

Standardisation on Statistics: ISO Standards and R Tools

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MOTIVATION

- Different interpretations in applying statistical methods and terminology is easily found among scientists and professionals in statistics
- Achieving unique and worldwide agreed criteria is the goal of the ISO standards
- An ISO standard is a worldwide agreed and accepted document developed by experts from countries all over the world
- Research projects **funding schemes** are more and more **requiring** the adoption and creation of standards

ISO & AENOR



International Standardization Organization

www.iso.org

- Some ISO standards are very well known such as ISO 9001 or ISO 14001 but ISO standards cover many and varied fields and Statistics is one of them
- Standards on Statistics are developed by a specific Technical Committee (TC):

ISO/TC 69 - Applications of statistical methods

“Standardization in the application of statistical methods, including generation, collection (planning and design), analysis, presentation and interpretation of data.”

AENOR

www.aenor.es

Asoc. Española de Normalización y Certificación
Spanish Standardization Body

- Member of ISO and of ISO/TC 69
- Responsible for the adoption and management of ISO Standards on statistics in Spain
- A specific technical body for statistics standardization within its structure:

CTN66/SC3: Métodos estadísticos (Statistical methods)

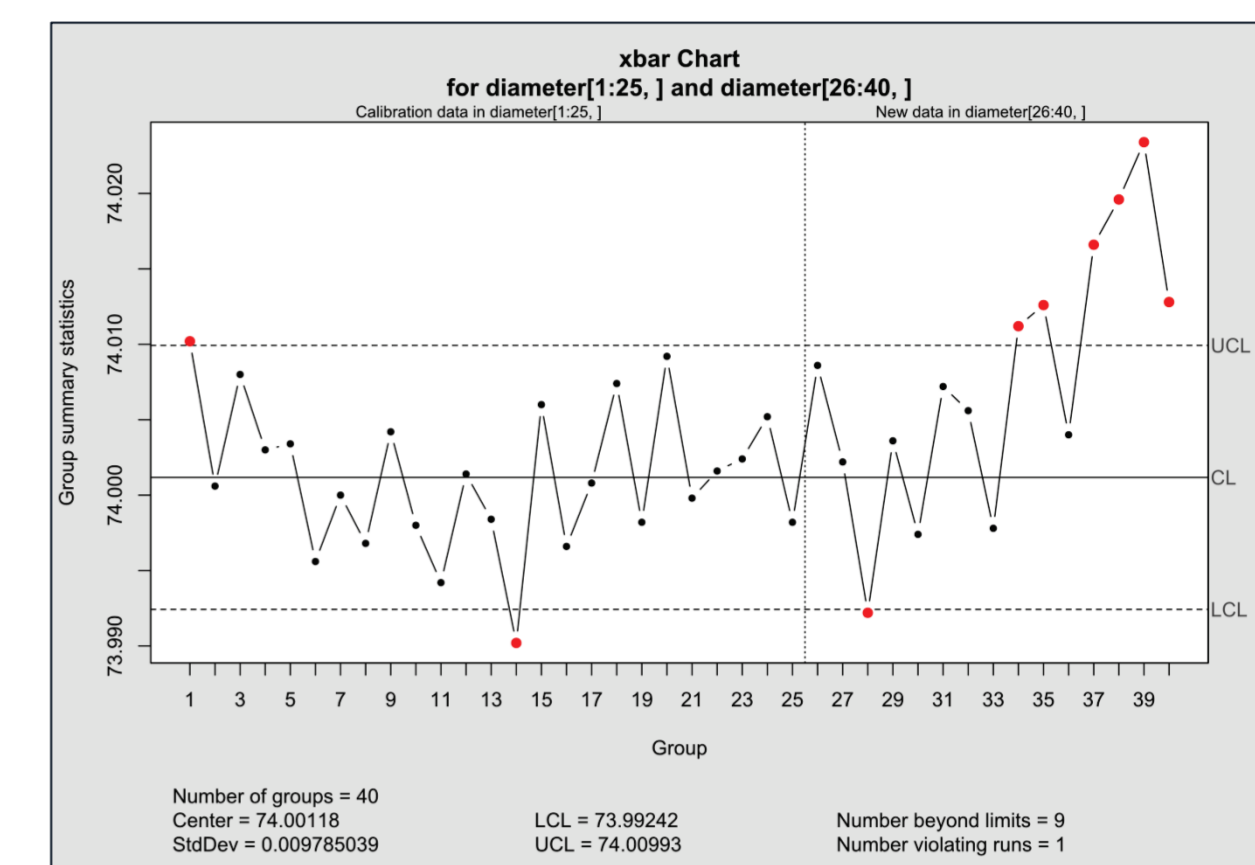
- Promotion of the use of standards on Statistics by professionals, academics and scientists
- Participate in the development of international standards on Statistics
- Sampling procedures and schemes for inspection, Six Sigma, vocabulary, etc

