

Verification and validation

Fundamental QA concept

Verification

We are developing the right product or not.

Validation

We have developed the product right.

Verification?

- Evaluating the intermediary work products of to check if we are in the right track of creating the final product.
- **Intermediary or mediator products?**
Documents which are produced during the development phases
- Verification ensures that the system complies with an organization's standards and processes.
- **Static Testing**

Verification Situation	Actors	Definition
Requirement Review	Dev team/client	<ul style="list-style-type: none"> - Requirements Correct - Requirements feasible
Design Review	Dev team	<ul style="list-style-type: none"> - Requirements can be met via the design proposed.
Code Walkthrough	Individual Developer	<ul style="list-style-type: none"> - Identify any syntactic errors.
Code Inspection	Dev team	<ul style="list-style-type: none"> - Formal set up. - Experts and developers check the code to make sure it is in accordance with the functional
Test Plan Review (Internal)	QA team	<ul style="list-style-type: none"> - A test plan is accurate and complete.
Test Plan Review (External)	Project Manager, Business Analyst, and Developer.	<ul style="list-style-type: none"> - Formal analysis of the test plan document - Timeline and other considerations of the QA team are in line with the other teams and the entire project itself.

Validation?

- Evaluating the final product to check whether the software meets the business needs.
- Test execution is actually the validation activity which includes smoke testing, functional testing, regression testing, systems testing, etc.
- Dynamic Testing

Verification QA	Validation QC
Evaluates the intermediary	Evaluates the final product
Product is built as per the specified requirement and design specification.	Determines whether the software is fit for use and satisfies the business needs.
“Are we building the product right”?	“Are we building the right product”?
Done without executing the software.	Done with executing the software.
Involves all the static testing techniques.	Includes all the dynamic testing techniques.
Examples include reviews, inspection, and walkthrough.	Example includes all types of testing like smoke, regression, functional, systems and UAT.

V&V In Different Phases Of The Development Lifecycle

#1) V & V tasks – Planning

- Verification of contract.
- Evaluation of Concept document.
- Performing risk analysis.

#2) V & V tasks – Requirement phase

- Evaluation of software requirements.
- Evaluation/analysis of the interfaces.
- Generation of the systems test plan.
- Generation of Acceptance test plan.

#3) V&V tasks – Design Phase

- Evaluation of software design.
- Evaluation / Analysis of the Interfaces (UI).
- Generation of Integration test plan.
- Generation of the Component test plan.
- Generation of test design.

#4) V&V Tasks – Implementation Phase

- Evaluation of source code.
- Evaluation of documents.
- Generation of test cases.
- Generation of the test procedure.
- Execution of Components test cases.

#5) V&V Tasks – Test Phase

- Execution of systems test case.
- Execution of the acceptance test case.
- Updating traceability metrics.
- Risk analysis

#6) V&V Tasks – Installation and checkout phase

- Audit of installation and configuration.
- The final test of the installation candidate build.
- Generation of the final test report.

#7) V&V Tasks – Operation Phase

- Evaluation of new constraint.
- Assessment of the change proposed.

#8) V&V Tasks – Maintenance Phase

- Evaluation of the anomalies.
- Assessment of migration.
- Assessment of the retrieval features.
- Assessment of the proposed change.
- Validating the production issues.

ISO / IEC 12207:2008

Verification Activities	Validation Activities
Requirement verification	Prepare the test requirements documents, test cases, and other test specifications to analyze the test results.
Design Verification	specifications reflect the requirements and is fit for use.
Code vérification	Test for boundary values, stress, and the functionalities.
Documentation Verification	Test for error messages and in case of any error, the application is terminated gracefully.

CMMI:
Verification and validation are two different KPAs at maturity level 3

Verification Activities	Validation Activities
Performing peer reviews.	Validate that the products and its components are suitable for the environment.
Verify the selected work products.	When the validation process is being implemented, It is monitored and controlled.
Standardize a definite process by establishing organizational level policies for planning and doing reviews.	Do lessons learned activities and collect improvement information. Institutionalize a definite process.

IEEE 1012:

The objectives of these testing activities are:

- Facilitates early detection and correction of errors.
- Encourages and enhances management intervention inside process and product risks.
- Provides supportive measures for the software lifecycle process, to enhance the compliance with schedule and budget requirements.

Is UAT Validation or Verification?

UAT (User Acceptance Testing) should be considered as validation. It is the real-world validation of the system or application, which is done by the actual users who validate if the system is “fit for use”.