



7 ways a test engineering platform can help you cut test costs in 2009

Whitepaper

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THE EYE OF THE STORM

Today's headlines shout a story of economic crisis. Spending is lowered, revenues are shrinking, and government leaders are implementing urgent stimulus packages. In this environment, manufacturers are faced with the important challenge of identifying what costs to cut, in order to offset decreasing profits. The challenge: where to reduce spending and what impact will it have on the bottom line?

Making investment decisions or initiating cost-cutting measures involves many different parts of a company, and making the *right* decisions is essential to helping manufacturers stay on top during an economic storm. A study by McKinsey and Company of the 2000-2001 recession looked at the companies that stumbled and the ones that benefited from sluggish times to make gains on their competitors. The findings demonstrated that close to 40% of industrial companies lost their leadership position, falling from the first quartile within their sector, while a third of leading US banks met the same fate.

This paper will discuss costs incurred by OEMs, relating to the test and manufacturing division of a communications or electronics OEM. Most importantly, it will examine how technology can facilitate the decision-making process to bring down these costs.

A BETTER WAY TO IDENTIFY MANUFACTURING AND TEST COSTS

An organization's test and manufacturing department incurs costs related to the following four key areas:

1. Test development
 - Cost of the test engineering team
 - Cost of the tools used by this team
2. Supporting manufacturing
 - Data acquisition, reporting, and analysis—
 - Remote manufacturing management
 - Root cause analysis and troubleshooting
3. Manufacturing capacity
 - Number of test stations, their availability, and utilization
 - Test cycle time and system uptime
4. Production and quality
 - Low yield
 - Repair and rework, or Out-of-the-Box Quality (OBQ) issues

IN YOUR OPINION, WHAT IS THE MOST EXPENSIVE AREA OF TEST AND MANUFACTURING?

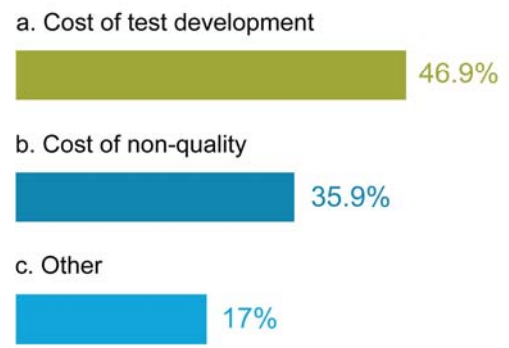


FIGURE 1 – COSTS INCURRED AS A RESULT OF MANUFACTURING AND TEST

Software technology is the backbone on which an organization can map out the reality of its test environment. It can help a company automate manual tasks for greater efficiency, to achieve control over test flow and test processes, and to improve product quality in order to meet OBQ goals. In addition, it gives these companies a heightened visibility over operations, and can help them identify where resources can be optimized.

How can you determine whether now is the right time to introduce new software into your testing processes? Today's economic environment is the *ideal* climate to investigate new technologies: it is a time to trench in and understand the fundamentals on how your business spends money, so you can identify how and where your money is being allocated and regulate your spending practices. It is the perfect time for management and their teams to fine-tune their decision-making habits.

A PLAN FOR CHANGE: ENTERPRISE TEST SOFTWARE (ETS)

Enterprise Test Software (ETS) is a unified platform that will simplify many of the areas associated with test and manufacturing. It will help you automate your test processes to achieve the efficiency, visibility, and control on a company-wide level.

An ETS can be used to build a deeper understanding of your product and test process quality, over and above the capabilities offered by a manufacturing execution system (also known as MES). It provides strong reporting capabilities and can be considered as an Operations Decision Support System (ODSS).

ETS solutions have existed since the 1980s, when high-end electronics OEMS identified the need to manage immense amounts of data being produced in manufacturing. Furthermore, with the growing trend to outsource manufacturing to low-cost countries, they needed a way to maintain visibility over far-flung operations. Back then, there were no available off-the-shelf ETS solutions, and companies had no choice but to design in-house platforms. This led to the birth of the ETS, which has been evolving ever since.

