

What is the difference between product quality and product conformity?

On an American Society for Quality (ASQ) web site, a member posted the question, “What is the difference between product quality and product conformity?” The question generated a number of responses from other members, among them:

- There is no difference between them, just the application. Both have to meet certain criteria related to them.
- A product's conformity to specifications is relatively measurable: It either conforms or not. A product's quality is more than just specs and may not be easily measurable.
- Product quality is meeting or exceeding the intended user's expectations. Product conformity is meeting all agreed upon specifications laid out in the Product Design Input document – i.e., Customer's expectations as well as applicable regulatory obligations.
- What is the difference between product quality and product conformity? This may be over-simplistic but a Skoda and a Ferrari are both high quality motor cars when they both fully conform to manufacturing standards and requirements. However should either manufacturer deviate from their own manufacturing requirements and standards one or both will become lesser quality cars.
- Product Conformity is an attribute variable. The product either is conforming or non-conforming. Product Quality is a continuous variable, measured by the quality characteristics that have been agreed to by supplier and customer.

It struck me that the question and answers above seemed to be dancing around the longstanding question, “What is quality?” Traditionally, it was always defined as conformance to specification or requirement. Thus, product conformity can be viewed as the old-fashioned definition of quality.

Product quality, however, is different from mere conformity. Product quality is minimal variation around some target or optimum value. An excellent illustration of the distinction between these two terms will be found in the classic Batavia Study that was conducted by Ford Motor Company in the late 1980's.

Ford had opened its new automatic transmission assembly plant in Batavia, Ohio. The plant was built around Ford's definition of quality at the time; i.e., "Ford has good designs. Everything produced in this plant will conform to those good designs." Based on that definition, the new plant launch was a resounding success. Nothing manufactured in the plant – from part and component level to final assembly – used more than 90% of the total tolerance.

But then the new plant encountered a dilemma. Ford Escorts were selling so well worldwide that the new plant no longer had the capacity to fuel the assembly plants. So, Ford outsourced the automatic transmissions. They submitted their designs to Mazda and the Japanese manufacturer started to produce Ford transmissions to Ford designs for Ford cars.

Some time passed and some strange data started to emerge. The repair frequency of the Batavia transmissions was five times higher than the Mazda transmissions. The warranty costs of the Batavia transmissions were also much higher than the Mazda transmissions. A team of Ford engineers set out to find out why there was such a discrepancy.

They took a bunch of Batavia transmissions and a bunch of Mazda transmissions and they tore them apart. They then proceeded to measure everything – size of the valve, size of the bore, sub-assembly, final assembly, functional test. The team discovered that the Mazda transmissions never used more than 27% of the total tolerance for any of those characteristics, from part and component level up to final assembly.

One of the Ford engineers involved in the study concluded, "We have always defined quality as conformance to design, conformance to print. The competition sings from a completely different song sheet when it comes to quality. Their definition is every part alike."

Both the Ford and the Mazda transmissions exhibited product conformity; both conformed to specifications. But the Mazda transmissions exhibited quality – minimal variation around the nominal values.

This conformance mentality in American industry goes beyond mere product conformity. Too many design engineers apply Design Failure Mode and Effects Analysis (DFMEA) with a compliance mentality. That is, they only perform the DFMEA because it's required by the customer, regulation, or their quality management system. So, the DFMEA is cranked out the week before design release and the project does not enjoy the many benefits of FMEA when applied correctly.

Six Sigma is also a reflection of our conformance mentality. It used to be, “If the product conforms to specification, it’s good enough.” Now, it’s “If we have a Cpk of 1.33, it’s good enough.” Both prove to be barriers to continuous improvement.

In 1987 – before the spread and popularity of Six Sigma – the Mazda transmissions were centered on the nominal, using only 27% of total tolerance. Do the math. The first Ford Escort transmissions Mazda ever made came in at *Eleven Sigma* – and we settle throughout American industry for Six Sigma. In fact, few so-called Six Sigma companies are even striving for Six Sigma quality. The most common standard I encounter for both internal operations and external suppliers is a Cpk of 1.33 – or merely *Four Sigma*.

Let’s return to the original question on the ASQ web site. “What is the difference between product quality and product conformity?” Product quality is minimal variation around some target or optimum value. Product conformity and any other form of a conformance mentality are all recipes for mediocrity.

Notes

_____, “Continuous Improvement in Quality and Productivity,” Film produced by Radio, TV, and Public Affairs Staff, Ford Motor Company, Dearborn, MI (1987).

J. F. Leonard, “I ain’t gonna teach it!”, <http://www.jimleonardpi.com/blog/i-aint-gonna-teach-it/>, August 21, 2013.