Introduction to Data Analytics for Accounting

SECOND EDITION

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Mc Graw Hill

INTRODUCTION TO DATA ANALYTICS FOR ACCOUNTING

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Dedications

To my most amazing daughter, Rebecca, for sharing joy and laughter with me. From the first time you sat on our laps in Russia and became our child . . . until now! Love you!

—Vern Richardson

To my many students over the past years and in the upcoming years—you inspire me to do better and I learn as much from you as I hope you learn from me.

—Katie Terrell

To my mom and dad and the many memories they create.

—Ryan Teeter

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Vernon J. Richardson is a Distinguished Professor of Accounting and the G. William Glezen Chair in the Sam M. Walton College of Business at the University of Arkansas and a Research Fellow at Baruch College. He received his BS, Master's of Accountancy, and MBA from Brigham Young University and a PhD in Accounting from the University of Illinois at Urbana–Champaign. He has taught students at the University of Arkansas, University of Illinois, Brigham Young University, and University of Kansas and internationally at Chinese University of Hong Kong Shenzhen, Aarhus University, the China Europe International Business School (Shanghai), Xi'an Jiaotong Liverpool University, and the University of Technology Sydney.

Dr. Richardson is a member of the American Accounting Association. He has served as president of the American Accounting Association Information Systems section. He previously served as an editor of *The Accounting Review* and is currently an editor at *Accounting Horizons.* He has published articles in *The Accounting Review, Journal of Information Systems, Journal of Accounting and Economics, Contemporary Accounting Research, MIS Quarterly, International Journal of Accounting Information Systems, Journal of Management Information Systems, Journal of Operations Management,* and *Journal of Marketing.* Dr. Richardson is also the author of McGraw Hill's *Accounting Information Systems, Data Analytics for Accounting* and *Introduction to Business Analytics* textbooks.

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Katie L. Terrell is an instructor in the Sam M. Walton College of Business at the University of Arkansas. She received her BA degrees in English literature and in the Spanish language from the University of Central Arkansas and her MBA from the University of Arkansas. She expects a doctoral degree by 2023. She has taught students at the University of Arkansas; Soochow University (Suzhou, China); the University College Dublin (Ireland); and Duoc UC, a branch of the Catholic University of Chile (Vina del Mar, Chile).

She is a member of the American Accounting Association and has published a *Statement on Management Accounting* for the Institute of Management Accountants on managing organizational change in operational change initiatives. Terrell was named the 2019 Business Professional of the Year (Education) by the national Beta Alpha Psi organization. She has recently been recognized for her innovative teaching methods, receiving the Mark Chain/FSA Teaching Award for innovative graduate-level accounting teaching practices in 2016. She has worked with Tyson Foods, where she held various information system roles, focusing on business analysis, project management for ERP implementations and upgrades, and organizational change management. She is also the author of McGraw Hill's *Data Analytics for Accounting* and *Introduction to Business Analytics* textbooks.

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Dr. Teeter is a member of the American Accounting Association and has published articles in the *Journal of Strategic Technologies in Accounting* and *Issues in Accounting Education.* He has received grant funding for data analytics research from PwC. Dr. Teeter is also the author of McGraw Hill's *Data Analytics for Accounting* textbook.

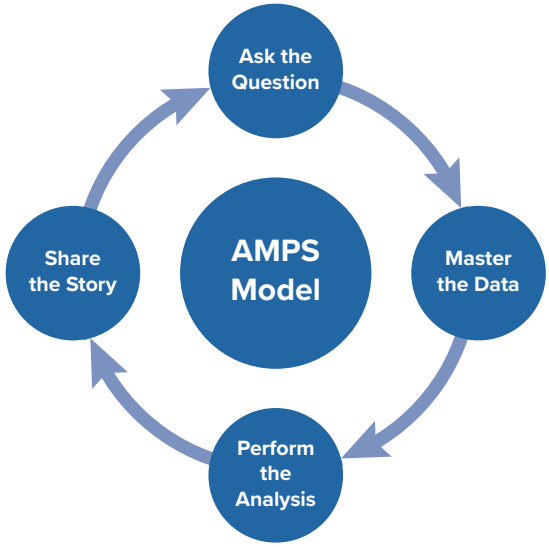
Preface

Accountants are increasingly applying an analytics mindset by analyzing data to address accounting questions. Indeed, the CPA Evolution initiative encourages such by recognizing the rapidly changing data analytics skills and competencies that the practice of accounting requires not only today, but in the future.

Building upon the fundamentals of accounting learned in prior courses, *Introduction to Data Analytics for Accounting* works to develop the analytics mindset by applying analytics to accounting questions. We also emphasize the analytics tools accounting students will encounter in the workplace such as Excel®, Tableau®, and Power BI®.