ETS application areas

A comprehensive ETS solution should cover 5 test applications areas:

- 🕒 **Product and test data management** – Managing product families, lines, variations, Engineering Change Orders (ECO), and test results
- 🕒 **Test automation** – Automating pre-functional, functional, and system test
- 🕒 **Manufacturing process control** – Routing based on pass/fail and fail & repair information
- 🕒 **Multi-site collaboration** – Exchanging data between manufacturing sites
- 🕒 **Test asset management** – Managing test equipment

Less than 5% of OEMs use an ETS solution that covers all 5 areas. Unfortunately, many of these companies still rely on paper-based data management—often using Excel for reporting—and relying on multiple applications and databases to achieve these tasks.

Thankfully, comprehensive off-the-shelf ETS solutions are available, placing enterprise-wide test efficiency well within reach.

TIP 1: INCREASE TEAM EFFICIENCY THROUGH A CENTRALIZED REPOSITORY FOR INBOUND AND OUTBOUND TEST INFORMATION

What is inbound and outbound information?

Manufacturing and test engineering challenges are linked to the amount of data that has to be managed. A lot of this data is created during the test development phase, though it is also needed during the manufacturing phase. This means that an ETS solution has to manage and store a large amount of data, while providing user-friendly capabilities to analyze and interpret it.

Let's now take a look at why centralizing all inbound and test information—and managing it within a single application—is the best way to gain test efficiency.



FIGURE 3 – INBOUND / OUTBOUND INFORMATION

Benefits of centralization

First off, by asking your team to configure and use an off-the-shelf solution rather than design and build one from scratch, you will be able to outsource the cost of R&D and support to a third party. Similarly, training and documentation becomes a lot simpler.

Another benefit of centralization is the ability to design a software management layer, one that can automate the collection and manipulation of thousands of files, saving weeks of engineering time! This layer also creates a closed-loop environment, thereby limiting the

possibility for human error. In short, it gives you unquestionable correlation between your inbound and outbound data, which inevitably translates into greater product quality.

With this new efficiency, engineers will be able to focus on their core objective—utmost product quality. Managers will be able to decrease the cost of test and the Cost of Non-Quality (CNQ), to make operations a more efficient machine.

TIP 2: SPEND LESS TIME CREATING REPORTS, AND MORE TIME REACTING TO TEST RESULTS AND MANUFACTURING TRENDS

Reporting in the Information Age

Even though the Industrial Age is well behind us, we still sometimes use the outdated methods we inherited from our mentors. Today, information is shared and consumed at the Gigabyte level, and we need tools to filter out the information that is important to us. Decision dashboards, capable of giving instant snapshots of negative and positive trends, will help us keep in step with our high-bandwidth world.

Imagine putting yourself in a position where you can sit in the driver's seat and focus on steering the company in the right direction...rather than shovelling coal in the furnace. Again, the goal is to be able to ship quality products, improve efficiency, and decrease costs.

The following diagram shows data being imported from multiple databases into a pre-defined decision dashboard.

