

eBook

InfinityQS[®]
Quality Re-imagined

Quest for Quality

9 Resources for a
Successful Journey



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9 Resources for a Successful Journey

Quality improvement is a journey, not a destination. And no matter how long you've been on your quality journey, seeking continuous improvement is a must for organizational success, from the plant floor to the marketplace. In that spirit of continuous improvement, we've assembled nine resources to further your successful journey.

Whether you need to focus on high-level aspects of quality management or on solutions for day-to-day quality challenges – it's all here to help you and your quality team. From using quality metrics with the C-suite and understanding the value of an enterprise quality hub to using mobile technology and cloud computing, you'll gain new management insights. Learn about in-process sampling strategies, equipment and vendor integration, presenting data formats by role, moving from paper-based to electronic quality systems, and selecting mobile data collection devices to solve your daily quality challenges.

Any successful journey requires planning, learning, and mapping out a strategy. Use these resources to continue your quest for quality now!

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1. Prove the Value of Quality Through Meaningful Metrics

Article first appeared in [Manufacturing Business Technology](#) as “Measuring the Impact: Quality Metrics And Manufacturing Intelligence.”

By Steve Wise, Vice President of Statistical Methods

What if you could report to your board room that reducing scrap has increased your company's profit by 10%? Or what if you could show plant managers that exactly 15 defects occurred within a particular shift?

Because quality affects every level of an organization – from the plant floor, to the C-suite, to the customer – it is far more than a cost of doing business; it is a game changer. However, not everyone in your company may understand the true value of quality, which may hinder your ability to justify investments in improvement projects.

To prove the value of quality, you need to increase the visibility of quality by providing the right quality metrics to the right people in the right format. When visibility is applied properly, it is possible to turn manufacturing data into actionable information, or Manufacturing Intelligence, which can both demonstrate the value of quality improvement projects to upstream management and result in ROI.

Given today's manufacturing challenges, quality metrics are more important than ever. For one, production is rarely a single-site operation and manufacturers rely on suppliers all over the globe to provide quality products. Other complexities, such as compliance with government regulations, siloed data, and the focus on customer satisfaction, lead manufacturers to rely on quality metrics to control and improve their products.

The first step in proving the value of quality is understanding what each department or staff member sees as valuable. To identify what data to collect, get input directly from each level of your organization, from the top down, and find out what metrics are important to them. For example, executives will want high-level summaries of data, such as percentages and raw data values, which help them determine areas of improvement, like waste reduction. However, plant managers require metrics such as Overall Equipment Effectiveness (OEE) or number of defects in a particular timeframe, which help identify costs and plant performance efficiencies. Operators also rely on OEE as well as other, more targeted metrics like product-specific features and alarms for out-of-spec events.

Once you have gathered insights from the various departments, how do you know which data needs to be measured? Metrics must be meaningful, and there are good metrics and bad metrics. Good metrics must be bi-directional, and serve customers both upstream and downstream. They should also be objective, customer-specific, and assist decision makers with real-time and historical data. Also, don't worry about getting the perfect, high-end set of metrics right away – collect data, but make sure you challenge it. Identify where specific metrics fit in the process; if they are deemed no longer useful, there is no need to continue to measure them. Remember that just because something can be measured doesn't mean it is important.



1. Prove the Value of Quality Through Meaningful Metrics (continued)

With the right blend of three things — people, process, and technology — you can ensure the correct implementation of your quality system and quickly begin to realize ROI.

People: Be diligent in your efforts to demonstrate the value of quality to all departments of your organization; focus first on upper management and recruit the highest-level manager to be your champion. This person can help relay the importance of the quality systems to others at the company. Just as important, ensure buy-in and agreement from your plant operators. They are the people who will deal directly with collecting the data on a daily basis, often before anyone else sees this information.

Process: It is important to remember that you won't solve everything overnight, so focus on getting results within a manageable scope before expanding to other areas. Invest the time and resources necessary to set a standard for data collection up front and follow it. Identifying areas that will show fast, significant improvements will serve as quick success stories that add to your credibility.

Technology: Ideally, your quality system should be able to aggregate data from different sources into one, single location, or hub. With a centralized repository, rather than silos of disparate data, it is easy to collect, analyze, and report on meaningful, real-time quality data that delivers Manufacturing Intelligence. In addition, systems with mobile data collection and analysis capabilities offer extra value and convenience to executives on the go.

Because each department's actions affect downstream successes, it can be beneficial to look for problems and areas for improvement beginning at the bottom, and work your way up to the top. Rather than focusing right away on corporate goals, look first at manufacturing processes. When you capture and promote meaningful data and keep it current, it is easier to "sharpen the saw" of quality and move these metrics up the chain to correlate with corporate goals. Showing upper management metrics that could help increase the organization's overall profitability, such as cutting costs by preventing overfill, adds credibility to your quality program and proves the value of improvement projects for everyone involved.

2. Total Quality Management Demands an Enterprise Quality Hub

Article first appeared in [Quality Magazine](#) as “Total quality management software provides a centralized quality hub.”

By Michael A. Lyle, President and CEO

Whether using ERP and MES systems, or even Microsoft Excel, many manufacturers rely on data from numerous disparate sources to provide the information they need to create a quality product. Often, one piece of the puzzle is missing: a centralized quality hub that collects and analyzes data from these various sources using Statistical Process Control (SPC) principles.

The American Society for Quality (ASQ) defines total quality management as “a management approach to long-term success through customer satisfaction.” Without a doubt, customer satisfaction has evolved from merely a good practice to become the driving force behind the philosophy of total quality management. Factors such as stricter regulatory compliance and the customer’s ability to leverage product quality as a competitive differentiator contribute to the need for total quality management. With the ability to collect and analyze real-time data in a single repository, or centralized quality hub powered by SPC, manufacturers can obtain true Manufacturing Intelligence, and therefore achieve enterprise-wide, total quality management.

