

## EXCEL BASICS TO BLACKBELT

*Third Edition*

This third edition capitalizes on the success of the previous editions and leverages the important advancements in visualization, data analysis, and sharing capabilities that have emerged in recent years. It serves as an accelerated guide to decision support designs for consultants, service professionals, and students. This “fast track” enables a ramping up of skills in Excel for those who may have never used it to reach a level of mastery that will allow them to integrate Excel with widely available associated applications, make use of intelligent data visualization and analysis techniques, automate activity through basic VBA designs, and develop easy-to-use interfaces for customizing use. The content of this edition has been completely restructured and revised, with updates that correspond with the latest versions of software and references to contemporary add-in development across platforms. It also features best practices in design and analytical consideration, including methodical discussions of problem structuring and evaluation, as well as numerous case examples from practice.

Elliot Bendoly is Distinguished Professor of Management Sciences at the Fisher College of Business, Ohio State University. He serves as an associate editor for the *Journal of Operations Management*, a senior editor for *Production and Operations Management*, and an associate editor for *Decision Sciences*. His previously published books include (as co-editor) *Visual Analytics for Management* (2016) and *The Handbook of Behavioral Operations Management* (2015).

Cambridge University Press  
978-1-108-73836-1 — Excel Basics to Blackbelt  
3rd Edition  
Frontmatter  
[More Information](#)

---

EXCEL BASICS TO BLACKBELT  
*An Accelerated Guide to Decision Support Designs,  
Third Edition*

ELLIOT BENDOLY  
*Ohio State University*



CAMBRIDGE  
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom  
One Liberty Plaza, 20th Floor, New York, NY 10006, USA  
477 Williamstown Road, Port Melbourne, VIC 3207, Australia  
314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,  
New Delhi – 110025, India  
79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

[www.cambridge.org](http://www.cambridge.org)

Information on this title: [www.cambridge.org/9781108738361](http://www.cambridge.org/9781108738361)

DOI: 10.1017/9781108768641

© Elliot Bendoly 2008, 2013, 2020

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2008

Second edition published 2013

Third edition published 2020

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

*A catalogue record for this publication is available from the British Library.*

*Library of Congress Cataloging-in-Publication Data*

Names: Bendoly, Elliot, author.

Title: Excel basics to blackbelt : an accelerated guide to decision support designs, third edition / Elliot Bendoly, Ohio State University.

Description: Third edition. | New York, NY : Cambridge University Press, 2020. | Includes index.

Identifiers: LCCN 2019059887 | ISBN 9781108738361 (paperback) | ISBN 9781108768641 (ebook)

Subjects: LCSH: Decision support systems. | Microsoft Excel (Computer file)

Classification: LCC HD30.213 .B46 2020 | DDC 005.54–dc23

LC record available at <https://lcn.loc.gov/2019059887>

ISBN 978-1-108-73836-1 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

## Contents

<i>Associated Links</i>	<i>page</i> ix
<i>Preface</i>	xi
<b>SECTION 1 GETTING ORIENTED</b>	1
<b>1 Necessary Foundations for Decision Support</b>	3
1.1 Intentions and Approaches	3
1.2 Stages in Development	5
1.3 Overview and Resources	8
<b>2 The Common Development Environment</b>	12
2.1 Entering Data and Simple Extrapolation	13
2.2 Format and Attributes of Cells	17
2.3 Functions (An Introduction)	25
2.4 Data Management (An Introduction)	33
2.5 Copying Content	34
Supplement: The Nature of Conditional Statements	35
Practice Problems	39
<b>3 Acquisition, Cleaning, and Consolidation</b>	41
3.1 Text File Imports and Basic Table Transfers	41
3.2 Online Data Acquisition	44
3.3 Living Data Records: The Basics	53
3.4 Selective Filtering and Aggregation	58
3.5 Guidance in Attribute Grouping	60
3.6 Guidance in Record Grouping	67
3.7 Caution with Data	82
Supplement: Unique Data Generation Hacks	82
Practice Problems	85

