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Statistical methods for implementation of Six Sigma — Selected illustrations of contingency table analysis

Méthodes statistiques pour l'implémentation de Six Sigma — Exemples sélectionnés d'application de l'analyse de tableau de contingence

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 7, *Applications of statistical and related techniques for the implementation of Six Sigma*.

Introduction

The Six Sigma and international statistical standards communities share a philosophy of continuous improvement and many analytical tools. The Six Sigma community tends to adopt a pragmatic approach driven by time and resource constraints. The statistical standards community arrives at rigorous documents through long-term international consensus. The disparities in time pressures, mathematical rigor, and statistical software usage have inhibited exchanges, synergy, and mutual appreciation between the two groups.

The present document takes one specific statistical tool (Contingency Table Analysis), develops the topic somewhat generically (in the spirit of International Standards), then illustrates it through the use of several detailed and distinct applications. The generic description focuses on the commonalities across studies designed to assess the association of categorical variables.

The Annexes containing illustrations do not only follow the basic framework, but also identify the nuances and peculiarities in the specific applications. Each example will offer at least one "winkle" to the problem, which is generally the case for real Six Sigma and other fields application.

Statistical methods for implementation of Six Sigma — Selected illustrations of contingency table analysis

1 Scope

This document describes the necessary steps for contingency table analysis and the method to analyse the relation between categorical variables (including nominal variables and ordinal variables).

This document provides examples of contingency table analysis. Several illustrations from different fields with different emphasis suggest the procedures of contingency table analysis using different software applications.

In this document, only two-dimensional contingency tables are considered.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3534-1 and ISO 3534-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
categorical variable
variable with the measurement scale consisting of a set of categories

3.2
nominal data
variable with a nominal scale of measurement

[SOURCE: ISO 3534-2:2006, 1.1.6]

3.3
ordinal data
variable with an ordinal scale of measurement

[SOURCE: ISO 3534-2:2006, 1.1.7]

3.4
contingency table
tabular representation of categorical data, which shows frequencies for particular combinations of values of two or more discrete random variables

Note 1 to entry: A table that cross-classifies two variables is called a "two-way contingency table;" the one that cross-classifies three variables is called a "three-way contingency table." A two-way table with r rows and c columns is also named "r × c table."

EXAMPLE Let n items be classified by categorical variables X and Y with levels X_1, X_2 and Y_1, Y_2, respectively. The number of items with both attribute X_i and Y_j is n_{ij}. Then, a 2 × 2 table is as follows.