Taking a Leap with Technology

GSI Technologies LLC (Burr Ridge, IL), the intelligent printing partner for Functional Printing and Industrial Graphic Products, recently discovered the value that SPC and a centralized quality hub can provide. GSI was using a homegrown SPC program that made it difficult to aggregate data from different sources. Although GSI had relied on the homegrown software for years, it realized that a more sophisticated platform could support long-term business growth when one of its customers expressed a need for more in-depth reporting and analysis to meet regulatory compliance.

Determined to achieve total quality management, GSI sought a flexible SPC platform that would allow for continuous improvement and provide advanced data collection and analysis capabilities to support a fact-based decision model and meet customers’ evolving requirements. On its functional printing side – an emerging space of printed electronics – it was vital for GSI to verify that after something was printed and had dried, the actual component function was achieved. By capturing data at critical control points, GSI could easily show its customers that the process complied with its predetermined specifications.

GSI also needed to configure data for all the unique parts it produced for different customers, each with very specific requirements. Further complicating the situation, GSI had disparate systems, and needed a way to bring all the data together. The company wanted a SQL-based platform that could be used throughout the organization to communicate with its other systems, including Vision inspection systems, CMM scales, multimeters, and a document control system.

These needs pointed GSI toward an enterprise quality hub powered by SPC that would allow GSI to consolidate its quality data, streamline the process for data collection, integrate disparate plant-floor and enterprise systems, monitor data in real time, and report on data to support the needs of all users, including customers.

Bringing It All Together

GSI didn’t just put an emphasis on building total quality management quickly; the management team wanted to make sure they got it right. To ensure optimal adoption and ownership, some decisions require the entire staff to be on board and invested in the project. To accomplish this, GSI assigned enterprise quality experts to ensure all employees have data analysis that relates to them and allows them to perform their jobs more effectively.

2. Total Quality Management Demands an Enterprise Quality Hub (continued)

Kathy Andersen, GSI Director of Quality Assurance, said, “You cannot improve quality without the right people, the right focus, right mindset, right tools, and right training. By partnering with enterprise quality experts, we worked closely to identify the areas where we needed to focus and invest our time and efforts. It is one thing to implement a tool like SPC, but to realize its benefits you must use it to its full capabilities and fully implement all available functionality.”

The Final Piece of the Puzzle

For GSI, an enterprise quality hub proved to be the missing piece of total quality management. With a centralized repository for all quality data, manufacturers like GSI can harness the power of Manufacturing Intelligence to achieve total quality management. This type of end-to-end enterprise quality system enables manufacturers to overcome challenges and collect actionable data.

- › **Visibility:** Obtain a real-time view of data from disparate sources across the enterprise.
- › **Traceability:** Adhere to the strictest compliance requirements and protect brand reputation.
- › **Complete view of the plant floor:** Predict errors before they occur, preventing recalls and reducing scrap.
- › **Workflow management:** Allow operators to quickly and easily collect data without compromising daily tasks.

- › **Data analysis:** Collect, organize, and analyze meaningful data to help improve business operations and relay information to customers and suppliers for making strategic decisions.

With the missing puzzle piece in place, GSI has benefited on multiple levels. Engineers can get real-time feedback on their processes and make adjustments in a timely manner. The engineers also automate data collection and put the information in easy-to-understand graphs that can be used to fuel discussions with suppliers and customers. Plus, GSI can easily adhere to industry regulations, such as ISO compliance and FDA requirements.

On a corporate level, GSI benefited because total quality management allows it to enhance its brand. Jack Kraemer, GSI President and Chief Operating Officer, said, “We see quality as a competitive differentiator. Not many printing companies utilize this kind of sophisticated data analysis.”

Finally, GSI’s customers benefit from the company’s total quality management. They are assured their products are in compliance and are confident that they are receiving a more unified product. In fact, GSI describes its philosophy towards quality as customer-focused — their requirements strongly influenced its decision to invest in total quality management. After all, customers and their perception of a company will make or break a business.

“We find that when new and prospective customers visit our facility, the fact that we have real-time SPC configured in our plant gives them confidence that we understand our products and processes,” Kraemer said. “To attract and retain customers, companies must continue to improve their capabilities across the entire business. Information is a critical element.”

What’s Next?

As a result of GSI’s commitment to total quality management, its customer complaint rate dropped from 2.5% in 2009 to less than 0.5% in 2012. GSI’s continuous improvement efforts resulted in a recent conversion to a new ERP system and additional inspection devices — all linked together by its enterprise quality hub.

Before data can be actionable, it must first be accessible. With an enterprise quality hub, manufacturers like GSI can complete their quality puzzle to realize the full potential of data-driven total quality management.

Summary

- › GSI Technologies LLC used total quality management to reduce customer complaints from 2.5% to under 0.5%.
- › Engineers can get real-time feedback on their processes and automate data collection.
- › The company can easily adhere to industry regulations such as ISO compliance and FDA requirements.

3. Developing In-Process Sampling Strategies

Article first appeared in [Quality Digest](#) as “How to Determine In-Process Sampling Strategies: What Should You Measure or Avoid?”

By Steve Wise, Vice President of Statistical Methods

Determining an effective in-process sampling strategy can be a tricky business. What should you measure? What should your sample size be? What are the pitfalls? Your approach can be the factor that determines whether you will ever attain true understanding of process performance or see any significant improvements in quality, uptime, or deliverability at cost.

Developing sampling plans for acceptance sampling is typically a well-documented process based on industry-accepted standards and practices designed to detect whether a lot meets an acceptable quality level. Most quality managers use acceptable-quality-level tables to determine the number of parts to sample from a given lot size. However, developing in-process sampling strategies is more than referring to tables; it requires an understanding of the manufacturing process, patterns of variability, historical stability of the process, and a willingness to use data to drive improvements.

Why in-process sampling matters

In-process sampling is valuable because collecting data throughout a manufacturing run allows you to monitor and ensure the process is operating in a desirable manner.

