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WHAT IS THE LAW OF VARIATION?

Quality Glossary Definition: Variation (/quality-resources/quality-glossary/v)

The Law of Variation is defined as the difference between an ideal and an actual situation. Variation or variability is most often encountered as a change in data, expected outcomes, or slight changes in production quality. Variation usually occurs in four separate areas:

1. Special causes
2. Common causes
3. Tampering

4. Structural variation

An ideal situation represents a standard of perfection—or the highest standard of excellence defined by stakeholders (/quality-resources/stakeholders), including direct customers, internal customers, suppliers, society, and shareholders.

Though manufacturing groups and service providers strive for an ideal situation, they usually do not achieve this goal. Therefore, stakeholders almost always experience some variation from the perfect situations they envision. Reducing the variation stakeholders experience is the key to quality and continuous improvement (/quality-resources/continuous-improvement).

According to the law of variation as defined in the *Statistical Quality Control (/quality-resources/statistical-process-control) Handbook:*

- "Everything varies."
  - In other words, no two things are exactly alike.
- "Groups of things from a constant system of causes tend to be predictable."
  - We can't predict the behavior or characteristics of any one thing. Predictions only become possible for groups of things where patterns can be observed.

If outcomes from systems can be predicted, then it follows that they can be anticipated and managed.

VARIATION MANAGEMENT

In 1924, Dr. Walter Shewhart (/about-asq/honorary-members/shewhart) of Bell Telephone Laboratories developed the new paradigm for managing variation. As part of this paradigm, he identified two causes of variation:

- Common cause variation, also known as noise variation, is inherent in a process over time. It affects every outcome of the process and everyone working in the process. Managing common cause variation thus requires improvements to the process.
- Special cause variation, also known as signal cause variation, arises because of unusual circumstances and is not an inherent part of a process. Managing this kind of variation involves locating and removing the unusual or special cause.

Shewhart further distinguished two types of mistakes that are possible in managing variation: treating a common cause as special and treating a special cause as common.

Later, W. Edwards Deming (/about-asq/honorary-members/deming) estimated that a lack of an understanding of variation resulted in situations where 95% of management actions result in no improvement. Referred to as "tampering," action taken to compensate for variation within the control limits of a stable system increases, rather than decreases, variation.

Variation Articles & Resources

Continuous Improvement on the Free-Throw Line (/quality-progress/1997/10/problem-solving/continuous-improvement-on-the-free-throw-line.pdf) (PDF) A father and son successfully use the plan-do-study-act cycle (/quality-resources/pdca-cycle) combined with decision making (/quality-resources/decision-making-tools) and problem solving (/quality-resources/problem-solving) to reduce variation and improve basketball free-throw shooting.

Appraiser Variation in Gage R&R Measurement (/quality-progress/2006/05/measure-for-measure/appraiser-variation-in-gage-rr-measurement.html)

Using Corrective Action to Make Matters Worse (/quality-progress/2000/10/quality-tools/corrective-action-to-make-matters-worse.pdf) (PDF) One of the major reasons for ineffective corrective action programs is failure to consider the effects of variation.

References

Success Through Quality: Support Guide for the Journey to Continuous Improvement (/quality-press/display-item?item=E1006), ASQ Quality Press, 1999.

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