

**SECOND EDITION**

# **VISUAL** **SIX SIGMA**

MAKING DATA ANALYSIS LEAN

**IAN COX • MARIE A. GAUDARD • MIA L. STEPHENS**

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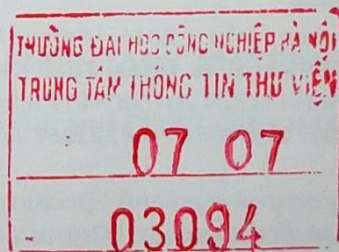
# Visual Six Sigma

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*Making Data Analysis Lean*

**Ian Cox**  
**Marie A. Gaudard**  
**Mia L. Stephens**

Second Edition



**WILEY**

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# Preface to the Second Edition

The first edition of this book appeared in 2010, so we decided to produce an updated and expanded second edition. The purpose of the book remains unchanged—to show how, using the three principles of Visual Six Sigma, you can exploit data to make better decisions more quickly and easily than you would otherwise. And, as you might expect given their power and utility, these principles are also unchanged. However, production of this second edition allows us to take advantage of some interim developments that make the implementation of Visual Six Sigma even easier, further increasing the scope and efficacy of its application. It also allows us to improve and enhance the content and form of the first edition.

The staying power of Six Sigma as a methodology can be attributed to the fact that it can provide a common language for, and approach to, project-based improvement initiatives. Nonetheless, as we pointed out in the first edition, there is a clear need to evolve the mechanics of Six Sigma both to accommodate the greater availability of data and to address the fact that, historically, approaches to analyzing data were overly concerned with hypothesis testing, to the detriment of the hypothesis generation and discovery needed for improvement. We believe that Visual Six Sigma can foster this evolution, and this is part of our motivation for keeping this text current.

At the same time, the past five years have seen the explosion of “big data,” at least as an identifiable area that software providers and implementation consultants make strenuous efforts to market to. In this language, the increased data availability mentioned above is measured using three dimensions: volume, variety, and velocity. Even though the precise definition of big data is not always clear, we think there is much for would-be data scientists to learn from the principles of Visual Six Sigma and their application. In addition, if a project-based approach is warranted, the language of Six Sigma may also be useful.

Although the principles of Visual Six Sigma are general, their effective and efficient adoption in practice is reliant on good enabling software. The first edition was tied to version 8.01 of JMP, Statistical Discovery software from SAS Institute®. This second edition has been revised to be consistent with the version current at the time of writing, JMP 12.2.0. Generally, JMP aims to exploit the synergy between visualization and analysis, and its continuing development has opened up new possibilities for Visual Six Sigma. In some cases, these are simply matters of detail and efficiency, but in others there are important new capabilities we can use.

A key feature of the book remains the six self-contained case studies. Given feedback from the first edition, we are even more convinced of the advantage of this format in showing how seemingly disparate techniques can be used in concert to accomplish something useful. We interweave the new capabilities of JMP where they usefully support or extend the case studies.

Consistent with the requirements of Visual Six Sigma in the new era of big data, we have introduced two new chapters:

- Chapter 4, “Managing Data and Data Quality,” precedes the case studies and addresses the management of data and data quality. Data quality, at an organizational level, is a ubiquitous topic that is often seen as mainstream to the point of being boring. However, the importance of data quality for project teams and anyone making decisions with data cannot be overstated. As we shall see, the Visual Six Sigma context leads to some important and interesting nuances.
- Chapter 11, “Beyond ‘Point and Click’ with JMP,” follows the case studies and shows how to go beyond the interactive usage of JMP for discovery and improvement. No matter how simple or complex, the performance of empirical models always degrades over time. Once improvements are made, there is always the need to monitor and adapt with an appropriate frequency. In turn, this means that analyses need to be repeated as new data arrive, and this is often best done with an element of automation.

The case studies appear in Part Two of the book. Chapter 4 is appended to Part One, making this section four chapters long. Given the nature of the content, Chapter 11 appears as a singleton chapter in Part Three.

Finally, we have tried to make the case studies easier to use by having clearer typographic separation between the narrative (consisting of the *why*, the *what*, and the findings of each technique as it is used in a specific context) and the “how to” steps required in JMP. As well as helping to keep things concise, this arrangement better accommodates users with different levels of prior familiarity with JMP, and may make it easier to use other software should this be required or mandated.

As in the first edition, we have used different fonts to help identify the names of data tables, of columns in data tables, and commands. Data table names are shown in **MeridienLTStd-Bold**, the names of columns (which are variable names) are shown in *italic Helvetica*, and the names of commands and other elements of the user interface are shown in **bold Helvetica**.

We are now living through a time of rapid change in the world of data analysis. We have tried to reflect this in our changes and additions. We hope that this second edition on Visual Six Sigma contains even more of interest for current or would-be Six Sigma practitioners, or more generally for anyone with



a stake in exploiting data for the purpose of gaining new understanding or of driving improvement.

## Supplemental Materials

We anticipate that you will follow along, using JMP, as you work through the case studies and Chapters 4 and 11. You can download a trial copy of JMP at [www.jmp.com/try](http://www.jmp.com/try). Chapter 10 requires JMP Pro. You can request a trial version of JMP Pro at [www.jmp.com/en\\_us/software/jmp-pro-eval.html](http://www.jmp.com/en_us/software/jmp-pro-eval.html). JMP instructions in this book are based on JMP 12.2.0. Although the menu structure may differ if you use a different version of JMP, all the functionality described in this book is available in JMP 12.2.0 or newer versions.

The data sets used in the book are available at <http://support.sas.com/visualsexsigma>. This folder contains a journal file, **Visual Six Sigma.jrn**, that contains links to the data tables, scripts, and add-ins discussed in this book. The color versions of the exhibits shown in the book are also available here. Exhibits showing JMP results were taken using JMP 12.2.0 running on Windows.