Done properly, sampling provides an early detection point so operators can take corrective action before continuing a run of unacceptable product. Doing acceptance sampling only at the end of the run may be a common practice, but end-of-run sampling does not provide any real-time notifications when processes start to misbehave, and adds to the risk of not being able to identify bad product before it heads out the door.

The director of quality at a manufacturer of precision plastics for laboratory use described to me how an incident that caused several pallets of finished product to be scrapped, at a significant cost to the company, was the impetus for changing his sampling approach. Originally he performed chemical testing on batches by sampling at the end of the production process. After determining where the problems were in the molding and packaging process, he changed the work procedures and then began sampling during setup. The chemical testing is time-consuming, but he now tests for the most likely contaminants first, during setup runs, to catch problems early in the process.

What to measure

Deciding what to measure typically falls into one of two categories: part measurements, such as diameter and thickness; or process parameters, such as temperature and pressure. Sampling in both categories can indicate variability and instability in the process and can be used to bring the process back on track.



The goal is to detect special causes of process variability so that immediate corrective action can be taken.

Part measurement sampling uses control charts to track the process's ability to maintain a stable mean with consistent variability about that mean. Ideally, the mean of the data stream is very close to the desired feature's target value. Any measurements outside the upper or lower control limits would indicate the process mean or variability has deviated from historical norms. In fact, there are a number of additional patterns that occur within the control limits that act as early detection warnings.

When deciding what process parameters to measure, choose those that have a direct effect on quality and then determine what the optimum settings should be to deliver consistent quality.

3. Developing In-Process Sampling Strategies (continued)

For example, if the temperature of an incoming fluid has no effect on the outgoing quality, but the flow rate does, then it's better to monitor the flow rate.

Setting sampling requirements

After establishing what to measure, the next step is to determine the actual sampling requirements, such as how often to take samples and how many measurements per sample, and also factor in the risks and costs of sampling. When determining how often to sample, it's helpful to think about how long the process can hum along and still produce good product. If the process tends to be very stable, then taking minimal measurements, for instance, at the beginning, middle, and end may suffice. However, if the process is less predictable, then more sampling is in order.

If in-process adjustments are typically needed every couple of hours, then consider taking at least two samples between adjustment periods. These samplings will let you know what happens with the process within each adjustment period. In addition to time-based sampling intervals, samples should also be taken whenever there is a known change in the process, such as when the shift changes, during setup, at start-up, or when tooling is refreshed.

In some cases, there is no historical process knowledge from which to base a reasonable sampling strategy. In these cases, consider sampling 100% for as long as it takes to expose the process variability patterns. Then, if conditions warrant, reduce sampling as you begin to better understand the process behavior.

Sample size

Generally, most textbooks use sample sizes of 1, 3, 5, and 10. In industry, these sizes have become common as well. When the sample size is greater than one measurement, the assumption is that the values are consecutive. That is, if three bottle weights make up the subgroup, those three bottles were manufactured consecutively.

The purpose of a subgroup is to provide a snapshot of a process's mean and the short-term variability about that mean. If you capture five consecutive measurements, then you have a more definitive measure of the mean and short-term variability than three measurements. But at some point, the strength of the statistic does not appreciably improve by increasing sample size. As a rule, you'll get more process knowledge by taking more frequent samples rather than by increasing the number of measurements within a sample.

Sometimes a sample size of one is the only size that makes sense. For example, the differences in three consecutive samples taken of a homogeneous product (e.g., agitated gravy in a mixing tank) would only be an indication of measurement error. A better strategy in this situation is to use a sample size of one. If the mixing tank were sampled again, say 30 minutes later, the differences in the two measurements would indicate how much the feature changed since the last sample. Sample size of one is also appropriate when only one value exists, like overtime hours for a given day, or peak temperature for a given oven cycle.

Improving sampling strategy

There are typically three situations that call for modifying a sampling strategy. The first is when a failure happens, but is not detected until downstream in the process. This indicates a need to change what is being measured upstream or to increase the sampling frequency. The second situation is when no failures are ever detected, indicating less frequent sampling may be appropriate. The third is when the measured product feature is showing no variation. This would indicate that the process produces to tighter tolerances than can be detected by the measurement system – or that someone is arbitrarily adding a value that he knows will report within limits.

3. Developing In-Process Sampling Strategies (continued)

Common pitfalls

Data can provide more value than one might think. When speaking of in-process data collection, the useful life of a single point is short-lived if the data is used only to provide real-time feedback. As important as it is to use data in real time, the value of that data is far from over. Historical data now becomes an infinitely valuable process database. All data collected for real-time decisions takes on a “second life” for quality professionals to help them determine what to do today to make things better tomorrow. Analyzing and mining that data can yield process improvement golden nuggets. Slicing and dicing data becomes the practice to expose relationships that would otherwise go undetected.

Another common pitfall is not utilizing software investments to their full capabilities. There is a tendency to configure Statistical Process Control (SPC) software to meet current goals and then forget it. But usually the software offers additional processes and sampling opportunities. For example, a worker may still use a clipboard to complete a pre-operation checklist. Today this can be done using a tablet or smartphone to eliminate the paper, not only saving time, but also improving data integrity. Having this additional data in the process database also improves process analysis capabilities.

Build a strategy that lasts

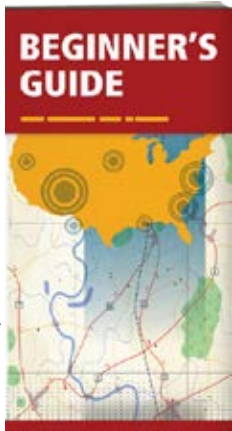
Finally, don't let in-process sampling improvement efforts stagnate. Make sure there are always two internal people who really know the in-process sampling strategies and are constantly looking for new ways to use the SPC software.

