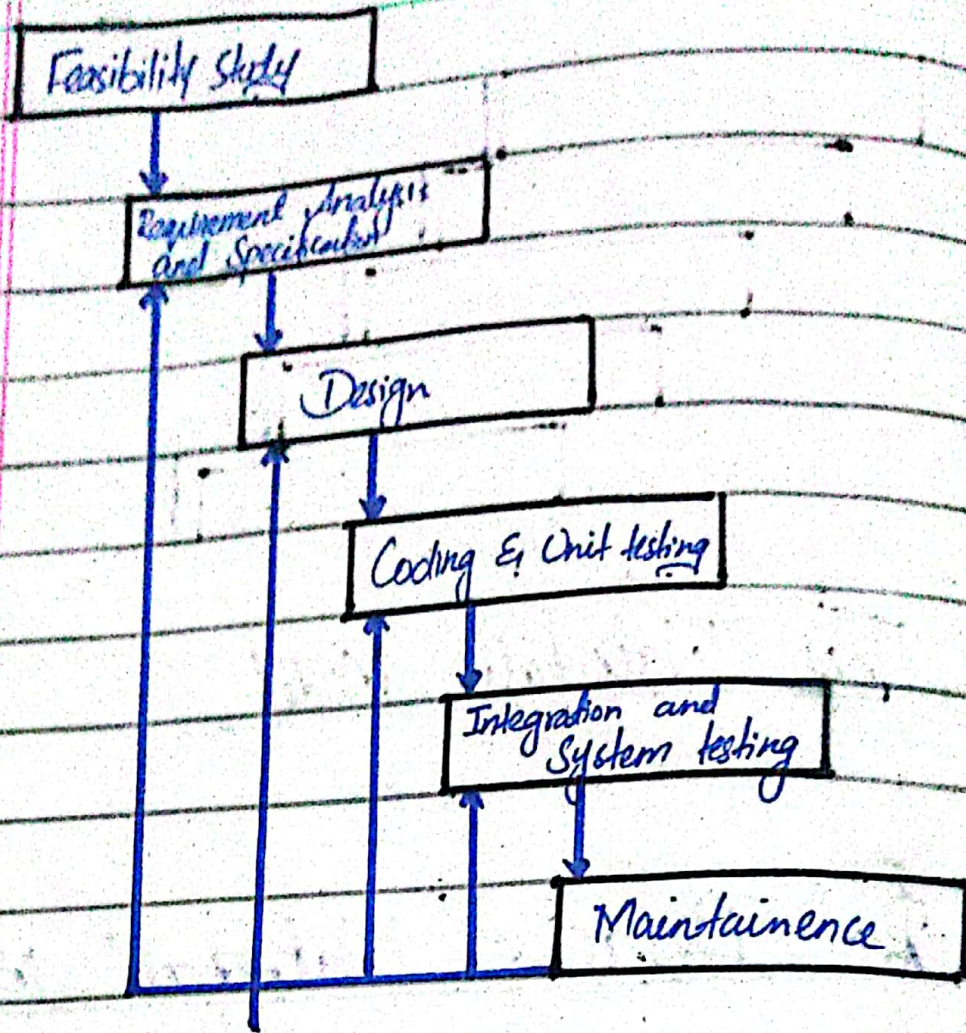
- No feedback
- No Experiment
- No Parallism
- High risk
- 60% effort in maintainence
- Don't use for large projects.



The Waterfall Model

2.- Iterative Waterfall Model

The iterative waterfall model is a variation of the traditional waterfall model. It follows a sequential approach but allows for iterations and feedback loops. After each phase there is a ~~top~~ review and evaluation process which helps in identifying and necessary changes or ~~im~~ improvements. This iterative approach allow for flexibility ~~study~~ and adaptability throughout the software development process.



Advantages :

- Base Model
- Simple and Easy
- Small projects
- Feedback

Disadvantage :

- Rigid
- No Parallelism
- Low Customer interaction

3. PROTOTYPING MODELS

Prototype:

"A 'prototype' is a early version of a product from which future versions are developed"

Prototype models:

The prototype model in SDLC is an iterative approach where prototypes are built and refined based on user feedback. It allows for early validation and refinement of the software design.

