DOWNLOAD PDF STATISTICAL QUALITY ASSURANCE

Chapter 1 : Quality assurance - Wikipedia

This undergraduate statistical quality assurance textbook clearly shows with real projects, cases and data sets how statistical quality control tools are used in practice. Among the topics covered is a practical evaluation of measurement effectiveness for both continuous and discrete data.

History[edit] Initial efforts to control the quality of production[edit] During the Middle Ages , guilds adopted responsibility for the quality of goods and services offered by their members, setting and maintaining certain standards for guild membership. For this reason, King John of England appointed William de Wrotham to report about the construction and repair of ships. The Industrial Revolution led to a system in which large groups of people performing a specialized type of work were grouped together under the supervision of a foreman who was appointed to control the quality of work manufactured. Wartime production[edit] During the time of the First World War , manufacturing processes typically became more complex, with larger numbers of workers being supervised. This period saw the widespread introduction of mass production and piece work , which created problems as workmen could now earn more money by the production of extra products , which in turn occasionally led to poor quality workmanship being passed on to the assembly lines. Pioneers such as Frederick Winslow Taylor and Henry Ford recognized the limitations of the methods being used in mass production at the time and the subsequent varying quality of output. Taylor, utilizing the concept of scientific management, helped separate production tasks into many simple steps the assembly line and limited quality control to a few specific individuals, limiting complexity. Shewhart at Bell Laboratories in the early s. Shewhart developed the control chart in and the concept of a state of statistical control. Statistical control is equivalent to the concept of exchangeability [15] [16] developed by logician William Ernest Johnson also in in his book Logic, Part III: The Logical Foundations of Science. Shewhart consulted with Colonel Leslie E. General Douglas MacArthur oversaw the re-building of Japan. During this time, General MacArthur involved two key individuals in the development of modern quality concepts: Edwards Deming and Joseph Juran. Both individuals, as well as others, promoted the collaborative concepts of quality to Japanese business and technical groups, and these groups utilized these concepts in the redevelopment of the Japanese economy. In mechanical terms this is the operation of a product until it fails, often under stresses such as increasing vibration , temperature , and humidity. This exposes many unanticipated weaknesses in a product, and the data is used to drive engineering and manufacturing process improvements. Often quite simple changes can dramatically improve product service, such as changing to mold -resistant paint or adding lock-washer placement to the training for new assembly personnel. Statistical control[edit] Statistical control is based on analyses of objective and subjective data. Any product can be statistically charted as long as they have a common cause variance or special cause variance to track. Control can then be implemented on the part in the form of rework or scrap, or control can be implemented on the process that made the part, ideally eliminating the defect before more parts can be made like it. Total Quality Management The quality of products is dependent upon that of the participating constituents, [25] some of which are sustainable and effectively controlled while others are not. For instance, the parameters for a pressure vessel should cover not only the material and dimensions but operating, environmental, safety , reliability and maintainability requirements. Models and standards[edit] ISO is an international standard that specifies the general requirements for the competence to carry out tests and or calibrations. There are 15 management requirements and 10 technical requirements. These requirements outline what a laboratory must do to become accredited. WHO has developed several tools and offers training courses for quality assurance in public health laboratories. The CMMI maturity levels can be divided into 5 steps, which a company can achieve by performing specific activities within the organization. Company quality[edit] During the s, the concept of "company quality" with the focus on management and people came to the fore in the U. The company-wide quality approach places an emphasis on four aspects enshrined in standards such as ISO QA is not limited to manufacturing, and can be applied to any business or non-business activity, including: It comprises a quality improvement process, which is generic in the sense that it can be applied to any of these activities and it

