

► Manufacturing organizations can use quality data combined with analytics to test smarter, significantly improving overall throughput and product quality
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USE ANALYTICS TO TEST SMARTER

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► Do you remember the time before Google Maps or GPS? You know, when you manually wrote down directions, got out a paper map, and hunted for the right street? You worked with a rough estimate of arrival time, and the only option to arrive earlier was to drive faster.

Map services today are based on a comprehensive knowledge of driving habits and typical traffic patterns, as well as information that affects those habits—maps of every street, road, and alleyway, as well as real-time data from traffic sensors, accidents/slow-downs, route diversions, and crowd-sourced input. The time savings from smarter

route adjustments far exceed your ability to drive faster, and consequently, avoid those costly speeding tickets. Why does it work? Because it is comprehensive, organized, accurate, and accessible.

In the same way that these factors work to improve day-to-day activities like navigation, they can also be applied to product testing. Manufacturing organizations can use quality data combined with analytics to test smarter, significantly improving overall throughput and product quality. In many industries, the need for digital transformation in product testing is business-critical as product complexity increases, and time-to-market windows get smaller.

Much of the focus is on faster execution times for individual tests. While that is important, especially for high-volume manufacturing, you must go beyond execution speeds to garner maximum value. To achieve test operations excellence, you need to (1) fail fast/fail early, (2) optimize throughput, and (3) utilize both historical and real-time accurate and reliable data.

The key is to deploy enterprise-grade test operations software to centrally manage test equipment and organize test data across all phases of testing. This provides the foundation necessary to apply analytics to optimize tests and equipment utilization to improve overall product throughput.

Fail Fast, Fail Early

Products should not fail; applications should not crash. That is what we all want. However, the reality is sometimes they do fail and crash. The goal is to fail early and avoid false failures (e.g., false positive, false negative, etc.) because the longer it takes to identify a failure, the longer it takes to fix and the more it costs.

For example, correlation analysis of test failures and test times can force test sequence changes so high potential failures occur earlier and faster. This will reduce time wasted running through most of a test sequence before discovering a faulty unit. Furthermore, retest procedures can be optimized to only execute required tests, versus re-running a full test.

Another consideration is to eliminate tests that never fail or are obsolete due to product patches. Tests may be completely avoided if anomalies are detected in data from upstream assembly processes. Eliminating any source of process failure—within the test process as well as looking holistically across the production process—is key. In today's complex business environment, where things are constantly changing, speed of execution must be balanced with optimal execution.

Optimize Throughput

Automated test systems generate tons of data from test sequences, parametric test results, and complex measurements. Over time, automated data analysis of trends can deliver the insights you need to optimize your throughput and eliminate bottlenecks. For manufacturers, production throughput can mean the difference between meeting delivery schedules and losing customers to the competition. Don't confuse output with throughput. Output is your total production, including scrap, rejections, and stockpiled products, while throughput only counts the parts that are successfully delivered and accepted by the customer.

One of the most effective ways to improve throughput in manufacturing is to analyze your test process for bottlenecks carefully. This includes, but is not limited to, understanding test station and instrument utilization to determine if there are opportunities to increase throughput by

parallelizing tests or redistributing existing assets.

Analyzing unplanned downtime due to improper hardware configuration, software versions, or equipment calibration kills manufacturing productivity and efficiency. It is essential to have a system in place to track overall system health and proactively notify test engineers and technicians of any imminent issues with test equipment to plan for maintenance and repair properly. Once identified, you can eliminate the bottlenecks, so they no longer cause throughput delays.

Smarter Testing Through Data Analytics

The foundation to fail fast and optimizing throughput is data. But it goes beyond test results data. Every process generates data—from test station health and operator indicators to test status and performance results—that can be used to your advantage to identify patterns in your process that introduces inefficiencies. As an example, tracking asset utilization and availability data in real-time can optimize capital expenditures while making your organization more agile and responsive to business needs. If you take it one step further and start utilizing historical data, then you can identify patterns and determine where you see process variations.

This can lead to insights that tell you things like where you have most unplanned downtime and what the trends leading up to that looks like, if additional training of operators is needed, and how your capacity has changed over time and where it is going in the future. To truly excel in using your data, you must bring together design engineers, test engineers, and data scientists to identify and implement analytics or machine learning algorithms to provide data-driven decision making and smarter testing. This is an iterative process as you determine the impact on key business metrics.

Getting Started

As market dynamics increase the pressure for manufacturing to deliver new products faster at lower costs, the status quo is no longer a viable option. Smarter testing through data analytics can

provide a competitive advantage. But how do you start? As with any big initiative, you need to start small because boiling the ocean never works. But the right proof of concept can provide a key transformative example for your organization.

First, identify a few key business metrics to improve by quantifying costs and inefficiencies of current processes. Smarter testing can obviously increase throughput and yield, but it can also reduce scrap costs, decrease lead times and inventory, and improve gross margins. Next, assess the current state of accessing data in terms of quality, frequency, and accessibility.

Many organizations have highly disparate data sources and almost no visibility to test equipment compliance and utilization. Data analytics is only as good as the quality of data, so it is critical to deploy test operations management software to centrally manage test assets, enforce data standardization, and create a robust data pipeline. The key is to move from inflexible platforms and workflows to “permanently agile” ones.

Operations Management Software

NI SystemLink is an example of test operations management software to connect your test environment to utilize test and measurement data to uncover actionable insights. SystemLink provides the visibility you need to remove bottlenecks across the test workflow, from pre-test coordination and preparation and automated test execution to post-test analysis and proactive action.

The growing trends of big data and machine learning have already disrupted consumer markets. Amazon and Netflix disrupted traditional brick and mortar companies with the internet, but their use of big data analytics to serve customers faster and smarter creates a significant competitive advantage. Test organizations have the same opportunity to leverage the untapped potential of test data to evolve from a necessary cost center to a significant competitive advantage. The question you need to ask yourself: will you be leading this revolution or become a casualty? [E3](#)