STATISTICAL STANDARDS & R

ISO 7870 series - Control charts

- ISO 7870-1 - Part 1: General guidelines
- ISO 7870-2 - Part 2: Shewhart control charts
- ISO 7870-3:2012 - Part 3: Acceptance control charts
- ISO 7870-4:2011 - Part 4: Cumulative sum charts
- ISO/DIS 7870-5 - Part 5: Specialized control charts
- ISO/CD 7870-6 S- Part 6: EWMA Control Charts

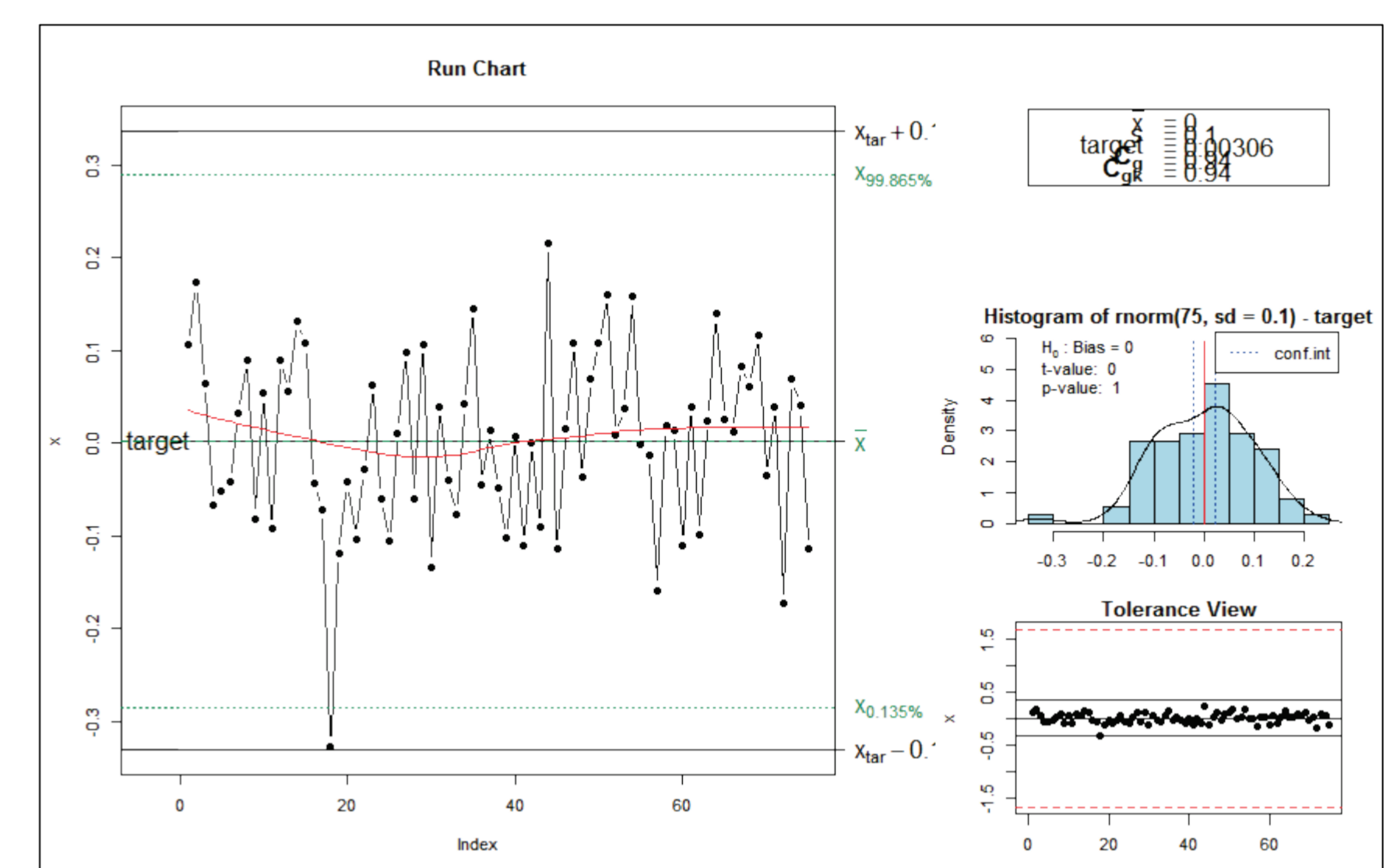
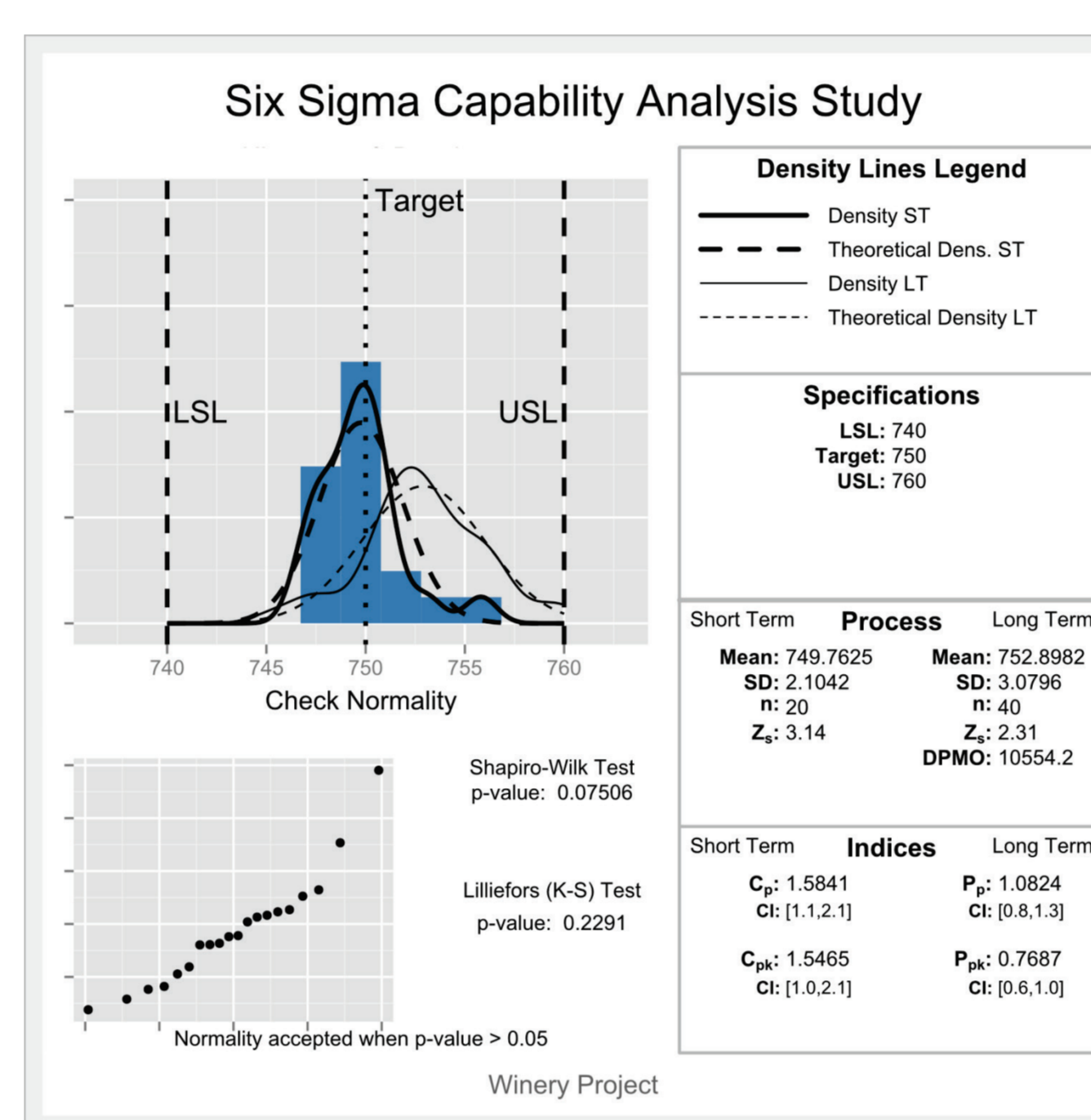
Main R Packages: IQCC, qcc