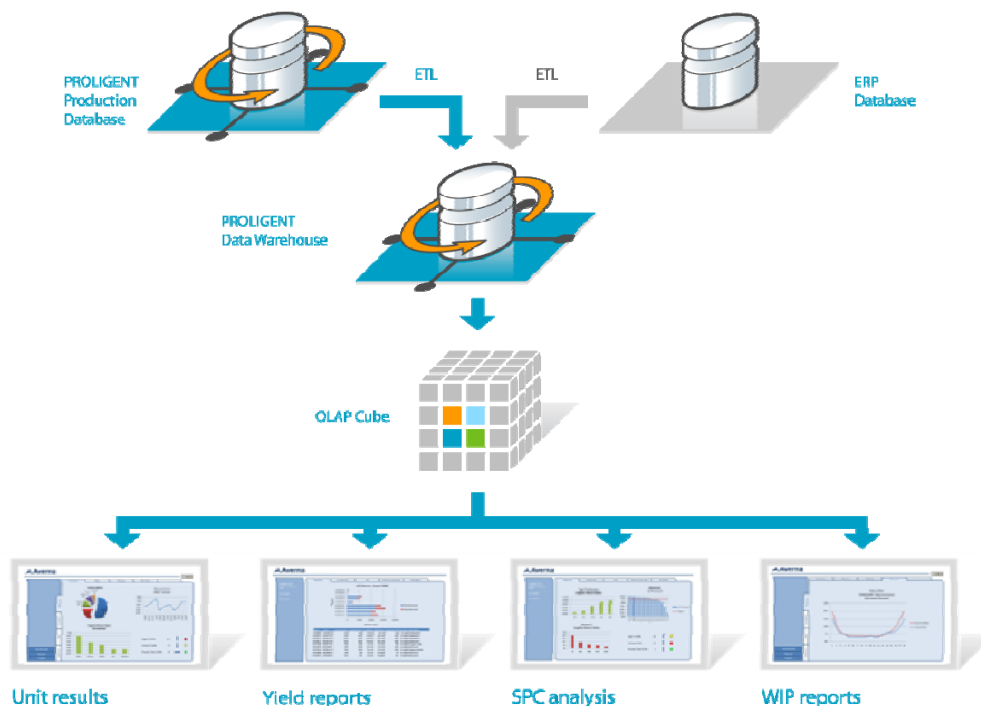


FIGURE 4 – PROLIGENT DECISION DASHBOARDS

By using Information-Age technology standards such as Online Analytical Processing (OLAP) database front end technology, you finally have a way to analyze a large amount of information quickly.

Benefits of pre-defined reports

What good is quick access to data if company stakeholders do not agree on the delivery format? Reaching an agreement on standardized corporate reports built on clean and trustworthy data is key. There should be no argument as to who has the right information.

An ETS solution gives you access to automated, out-of-the-box reports such as Unit Results, Yield Reports, SPC Analysis, and WIP Reports. You can pre-define them to receive information on a daily or weekly basis, as well as customize your views. In addition, you can be proactive on trends by setting alarms on key indicators such as SPC or CPK. Because you and your team will not have to crunch, prepare, and send the reports, you will be able to quickly analyze and respond to situations, and stay on top of your game.

Our experience shows that the average test engineer will spend almost a month every year arranging test data and creating reports, and management sometimes has to wait precious days until a report is generated and presented. Often, multiple revisions are required until all data has been cleaned up. A solid ETS solution makes these issues a thing of the past.

TIP 3: CONTROL COSTS ASSOCIATED WITH REMOTE TEST MANAGEMENT

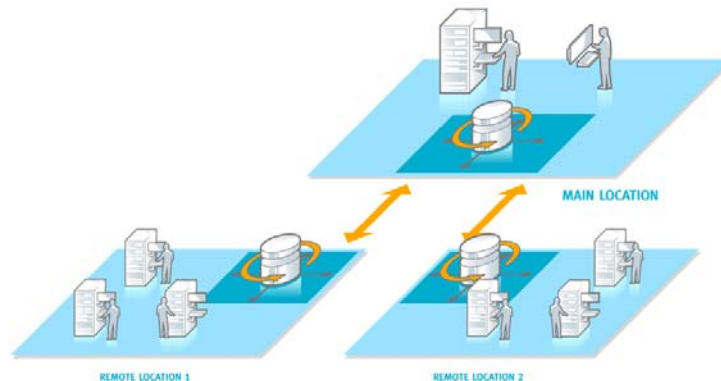
Remote manufacturing, as much as it is supposed to help you produce at a lower cost, has its challenges. There is always the danger of losing control over your manufacturing processes, and training for operators and repair technicians at remote sites can be cumbersome. In addition, you may experience a loss of “tribal knowledge” (first-hand test and manufacturing know-how shared on an informal basis) due to distance and lack of documentation.

In order to tackle these challenges, maybe you send a travelling “swat team” to multiple manufacturing sites, or perhaps you have installed permanent employees in these remote locations. Either way, it is a costly venture that incurs unnecessary costs.

A window into manufacturing

An ETS solution will minimize, if not eliminate, these costs, while ensuring seamless communication with all manufacturing sites. This delivers the control and visibility needed to obtain remote test data in real-time, and to synchronize updates on all test stations, wherever they may be. It eliminates the need for a Virtual Private Network (VPN), or any other solutions.

Enterprise Test Software will help you achieve more from a distance. For example, you can decide to push test and manufacturing updates to your test stations from afar, gaining greater visibility over your work in progress, and consequently decreasing the need for supplier audits or on-site debugging.



