

Speaking of Quality: Quality 4.0 and Quality Improvements

The new technology will help organizations reduce all sources of variation.

Exponential growth and accelerated changes, the main characteristics of Industry 4.0, are determining Quality 4.0. Cyber-physical systems, the internet of things and systems, information and communications technology, new materials, big data, cloud and cognitive computing, augmented and virtual reality, artificial intelligence, machine learning, blockchain technology, 3D printing and many other technologies are making a significant impact on the process of creating products and services and therefore, their quality. People, processes and technologies—the three key elements of Quality 4.0—are combined to achieve operational excellence and improve overall performance and quality of products and services. All these advancements will affect the level of quality in a positive way.

Quality Improvements In Quality 4.0

It is well known that variation is the “enemy” of quality. Variation comes from many different sources along the process but generally, it can be stated that variation is present in the process itself and in a measuring system that is in place to assure the conformity of manufactured products. Furthermore, the variation present in the process itself could be due to a presence of common or special cause variation, and variation in a measuring system could be due to the variation that is present in measuring and monitoring instruments and also variation that comes from different appraisers that use them.

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The ability to detect the special cause variation in a manufacturing process from advanced sensor technology is invaluable to manufacturers. Many measuring and monitoring sensors as a part of Quality 4.0 implementation will be able to produce data to show early detection of variation in a manufacturing process. The traditional approach to rely on statistical process control and control charts to discover special cause variation will be slow and time consuming, and therefore, not very effective. Digitalization and automation will also ensure better

quality and conformance of products by reducing potential errors and variability, allowing efficient and effective problem solving. Furthermore, improved agility of controls and shorter time to execute control will significantly reduce quality control lead times and eventually result in real-time acceptance.

Common cause variation, a measure of process effectiveness when special cause variation does not exist, is naturally present in every process. It represents a deviation from the target caused by unknown factors resulting in a steady but random distribution of output around the mean. Quality 4.0 suggests using analytics of big data that are collected from smart sensors and processed through cloud computing and the internet of things platforms so that patterns that would be otherwise impossible to detect will be discovered and actions to address them implemented in real-time. Big data analytics can help discover hidden variables causing problems in the manufacturing process, which will be very difficult to discover using a traditional approach. Predictive analytics along with artificial intelligence will be able to detect variation in an early stage, providing an opportunity to act immediately and bringing the process back to its nominal value.

There is no doubt that major breakthrough improvement related to Quality 4.0 will occur in the measuring aspect of manufacturing. Numerous sophisticated devices that should be part of the manufacturing environment like sensors, smart detection systems, automated equipment that monitors and measures critical characteristics, supported by artificial intelligence, will be extremely beneficial to manufacturers who constantly face challenges to introduce new products rapidly, by maintaining a high level of quality and operational efficiency.

By using the automated measuring and monitoring equipment that is supported by artificial intelligence, the variation caused by appraisal factors will be completely removed from the equation when it comes to overall variability.

Conclusion

There is no doubt that major changes that are expected to be implemented in Quality 4.0 will affect the level of quality of products and services in a positive way. The new technology will help organizations reduce all sources of variation and, moreover, to be able to detect them early in their development and react in real-time to eliminate the root cause. Predictive analytics will also help organizations to detect presence of potential problems much before they even start producing defects. With all these changes, we should be very optimistic when comes to the quality of products and services in the future.

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For Applied Science, Technology,
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Mumbai.
email: dlshahtrust@yahoo.co.in
Ph: 022 2267 2041

Edited by Hari Taneja, Mumbai
email: dlshahtrust@yahoo.co.in