

TEST & QA REPORT

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Reducing Risk Through Independent Verification and Validation

When systems developers rely on information technology to automate critical decisions, they run the risk of increasing their number of errors. How can they then evaluate how well the software system meets specifications and runs correctly? Why not try a process called *verification and validation*? When verification and validation is carried out by a separate group from the development team, as it may well be, the process is called *independent verification and validation*. Commonly known as IV&V, the process is designed to minimize risk and instill confidence in the final product.

"IV&V is a series of technical, managerial and financial activities performed by resources independent of the project team to provide management with an assessment of a project's ongoing health," says Jim Gates, Senior Practice Manager at Questcon Technologies, a QA services company based in Greensboro, NC. "By focusing on an unbiased audit and assessment of processes and deliverables, IV&V ensures goals are met for cost, dates and results."

He defines *verification* as the process of evaluating a system or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase.

Validation is the process of evaluating a system or component during or at the end of the development process, to determine whether it satisfies specified requirements. It takes an audit approach toward the build/delivery process.

Gates enumerates IV&V benefits such as fewer defects created, better detection of defects, risk mitigation, and greater visibility at the financial, managerial and subject matter level.

"IV&V promotes earlier detection of software/process errors to ensure peak detection is completed during the creation phase," Gates says. "This dramatically reduces the effort and cost of removing detected errors, enhancing

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operational accuracy and reducing variability in development process.”

Analytical Approaches

Accurate analysis is integral to the success of IV&V, Gates notes, listing three analytical approaches employed:

- **Static Analysis** -- The direct analysis of the form and structure of a product without executing it. This includes reviews, inspections, audits and dataflow analysis.
- **Dynamic Analysis** -- The execution or simulation of a developed product to detect errors by analyzing the product's response to sets of input data where the range of output is known.
- **Formal Analysis** -- The use of rigorous mathematical techniques to analyze the algorithms of a solution, including formal proof of correctness and algorithmic analysis.

Focal Points

Gates also lists several IV&V focal points. They include the following:

- **Requirements Verification** -- Confirms that the software and interface requirement specifications are consistent with system requirements in a way that is unambiguous, complete, consistent, testable (or verifiable) and traceable.
- **Design Verification** -- Ensures that interfaces between hardware and software are appropriate and verifies that interface design documents are consistent.
- **Software Test Plan and Software Test Description Verification** -- Looks for effective test coverage. It's important to build and examine traceability tables and document software requirements design artifacts.
- **Implementation Verification** -- Ensures that design is accurately reflected in the implementation and verifies that approved standards and practices are followed for such things as coding, documentation, naming, data dictionary terms, and completeness and correctness of algorithms.
- **Application Verification** -- Allows for the verification of adherence to software test.
- **Plans and Software Test Descriptions** -- A duplication of some tests by an independent party ensures correctness.
- **Process Validation** -- Ensures that client standards and industry best practices are being employed to develop the product or execute the project.

Savings Through Better Detection

But what about the cost of implementing independent verification and validation? “Many senior management

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teams believe that IV&V is cost prohibitive,” says Gates. “Full-phase IV&V increases development costs 10 to 20 percent. This only translates to 3 percent to 4 percent of total life-cycle costs. However, the savings through earlier and more thorough detection can be 200 percent or more than the cost of the IV&V work itself.”

IV&V is said to work best when incorporated into the entire software and hardware development life cycle, from requirements definition to product development to testing. “The benefits derived from employing IV&V are substantial and span the product life cycle,” says Gates, “beginning with improved requirements specifications and ending with a complete, more maintainable application that meets user needs. IV&V can be viewed as an effective risk mitigation strategy that significantly increases the probability of producing a quality application, on time and within budget.”

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