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# The Agile V Process Model

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**Abstract**

Software Development methodology is a framework that is used to structure, plan, and control the process of developing Software to achieve project goal. Many software development methodologies exist in market and choosing right model for developing software product or application is very important. "Waterfall Model" is traditional model which was used by majority of software development in early days. As maturity of model evolve over different period of time "V Process" Model became very familiar because of its verification and validation approach to make the software stable. Very recently "Agile" Methodology is being used by many companies to benefit the time to market. In this Journal we will see the advantages and disadvantages of both "V Process" model and "Agile" Model. Later we will see the advantage of integrating both process models to achieve project goals in efficient way.

**Keywords**— Software Development Methodology, Hybrid Model, Agile Methodology, V Process Model, Agile advantages, V Process Model advantages, Agile in V Process Model.

## I. Background

V Process model usually works better for smaller projects where requirements are very clear. The development and testing phase will be planned in parallel; therefore it will have Verification phases on one side and Validation phases on the other side.

Agile development model is an Incremental developmental model. Software is developed in many iterative cycles. This results in small incremental releases with each release building on previous functionality. Each release is thoroughly tested to

ensure software quality is maintained. It is used for time critical applications. Extreme Programming (XP) and Scrum Model are currently most well known agile development life cycle models.

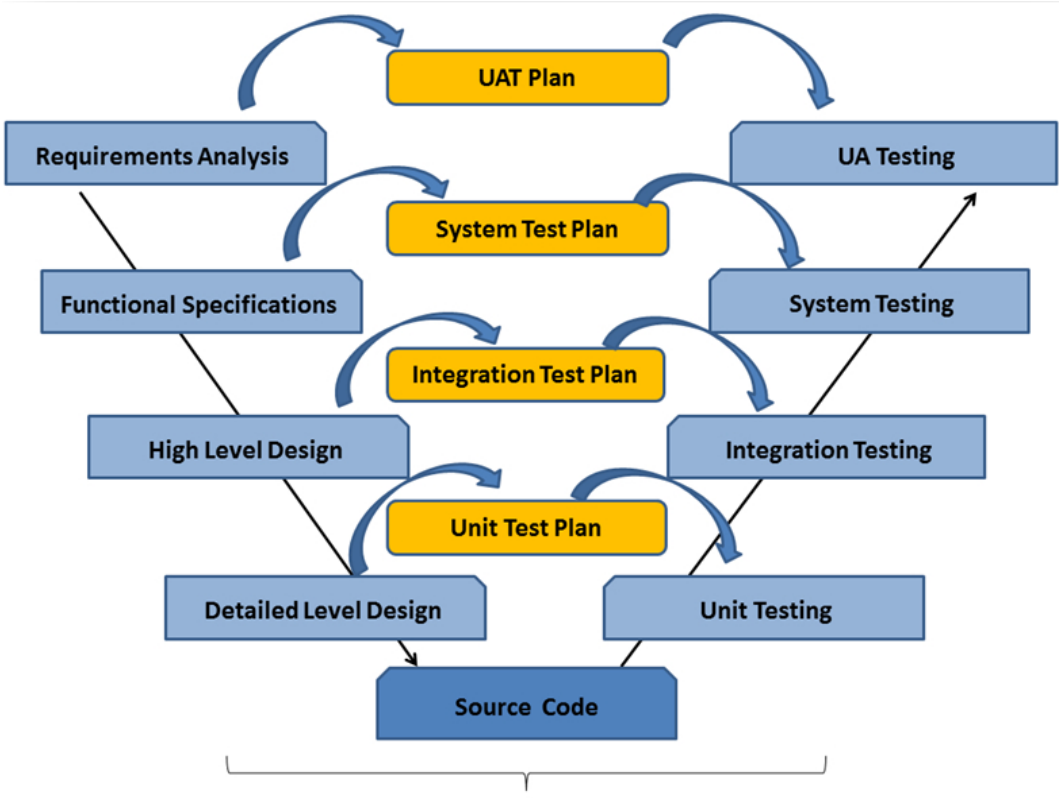
## II. Different Phases of V Process Model

Business Requirements begin the life cycle model just like the waterfall model. The system test plan is prepared as soon as the business requirements are signed off and just before the development.