establishes a behavior pattern , which supports the achievement of quality. This in turn is supported by quality management practices which can include a number of business systems and which are usually specific to the activities of the business unit concerned. In manufacturing and construction activities, these business practices can be equated to the models for quality assurance defined by the International Standards contained in the ISO series and the specified Specifications for quality systems. In the system of Company Quality, the work being carried out was shop floor inspection which did not reveal the major quality problems. This led to quality assurance or total quality control, which has come into being recently. Medical industry[edit] QA is very important in the medical field because it helps to identify the standards of medical equipments and services. Hospitals and laboratories make use of external agencies in order to ensure standards for equipment such as X-ray machines, Diagnostic Radiology and AERB. QA is particularly applicable throughout the development and introduction of new medicines and medical devices. The Research Quality Association RQA supports and promotes the quality of research in life sciences, through its members and regulatory bodies. Aerospace industry[edit] The term product assurance PA is often used instead of quality assurance and is, alongside project management and engineering, one of the three primary project functions. Quality assurance is seen as one part of product assurance. Due to the sometimes catastrophic consequences a single failure can have for human lives, the environment, a device, or a mission, product assurance plays a particularly important role here. It has organizational, budgetary and product developmental independence meaning that it reports to highest management only, has its own budget, and does not expend labor to help build a product. Software quality assurance Software quality assurance consists of a means of monitoring the software engineering processes and methods used to ensure quality. The methods by which this is accomplished are many and varied, and may include ensuring conformance to one or more standards, such as ISO or a model such as CMMI. In addition, enterprise quality management software is used to correct issues such as:

Chapter 2 : Statistical process control - Wikipedia

This course includes software-- development process, process models, project planning, quality assurance, configuration management, process and project metrics, change, re-engineering.

SPC â€" Which is right for my manufacturing process? Both SQC and SPC play an important role in optimizing your operations so you can get the best result and most efficient output. Statisticsâ€" is the study of the collection, analysis, interpretation, presentation, and organization of data. Statistical toolsâ€" is the application of statistics for the purpose of visualizing, identifying and predicting results based on the data collected. Statistical Process Control SPC â€" is the recording and measuring of the parameters of a process such as speed, pressure, caliper etc against a set of standards using statistical methods to verify they are within required limits. Minimize variation and run to optimum target Statistical Quality Control SQC â€" is typically the measuring and recording of data against specific requirements for a product ensuring they meet the necessary requirements â€" size, weight, colour etc. Auditing process validating outputs from a process meet the requirements of the ultimate customer or next stage of the manufacturing process. That very well may be true but in a typical manufacturing facility there are two distinct roles. SPC â€" Why should I care? Because they both play an integrated role in seeing you achieve operational success! While the two roles exist in a facility there is a move to do more of the SQC validation directly to the manufacturing floor decreasing the time lag between finding a problem and fixing it. The important part of both of these responsibilities is to ensure that both roles are being performed and more importantly checking the right parameters and measuring on the right frequency. This is where Statistical tools come into play and are very important. Applying statistical tools to the data collected allows for the detection of immediate issues like being outside specification or control limits. These would be detected based on the setting of these limits and measuring against them. The next set of statistical tools involve what is termed descriptive statistics. Descriptive statistics are applied to a population of data and are used to describe the data in that population. QW 5 provides an extensive list of these Statistics to select from to best suit any population of data collected in a QW 5 application. A key understanding of statistics is that they act as indicators, like blood pressure and heart rate, to help diagnose or better understand the data collected. An example would be the Descriptive statistic Observed Out of Specification where each data point in the population is measured against fixed specification limits to determine the number that exceed the specification limits. The inferential example would be the Calculated out of specification which is based on the volatility of the data. It speculates on whether there would be more out of specification values found if more samples were taken. It can be used as a test on whether the testing frequency is correct based on the variation detected in the data collected. So in summary SPC is focused on minimizing variation in a process and running at target , while SQC , using similar tools, is the auditing method of insuring outputs meet exact requirements. In addition its failure analysis capabilities to capture, analyze and eliminate productivity losses like Downtime, Defects and Waste making it the complete cost effective solution for the manufacturing floor. Try Quality Window 5 QW5 Collect, visualize, analyze and react to your process data so you can increase efficiencies across the manufacturing floor.