With a window into manufacturing, you will have better access to the goings on at remote locations, and be better situated to improve your company's competitive edge.

TIP 4: BOOST PERFORMANCE OF YOUR CONTRACT MANUFACTURER BY UNDERSTANDING ITS STRENGTHS AND WEAKNESSES

The choice of one contract manufacturer (CM) over another depends on many factors, but at its core, the decision is based on whether the CM ships on time, at lowest cost, with the highest quality possible.

The above is a loaded statement, with quality being perhaps the most difficult variable to evaluate, at the same time having the largest impact on the decision. Consider the cost and impact of shipping DOA products to your most important customer.

How does an OEM validate the performance of their CM? They rely on real data and analytics, for example:

- 📍 Yield per station or site
- 📍 Cycle time per station (test, repair, etc.)
- 📍 Work in Progress (rework pile)
- 📍 First Pass vs Second Pass yield

Armed with this information, an OEM is in a position to effectively assess the performance of their CM and determine the best measures to undertake to boost their performance.

OEMs and CMs are equally motivated to improve performance. Reliable metrics provide an OEM the insight required to understand realities of production, giving them the insight to evaluate the strengths and weaknesses of their CM. This empowers them to influence the performance of their CM for the best possible outcome: quality products at the lowest possible cost.

Whereas an OEM has the depth of technical knowledge, and understands test strategies for their product, a CM provides manufacturing competency. As such, an OEM must have complete control over their test environment, as it affects their product. An ETS will provide details over and above what a CM can offer with its MES system, drilling right down into unit specific information.

If working with multiple CMs, the information provided by an ETS is even more crucial: it is possible to gather information from all sites, correlate quality, and pinpoint process or product issues. An OEM is in a better position to maximize the performance of their CM by guiding them in either direction. Likewise side-by-side comparisons make it possible to outsource manufacturing to different locations, based on differing strengths.

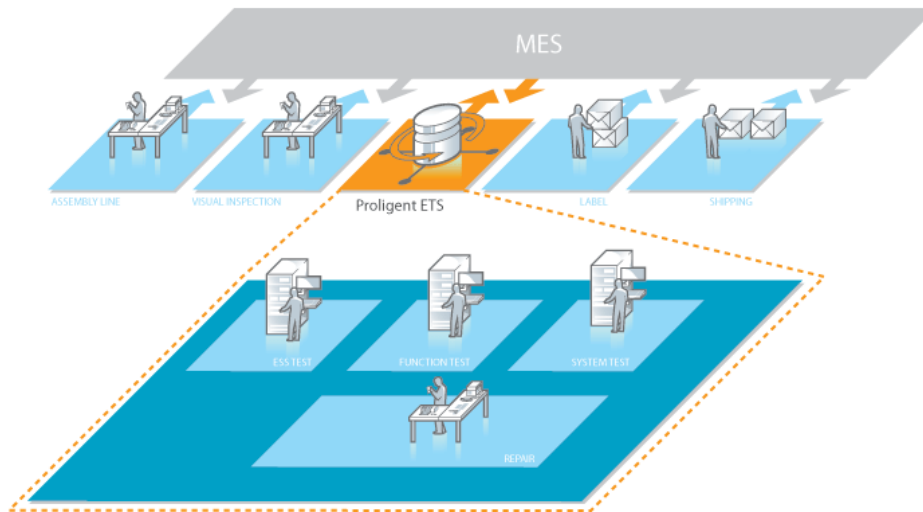


FIGURE 5 –PROLIGENT ETS FACILITATES CM MANAGEMENT

An ETS delivers other benefits: it will help an OEM gain independence from their CM, and facilitate transition in times of need. Ultimately, by keeping control over your test data, an OEM can not only boost the performance of its CM, but it can also improve its negotiation power when times are tough.

TIP 5: MAXIMIZE EQUIPMENT INVESTMENT WITH BETTER TEST STATION UTILIZATION

Test equipment is expensive. To maximize this investment, an OEM needs their test systems running with maximum throughput at all times. The ability to visualize and monitor capacity is therefore essential.

