



Are YOU Maximizing
the productivity of YOUR team?

Driving Business Improvement through the Function of Test

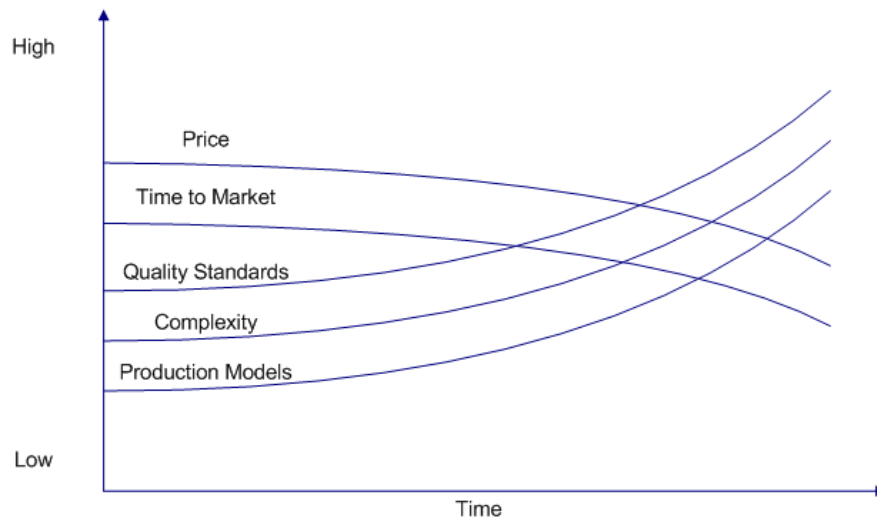
Bob Jacobs - President

Wyatt Meek – Director of Marketing

V I Engineering, Inc.

State of Affairs

The function and implementation of test has changed dramatically in the last 10 years due to trends in the product development lifecycle. In order to stay competitive in a global economy companies have been forced to reduce their prices and find methods to bring products to market more quickly. At the same time the majority of products have increased complexity due to advancements in electronics and software, need to meet increasing quality standards to avoid litigation, and support more models for different consumer demands. These trends are represented in Figure 1.



Source: *Manufacturing Test Strategies, National Instruments Corporation*

Figure 1: Industry Trends

In response to these trends companies have invested millions of dollars to implement improvement methodologies and tools. Examples include Lean Manufacturing principles and PLM systems to eliminate wasted processes, Six Sigma and SPC tools to improve repeatability of processes, and CMMI to improve the product development process. Unfortunately test as a function has traditionally been ignored and few companies have tailored these methodologies to the function and implementation of test and specifically the flow of information and test data between test and other functional groups. VI Engineering is a pioneer in this space and is ready to step up and define for companies the critical role of test and address the hidden issues hindering business results today.

To stay competitive the cost of testing needs to go down and testing needs to be accomplished as quickly as units are created, regardless of whether the unit is a simulation program, prototype, or released product. Test thoroughness, hence referred to as coverage, needs to increase in order ensure quality, but is often difficult due to lack of access points to complex products. Finally test systems need to be configurable to support various models while at the same time eliminating human error in executing incorrect tests.

In addition to these forces there are many others that impact test system development which in turn impacts program cost, schedule, and quality. These forces are summarized in Figure 2.



Figure 2: Forces Impacting Test

All five elements exert pressure on test which can lead test groups in an opposite direction from the corporate objective. To combat this pressure, management must address and implement a test strategy that is aligned to corporate objectives. A relatively small investment is required, with a big overall return to program and product success the expected outcome.

Impact of Test

As discussed earlier there are many ways the test function can adversely impact a program's cost, schedule, and quality. This section highlights a few of the common fundamental problems in companies and the impact those problems have on programs.

The test function in many companies is disorganized and inefficient. Some companies fail to have a defined test group responsible for test strategy and test execution. The results of a disorganized and inefficient test group are schedule slips, excessive development costs, cost overruns, and warranty costs.



For companies with a formal group responsible for the test function and implementation, many problems may still exist resulting in millions of dollars lost within individual programs and months of delays. A few of the more common problems and root issues are highlighted below.

