ANALYTICS STORIES

USING DATA TO MAKE GOOD THINGS HAPPEN

Wayne L. Winston

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Analytics Stories

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To my lovely and talented wife Vivian and my wonderful children,
Gregory and Jennifer. All three of you light up my life!

About the Author

Dr. Wayne Winston is a Professor Emeritus of Decision Sciences at the Kelley School of Business at Indiana University. He holds a bachelor of science degree in mathematics from M.I.T. and a PhD in operations research from Yale. He has won more than 40 teaching awards at Indiana University and has written more than a dozen books, including *Marketing Analytics: Data-Driven Techniques with Microsoft Excel* (Wiley, 2014), *Business Analytics: Data Analytics & Decision Making* (Cengage Learning, 2016), *Operations Research: Applications and Algorithms* (Cengage Learning, 2003), *Practical Management Science* (Cengage Learning, 2016), *Excel 2019 Data Analysis and Business Modeling* (Wiley, 2019), and *Mathletics: How Gamblers, Managers, and Sports Enthusiasts Use Mathematics in Baseball, Basketball, and Football* (Princeton University Press, 2012). Dr. Winston has taught classes and consulted for many leading global organizations. He also is a two-time *Jeopardy!* champion and has consulted for the NBA's Dallas Mavericks and New York Knicks.

About the Technical Editor

Joyce J. Nielsen has worked in the publishing industry for more than 25 years as an author, technical editor, development editor, and project manager, specializing in Microsoft Office, Windows, Internet, and general technology titles for leading educational and retail publishers. Prior to her work in publishing, Joyce was a research analyst for Simon Property Group in Indianapolis. Joyce holds a bachelor of science degree in quantitative business analysis from Indiana University's Kelley School of Business in Bloomington, Indiana. She currently resides in Tucson, Arizona.

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Contents at a Glance

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Introduction

In March 2007, Tom Davenport and Jeanne Harris wrote the groundbreaking book *Competing on Analytics* (Wiley, 2007). Google Trends (discussed in Chapter 36) tells us that Internet searches for the word *analytics* tripled by May 2011! If you have picked up or downloaded this book, I am pretty sure you have heard the word analytics in the workplace or in the media.

A great description of analytics is given on the SAS Institute website (see `www.sas.com/en_us/insights/analytics/what-is-analytics.html`). Simply stated, analytics is the use of mathematics and/or statistics to transform data and/or mathematical models into a better understanding of the world. Most applications of analytics involve answering at least one of the following questions:

- What happened?
- Why did it happen?
- What will happen?
- How do we make good things happen?

In my 40+ years of teaching MBAs, I have won over 40 teaching awards and leaned heavily on teaching concepts by example. This book is no exception. Through a discussion of over 60 analytics applications (most successful, some unsuccessful), we will enhance your understanding of analytics. You can perform all calculations discussed in Microsoft Excel. In order to not disrupt the discussion flow in our stories, we placed Excel instructions for most examples at the end of the chapter. In each story, we focus on the following issues:

- State the problem of interest.
- What data, if any, is needed to attack the problem?

- How do we analyze the data or develop the relevant mathematical model?
- How does our model solve (or not solve) the problem of interest?

Below we give a preview of some or all our analytics stories.

What Happened?

In many situations, it is not clear what happened. In Part I, "What Happened?," we describe analytics techniques that can be used to illuminate what happened in many well-known situations. For example, since not all votes were counted, more than 20 years after the 2000 Gore-Bush U.S. presidential election, it is not clear who won the election. In Chapter 3, we give you the pro-Bush and pro-Gore arguments and let you decide.

What Will Happen?

We all want to know if the stock market will go up or down next year, whether our favorite sports team will win the championship (if it's the Knicks, they won't), how many units our company's top product will sell next year, and so forth. The use of analytics to predict what will happen is known as *predictive analytics*. In Part II, "What Will Happen?," we give many applications of predictive analytics, such as a discussion (see Chapter 22) of whether the past success of an investment fund is predictive of its future success.

Why Did It Happen?

Often, we know what happened, but we want to know why it happened. In Part III, "Why Did It Happen," we try to determine the cause of the outcomes in many well-known situations. For example, children raised in neighborhoods only a mile apart often have vastly different life outcomes. In Chapter 44, we attempt to explain this important phenomenon.

How Do I Make Good Things Happen?

Prescriptive analytics helps us "prescribe" solutions to a problem that drive a situation towards a desired outcome. In Part IV, "How Do I Make Good Things Happen?," we discuss many important applications of prescriptive analytics. For example, Chapter 54 describes how the 2012 Obama and 2016 Trump campaigns used analytics to win the presidency.