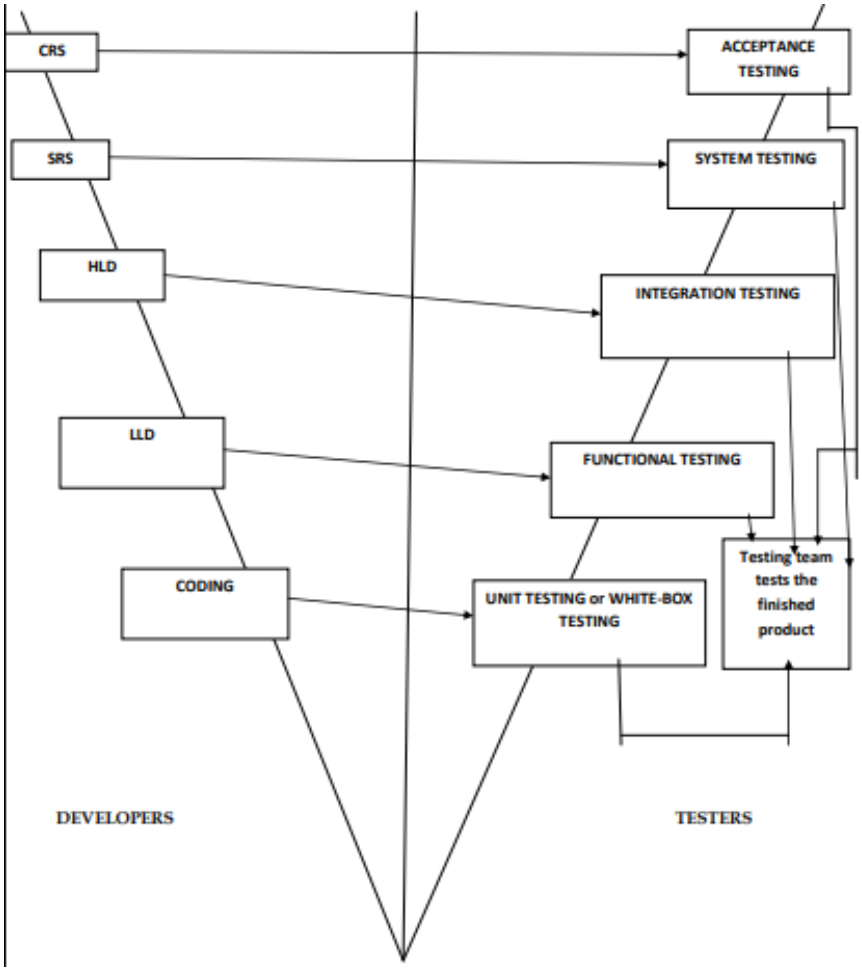
V Model (V – MODEL / V & V MODEL (Verification and Validation Model))

This model came up in order to overcome the drawback of waterfall model – here testing starts from the requirement stage itself

V-Model also referred to as the Verification and Validation Model. In this, each phase of SDLC must complete before the next phase starts. It follows a sequential design process similar to the waterfall model. Testing of the device is planned in parallel with a corresponding stage of development.



Verification: It involves a static analysis method (review) done without executing code. It is the process of evaluation of the product development process to find whether specified requirements meet.

The verification is also called static testing because, during the verification of the software application, the real application is not executed or used. But we have verified the documents, and the codes find the defects on it.

The different methods of verification are present to verify the documents or the codes of the application. That is:

- Review
- Inspection
- Walkthrough

Validation: Validation is the process to classify the software after the completion of the development process to determine whether the software meets the customer's expectations and requirements.

So V-Model contains Verification phases on one side of the Validation phases on the other side. The Verification and Validation process is joined by a coding phase in V-shape. Thus it is known as V-Model.

The validation is also dynamic testing. During the validation, we are using the real application to find out the defect in it.

During the validation process, we try to find out that the developed software product (development completed) weather met the customer’s expectations and requirements. To find out the defects of the application we are using different techniques or methods, that are:

- Functional testing
- Non-functional testing

1) In the first stage, the client sends the CRS both to developers and testers. The BA translates the CRS to the SRS.

The testers do the following tests on CRS,

1. Review CRS
    a. conflicts in the requirements
    b. missing requirements
    c. wrong requirements
2. Write Acceptance Test plan
3. Write Acceptance Test cases

The testing team reviews the CRS and identifies mistakes and defects and send it to the development team for correcting the bugs. The development updates the CRS and continues developing SRS simultaneously.

2) In the next stage, the SRS is sent to the testing team for review and the developers start building the HLD of the product. The testers do the following tests on SRS,

1. Review SRS against CRS
    a. every CRS is converted to SRS
    b. CRS not converted properly to SRS
2. Write System Test plan
3. Write System Test case

The testing team reviews every detail of the SRS if the CRS has been converted properly to SRS

3) In the next stage, the developers start building the LLD of the product. The testers do the following tests on HLD,
1. Review HLD
2. Write Integration test plan
3. Write Integration test case

4) In the next stage, the developers start with the coding of the product. The testing team carries out the following tasks,
    1. Review LLD
    2. Write Functional test plan
    3. Write Functional Test case

After coding, the developers themselves carry out unit testing or also known as white box testing.
Here the developers check each and every line of code and if the code is correct.
After white-box testing, the s/w product is sent to the testing team which tests the s/w product and carries out functional testing, integration testing, system testing and acceptance testing and finally delivers the product to the client.

How to handle requirement changes in V&V :-
Whenever there is change in requirement, the same procedure continues and the documents will be updated.

Advantages of V&V model

1) Testing starts in very early stages of product development which avoids downward flow of defects which in turn reduces lot of rework
2) Testing is involved in every stage of product development
3) Deliverables are parallel/simultaneous – as developers are building SRS, testers are testing CRS and also writing ATP and ATC and so on. Thus as the developers give the finished product to the testing team, the testing team is ready with all the test plans and test cases and thus the project is completed fast.
4) Total investment is less – as there is no downward flow of defects. Thus there is less or no re-work
5) Each phase of development is tested before moving to next phase, hence there is a higher rate of success.

Disadvantages of V&V model
1) Initial investment is more – because right from the beginning testing team is needed
2) More documentation work – because of the test plans and test cases and all other documents

Applications of V&V model
We go for V&V model in the following cases,
1) for complex applications
2) when customer is expecting a very high quality product within stipulated time frame because every stage is tested and developers & testing team are working in parallel

When to use V-Model?

- When the requirement is well defined and not ambiguous.
- The V-shaped model should be used for small to medium-sized projects where requirements are clearly defined and fixed.

Difference Between Software Verification and Validation

Verification	Validation
Are we building the product right?	Are we building the right product ?
It is the process of evaluating products of a development phase to find out whether they meet the specified requirements.	It is the process of evaluating software at the end of the development process to determine whether the software meets customer expectations and requirements.
The following activities are involved in Verification: Reviews, Meetings, and Inspections.	The following activities are involved in Validation: Testing like black-box testing, white box testing, grey box testing, etc.
It is manually checking the documents and files like requirement specifications etc.	It is checking the developed program based on the requirement specifications documents & files
It is carried out before the Validation.	Its activity is carried out just after the Verification.