- Unpredictable Test System Development and Performance
 - Missing or incomplete requirements, Incorrect estimates and/or timelines, poor project management, lack of standards and reuse, untrained or inappropriate developers, poor infrastructure and tools, lack of training.
- Test Execution Inefficiency
 - Unnecessary retest due to poor communications between design and test functions, products not designed for testability
- Low Asset Utilization
 - No asset ownership, no central asset tracking or utilization metrics, lack of asset standards
- Lack of management systems and metrics
 - Limited and inaccurate status reporting, no central system to track efficiency, silo-based functional teams, prioritizing tools missing or dependent on individual judgment rather than overall system view
 - Inaccurate, untimely or missing information flow about test needs causing delays or tests of no or limited value

Ultimately, these issues are driven by a lack of test strategy and management visibility into metrics. As a result no one has responsibility to look at efficiencies in the area of test and make the necessary changes. No data exists to prove ROI cases, judge asset utilization, measure impact of obsolescence, improve or even detect inefficiencies in development, measure reuse, or challenge and define need for test. Test should be tied to corporate goals but is often driven by technology concerns of engineering only.

Driving Change

V I Engineering has been concerned with the overall effectiveness of our clients' test activity and constantly seeks ways to add value to clients by bringing more attention to the test function. Ultimately, our objective is to provide the best value to our clients by accumulating the Best Practices we see in industry and defining plans for our clients to move from whatever state of management oversight of test they are in to a more advanced state. We do this with the following organizational approach to test.

V I Engineering's Engagement Approach

By providing services across these four levels, V I Engineering can understand the different management, engineering, and human issues impacting businesses and drive results. The different ways V I Engineering engages customers are represented in Figure 3.

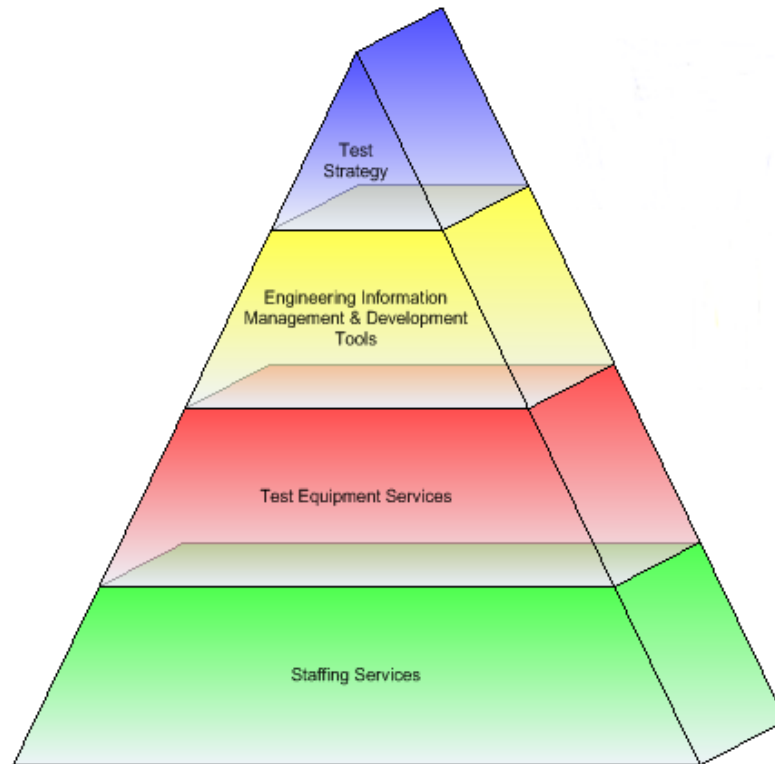


Figure 3: VI Engineering's Offerings

VISTA Test Strategy provides management level consulting focused on test strategy assessment, definition, and implementation. It usually begins with a GAP analysis and planning of improvement initiatives. Implementation is tracked through metrics with the impact put into a program perspective. The goal is to implement business level decision making in the area of test through implementation of a Balanced Score Card (BSC) system.

Engineering Information Management consists of the tools which enable automated test workflow and metrics reporting. This may consist of web based test management applications to measure and improve efficiency of test system development, improve test resource utilization, and maximize test data leverage.

Test Equipment Services delivers systems, subsystems, and software to meet each customer's product testing requirements. Projects follow a formal development process based on CMMI and PMI principles. VI Engineering serves as a relief valve for many customers with internal test groups in times of high demand.