The high-level design (HLD) phase focuses on system architecture and design. It provides overview of solution, platform, system, product and service/process. An integration test plan is created in this phase.

The low-level design (LLD) phase is where the actual software components are designed. It defines the actual logic for each and every component of the system. Class diagram with all the methods and relation between classes comes under LLD. Component tests are created in this phase.

Coding is at the bottom of the V-Shape model. Once coding is developed, unit testing will be done by the developers.




**Advantages of V-model:**

- It is simple but highly disciplined Model and Phases are completed one at a time.

- Test plan is prepared before coding. This helps the developer and all stakeholders to understand the scope of testing before the development.
- Proactive defect tracking – that is defects are found at early stage.
- Good documentation available on developed product.

**Disadvantages of V-model:**

- Very rigid and least flexible.
- Software is developed during the implementation phase, so no early prototypes of the software are produced.
- If any changes happen in midway, then the test documents along with requirement documents has to be updated.
- No working software is produced until late during the life cycle.
- Not suitable for the projects where requirements are at a moderate to high risk of changing.

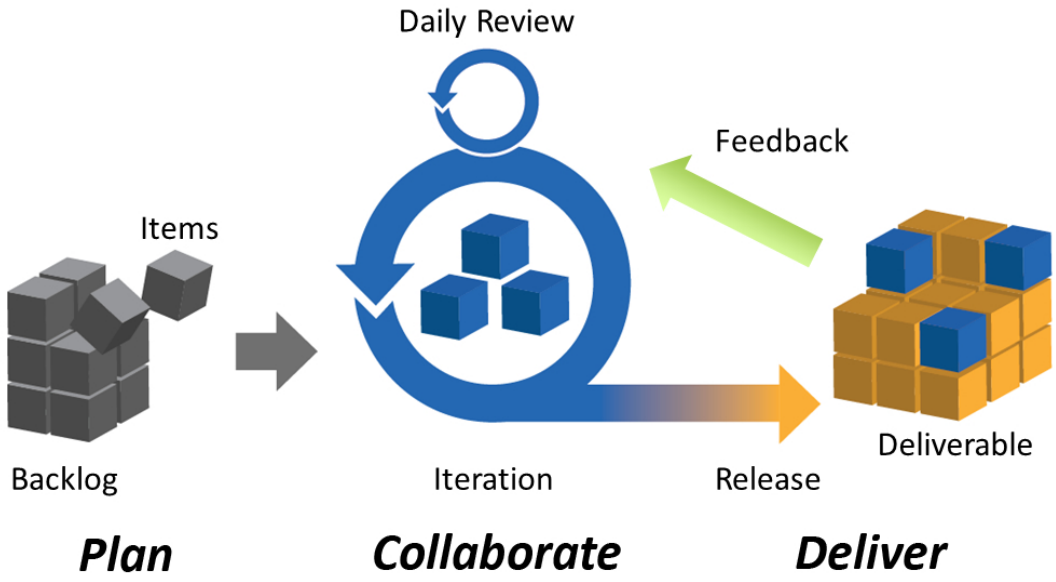
**When to use the V-model:**

- When the project requirement is clear and well defined.
- Suitable for small to medium sized projects.
- When good technical resources are available to provide technical expertise.
- High confidence of customer is required for choosing the V-Shaped model approach. Since, no prototypes are produced, there is a very high risk involved in meeting customer expectations.

## III. Different Phases of Agile Model

Once the vision of the project is understood, the requirements are planned and prioritized for each Iteration Development. Each iteration will have the following phases executed sequentially

- Planning
  - Detailed Requirements in form of short stories.
  - Prioritization of Requirements
- Iteration
  - Design and Analysis of requirements
  - Development
  - System Testing
  - Acceptance Testing
- Deliver
  - Deployment
  - Feedback




**Advantages of Agile model:**

- Continuous delivery of working software modules quickly.
- Customer satisfaction through the functionality developed rapidly and demonstrated.
- Less time to market
- Resource requirements are minimum.
- Little or no planning required
- High collaboration among all stake holders.
- Continuous attention to technical excellence and good design.
- Regular adaptation to changing requirements. Even late changes in requirements are welcomed

**Disadvantages of Agile model:**

- Lack of documentation.
- Not suitable for handling complex dependencies.
- Depends heavily on customer interaction, so if customer is not clear, team can be driven in the wrong direction.
- Self sustained team members can contribute better in this model.
- Transfer of technology to new team members may be quite challenging due to lack of documentation.

