



Accurate data collection

It is important to have accurate data available to conduct focused and more effective Six Sigma programs... by **Thomas R. Cutler**

The Six Sigma community puts up with an amazing amount of busy work in order to become data driven," opines Evan J Miller, President & CEO of Hertzler Systems (and manufacturer of GainSeeker). Miller asserts that frequently manufacturing executives define this data collection process as "the every day junk work that we do that we call our jobs. The root of this situation are deep within Six Sigma itself: Black belts are brought into training, assigned to a project, and told to go start measuring something. They are rarely IT people, but they are smart, resourceful and, very driven. They go and get some data."

What will they do to get data?

Manufacturing firms intent on capturing and distilling rich streams of data will find it. Often companies will look at a Capability Maturity Model (CMM); a typical format will show a data source, viewed in Excel. Viewing by rows and columns is common across many industries and many applications. Most data dumped from a database ends up looking like a data-rich grid, whether it is manufacturing or transactional data.

Each row represents a part that is inspected; each column a dimension or reading. Most engineers see these data tasks as an example of every "junk work" that takes hours to prepare and upkeep. One manufacturing executive reported that it took 24 Power Point slides to document this activity, which included 43 discrete steps, including two loops, one of seven steps and one of 19 steps.

According to Miller, "The time this takes is substantial. Even if only twenty variables are being tracked, it often takes 20-25 minutes to capture data for each part number. Since most companies, particularly those in metal working production, produce multiple products

simultaneously, it is easy to see how an otherwise productive manufacturing professional spends his entire time preparing reports."

Recently, an electronics manufacturer had difficulty with out-of-the-box failures with units that passed the final test, but failed when the customer opened the box. Obviously, it was necessary to find out what happened; what changed in transit and whose test was right – the supplier or the customer?

After agonizing over this for years, a bright Six Sigma black belt asked for seven days of data – one day for each unit that had failed at the customer site. She narrowed down her search to a couple of suspected key Xs for each defect reason and discovered that although the test result for a given serial number was within specification, its difference from the other units test on the same parameter on the same day was statistically significant. When the process speaks (instead of artificial engineering limits), it revealed when there was a defective unit!

Extensive steps to data collection

But look what steps are needed to capture this data: Open a text file. Record the time the sample was taken. Scroll down or search for the first parameter; copy and paste or (probably faster) type the value into a spreadsheet or Minitab. Repeat the search, copy and paste for all the suspected Xs in the file. Repeat with 30-40 of these files. According to Miller, "This process is time consuming and error-prone to perform on a daily basis, particularly in real-time. Is there any wonder this organisation is eager to automate this process?"

A culture where opinions and job title take a back seat to data: Six Sigma's holy grail is to become data driven; it is a culture where truth in the form of objective statistical



analysis of reliable data trumps personalities and politics. Royce Binion, Operations Manager for BAE Systems, Fort Wayne, Indiana, said, "Real-time access to accurate, actionable data is the number one tool that has enabled us to move to a data driven culture."

IT solutions have only been deployed by 27 per cent of the population and automated data collection by only 19 per cent. Miller, a strong proponent of statistical process control (SPC) insists, "Maybe it is time to stop spending so much effort training people and instead give them the data so they can use the training."

Jeff Holman, President of Micropump, a Lean Six Sigma manufacturing company, captures the challenges of how to best use engineering staff. According to Holman, "I had these two high-powered and highly compensated engineers, really two of my best people – spending hours scrubbing data and building databases to get the information they needed for their projects."

Holman decided to establish a system for capturing real-time process data across the company. Holman set up a team to develop a list of critical to quality characteristics (CTQs) for this system. Here are the CTQs that the MicroPump Six Sigma team developed:

SPC must be used for process control in manufacturing: We need the ability to automate data collection and real-time alarms in all of our manufacturing processes. We must use existing quality data collection processes wherever possible. We also need better support for automatic gauging, and more transparent data sharing. And we want our process owners to be able to respond instantly to process shifts or special cause variation.

The ability to accurately track transactional process performance: We believe that we should be able to track manufacturing and transactional data at the same time, with the same system. While there clearly are differences between transactional and manufacturing data, there are

also a lot of similarities. We want a comprehensive system that can live in both worlds.

A way to link information from many databases for use in operations: We already have a lot of data in various databases. We need a way to bridge these disparate systems.

One source for process and product data: Once again, regardless of the source of the data, (dimensional, equipment performance, cycle times, defects, product testing), we need a way to reach it.

Mistake-proofing of data: We need to use current technology to eliminate operator data input errors. We need the ability to use barcode scanning, pre-filled data fields, drop-down lists, etc.

Real-time information about all processes: We already have the taste of how real-time data can help certain operations. We want that shared across all processes.

Ease-of-use by operators, supervisors, engineers and Black Belts: We already have a system that is cumbersome and difficult to use. We want to make their lives better, not worse.

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Compatibility with statistical analysis software: Our standard for advanced analysis is MINITAB. We need a system that will readily share data with MINITAB. This point is actually a subset of the topic 'Ease of use.'

Limited resources required for initial set-up and ongoing system maintenance: Finally we need a system that requires minimal ongoing IT support and resources. We are stretched too thin to place more demands on the IT staff.

The MicroPump team then considered several options for meeting the CTQs. Here is their analysis of the options:

- Dedicating a portion of a Black Belt resource to data integrity.
- We quickly recognised that while having clean, reliable data was absolutely essential to driving Six Sigma projects the act of getting that data added absolutely no value to our business. Clean data is an enabler, but it does not add value. So dedicating highly valued resources to non-value-added activity was counter-intuitive.
- We considered investing in training and develop-

ing other people to harvest the data we needed, but the investment costs in lead time and training resources were considerable. And the bottom line was that they still needed some kind of software and hardware to do the job. Clipboards, pencils, stop watches, and mechanical gauges were inadequate resources no matter who did the work. Better to find the right systems and then find the best resources to implement those systems.

- Investing in an enterprise wide knowledge-management system.
- Enterprise-wide knowledge management systems created summary reporting tools, but they all lacked several key capabilities that were essential to our business.
- First, a large portion of our efforts was focused on the manufacturing shop floor. These systems lacked the connections we needed to gauges and manufacturing equipment. Coupled with that was a serious weakness in real-time statistical analysis capabilities. While most of these tools could tell us when something missed a target, they could not identify a statistical shift in mean or a statistical trend in real-time. Nor did they readily interface to our statistical analysis software (MINITAB). Finally, they did not help us scrub the data. In that way, they really did not move us beyond where we already were: spending countless hours scrubbing data for our projects.

Investigating the capabilities of different SPC software packages

According to Holman, "This proved to be the best course of action for us. While these systems have a reputation for belonging on the shop floor, the good ones do that and much more. In short, we were able to find a system that met all of our criteria. That system has been deployed now for nearly four years, and it continues to provide us with clean, reliable data in real time so that we can deploy continuous improvement across the company. Our precious Belt resources now spend their time doing the work of continuous improvement instead of cleaning data or being a shadow IT department."

For Micropump, projects are scoped, prioritised and chartered faster in the define phase. In the measure phase, there is an average 10 per cent reduction in cycle time, and they have an almost painless transition to control. Hertzler Systems' research findings reveal that, "Organisations that make sure their people have accurate, actionable data available in real-time have more effective and focused Six Sigma programs." **2.0**

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