<b>SECTION 2 STRUCTURING INTELLIGENCE</b>	87
<b>4 Estimating and Appreciating Uncertainty</b>	89
4.1 Prediction and Estimating Risk	90
4.2 Simulating Data: The Basics	97
4.3 The Use of Simulation in Analysis	105
4.4 Examples in Simulation Modeling	107
Supplement: Control Made Friendly	135
Practice Problems	140
<b>5 Visualizing Data, Dynamics and Risk</b>	142
5.1 Approaching the Task of Visualization	143
5.2 Working with Standard Charts	145
5.3 Complex Area Visualizations	168
5.4 Visualizing System Structures	180
5.5 Options in Other Platforms	191
Supplement: Dynamics along Visually Derived Paths	192
Practice Problems	194
<b>SECTION 3 PRESCRIPTION DEVELOPMENT</b>	197
<b>6 The Analytics of Solution Search</b>	199
6.1 Encapsulating Decision-Making Contexts	200
6.2 Developing Solutions from Structures	210
6.3 Optimality Searches under Moderate Complexity	220
6.4 Deeper Insights into Optimization Solutions	239
Supplement: Decision Logic with Interdependent Utilities	249
Practice Problems	251
<b>7 Searches in Highly Complex and Uncertain Landscapes</b>	255
7.1 Limitations of Simple Hill Climbing	255
7.2 Genetic Algorithms for Evolutionary Search	264
7.3 Evolutionary Search Using @RISK	267
7.4 Simulation Optimization Basics	284
7.5 Optimization for System Simulations	289
Supplement: Leveraging Solver’s Evolutionary Search Engine	300
Practice Problems	302
<b>SECTION 4 ADVANCED AUTOMATION AND INTERFACING</b>	305
<b>8 VBA Editing and Code Development</b>	307
8.1 The Visual Basic for Applications Editor	307
8.2 Previewing Unique VBA Capabilities	314
8.3 Syntax and Storage	322

<i>Contents</i>	vii
8.4 Common Operations in VBA	333
8.5 User Defined Functions (UDFs)	345
8.6 Error Handling	353
8.7 Increasing Access to Code: Creating Add-ins	356
Supplement: Coding Parallels in iOS Swift	358
Practice Problems	360
<b>9 Application and User Interfacing</b>	<b>362</b>
9.1 Application Automation and Integration	364
9.2 Guided Design and Protection in Workbooks	382
9.3 GUIs beyond the Worksheet: Userforms	386
9.4 Customizing Excel Ribbon and Menu Interfaces	393
9.5 Final Thoughts on Packaging	399
Supplement: Simple Interface Parallels in iOS Swift	400
Practice Problems	402
<i>Glossary of Key Terms</i>	405
<i>Appendix A Workbook Shortcut (Hot Key) Reference</i>	419
<i>Appendix B Blackbelt Ribbon Add-in Tools and Functions</i>	421
<i>Index</i>	425

Cambridge University Press  
978-1-108-73836-1 — Excel Basics to Blackbelt  
3rd Edition  
Frontmatter  
[More Information](#)

---



## Associated Links

**Main resource/course portal:** [www.excel-blackbelt.com](http://www.excel-blackbelt.com)

**Blackbelt Ribbon add-in:** *Most current versions always updated on above site.*

**Example workbooks from the text:**

Available either through the Blackbelt course portal (left sidebar), or using [www.bbexamples.com/](http://www.bbexamples.com/) followed by the chapter number and the filename (provided in the text). For example, to access Chp2\_IdentitiesList.xlsx, use [www.bbexamples.com/Chp2/Chp2\\_IdentitiesList.xlsx](http://www.bbexamples.com/Chp2/Chp2_IdentitiesList.xlsx)

**Demonstration Blackbelt projects:**

<https://sites.google.com/site/basics2blackbelt/home/Gallery>

**LinkedIn group** (which contains Non-English language subgroups):

[www.blackbeltsgroup.com](http://www.blackbeltsgroup.com)

**Data Visualization resources:** [www.ma-vis.com](http://www.ma-vis.com)

Cambridge University Press  
978-1-108-73836-1 — Excel Basics to Blackbelt  
3rd Edition  
Frontmatter  
[More Information](#)

---

## Preface

Change can be daunting. People tend to resist it, and often for good reason. We can't control everything that life and work throws at us, but we can control a good deal of it. And it's that control that allows us to be effective in dealing with that which is unavoidably dynamic and out of our control. Without that stability, without a little bit of caution regarding change, we'd spend most of our time fighting fires and chasing shiny objects, and not actually getting things done.

On the other hand, when there are clear opportunities for doing things better through change, we need to capitalize on them. A little well-planned chasing can go a long way. It's how we learn. Again, this doesn't mean that we should drop everything the moment a new technology or framework pops up, with the hope that it might pay off. Instead it just means that we need to be deliberate in our *choices* of which changes to embrace and which, at least for the moment, to disregard.

