Six Sigma Quality Using R: Tools and Training

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Six Sigma is a known methodology for Process and Quality Improvement. It is also a philosophy, and a *set of tools*. It is based on the methodology **DMAIC** (Define, Measure, Analyze, Improve, Control). There are other business-process management methodologies related to Six Sigma, such as DFSS (Design For Six Sigma) or Lean Manufacturing (Lean Six Sigma).

Six Sigma is notable for using the Scientific Method, and Statistical Techniques. Some of the statistical tools that are used in Six Sigma projects are:

- Graphic Analysis: Pareto Charts, Histograms, Scatterplots, Box-Whisker Charts, Group Charts, Location Charts, Control Charts, Multivari Charts

- Design of Experiments

- Regression and Analysis of Variance (ANOVA)

- Confidence Intervals, Hypothesis Testing

- Gage R&R Studies

- Acceptance Sampling, Capability Analysis, Reliability Analysis

Commercial statistical software usually includes specific options for Quality Management, for example control charts. There are also a couple of contribution packages in *R* regarding control charts (**qcc**, **IQCC**) but there is no a complete set of tools for *Six Sigma*.

We are currently working in several initiatives aimed at **explain and facilitate Six Sigma practitioners to carry on their Six Sigma projects with *R***, such as a **SixSigma** package (already at `CRAN` repositories) with some functions deployed and many others in mind, as well as an on-line training course within the EC Lifelong Learning Programme VRTUOSI project, and several publications in preparation.

References

Allen, T. T. (2010). *Introduction to Engineering Statistics and Lean Six Sigma - Statistical Quality Control and Design of Experiments and Systems*. Springer.

Box, G. (1991). Teaching engineers experimental design with a paper helicopter. Report 76, Center for Quality and Productivity Improvement. University of Wisconsin.

Chambers, J. M. (2008). *Software for data analysis. Programming with R*. Statistics and Computing. Springer.

ISO (2009). *ISO/TS 16949: Quality management systems – Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations*. International Organization for Standardization.

Montgomery, D. (2005). *Introduction to Statistical Quality Control* (5th ed.). New York: Wiley.

Murrell, P. (2005). *R Graphics*. Chapman & HallCRC.