Advantages:

- Early feedback
- Improved Communication
- Better understanding of user requirements
- Throwing away Model

Requirement Gathering

Prototype Development

Quick Design

Refinement

Specification

Enhancement

Customer Acceptance

Final Prototype

Iterative Development

Design

Implementation

Test

Maintenance

System Requirements

Advantages:

Prototyping Model

- There is no end of

development

Evolutionary Model

Evolutionary model is the combination of iterative and incremental model of SDLC

Incremental model

Incremental model first implement a few basic features and deliver to the customer. Then build the next part and deliver it again and repeat this step until the desired system is fully realized

Iterative model

Iterative model main advantage is its feedback process in every phase.

Also known as :

"Design a little, build a

little, Test a little, Deploy a

little" method

Advantages:

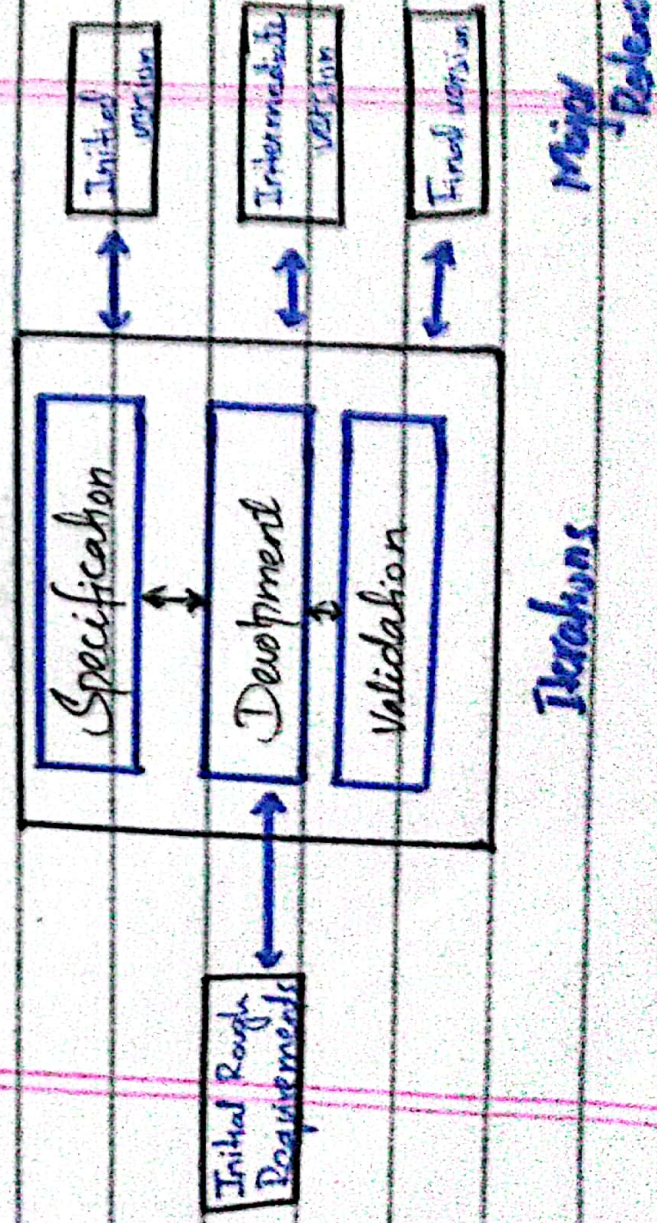
- Customer requirements are clearly specified
- Risk analysis is better
- Better suited for large project

Disadvantages:

- Not suitable for smaller projects

Cost:

- Highly skilled resources are required



Evolutionary Model

5:- INCREMENTAL MODEL

Incremental means we are developing module by module rather than doing development at a single time. It is specially for larger projects.

