What is the Philosophy of Process Control (Rather than Product Control)?

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What is Quality?

Ask people involved with the design and manufacture of a product the following question: "What is Quality?" Many if not most of the responses will be some form of the following: "Quality is ensuring that our products meet the customer (or engineering) specifications. Unfortunately, this leads to a "conformance to specifications" or a "Product Control" approach to quality.

Controlling the product means that the product (incoming or outgoing) is *inspected* to ensure that all product conforms to the stated specifications. Several problems exist with this approach:

- The only time we react is when the product is out-of-specification. By this time, we may have a major crisis on our hands. The product is unusable and must be scrapped, reworked, or downgraded. Product control is reactive. In other words, we allow the process to control us!

- Inspection does not distinguish between parts that are very close to target vs. parts that are nearly out of specification --- all are treated as "good". However, almost always our customers would prefer to receive parts close to target.

- Inspection does not inherently monitor the evolution of the process over time. When a problem occurs, no data is available to support the determination of root cause(s).

- Inspection systems (people and equipment) make errors. "Good" parts may be rejected and "bad" parts may be accepted.

On the other hand Process Control, is *proactive* rather than reactive. Key elements of process control follow below:

- By first monitoring a process for a period of time, we learn what to *expect* from the process (with regard to key characteristics such as the process average and amount of process variation.)

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- Once we know what to expect under normal circumstances, we can detect when significant *changes* to the process occur.

- We then react to the observed change, determine the root cause(s) of the process change, and act to prevent future occurrences. Note that we typically will react long *before* we produce non-conforming product and crises may be averted. Furthermore, since we identify when the process change occurs we have a much better chance of identifying the root cause quickly.

Moving Upstream in the Process

Process control is even more beneficial when we move *upstream* in the process. When the significant process variables that affect a key process output are being controlled, then the process output is predictable. Costly (and imperfect) inspection may be eliminated.

It is curious that most customers demand process capability studies from their suppliers but few insist on evidence of process stability -- which is required before properly assessing capability.

Of course, to consistently achieve desired process outputs by controlling the relevant inputs, those relevant inputs must be determined by developing process understanding. Statistical methods such as Design of Experiments, and Regression Analysis are invaluable for this task.

Back to Quality

Two definitions of Quality that are consistent with a process control philosophy are:

- Quality is Closeness to Target
- Quality is Minimizing Variation

With these definitions, quality may be objectively measured. When variability in important product characteristics is reduced, the quality improves. Customers know what to expect and product performance is consistent! Only a *process control* focus allows us to minimize variation by detecting and eliminating root causes of process changes.

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