Abstract

In my Doctoral thesis, improved control charts for monitoring generally inflated processes are developed, in order to cope with the low occurrence rate of defective objects and the overdispersion in high-level processes of this kind.

First, two synthetic control charts are studied which are suitable for monitoring a generally inflated (GIP_r) and a zero inflated (ZIP) Poisson processes and in particular for detecting increases in the mean level of the process. Then two-sided control charts are proposed and studied for monitoring a generally inflated (GIP_r) and a zero inflated (ZIP) Poisson processes with supplementary stopping rules to increase the sensitivity of the Shewhart-type chart in detecting shifts in the process parameters. In these charts, two rules are applied to detect increases and one rule to detect decreases in the average level of the process. Finally, the performance of an upper one-sided Shewhart-type control chart for zero-inflated processes (ZIP) is studied, when the in-control values of the process parameters are unknown and must be estimated, since there is a significant difference between the theoretical and the actual performance of a control chart , where in the first we consider the values of the process parameters to be known, while in the second these values are unknown and have been estimated. Furthermore, it is much more realistic to assume that both process parameters are not known.

From the relevant bibliographic review, it emerged that the charts studied had not been studied until now. Moreover, the numerical results showed that they can be reliable alternative methods for statistical monitoring of generally inflated processes with remarkable ability to detect abundance out of control states. For all the above-mentioned controls, their statistical design is presented in detail, with suggested rules for determining their parameter values, as well as their operation mode and their practical applications in real problems from industry and public health.