Chapter 3 : Statistical Methods of Quality Assurance - Hans-Joachim. Mittag, Horst Rinne - Google Books

Quality assurance (QA) is a way of preventing mistakes and defects in manufactured products and avoiding problems when delivering solutions or services to customers; which ISO defines as "part of quality management focused on providing confidence that quality requirements will be fulfilled".

Shewhart at Bell Laboratories in the early s. Shewhart developed the control chart in and the concept of a state of statistical control. Statistical control is equivalent to the concept of exchangeability [1] [2] developed by logician William Ernest Johnson also in in his book Logic, Part III: The Logical Foundations of Science. Shewhart consulted with Colonel Leslie E. Deming was an important architect of the quality control short courses that trained American industry in the new techniques during WWII. The graduates of these wartime courses formed a new professional society in , the American Society for Quality Control, which elected Edwards as its first president. Common cause and special cause statistics Shewhart read the new statistical theories coming out of Britain, especially the work of William Sealy Gosset , Karl Pearson , and Ronald Fisher. However, he understood that data from physical processes seldom produced a " normal distribution curve"; that is, a Gaussian distribution or " bell curve ". He discovered that data from measurements of variation in manufacturing did not always behave the way as data from measurements of natural phenomena for example, Brownian motion of particles. The notion that SPC is a useful tool when applied to non-repetitive, knowledge-intensive processes such as research and development or systems engineering has encountered skepticism and remains controversial. This implies that SPC is less effective in the domain of software development than in, e. Variation in manufacturing[edit] In manufacturing, quality is defined as conformance to specification. However, no two products or characteristics are ever exactly the same, because any process contains many sources of variability. In mass-manufacturing, traditionally, the quality of a finished article is ensured by post-manufacturing inspection of the product. Each article or a sample of articles from a production lot may be accepted or rejected according to how well it meets its design specifications. In contrast, SPC uses statistical tools to observe the performance of the production process in order to detect significant variations before they result in the production of a sub-standard article. Any source of variation at any point of time in a process will fall into one of two classes. It refers to many sources of variation that consistently acts on process. These types of causes produce a stable and repeatable distribution over time. It refers to any factor causing variation that affects only some of the process output. They are often intermittent and unpredictable. Most processes have many sources of variation; most of them are minor and may be ignored. If the dominant assignable sources of variation are detected, potentially they can be identified and removed. When they are removed, the process is said to be "stable". When a process is stable, its variation should remain within a known set of limits. That is, at least, until another assignable source of variation occurs. When the package weights are measured, the data will demonstrate a distribution of net weights. If the production process, its inputs, or its environment for example, the machines on the line change, the distribution of the data will change. For example, as the cams and pulleys of the machinery wear, the cereal filling machine may put more than the specified amount of cereal into each box. If the manufacturer finds the change and its source in a timely manner, the change can be corrected for example, the cams and pulleys replaced. Understanding the process and the specification limits. Eliminating assignable special sources of variation, so that the process is stable. Monitoring the ongoing production process, assisted by the use of control charts, to detect significant changes of mean or variation. Control charts[edit] The data from measurements of variations at points on the process map is monitored using control charts. Control charts attempt to differentiate "assignable" "special" sources of variation from "common" sources. Using control charts is a continuous activity, ongoing over time. Stable process[edit] When the process does not trigger any of the control chart "detection rules" for the control chart, it is said to be "stable". A process capability analysis may be performed on a stable process to predict the ability of the process to produce "conforming product" in the future. Excessive variations[edit] When the process triggers any of the control chart "detection rules", or alternatively, the process capability is low , other activities may be performed to identify the source of the

excessive variation. The tools used in these extra activities include: Ishikawa diagram , designed experiments , and Pareto charts. Designed experiments are a means of objectively quantifying the relative importance strength of sources of variation. Once the sources of special cause variation are identified, they can be minimized or eliminated. Steps to eliminating a source of variation might include: Process stability metrics[edit] When monitoring many processes with control charts, it is sometimes useful to calculate quantitative measures of the stability of the processes. These metrics can also be viewed as supplementing the traditional process capability metrics. Several metrics have been proposed, as described in Ramirez and Runger. Mathematics of control charts[edit] Digital control charts use logic-based rules that determine "derived values" which signal the need for correction.