An ETS provides the infrastructure to define, manage and monitor test stations, no matter where they are in the world. All of the test stations are connected to a central server giving an accurate snapshot of production capacity for the network of systems, as well as the throughput for individual test stations. It is possible to know details like up-time, test times and down-time. The value of this capability as applied to local test stations is amplified when managing remote test stations. Imagine having immediate access to this kind of information from test stations deployed at several locations around the world.

Maximizing test station utilization also has implications in terms of testing your products in parallel, or sharing instruments between stations. Enterprise Test Software makes it easy to configure systems for parallel testing, and provide detailed production reporting about the results.

The reports provided by an ETS also provide valuable information about specific test equipment: Reports will aid in determining when you need to invest in new equipment to sustain a production ramp, or when older equipment can be reused to support new product introduction.

TIP 6: LIMIT SHOP-FLOOR IMPROVISATION TO INCREASE QUALITY CONSISTENCY AND REDUCE RMAS.

The costs associated with non-quality can be difficult to assess in real terms, however, the impact is clear. From RMAs and cost of overall Cost of Goods Sold (COGS), to brand recognition, the effects can be immediate.

Shop-floor improvisation introduces significant risk into the manufacturing and test process. When an operator creates their own test flow, the OEM no longer has control over the process which puts into question the total quality of the end-product. It is essential for an OEM to implement a system that ensures their manufacturing facilities are following your business' best practices. An electronic shop-floor control system forces human operators to follow the rules, and produce better quality products.

Furthermore, by integrating these functions with your ETS you will introduce the ability to correlate information between test definitions and repair actions, enabling you to build a statistical guide for shop-floor technicians. This is valuable information that will help you bring down expensive repair loops, or limit DOA products.

The final outcome of any test engineering activity is to help bring the quality level of your product and test process to a final state, a state where the test engineer is no longer required to support the product. Since you are spending money in the repair loop, you should own the repair data to improve the repair process. Remember, this data is your. The cost associated with troubleshooting and repair must go down, and this includes making sure that inventory is not spending weeks in the repair loop due to a lack of efficiency or lack of troubleshooting knowledge.

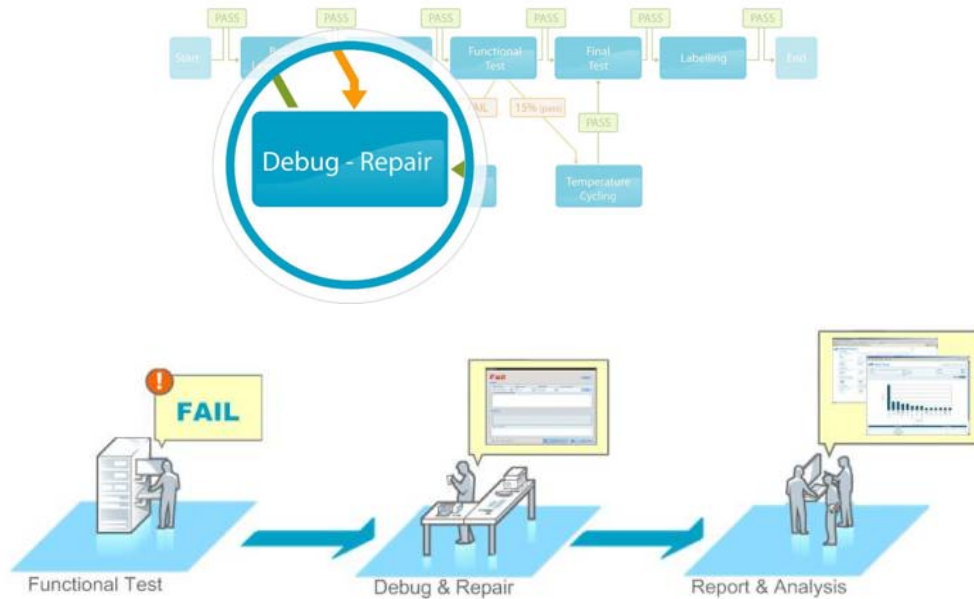


FIGURE 7 – PROLIGENT FAIL AND REPAIR LOOPS ENABLE TEST FLOW AUTOMATION AND CONTROL

In the longer term, integrating an ETS will support test engineers, helping them be more effective in improving the test process. They will have the information they need to proactively address product issues, before the product is shipped, and thereby reduce the high cost of RMAs. Furthermore, test engineers can spend less time supporting existing product versions, spending instead more time and attention planning for the next release, or learning new technologies or planning test processes for the next product to be introduced.