Staffing Services provides demand based, pre-screened staff to support on-site test engineering requirements. Staffing includes both contract and permanent placement individuals after a heavy screening and matching to job requirements. Because of our broad reach, we have a large network of resources, including passive job seekers that others don't find. This service is appropriate when clients approach "Core Competency" issues and determine optimum staffing levels.

Getting Started

One of the best ways to get started is through a GAP analysis. A GAP analysis provides an outsider's perspective to the current test function and implementation. The GAP analysis also provides a mechanism to prioritize improvement initiatives. Areas for possible investigation by a GAP analysis are in following table.

Category	Sample Topics	General Description
Business Factors	<ul style="list-style-type: none"> - Known Issues: Cost, Schedule, Quality - Recent Failures - Initiatives - Metrics (i.e., Scoreboard) 	This category is focused on the business aspects of "test" within the organization. Typically the perspective and feedback from Project/Program Managers and above.
Test Approach	<ul style="list-style-type: none"> - Test Strategy - Test Methods - Plans/Cases/Procedures - Automation - Repeatability 	Within this category, the technical aspects of the test approach are examined. It includes review of the appropriateness of test methods, consistent application, repeatability, etc.
Resources	<ul style="list-style-type: none"> - Utilization: People, Equipment, Facilities - Reuse of existing approaches, designs and assets - Adequacy to meet Test Strategy - Training 	These topics look at the resources which are available to implement the strategy. It examines both the adequacy of the resource and the ROI factors including utilization of people and capital equipment.
Process	<ul style="list-style-type: none"> - Requirements Development & Measurement - Configuration Management - Change Control - Project Planning & Control 	Specific process areas are driven out of organizational issues and maturity levels. These are very typical areas that require additional attention
Information Management	<ul style="list-style-type: none"> - Automated Workflow - Data Accessibility - Analysis Routines - Infrastructure 	Many of the topics in this area support other categories and drive reduced manual effort with greater repeatability.
Quality	<ul style="list-style-type: none"> - Regulatory Requirements - Audit Finding - Lessons Learned 	Examination of factors that include process compliance based on regulatory, industry and/or company requirements. Also reviews feedback mechanisms from ongoing lessons learned and Corrective Actions (CA).

Conclusion

VI Engineering's tiered engagement approach with customers provides a comprehensive view of each customer's unique test engineering challenges. While the challenges facing each customer may vary the underlying vision is usually the same; On Time and On Budget Product Launch. Three of the more common initiatives to drive results that impact the overall product development lifecycle are Maximize Accessibility and Leverage of Test Information, Predictable Test System Delivery, and Increase Test Asset Reuse.



To manage any improvement initiative it is important to have metrics in place to track progress. Sample areas to track the impact of test include quality statistics, the financial impact of rework, and product launch delays due to test system delays and lack of information. For customers developing test systems internally it is important to baseline development effort for common tasks. To get the most out of current systems, resources, and information, it is important to measure utilization and understand the financial, quality, and schedule impact of each area.

V I Engineering, through our VISTA consulting, offers the broadest and most comprehensive service toward driving business improvements throughout the test function. In addition, we also offer implementation services for infrastructure with web enabled portals into many of the applications called for by a comprehensive Test Strategy. Finally, we offer test development services and staffing services to clients for short term or long term partnering situations.

Sample Results

The intent of V I Engineering is to become a go-to strategic test partner that understands the business and technical issues facing our clients today and can deliver improvement for present and future.

Below are a few results from past initiatives:

- A technical center comprised of 25 engineers saved \$100k/year through the automation of test request, configuration, and data management processes through a web based system.
- A defense contractor saved hundreds of thousands of dollars by implementing a common software and hardware architecture for all test phases of a program.
- A design validation test group cut test system development and maintenance costs by 60% through training, development of a reuse strategy, and software process tools.
- An R&D simulation lab reduced system wiring configuration and validation time for complete vehicle simulation testing by 50% through a web based configuration system and unattended validation.
- An engine manufacturer achieved a 90% decrease in data analysis time by moving from manual analysis on multiple platforms to implementation of common data formats, naming conventions, a central database, mining utilities, and standard algorithms. The resulting system was distributed across 13 facilities.
- An electronics company was able to achieve the fastest time to market for a new product launch through concurrent product and test system development with V I Engineering.