The backdrop for this third edition is certainly one that is full of new opportunities in complementary and alternative technologies for robust and highly accessible decision support tool development. This growth has taken place both within the sphere of ubiquitous Microsoft applications as well as across myriad other development environments (G-Suite, R, Tableau, Swift builds for iOS, etc.). However, the backdrop also involves something far more personal. It is painted by my own experiences in tool development and, more generally, problem-solving processes in educational settings and in practice; experience studying the behavior of other individuals as they face these challenges; and exposure to best practices in leveraging intelligent structures in processes and intermediate products, including the effective utilization of visualization in the field.

In the time between the original edition and this publication, I've assembled some of these experiences into a handbook on human behavior in complex management decision-making settings, and others into a handbook on the psychology and practice around visualization for

management. Along with these texts, I've authored an additional 50-plus articles, largely on how individuals in the field and in controlled settings interact with technology. I've taught decision support tool development, business analytics, and management visualization courses to nearly one thousand individuals in master's, MBA, and undergraduate business programs, involving approximately 200 proof-of-concept builds for industry and individual users. Through all of this, I've seen some technical and process approaches overtaken (appropriately) by the march of technical progress, while others show continued strength and adaptability. It is high time that some of these learnings are folded into the discussions of decision support tool approaches in Excel/VBA.

Frameworks such as the OUtCoMES Roadmap, and its more contemporary descendant the OUtCoMES Cycle, have evolved. They now provide guidance beyond model development and into broader systems and design thinking applications, demonstrating alignment with and enrichment of other established frameworks (PDCA, A3, etc.). Specialized visualizations have been developed to support this as part of the Blackbelt Ribbon suite, whose functionality and structure provide examples we will discuss throughout the text. Conversations distinguishing and integrating descriptive, predictive, and prescriptive analytical intentions, and statistical versus computational approaches, have also proven effective in training individuals for (and placing them in) a wide variety of professional management, consultant, and analyst roles. These distinction and integration opportunities are similarly reflected in the current edition.

In the case of technical approaches that have been overtaken, there are also lessons in pragmatism to be learned. These include the replacement of MapPoint by PowerMap and the MS Power BI Suite; the supplanting of earlier interactivity between Excel and G-Suite, XLStat, and Palisade products by advancements in these respective applications; Microsoft's divestment of MSNBC, impacting MSN stock data connections; and the ever-shifting landscape of RExcel. Fortunately, we are not at a loss for technical guidance on how to adapt to many of these changes. There are countless blogs and publications that maintain this chase, and we are all indebted to the many expert developers who continue to inform us on these fronts.

With this in mind, and a shift in tactics from the second edition, the present text focuses less on examples that are likely to be overtaken in the near term, and more on examples of process and on specific technical guidance largely resilient to those changes, either because they are both sufficiently robust and extensively established in practice, or because I have direct influence on their maintenance (e.g., the revised Blackbelt Ribbon suite of tools). The biggest exception to this is the additional time afforded to technical discussions relevant to the mobile application space (use of the Power BI

desktop to share dynamic visuals, communication with G-Suite tools, Swift code examples, etc.). This is an area in which we need greater management analytic discourse, so I'm willing to do a little chasing here.

In all of this, it almost goes without saying that the course of our discussions will continue to focus on what today remains the most flexible, accessible, and relevant platform for management tool inception and testing in the world, namely the Excel and the VBA developer combined environment. With the scale and velocity of data available today, we don't approach these discussions with the rose-tinted view that this is the destination of our build-journeys. As a clearer picture of our needs in practice evolves, we seek out appropriate alternative tactics and technologies, gaining efficiency as we trade off flexibility for customized functional consistency. But before we get there – while we speculate on what we might need, explore the fuzzy front end of our development process, and seek convenient testing grounds for building out complex solutions – the Excel/VBA sandboxing environment will be regarded as terra firma for our work, a stable foundation for exploring the unknown. To this end, it is critical that we develop for ourselves a rich understanding of what is possible here – an understanding that surpasses that of the 95 percent of users who still think it's just a nice place to calculate sums. When individuals uncover the full range of control they can have here, it changes the way they confront all other challenges. I can ask no more but to help them along the way.

Best wishes in all that you do.  
Dr. Elliot Bendoly, PhD

Cambridge University Press  
978-1-108-73836-1 — Excel Basics to Blackbelt  
3rd Edition  
Frontmatter  
[More Information](#)

---