POINTS :-

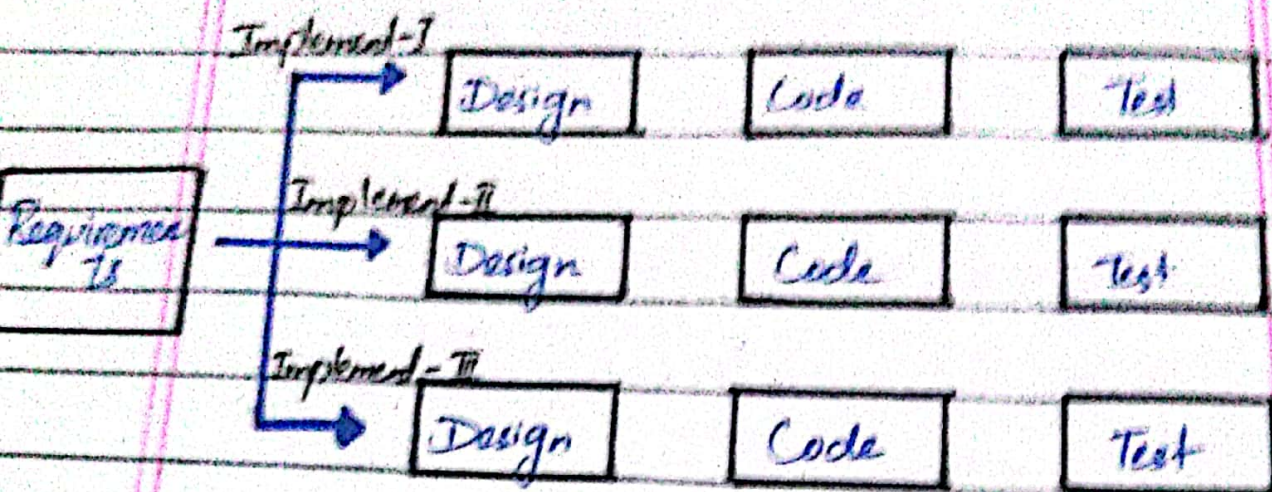
- Module by Module working.
- Customer interaction maximum.
- Early release product demand.
- Flexible to changes.
- Large Projects.

Advantages:-

- More flexible
- Easier to test and debug
- Customer can response to each built

Disadvantage:-

- Increase Complexity



INCREMENTAL MODEL

6 :- Spiral Model

The Spiral Model is a software development model that combines elements of both the waterfall model and iterative development.

It emphasizes risk management and allow for flexibility in the development process.

Phases :-

The spiral model consist of four main phases.

1. Planning
2. Risk Analysis
3. Engineering
4. Evaluation

1. Planning :

In this phase, project objectives, risks, and alternative solutions are identified. The project is divided into smaller iterations and a plan

k created for each iteration.

2. Risk Analysis :

In this phase, potential risks and uncertainties are identified and analyzed. Strategies are developed to mitigate these risks.

3. Engineering :

In this phase, the development team works on designing, coding, and testing the software. Each iteration involves a combination of these activities.

4. Evaluation :

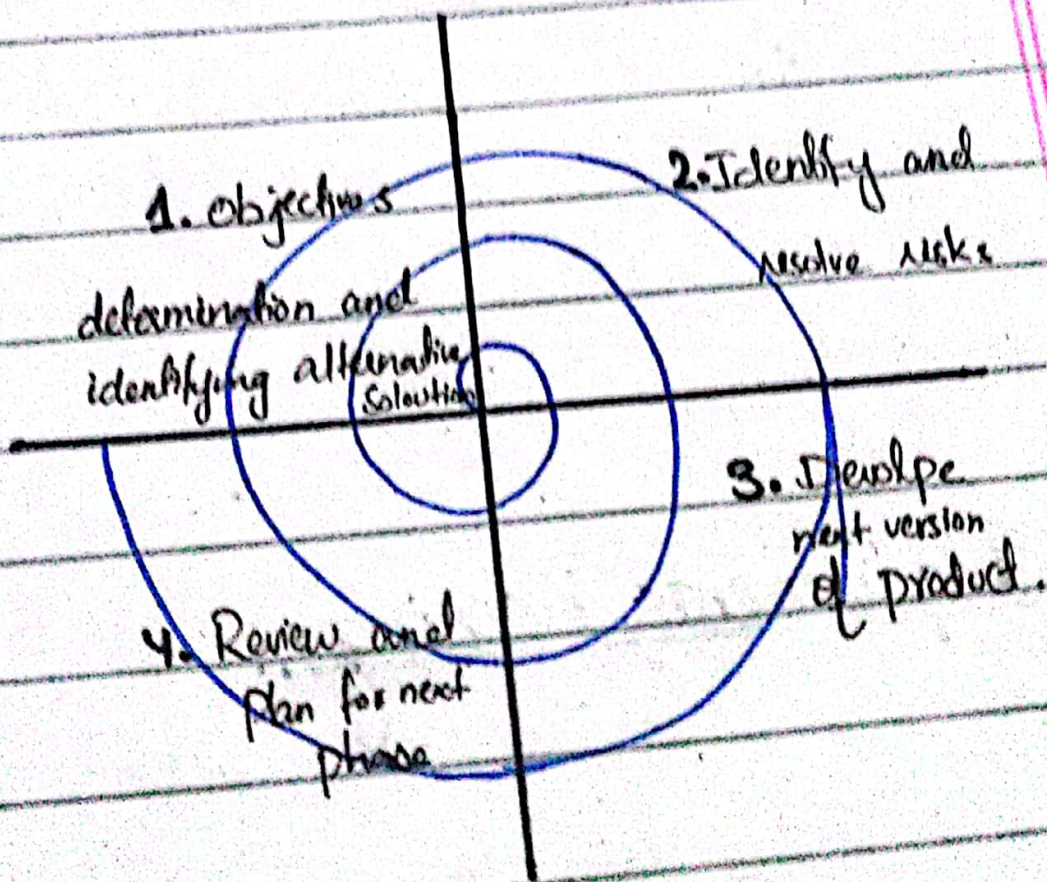
In this phase, the completed software is evaluated by the customer or enduser. Feedback is gathered, and necessary changes are made.