**When to use Agile model:**

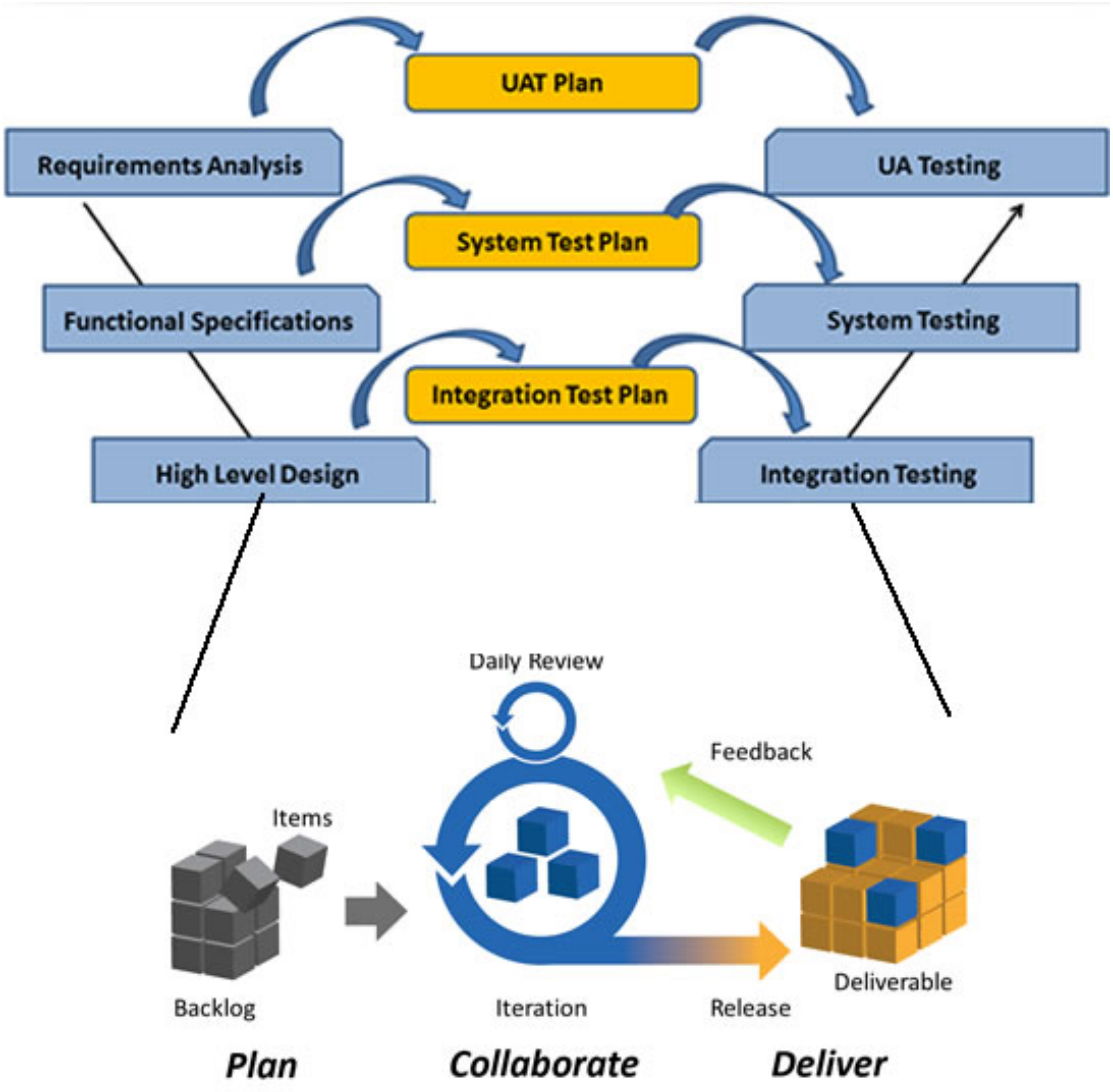
- When requirement volatility is high.
- When rapid development is needed.
- When there isn’t a clear picture of what the final product should look like.
- When you have skilled developers who are adaptable and able to think

independently.

