

Data Collection

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Avoid emotional decisions; let your products and processes do the talking.

Process improvement begins with good data. In their absence, emotions and autocracy run a business, people are blamed for problems outside their control, quality is measured by the amount of inspection, and customers wind up with rejectable product. And after receiving customer complaints, returned material, and corrective-action requests, identifying the root causes of a problem and developing a remedial solution becomes an impossible task for the manufacturer.

Sure, a lot of companies collect data on every process. What many fail to recognize, however, is what happens to data collected a few days or months prior. Often, these data go unused. Crunching the numbers often reveals incomplete log sheets, or inaccurate or artificial data. So the result is that we collect data by the ton and discard them, sans analysis, in equal measures. If significant resources are spent collecting data, shouldn't equally significant resources be invested to analyze them and reap the benefits?

Improvement through data analysis is critical to company profitability. To be consistently profitable we must know how efficiently the operation is running, yield numbers, major problem areas, and most importantly, which processes have variations. Eventually, excessive variations will lead to rejects.

For example, the emphasis of the newest version of ISO 9000 has changed from that of documentation to data analysis and improvement. Why? Experts realized that without proper emphasis on collecting data that measure the effectiveness of a process, it is difficult to create value. Indeed, without good data collection, decisions are made based on "manager memory" or convenience. Without meaningful data, it is difficult to identify problems that need to be solved.

The primary purpose of data collection is to control processes within operating parameters or to learn about process performance and identify opportunities for improvement. The secondary purpose is to be able to inform management of process performance so that any long-term improvements or investments are based on need analysis. Data collection and routine analysis can reduce problems by almost half. Unfortunately, oftentimes we ignore what the data tell us. But resolution cannot precede the acceptance that a problem exists.

Most companies could fill a room with data and facts they have on their operations. However, when we attempt to solve a problem, the data cannot be found or lack the depth to answer key questions. These questions include:

- What is the process problem?
- What is its magnitude?
- How frequently does the problem occur?
- What is the capability of the process with respect to the specifications?
- Was the process under control?
- What is the typical process performance?

- What were the process conditions when questionable parts were produced?

Data should provide insight into the historical performance of a product, and a good data collection system must be the product of deliberate design, implementation, and maintenance efforts. To design a good data collection system, the purpose, scope, and use of data must first be defined. The purpose of designing a data collection system is to monitor a process or a product. To monitor a process, we need to consider process inputs, in-process parameters, and output product parameters. To monitor a product, the data collection could be limited to product inspection or testing.

Process Mapping

Once the purpose is understood, a method and tool to collect the data must be developed. This is the time to avoid excessive data collection. The data collection plan must include developing a process map and prioritizing the performance of each process step based on reject rate or inconsistency. No data should be collected in the name of quality unless it makes economic sense. That said, the cost of data collection per product unit could be estimated, if necessary. Based on the importance and significance of the processes and available resources, we determine process and product parameters at various process steps. For each selected parameter, the data filing and analysis methods must also be identified. In short, where will the data be kept, how will it be analyzed and reported on, and who is responsible for data analysis and reports?

The layout of the data collection sheet should record information in the natural process flow. The sheet must be simple, logical, and intuitive. Also, the type of data – attribute or variable – to collect must be decided upon. Typical log sheets used in manufacturing operations show data in terms as simple as OK or Not OK. One company I have experience with had a roomful of data sheets collected over many years. Almost all of the entries said OK. If we were to trash that roomful of data, all that would be lost are two letters: OK. That type of data collection is unnecessary.

Attribute data are used to verify process setup or to monitor process performance. Attribute data are simple, implying pass or fail, and provide limited information about the symptoms of a problem. Variable data are much more sophisticated, providing a measurement on a continuous scale and information about the symptoms as well as the magnitude of the problem. Examples include thickness, current, voltage, viscosity, or temperature.

Once the parameters are identified and tools designed, personnel must be trained, to ensure accurate collection. During process audits it is helpful to conduct audits of the data collection process. And during analysis, regular (random) and irregular (discernable) patterns must be observed. Data are management's sensors to gain feedback from operations. To that end, let the products and processes do the talking.