At the precision plastics manufacturer, the director of quality's next goal is to further refine his sampling plans to make them dynamically respond to inspection results. Like an acceptable quality level methodology, sampling plans for in-process inspection will increase or decrease sampling based on the rejection history of a particular product line or process. The director notes, “I'm confident we can reduce the time and cost of inspections while maintaining or improving our internal product quality.”

4. Integration – Key Questions to Ask Hardware & Software Vendors

By Kyle Cahoon, Applications Engineer

Integration is a broad term used in quality circles to describe anything from manually merging data output from two different systems – such as Material Requirements Planning (MRP) and Statistical Process Control (SPC) – to commanding Programmable Logic Controllers (PLCs) from quality data input. Integrating systems, software, machines, and instruments can provide many desirable benefits such as increased throughput, ease of use, and increased accuracy. So, what questions can be asked of equipment vendors to ensure your new device is “integration friendly?”



Connectivity

Can the instrument interface with a PC? There are a variety of ways that an instrument or device can transfer data to a PC. These include:

- › **RS-232 (Serial)** – This provides a universal COM connection which enables the user to control the data stream independent of other peripherals that may use USB or other plug-and-play connections. This connection will likely require a driver to be installed which, generally, is provided by the device manufacturer.
- › **USB** – This connection is typically the simplest way of transferring data from device to PC, although your PC may treat the device as keyboard input rather than a separate COM connection. A driver (provided by the device manufacturer) may be available to allow configuration and control similar to a RS-232 connection.
- › **TCP/IP** – This connection enables the data stream to be read over a local area network (LAN). Some devices have direct TCP/IP connections (Ethernet) or you can use a third-party serial-IP converter. Converters are available in both wired and wireless varieties. TCP/IP is typically the most efficient way to transmit a signal to a PC over long distances, as serial cables have length limitations.

- › **Flat File** – Some devices have the option of creating a flat file containing the output data stream. The user can configure where the flat file is saved on the PC or network drive so that it can be accessed by a data collection or SPC system.
- › **OPC Server** – An OPC server is a piece of software that can interact with Programmable Logic Controllers (PLCs). If a device is connected (or can be connected) to a PLC network, then an OPC server provides a convenient means of sampling and making tags available for data collection and SPC systems.
- › **Database** – Some devices are capable of writing directly to a database such as Oracle, SQL, or historian. This connection can provide an easy way of archiving data while also providing a means to query and sample the data by a data collection or SPC system.

It is possible that some devices may be able to communicate in multiple ways, so it is important to understand from the device manufacturer which options apply to your device.

4. Integration – Key Questions to Ask Hardware & Software Vendors (continued)

Proprietary Software

Does the device require proprietary software to configure data output? Software may allow for more versatility with data output, enabling you to change settings with an easy-to-use interface. Other devices may require configuration on the device itself via analog controls or a digital screen. There are perks for each system. Keep in mind, though, that proprietary software may reduce portability. For example, if you would like to move a device to a new PC, software may have to be installed to configure the device and set the desired data output rather than having settings move with the device itself.

Output Format

What does the data output stream or flat file look like and can it be manipulated? In general, data output becomes more sophisticated as the functionality of the equipment increases. For instance, a digital caliper with a serial PC connection may send a data stream that includes the measurement reading plus a carriage return. A moisture analyzer, on the other hand, may be able to return ambient temperature, ambient moisture, percent moisture (in real-time throughout the test), percent moisture (once the test is complete), and so forth. It is important to verify the data stream output of the equipment and ensure that all desired data is (or can be) included in the output. It is also important to verify the type of data output such as digital or analog output stream and whether the device has the capability of exporting flat files.

More options will allow for more versatility and opportunity for integration.

Get Examples

With all of these capabilities, it is best if you can see them directly. **Ask if you can see an example of the device's output.** Sometimes you can do this directly by using a tool like Hyperterminal to see RS-232 or TCP/IP data, and sometimes it can be provided by the vendor as a text file or screenshot.

Integration of systems and equipment can be extremely valuable, so it is important to ask equipment vendors the right questions to ensure that you can take advantage of the information available to you. It is critical to understand the capabilities of your equipment so you know what possibilities exist. A little up front work will pay out with any integration project.

5. Quality Data: Visible and Actionable from Operators to Senior Management

Article first appeared in [Quality Digest](#) as “Knowing the Data Is Half the Battle: The other half is delivering the information to the right person”

By Eric Weisbrod, Engineering Project Manager

“If only I had known.” This phrase has been uttered countless times by nearly everyone. Additional information or a different vantage point could help us know when to buy or sell stock (“I should have bought that Google stock at the IPO”), what birthday presents to buy (“I wish I knew their son already had that video game”), how we maneuver our vehicles (“Your friend could’ve told me he parked right behind me”), and many other instances in our personal lives.

This desire for additional information is also found in the professional world, especially if you work in a quality position.

Knowing more information is generally a good thing, but knowing the “right” information is what really makes a difference when making decisions. What is the right information? That depends on the problem and your role in solving it. A quality director has different tools at her disposal than a quality manager, quality engineer, or line operator does. Knowing what information to collect, when to collect it, and how to present it is critical when making decisions in a manufacturing environment.

Same information, different audiences

In most manufacturing environments, companies collect data of some sort.

Data may be required for regulatory purposes or customer requirements, or needed for product and process improvement. Regardless of the reason for collecting data, it’s critical to make that information available to the appropriate individuals in a format that allows them to make the best decisions based on those data. Here are some common examples of roles, the information that is displayed, and how it is used.

Shop floor operator

Data type. Direct measurements from processes or products. These values may be entered manually, collected from a measurement device, or automatically reported from something like a process loop control.

Data presentation. Data for shop-floor operators must drive immediate actions to continue making the products the company depends on. An extremely useful data presentation is a control chart that tells the operator when process adjustments should be made. This is a simple way of presenting data to individuals who are responsible for many other tasks and who need to know what action to take based on their data.

Data use. The data should be used to make process adjustments.