- When customer involvement is present throughout the life cycle.

## IV. Integrating Agile and V Process Model

Each process model has its own advantages and disadvantages. Integrating and customizing both Agile and V Process Model helps to improve the development methodology more flexible and improves quality of deliverables.




## V. Advantage of Integrating both the model

- Highly disciplined approach is needed
- Test plan should be ready as soon as requirements are ready
- Good documentation is needed for any future references

- Proactive defect identification
- Continuous delivery of working software modules.
- Less time to market.
- Continuous attention to technical excellence and good design.
- Regular adaptation to changing requirements. Even late changes in requirements are welcomed

## VI. Let us eliminate the disadvantages of both the model.

- Remove the rigidity of development.
- Late delivery of working software module.
- Late testing of developed software module.
- Detailed documentation
- Detailed steps in development process.

## VII. Integration Matrix of Agile and V process model

| **Agile Phase** | **V Model Phase** | **Deliverables/Output** |
|---|---|---|
| Planning Phase | High Level Requirements are developed | • High Level Requirement<br>• High Level User Acceptance Criteria |
| | Functional Specification | • Functional Specification Document<br>• System Test Plan |
| | High Level Design | • High Level Design Document<br>• HLD to Short Stories<br>• Prioritized Stories<br>• Integration Test Plan |
| Collaborate Phase (Iterative Approach) | Low Level Design/Approach for Requirements/ Short Stories | Design approach for short stories |
| | Development | Source Code & Demo to user |
| | Unit Test Plan | • Unit Test Results<br>• System Testing Results<br>• User Acceptance of Short Requirement<br>• Retrospective feedback Results<br>• Workable Software |
| Deliver | Integration Plan | Integration Test Results |
| | High Level System Test Plan | System Test Results |
| | User Acceptance Test Plan | User Acceptance Test Results |

## VIII. Eliminating flaws in both the model with this Hybrid Model approach.

**Project Goal & Vision**

The V process model brings the advantage of defining the project goal and vision at the beginning of project. This avoids the rework and twisting of project during its execution. Agile Process helps to achieve this project goal and vision by delivering workable product at the end of each iteration.

**Documentation**

The main disadvantage of agile model is the lack of documentation. Integrating V Process model helps to maintain documentation through its deliverables in each phase of the project. On the other side, agile flexibility of accommodating late changes can be addressed by updating the documentation whenever needed by working backwards. To eliminate the effort spent on documentation, we can either skip the functional specification or detailed design document.

**Early delivery of workable software**

The disadvantage of V Process model can be eliminated using the agile approach of delivering workable product in each iteration. Requirements are broken into smaller task and prioritized. At the end of each iteration a shippable product is delivered. Customers are involved throughout the development process to make sure what has been developed is correct and to confirm we are moving towards the project goal.

**Accommodating Late Changes**

The Agile model has the advantage of accommodating even late changes. Even though the changes will lead to achieve the project goal, there could be some rework on documentation and source code changes. The team has to work backwards in updating all relevant documentation to keep them in sync to achieve project success. This will overcome the rigidity of V Process model.

**Testing**

The dynamic agile process will sometime lead us to lose the focus on Integration testing of project delivery happened at the end of each iteration. Integration test plan, System Test Plan & User Acceptance test plan prepared during the planning phase will help us to validate the project delivered is correct. Please note that all test plan should be kept updated whenever any change happen in the project which is not as per the plan.

**Traceability Matrix**

V Process model helps to cover the traceability of requirements till testing completion. This is one of the difficult tasks in agile model where the team lose focus when working on smaller task. Traceability matrix helps to track all task developed backward till requirement and forward till testing completion.

## IX. Conclusion

'V-model' was used by many companies which has its unique approach of 'Verification' and 'Validation' done side by side of the development.

The Agile brings the advantage of high collaboration and focus on working software. This journal brings out the advantage and disadvantage of both the model.

The Hybrid approach of integrating both the Agile and V model eliminates the disadvantages of both the model and brings values focusing on both of its advantages. It is necessary for the organization to clearly define the process of this hybrid model and educate the team before using this up. This journal gives some insight how to customize both the model for our organization need. Therefore this could also be further customized to achieve the project goal on time with quality.

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