Advantages :-

- (1) Flexibility
- (2) Emphasize risk management
- (3) Customer involvement
- (4) Early Prototyping

Disadvantages :-

- (1) Time Consuming
- (2) Costly



Spiral Model

7:- RAD

The Rapid Application Development (RAD) model is an iterative and incremental software development approach that focuses on quickly building and delivering functional software prototypes.

Main Parts :-

The RAD model consist of four main phases.

- 1.- Requirement Planning
- 2.- User Design
- 3.- Construction
- 4.- Cutover

1. Requirements Planning :-

In this phase, the project objectives and requirements are identified, and the scope of the project is defined. The development team works closely

2.- User Design :

In this phase the focus is on creating a functional prototype of the software. The development team works closely with end users to understand their needs and design a user-friendly interface.

3.- Construction :

In this phase, the prototype is refined and developed into a fully functional software product.

4.- Cutover :

In this phase, the software is deployed and transitioned to the end users. User training and support are provided to ensure a smooth transition.

Advantages

- (1) Faster development time
- (2) Increased user involvement
- (3) have ability to quick adapt to changing requirements.

Disadvantages

- (1) Not suitable for complex or highly critical system projects.
- (2) Depend on user availability

Business Modeling

Data Modeling

Process Modeling

Application Generation

Testing and Turnover

RAD Model

8.1- V-Model

The V model is a software development life cycle model that emphasizes a systematic and structured approach to software development. It is called V model because of its shape, which resembles the letter "V".

Phases of V-Model

In the V model each phase of the development process has a corresponding testing phase, forming a V-shape structure. The phases of the V-model include:

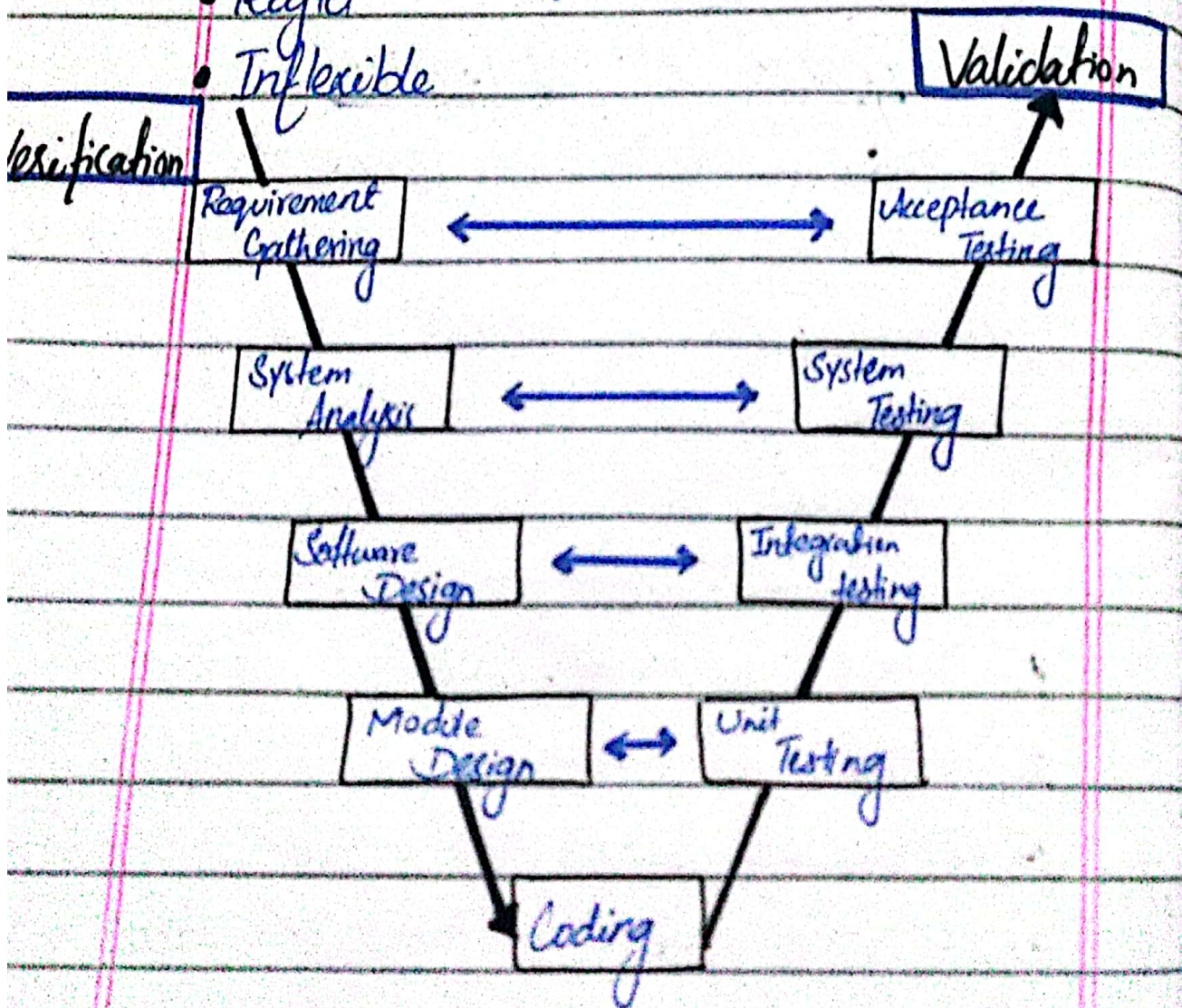
1. Requirement
2. System Design
3. Coding
4. Unit Testing
5. Integration Testing
6. System Testing
7. User Acceptance Testing
8. Deployment.