Quality engineer

Data type. Quality engineers most often use the same data set collected by the shop-floor operator.

Data presentation. Quality engineers will be very interested in process behavior, as can be seen in control charts, and will often want to extend beyond simple control charts as they strive for process improvement. Normalized control charts, group control charts, box-and-whisker charts, histograms, and Pareto charts are all ways for a quality engineer to make decisions about his process.

Data use. Quality engineers perform deep analyses with the goal of process improvement.

Quality director

Data type. Summarized and aggregate key process indicators are needed to give senior management an overall view of operations.

Data presentation. Because senior management often needs to evaluate data from many sites, processes, and suppliers, the ideal data presentation is one that can concisely summarize this information. Aggregated data in Pareto charts, line charts, box-and-whisker plots, and gauge displays are effective ways to summarize large amounts of information.

Data use. The primary use of the aggregated data is to make strategic improvements to help the business.

5. Quality Data: Visible and Actionable from Operators to Senior Management (continued)

These improvements may be with compliance, traceability, product giveaway, downtime reduction, and scrap, to name several.

Achieving results

The first step to improved data visibility at all levels is to begin collecting the data, with an understanding that more data isn't necessarily the answer. Many pieces of equipment and systems are able to export data, so there is often a lot of "free data" available. This can be both a blessing and a curse. Make sure the data that is being collected is actionable and has been determined to be an indicator of your process or product performance.

Once the appropriate data is being collected, it is important to make the data available to those who need it in a format they can use. The best way to do this is with a central system that acts as the data collection repository and can present the data in the needed formats. A central system has many advantages:

Process improvement. With all data in a single repository, it is possible to compare data from different pieces of equipment, sites, vendors, and products without having to manipulate the data.

Traceability. A single repository makes it easier to find the needed results during an audit or for customer reporting. Anyone who has lived through these events knows that sifting through filing cabinets for results isn't fun.

System management. A single quality system allows administration to be much simpler than maintaining multiple systems. Ideally, the quality system should be managed by the quality department so adjustments can be made to meet the ever-changing needs of the quality organization.

With a central repository, the data collection and reporting needs can be met with flexible tools to provide the necessary results. The same data repository can provide real-time control charts to shop-floor operators to make their data actionable, send email alerts to supervisors to alert them that an issue has occurred, provide notifications that collections are due to ensure compliance, and provide aggregate data to senior management to improve the company's business.

6. Quality Data Collection: How to Cut the Paper Addiction

Article first appeared in **Manufacturing Engineering** as “They Kill Trees for That? How to Cut Paper in Your Plant”

By Doug Fair, Vice President of Technical Services

In the last several years, I have visited many manufacturing plants including those for packaging, medical devices, electronics, consumer goods, and food. One thing I keep noticing is that many companies cannot cut their addiction to paper-based data collection systems.

It seems strange, considering the advancements in information systems and mobile technology, to see that paper check sheets are not only alive, but thriving. In the age of Big Data, why is so much valuable business intelligence being stored in filing cabinets? Consider this:

- › A full four-drawer file cabinet holds 18,000 pages. (Source: NAPO)
- › It costs about \$25,000 to fill a four-drawer filing cabinet and more than \$2100 per year to maintain it. (Sources: Gartner Group, Coopers & Lybrand, Ernst & Young)
- › The average office spends \$20 in labor to file each document and another \$120 in labor searching for each misfiled document, loses one out of every 20 documents, and spends 25 hours recreating each of those lost documents. (Source: Price Waterhouse Coopers)

- › The average document is copied 19 times. (Source: Price Waterhouse Coopers)

Although slightly different, each company's paper habits are oddly similar. They have checkboxes for confirming actions were completed, blank spaces for traceability fields like shift, order number, line number, and so forth, and placeholders for noting the time and date. Generally, the bottom of the page has a bold line for the operator to enter initials or a signature.

I've seen separate forms for safety checks, machine setups checks, production checks, shutdown checks, quality checks, and just about any type of data collection you can imagine. Some plants have operators write down Statistical Process Control (SPC) data on paper first, then manually type the numbers into another system for statistical analyses. Needless to say, paper-based systems are causing identifiable and nonidentifiable inefficiencies for manufacturers across every industry.

Amazingly, the management of paper is one of the most time-consuming tasks. Usually, forms are gathered up by an administrative assistant and delivered to the quality manager who then performs a cursory review of the data. Then, a second administrative assistant collects the pages from the quality manager and — cell by cell, page by page — painstakingly enters the data into a spreadsheet.