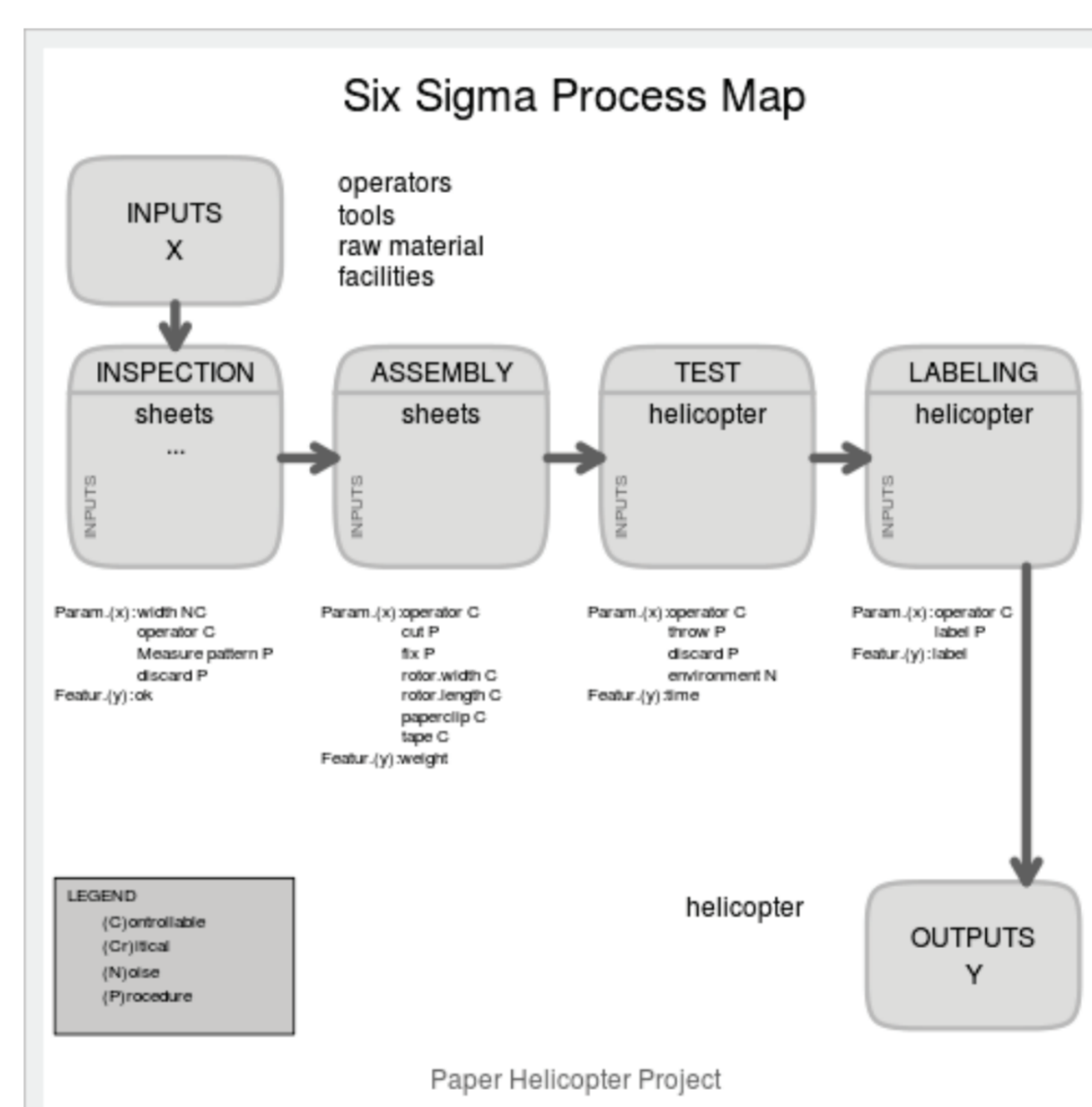
ISO 22514 series – Capability and Performance