Advantages :

- Clear documentation
- Early Testing
- Focus on verification and validation

Disadvantages :

- Time Consuming
- Rigid
- Inflexible



V-Model

9.1. BIG BANG Model :

Big Bang in software engineering refers to a specific approach to software development. It involves developing the entire software system in one go, without any incremental or iterative phases.

This approach can be risky because it can't allow for gradual testing and feedback. It is often used for small projects or when there are limited resources.

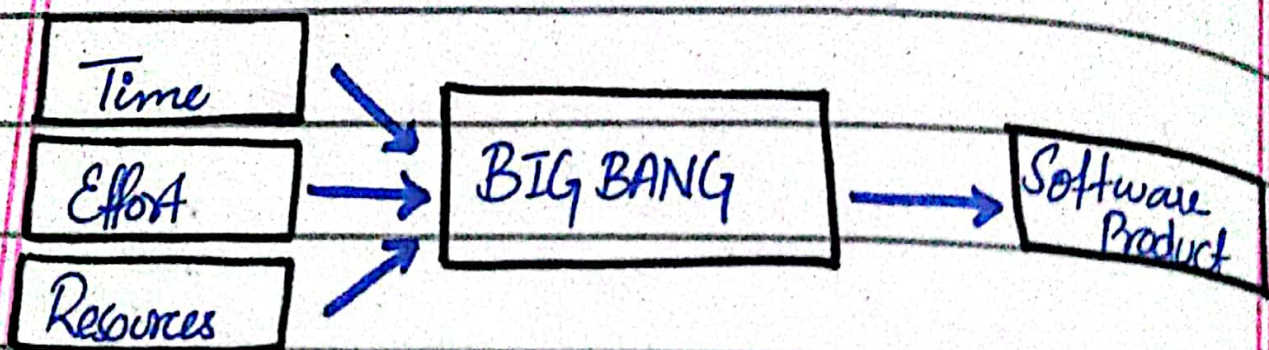
Advantages :

- Simple Model
- Very few resources required
- Gives flexibility to developers
- Easy to manage.

Disadvantages :

- Poor model for long and ongoing projects.

- Very High risk and uncertainty



THE BIG BANG MODEL

10:- Agile Model

Agile model is a popular software development approach that emphasize flexibility and collaboration.

"It involves breaking down the project into smaller iterations called sprint"

where team works on specific features and gather feedback from stakeholders.

This iterative process allows for continuous improvement and adaptation throughout the development cycle.

Advantages :-

- Great collaboration
- Frequent delivery
- Increase customer satisfaction

Disadvantages:

- Less predictable
- More time and commitment
- Lack of necessary documentation
- Project easily fall off track