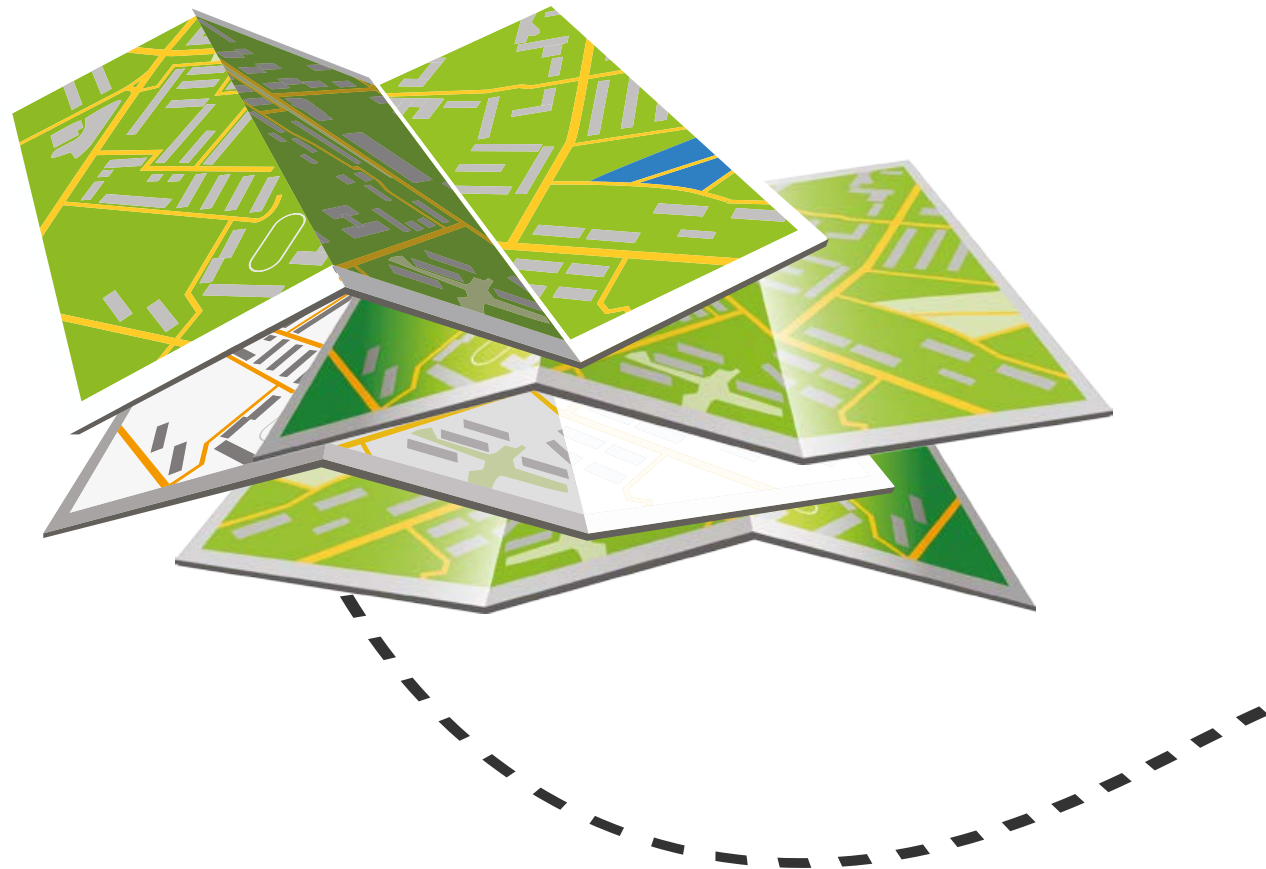
But more shocking is what happens with the paper after the data is entered into spreadsheets. In several of the plants, an on-site library and a full-time librarian are staffed to manage all that paper. After aging a year or so, the paper is shipped to a warehouse, where it sits for another seven or more years just in case someone might need it.

Paper is not only inefficient, but is also exceptionally expensive and difficult to manage. What's the solution? Many companies are replacing their paper-based systems with Manufacturing Intelligence systems such as InfinityQS® ProFicient™. Instead of writing numbers down on a sheet, they are automating data entry directly from plant-floor measurement devices or manually entering the data via scanner, touch pad, keyboard, smart phone, or mobile device. Instead of storing paper in a library or shipping it to a warehouse, the data is stored in a database. For archival purposes, the data is backed up on small, portable memory storage devices.

6. Quality Data Collection: How to Cut the Paper Addiction (continued)

Think about it: If paper is replaced by software, not only can you easily access the data without rifling through thousands of pieces of paper (and incurring all those paper cuts) but you can also instantly pull charts, graphs, and analyses of the data. If you have ever suffered through an audit, you know how time-consuming and challenging it is to dig up data — especially when it is stored only on paper. Instead, using software enables you to select a few fields and let the database queries and statistical analysis engine do the work for you, producing an accurate, detailed report with the precise data necessary for the audit.

The result? No more paper. No more library or librarian. No more warehouse storage facilities and no more transporting paper to and fro. Basically, replacing paper with an enterprise-quality solution that has automated data collection capabilities will make your quality system simpler, more efficient, faster, easier to manage, and less expensive. And who doesn't like that?



7. Mobile Technology and Cloud Computing Deliver Manufacturing Intelligence

Article first appeared in [Quality Manufacturing Today](#) as “Mobile Quality: Manufacturing intelligence delivered through mobile technology and the Cloud.”

By Michael A. Lyle, President and CEO

From smartphones to tablets to laptops, mobile devices are becoming the standard in virtually every industry, with the number of smartphones surpassing one billion worldwide this year, according to Strategy Analytics. Manufacturing is no exception, as many of today's global manufacturers are realizing the value that mobile technology can bring to their enterprise's quality program — due in part to the advancing capabilities and reliability of the cloud.

According to a recent report from IDC Manufacturing Insights, manufacturers cite “mobility” and “cloud” as two of the four most important emerging technologies to the supply chain.¹ Behind this trend are companies that are finding ways to use cloud and mobile solutions to close the reporting loop and collaborate through the supply chain based on real-time data. A large bicycle manufacturer monitors real-time quality data at seven supply facilities in China using the cloud and is able to respond to events in real-time. A midsize salad producer collects and sends enterprise-wide data into a single cloud repository, where it can be monitored for regulatory compliance.

Cloud technologies expand the mobility of quality programs by removing the physical constraints of attaining and sharing data in the supply chain. Tests that once had to be performed on check sheets and manually entered for post-production analysis can now be punched into an iPad and be instantly accessed halfway around the world in real time. The technology is opening up many new opportunities for companies to rethink how they approach quality and is putting the complete lifecycle of product quality and traceability data at your fingertips.

Many companies have built their data infrastructure in pieces, with different modules added over time to achieve different objectives. Incoming inspection data may be housed in one system, while mold process data is housed somewhere else. The hodgepodge of different systems means that data is rarely available to the right person at the right time.

If that describes the situation in one facility, then what happens if you are responsible for managing quality in 10 facilities, with the legacy systems acquired by each over time. How do you see which are your top performers? Which facilities are the biggest wasters? How do you know that each is maximizing their ability to succeed? The truth is, the data can all be integrated into a single system for monitoring and analysis, with the results displayed on charts and dashboards on a smart phone or any other device.