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Chapter 4 : Statistical Quality Assurance (SQA) (Hong Kong)

Statistical process control (SPC) is a method of quality control which employs statistical methods to monitor and control a process. This helps to ensure that the process operates efficiently, producing more specification-conforming products with less waste (rework or scrap).

Statistical Quality Control in R by yhat June 25, Quality Control and quality assurance are important functions in most businesses from manufacturing to software development. Often times QC and QA are performed manually by a select few specialists, and determining suitable quality can be extremely complex and error-prone. This is a post about quality assurance automation using statistics and R. What is statistical quality control? Statistical quality control is a quantitative approach to monitoring and controlling a process. The best way to explain it is though an example. How would you know if your machine has suffered a malfunction? Take a look at the plots below. Can you tell which one has experienced a change in the mean? You can think of each lug nut as an observation. This means that over time, the mean lug nut diameter should approach 10 mm. Enter the qcc package in R. This magical little library was built by Luca Scrucca for nothing but statistical quality control. You provide it with data and it tells you which points are considered to be outliers based on the Shewart Rules. It even color codes them based on how irregular each point is. In the example below you can see that for the last 10 points of the 2nd dataset I shifted the mean of the data from 10 to Simply add the data you want to calibrate it with as the first parameter, then add the parameter newdata with your test data see code above and plot below. It all just depends on how creative you are. The WER were first used by you guessed it the Western Electric Company as a way to standardize how their employees monitored their electric lines. While the Western Electric Co. The WER are remarkably straightforward and intuitive. For a recurring process take a sampling of points and measure the mean and the standard deviation. Then create 3 zones above and below the center-line, each 1 standard deviation in width. Based on these zones, the Western Electric Co. Defining the Zone The first thing we need to do is define the thresholds for each of the zones. Each zone is one standard deviation in width and there are 3 zones on each side of the center-line. What we end up with is a grid. The numbers in columns 1 and 2 correspond with the boundaries for Zone -3, columns 2 and 3 correspond with Zone -2, etc. Finding Outliers Since we know what the range is for each zone, now we need to determine which zone every point falls in. We can use rowSums which does row-wise summation on a data. The value of each item is the zone which it belongs in plus 4 the extra 4 is because a value of 1 maps to zone -3 , so we subtract 4 from the vector and Visualizing It All With all of our data points, we can now make a quality control chart. You can get the entire script here. Deploying to Yhat Deploying this one is really easy. We can bypass the model. While you might not be working at a lug nut factory, you probably have lots of jobs, processes, logs, or database metric that you could monitor using control charts.

Chapter 5 : National Quality Assurance Framework

"A polished Quality specialist with over 6 years of experience in quality evaluation, quality Management and remarkable support for higher-level management.

Chapter 6 : Statistical Process Control (SPC) Training & Courses | ASQ

This practice covers information for the design and operation of a program to monitor and control ongoing stability and precision and bias performance of selected analytical measurement systems using a collection of generally accepted statistical quality control (SQC) procedures and tools.

Chapter 7 : Statistical Methods in Quality Improvement | ASQ

Statistical Methods for Quality Control 3 The American Society for Quality (ASQ) defines quality as "the totality of

features and characteristics of a product or service that bears on its ability to satisfy given needs.".

Chapter 8 : Statistical Quality Control

Statistical Quality Assurance (SQA) As brands and retailers experience growing demand for the latest consumer products, the resulting increase in production and batch sizes makes quality control more challenging for companies.

Chapter 9 : Å·hat | Statistical Quality Control in R

a quality assurance framework an imperative for improvement of statistics of the African Statistics System. Meaning of statistical quality Based on ISO quality may be defined as the extent or degree to which materials, products, processes and.