



WHITE PAPER

# **Verify, Validate, Trace, and Test**

Successful Test Management for Systems Engineers

Designing a reliable test strategy requires broad, strategic thinking. The goal of verification is to ensure you release a best-quality system that meets customer expectations as documented in your early design concept and requirements gathering phases. To maximize the value of your test process, test your product objectives early.

## Design a Repeatable, Reliable Test Management Strategy Against Design

1. Provide mechanisms to trace tests to product objectives and their associated costs, risks, and priorities.
2. Engage all stakeholders (customers, developers, testers, requirements engineers, and product managers).
3. Allow large enterprises to coordinate, track, and manage many software testing projects and teams across multiple locations.
4. Make it easy to create, view, and report linkage between requirements, test cases, test data, test scripts, test results, and defects.
5. Ensure your process passes test and requirement data between specialized test tools and requirements repositories in an automated fashion.
6. Support analytics on testing progress and status through dashboards, reports and custom queries—all the data you need for thorough analysis.

## Know the Key Elements of a Successful Test Strategy

### Prioritize Test Cases for Efficiency and Quality

Prioritize tests by relevancy. Without proper planning, testing can be one of the most expensive phases of the development life cycle. To determine test case relevancy, trace test efforts to the documented primary objectives of the product or system and prioritize test plans from there. Managing all levels of test cases and maintaining their traceability to objectives and requirements ensures relevancy and prevents costly tests of functionality that may be lower priority or even changed or deprecated from the product.

While many teams may be tempted to cut corners to save time or money, it is important to balance these perceived cost savings against product quality. In the end, if the product doesn't meet the original objectives, money, time, and effort will be lost, not saved.

### Realize Value From Your Testing Strategy

The reporting and analysis of your test results must go deep enough to realize the value of your test strategy. You need testing to confirm that you've met the objectives of your requirements, and you also need each testing phase to reveal new learnings. New requirements should be captured as part of results analysis, and these should be incorporated into the next phase of product development. You will realize value from testing by incorporating the results of the test

strategy into the product strategy. Testing is the mechanism that proves whether the product strategy is effective.

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### **Test Early and Frequently to Improve Iterations**

Testing in some form at every stage of the development life cycle is worth the effort because it pays off. Although it might be time-consuming to coordinate stakeholders, getting the right feedback at the right moment increases your chances for delivering a high-quality product or system on time.

In the early stages of development, performing customer exploratory testing is the most cost-effective way to make sure your product strategy is on the mark. Moreover, fostering collaboration between developers and the customer early on (an agile best practice) allows for instant feedback and gives development teams the clarity they need to iterate and innovate.

At the end of the development life cycle, conduct system-integration tests to ensure components work harmoniously. Unit tests are beneficial to test various inputs and outputs, performance characteristics and boundary limits, whether you're building a hardware- or software-based system.

## **Trace Your Verification and Validation**

For systems engineers, being able to trace relationships between data types is fundamental.

**The problem:** Multiple levels of requirements, specifications, and verification artifacts all have their own sets of stakeholders who are architecting, performing engineering analysis, designing, testing, or offering feedback and ideas.

**The solution:** Jama Connect simplifies two complicated situations—traceability of data to data and traceability of the people connected to that data.

**The result:** You can analyze the who, what, where, and why of each change and ensure that essential info doesn't get missed. Here's how:

- 1. Connect test cases from problem statements to your requirements and design.** If you can't do this, you can't be sure you haven't overlooked something critical. Anything you miss at any stage can, and usually will, result in revisions that cost you time and money.
- 2. Connect system requirements to business/stakeholder requirements.** Same as above: Miss this connection and you risk incurring unplanned expenses that can ultimately affect the launch date, stakeholders' confidence, and the bottom line—all three if the changes affect hardware.

**3. Improve decomposition.** To make sure that components and subcomponents all come together to make a useful, functional system, you need to relate the lower-level requirements to the higher-level requirements. Mistakes here often lead to delays as you scramble to put the pieces back together and implement late-stage changes.

## Systems Engineering + Successful Test Management = Fewer Errors, Finer Systems, and Faster Launches

Companies can get to market faster when people and data stay in sync on product development activities and deliverables. Jama Connect's intuitive, virtualized review and approval technology shortens the time from ideation to value creation.

### Jama Connect™ Overview

Jama Connect is a single application for your data and supports a broad range of systems engineering capabilities for agile, the waterfall model and hybrid development approaches:

- Requirements Engineering (RE)
- Requirements Change Management
- Test Management (TM)
- Systems Engineering Verification and Validation (V&V)
- Risk Management
- Program/Project Management (PM)
- Variant Management for Product Lines

With Jama Connect, every engineering activity and asset seamlessly connects to related activities and assets throughout the entire system life cycle. Jama Connect captures product-development-related communication in context and brings all stakeholders together in one place for instant and comprehensive insight into what your teams are building and why.

Picture this: Traceable communication. Documented decisions and actions. All product and systems info organized and contextualized from concept to launch. With Jama Connect, it's your reality. [Try Jama Connect](#) and see how we can help you solve your team's systems engineering challenges.

### ABOUT JAMA SOFTWARE

Jama Software® is focused on maximizing innovation success in multidisciplinary engineering organizations. Numerous firsts for humanity in fields such as fuel cells, electrification, space, software-defined vehicles, surgical robotics, and more all rely on Jama Connect® requirements management software to minimize the risk of defects, rework, cost overruns, and recalls. Using Jama Connect, engineering organizations can now intelligently manage the development process by leveraging Live Traceability™ across best-of-breed tools to measurably improve outcomes. Our rapidly growing customer base spans the automotive, medical device, life sciences, semiconductor, aerospace & defense, industrial manufacturing, consumer electronics, financial services, and insurance industries.