That is why so many manufacturers are taking a closer look at where and how their quality data is stored. If it's managed internally, what is the cost and what additional modules are required to properly manage it? What other value could the required IT resources provide?

Cloud platforms create a much lighter footprint than on-premises deployments, are low risk, require less up-front capital, and have fewer ongoing maintenance considerations.

Building quality

To meet manufacturers' regulatory compliance needs, cloud-based quality systems are developed in the same manner as traditional on-premises systems and support increasingly stringent government and industry traceability mandates such as the Food Safety and Modernization Act and 21 CFR Part 11 requirements for electronic signatures in the Pharmaceutical & Medical Device industries. These systems give companies a beginning-to-end data structure that produces required audit reports and the ability to respond to product recalls in a timely manner.

7. Mobile Technology and Cloud Computing Deliver Manufacturing Intelligence (continued)

The most successful quality programs build quality into processes rather than testing quality out. When planning Six Sigma and continuous improvement objectives, consider how the quality system interacts with your manufacturing environment based on these five elements:

- › **Data Collection and Integration:** What type of data do you need to access and where is it currently stored? A system should support automated data collection from different systems and equipment (MES and ERP or CMMs and PLCs, for example) on the plant floor. If a situation requires an operator to manually enter data, then an intuitive user interface is essential.
- › **Real-Time Monitoring and Analysis:** Real-time monitoring and analysis give users the ability to react quickly to adverse events. Data is statistically analyzed the instant it's entered into the system. As a result, manufacturers are able to respond to problems before they occur, even remotely, eliminating the possibility of costly recalls and reducing scrap. Operators using a smartphone while on a lunch break can receive instantaneous updates whenever new data arrives, and can access data streams from the quality hub with customizable dashboards and visual reports.
- › **Workflow Management:** Automated and event-based tasks and reminders simplify workflow management, giving shop-floor operators more time to focus on more pressing jobs. When specific data collections are needed, or out-of-spec issues arise, operators can receive alerts directly via a mobile device and respond immediately, reducing the number of non-conforming parts produced.
- › **Advanced Reporting Suite:** A quality system requires sophisticated reporting capabilities that support the needs of users at all levels – from the plant floor to quality teams and the C-suite. Reports and dashboards should be accessible anywhere at any time for an up-to-date look at Manufacturing Intelligence across the enterprise.
- › **SPC Quality Hub:** Quality data should be accessible in a single, secure and easily accessible hub. This enterprise quality hub imports data from across disparate sources into a single, secure repository that can be accessed from any browser – even on a tablet while a user is waiting at the airport.

Undoubtedly, mobile solutions and cloud computing represent the next generation of manufacturing. These technological advancements allow manufacturers to respond to the most pressing issues in the increasingly complex supply chain. As a result, manufacturers can achieve Manufacturing Intelligence that ensures a quality product, controls costs, and drives more strategic, data-driven business decisions.

¹ IDC Manufacturing Insights, "Business Strategy: 2012 Supply Chain Survey Results and Insights," MI235719, July 2012

8. Considerations for Selecting Mobile Data Collection Devices

By Eric Weisbrod, Engineering Project Manager

Like many things in the manufacturing world, the definition of “mobile data collection” changes based on company, environment, collection type, required functionality, and who knows how many other variables. After many discussions with many customers on this topic, some general definitions of mobile data collection include:

- › **Data Collection Cart** – A movable cart that contains a laptop, gauges, and a wireless connection allows the user to move about the shop floor and collect data.
- › **Ruggedized PC/Tablet** – There are many tablets that run the Windows operating system and can be used like a normal PC/laptop. These ruggedized tablets can have integrated barcode scanners, Bluetooth, wireless, serial ports, and other features for integrating with other equipment.
- › **Tablet** – Devices like an iPad can run as a thin-client to collect data into an enterprise quality system. These devices don’t typically have connections to measurement devices, though that isn’t precluded.
- › **Handheld** – These devices are typically standalone and run an operating system other than full Windows. These devices may store data locally, to be transferred to another system via ‘syncing’, or use a wireless connection to an enterprise system.

› **Mobile Phone** – While many mobile phones can be used like a tablet as listed above and connect as a thin client, data collection through a simple HTML browser (Internet Explorer, Chrome, Firefox, Safari) has many advantages.

When considering mobile data collection needs, it is critical to understand your requirements. It isn’t difficult to imagine that certain industries and IT infrastructures may quickly drive decisions. For example, if your company doesn’t have thin-client expertise, that will require a device capable of running a full Windows operating system or relying on a system that allows input through available technologies, like web browsers. There are many types of requirements:

Environment – Does the device need to be waterproof to protect it during a line cleaning?

Data Types – What kind of data is collected? Variable data benefits from a numerical keypad, while attribute data is often driven by pick lists or keyboard entry.

Required Functionality – Does the device support the desired software? Perhaps measurement devices are going to be used, which require USB or RS-232 ports.

Data Collection Location – Will data be collected within your site, where it can use the wireless network? If data is to be collected in the field, how can that be accommodated?

Data Latency – If the device is synced to a central system, can you afford the delay in receiving that data? Will the device notify operators of alarms as they happen in real time, or will they have to wait until syncing to be notified?

If at all possible, you should try several devices before making a selection. There is nothing like a “real world” test to highlight differences in overall usability. There are many things to consider, but some common criteria include:

Battery Life – Will the battery last a shift? Who will replace the batteries? Does the device have multiple batteries that are “hot-swappable”, allowing users to change batteries without having to shut down the device?

Screen Resolution – Will the device support a screen resolution that is compatible with the software being run?

Ergonomics – Does the device easily fit into your manufacturing environment? Some industries prefer smaller devices that allow for easier maneuverability, while others prefer larger screens for better data viewing and analysis. There are often compromises in the overall form factor.