All this contributes to improving product quality, and reducing the high cost of RMA.

TIP 7: IMPROVE TIME-TO-QUALITY BY BEING PROACTIVE TO MANUFACTURING AND TEST ISSUES

Above, we presented the amount of time that it takes for a product to reach its final quality level. This is known as time-to-quality. Here we would like to present the savings that can be had as a result of time-to-quality.

Over the course of the product lifecycle, at the end of which we want to achieve product quality, many costs are incurred:

- 🕒 Development and deployment of Engineering Change Orders (ECOs)
 - 🕒 Developing new test software versions
 - 🕒 Modifying existing test stations
 - 🕒 Training manufacturing staff
- 🕒 On-site manufacturing repairs
- 🕒 Out-of-the-box quality issues related to shipping, replacement and customer confidence

- Root cause analysis for product improvements ... and guidance for new ECO development – which brings us full circle to the first bullet.

In short, the costs associated with quality are expensive – the costs of non-quality even more so.

An ETS enables quick access to information that speeds up the above process, due to several important factors:

- Centralized Source of Information
- Single Software Application
- Closed-Loop environment
- Real-Time access to data

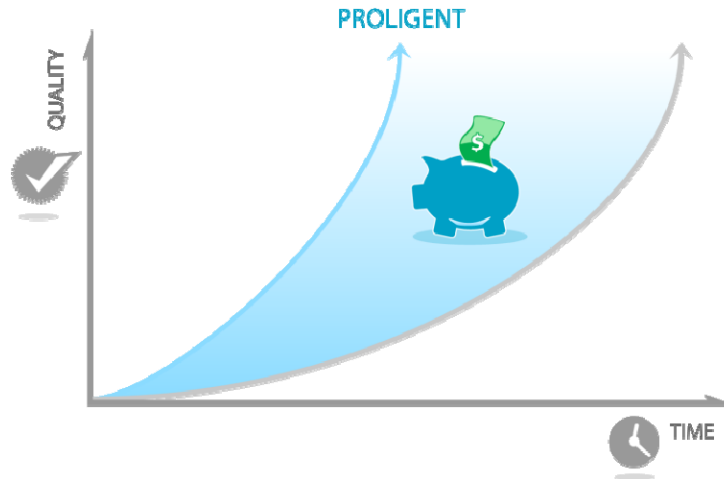


FIGURE 8 – PROLIGENT ENABLES TIME-TO-QUALITY SAVINGS

An ETS will improve the speed and accuracy of your analysis by providing clean, real-time data in pre-defined reports & dashboards. The analysis phase will enable you to quickly define areas of improvements, which will lead you to develop and deploy new ECOs faster to all of your manufacturing sites. The release of these ECOs will help your improve your first pass yield, and improve your quality level.

By pro-actively acting on manufacturing issues, you will improve your time-to-quality, and cut the costs associated with this process.

IN CONCLUSION

We are in the eye of an economic storm which forces us to do as much as before or more, but with less human and material resources. Enterprise Test Software will help you weather this storm by becoming more efficient, and by reducing costs associated with manufacturing.

Many companies choose to develop an ETS solution internally. It starts off as a small project that will grow in proportion of the volume of information that needs to be managed. It requires significant resources to build and maintain, and attention is focussed as much on the platform, as on the test coverage itself. By investing in off-the-shelf, a company can benefit instantly from out of the box functionality. All attention is then focussed on test coverage, time-to-quality, yield improvement and so on. This also give you access to a highly skilled 3rd party competencies which could act as an accelerator in times of need.

ETS like Proligent are developed and maintained by a team of dedicated software architects, database specialists and process specialists. It delivers all of the features listed above, in a ready-to-use, off-the-shelf platform.

We encourage you to investigate Proligent in more depth, to learn how it can be applied to your own manufacturing practices and help you achieve your financial goals for 2009.



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