- ISO 22514-1:2009 - Part 1: General principles and concepts + 6 other parts

Main R Packages: qualityTools, SixSigma



ISO 13053 series - Six Sigma



Main R Packages: SixSigma

More standards

- ISO 3951 series: Sampling procedures for inspection by variables
- ISO 2859 series: Sampling procedures for inspection by attributes
- ISO 18414, 13448: Acceptance Sampling
- ISO 28640 Random variate generation methods
- ISO 16269-4 Statistical interpretation of data -- Part 4: Detection and treatment of outliers

More R Packages and functions:

base, graphics, lattice, ggplot2, DoE, ts, lm, glm, anova, spcadjust, edcc, MCUSUM, MEWMA, RSA, gam, distributions, MFSAS, AcceptanceSampling..

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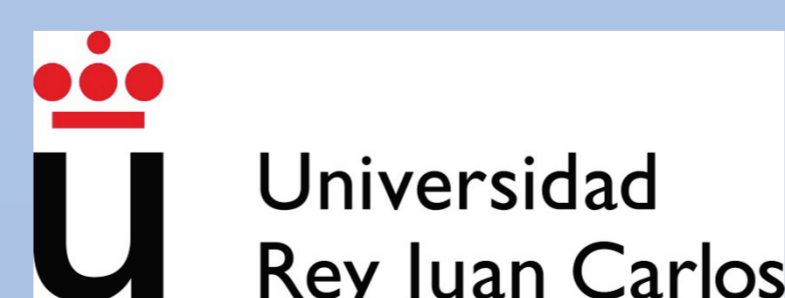
** /src/main/RNG.c **
...
case MERSENNE_TWISTER:
if(initial) I1 = 624;
/* No action unless user has corrupted
.Random.seed */
if(I1 <= 0) I1 = 624;
/* check for all zeroes */
for (j = 1; j <= 624; j++)
if(RNG_Table[RNG_kind].i_seed[j] != 0) {
notallzero = 1;
break;
}
}
if(!notallzero) Randomize(RNG_kind);
break;
...

```

Accessible and verifiable source code

CONCLUSIONS AND FURTHER WORK

- Data Scientists, and practitioners in general, can take advantage of the synergies between the knowledge and use of international standards and the use of R
- R programs can be easily verified (which is a requirement in many standards, e.g., ISO 9001) as it is Open Source
- Thus, any company or organization can go beyond the traditional « Quality Certified » stamp and extend the use of international standards to their analyses
- New book in preparation for the Springer useR! Series focusing on ISO standards



REFERENCES

Asociación Española de Normalización - AENOR, <http://www.aenor.es/>
 Emilio L. Cano, Javier M. Moguerza and Andres Redchuk (2012). Six Sigma with R. Springer, New York, <http://www.sixsigmawithr.com/>
 ISO/TC69 Applications of statistical methods, http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?commid=49742