Configurability – Many devices have buttons and systems that can be configured. These configurable items can make a device seem like it’s been designed for your manufacturing environment.

8. Considerations for Selecting Mobile Data Collection Devices (continued)

Selecting a mobile device to suit your environment, operators and infrastructure can be challenging. Like all new systems, outlining your requirements and evaluating the devices in your environment will help you make an informed decision. Polling other sites in your company or industry allows you to learn through others' experiences and helps ensure you won't repeat their mistakes. When it comes to investments in technology, you're wise to spend your time investigating the system upfront because it's a system you'll be living with for years to come.

Learn more in the webinar **Going Mobile: How the Cloud and Real-time Data are Changing Manufacturing**, available online at www.infinityqs.com/resources.

9. Made In China: Embracing Manufacturing Intelligence and the Cloud to Advance on the World Stage

Article first appeared in [Design News](#) as “Chinese Companies Are Using Manufacturing Intelligence to Overcome Shifting Dynamics”

By Matt Tweedy, Vice President of Product Management

Made in China is one of the most ubiquitous phrases in the modern manufacturing era. To many, the Made in China tag is a symbol of the decades of manufacturing and economic growth that has propelled China to greater prominence on the world stage. For others, a string of high-profile recalls and other quality issues are driving a parallel narrative about Made in China: one of cheap, mass-produced products that don't meet the global consumer's high standard of quality.

Chinese manufacturers do not underestimate the challenges in maintaining their strength in international manufacturing. A growing Chinese middle class has increased the demand for higher salaries, more benefits, and better working conditions. The changing cultural dynamics and slowing growth in Chinese goods, including a decrease of 0.3 percent in China's manufacturing purchasing managers index (PMI) in April, are making Chinese manufacturers more aware of the fact that they cannot continue to do the same things now as they did during the decades-long growth spurt.

To overcome these challenges, and to renew the pride of the Made in China label, many companies are placing a heavy emphasis on maintaining strength through the use of technology. Methodologies are emerging that use Manufacturing Intelligence to increase operational efficiency, supply chain visibility, and more competitive product quality from design to distribution.

Many Chinese manufacturing firms, however, house only basic IT infrastructure, if any at all. The market is demanding solutions that are quick to deploy, have a small IT footprint, and provide real-time visibility into manufacturing-process performance data that clears the path for efficient and consistent production.

There are technologies readily available across China that will help, but success requires identifying an enterprise-quality software application that utilizes mobile and cloud-based technologies and is also powered by a centralized Statistical Process Control (SPC) engine. This type of software configuration and functionality can offer a cost-effective, rapid deployment that will enable the collection, monitoring, and analysis of plant-floor data. The key to selecting the right software application is finding one that adequately addresses the quality needs of the manufacturer and remains highly functional in a cloud environment.

Many Chinese manufacturers are already taking the steps necessary to understand data collection and analysis better and to achieve the common goal of using the most effective tool to improve quality processes and to produce consistently high-quality products. Among these, innovative manufacturers – companies such as Bohai Piston (Shandong), EMBRACO (Beijing), SanDisk (Shanghai), and Singu Keller Automotive Cold Forming Parts (Beijing) – have seen decreases in scrap and expenses and increases in profits, employee skill levels, and quality awareness directly attributed to the successful use of SPC methodologies and Manufacturing Intelligence.

Mobile technology and the cloud

As of November 2012, China's Ministry of Industry and Information Technology (MIIT) said there were 1.104 billion mobile phone users in China, which translates to about 82% of the population. This means that manufacturing employees are likely to own mobile devices that they already use to access the cloud for personal communications, making it easy for manufacturers to implement bring-your-own-device (BYOD) strategies for a cloud-based software deployment.

9. Made In China: Embracing Manufacturing Intelligence and the Cloud to Advance on the World Stage (continued)

To facilitate this, the software application must include easy-to-use mobile data collection functionality and user interfaces with a centralized database that seamlessly integrates data from nearly any source, including enterprise systems like ERP or MES, measurement tools such as CMMs and scales, or even supplier facilities to track raw material production.

With the data entered into a cloud-based, centralized database through any mobile device, plant floor operators, management, and customers can analyze the data as it is sliced and diced in the SPC analysis engine. The resulting Manufacturing Intelligence yields opportunities for improvement in both manufacturing processes and product design. For example, one global bottling company used SPC to reduce overfill, which not only saved the company nearly \$300,000 in two years, but also challenged packaging design engineers to review the actual bottle designs and ensure ideal liquid fill amounts without compromising overhead space.

There is a sense that, in the era of mobility and advancements in housing and sharing data, Chinese manufacturers are not restrained by the long deployment timelines and high cost of decades-old IT infrastructure and methodologies. The improved systems that exist today mean they don't have to "plow the same field" as their international competitors did.

They are looking to gain an advantage by using a common-sense approach that matches the technological reality of the last five years rather than that of the last 50 years.

If Chinese manufacturers continue on the path to quality-driven manufacturing operations, there is little doubt that the phrase Made in China will once again stand alongside Made in Germany, Made in Japan, and Made in the USA to represent quality products



About InfinityQS International, Inc.

InfinityQS International, Inc.® is the global authority on enterprise quality. The company's Manufacturing Intelligence solution delivers unparalleled visibility across the enterprise, from the shop floor to the boardroom, enabling manufacturers to re-imagine quality and transform it from a problem into a competitive advantage. Powered by centralized analytics, InfinityQS solutions provide operational insight to enable global manufacturers to improve product quality, decrease costs and risk, maintain or improve compliance, and make strategic, data-driven business decisions. Headquartered near Washington, D.C., with offices in Seattle, London, Beijing, and Shanghai, InfinityQS was founded in 1989 and now services more than 40,000 active licenses with more than 2,500 of the world's leading manufacturers, including Kraft Foods, Ball Corporation, Boston Scientific, Graham Packaging, and Medtronic. For more information, visit infinityqs.com.

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