CONTINUOUS IMPROVEMENT, PROBABILITY, AND STATISTICS

USING CREATIVE HANDS-ON TECHNIQUES

WILLIAM HOOPER

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Continuous Improvement, Probability, and Statistics

Using Creative Hands-On Techniques

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Dedication

This book is dedicated all students that have struggled to learn data analysis, statistics, or continuous improvement.

Contents

Preface: Learning data, statistics, and continuous improvement another way

I remember it well. During a grad-level course in statistics, the professor whose name will remain anonymous, described the hypothesis testing method and told everyone to memorize the following for the exam: "Failure to reject the null hypothesis when the null hypothesis is false is a beta error and rejection of the null hypothesis when the null hypothesis is true is an alpha error." After class, several of us were exchanging notes when one student said to think of a courtroom trial as a better example as to what the hypothesis testing method is really saying. Intrigued, one person said, "Can you expand on that?" "For an alpha error, think of Nelson Mandela, and for a beta error, think of Al Capone." This opened up an entire discussion on how this almost 90-year-old theory can be used for experimentation and continuous improvement—not just memorized for the exam. How understanding that alpha error is falsely determining there was a change in a process when there was none, and beta error was the failure to recognize the change in the process when it really happened. How proper understanding of this method alone can begin to ignite the passion for continuous improvement in every machine operator, administrative clerk, plant manager, and leader.

After years of consulting by traditional methods, in 2011, I dedicated my life to a teaching method that would change the way the world sees data and probably more importantly taught data analysis and probability theory. What if instead of traditional lecture and test, probability could be learned by card and coin magic? What if the art of juggling could be used as a training technique in data analysis and statistics? What if the experimental helicopter could be used for teaching such concepts as the t-test, ANOVA, and design of experiments? What if 3D imaging could be used to visualize cube plots critical to understanding design of experiments?

This book is dedicated to all those who have struggled with the concept of statistics, have a genuine fear of data, and think the world of continuous improvement and experimentation is designed for a minor few and not for the masses. This book begins to answer the question; why can't every operator, technician, student, manager, and leader understand the fundamentals of data and the science of data analysis for incremental and many times breakthrough in continuous improvement?

I thank all my students from the continuous improvement courses over the past 10 years for their inspiration of this book and the hope that these methods will launch a new method of teaching and instructing in the science of continuous improvement.

William Hooper

Acknowledgments

Writing a book is about combining lonely effort with group therapy; I am forever grateful for those who supply the latter. Here is a partial list.

A special thanks to the editor, Kate Jakubas. We should all be so lucky to have her skill available for a project like this. Her attention to detail combined with questions regarding content on each chapter is what made this book. Could not have done it without her.

Also, special thanks to professional magician Ben Whiting. The concept behind many of the techniques in Chapters two and three can be traced to one-on-one instruction from Ben in 2010. While learning the card tricks, I started using them the next day in class to teach probability theory. That turned out to be a huge hit and a learning technique for the students, starting the process that eventually led to writing this book. Ben is a rare find in the magic world—a terrific entertainer, innovator, and a great one-on-one instructor.

Special thanks to professor Elizabeth Cudney of the University of Missouri S&T. Dr. Cudney attended my presentation before the 2014 American Society for Quality's World Conference in Dallas, Texas, when the concept of using card magic to explain probability theory was first introduced. That started the discussions with Dr. Cudney on the concept of writing a book based on that talk. She has been a terrific inspiration and coach through the book-writing process.

The use of juggling as a technique to teach continuous improvement was first brought up by a past student in 2015. My son Todd Hooper, who codesigned and presents the "Juggling for Creativity and Teamwork" workshop, and past Pro juggler Al Eisenhour, inspired the concept behind the use of juggling to teach continuous improvement. Juggling is an amazing, life-long learning process that few have started, let alone mastered. And as I hope all can see from Chapters five through eight, the sport of juggling follows very nicely the continuous improvement process.

The card trick in Chapter ten was inspired in part by seeing a video of the brilliant magician Wayne Dobson perform a similar trick, *Toss-out Deck.* Wayne Dobson performed this trick from a wheelchair while suffering from multiple sclerosis. He is now championing hands-free magic.

If there ever was an inspiration for using magic as a communications channel, it would be Wayne Dobson. To watch his amazing audience skills, follow him at www.dtrik.com.

Some of the card illusion techniques were an inspiration from working as a close-up magician for Open Heart Magic in the adolescent isolation sections at several Chicago area hospitals. Reducing the anxiety and putting a smile on a face for a child going through chemotherapy was a gift. Teaching Michael, who had a severe muscular disorder and who I could only talk to through visual language, was something to see. His reaction to the Dai Vernon's ambitious card routine was priceless, and the reaction from his parents, I will never forget.

Many thanks to juggling historian David Cain for the help with Chapter five on the history of juggling. The photos of Ronald Reagan, Barry Bakalor, and Alan Greenspan all came via David as well as the list of famous people who juggle.

Chapter four on Bayesian statistics was inspired by the failure of justice in the Sally Clark case. I hope everyone learns from the shortsightedness in this case and the damage that can occur from real-life alpha errors.

And finally, the true champion for this project—my wife of 38 years and best friend Maude. I could not have done it without her. She truly is the love of my life and inspiration for this lifelong endeavor.

Thanks to all.

Bill Hooper (spreading the love of data, statistics, and continuous improvement through card magic, juggling, and other innovative means).