Introduction to Data Analytics for Accounting provides a framework to help develop a data analytics mindset, which we refer to as the **AMPS Model:**

1. **A**sk the Question (Chapter 1).
2. **M**aster the Data (Chapters 2–4).
3. **P**erform the Analysis (Chapters 5–9).
4. **S**hare the Story (Chapter 10).



The AMPS model is used throughout the text in conjunction with the various types of analysis accountants need to perform. The labs also follow the AMPS model to reinforce the data analytics process. Chapter 11 acts as a capstone, providing two projects that help apply the complete AMPS model to address accounting questions. The first project guides students through analyzing Lending Club loans, while the second offers the framework for students to address their own accounting questions. Finally, in eBook only Chapters 12 and 13, financial statement analysis and managerial accounting topics and questions receive the AMPS treatment where it is particularly appropriate.

Key Features

Focus on Building Skills with Excel®,Tableau®, and Power BI®

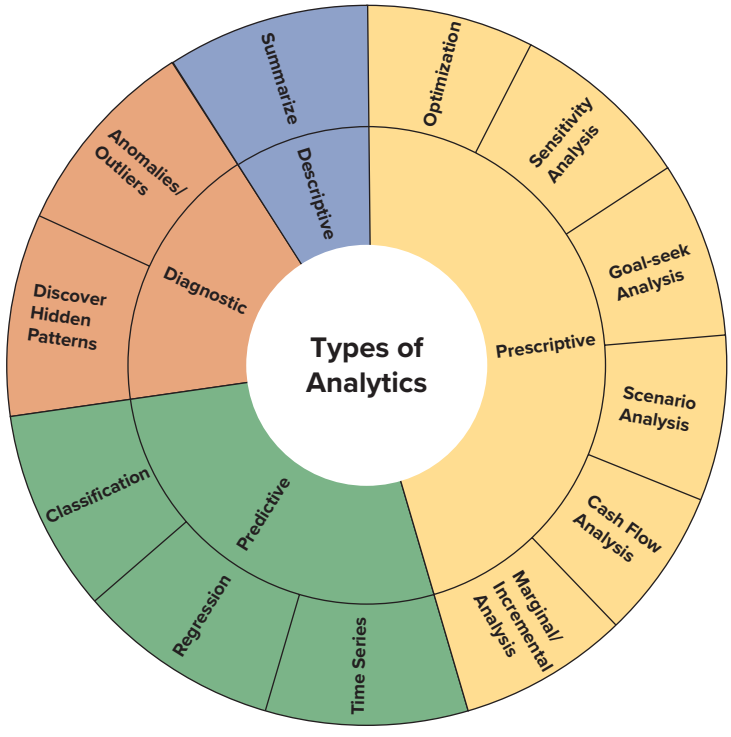
Students will learn how to conduct analysis using Excel, Tableau, and Power BI, exposing them to software tools they will use throughout their business careers.

Emphasis on Building Critical Thinking Skills & Performing Analysis

From learning to ask the right questions to interpreting and presenting results, *Introduction to Data Analytics for Accounting, 2e* fosters critical thinking while exploring data analytics skills.

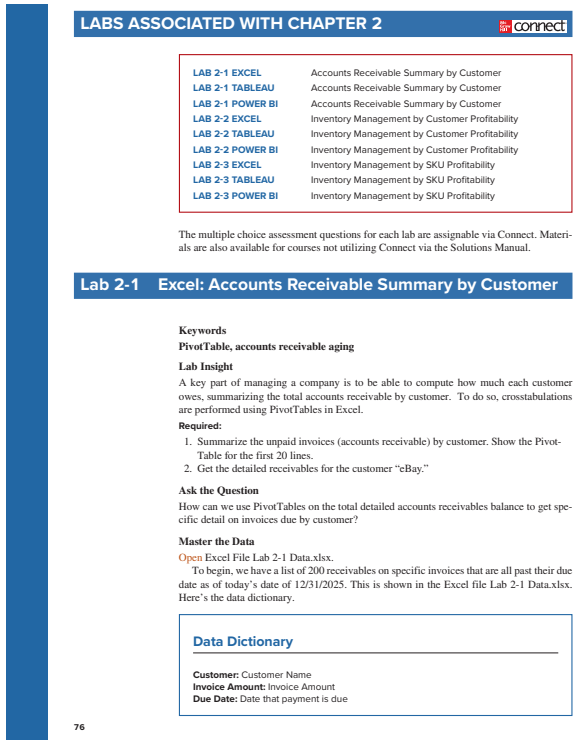
The text focuses on the four analytics types used to address different accounting questions.

1. *Descriptive analytics:* What happened?
2. *Diagnostic analytics:* Why did it happen? What are the root causes of past results?
3. *Predictive analytics:* What is the probability something will happen? Is it forecastable?
4. *Prescriptive analytics:* What should we do based on what we expect will happen? How do we optimize our performance based on potential constraints or changing conditions?



Hands-on Labs

To illustrate data analytics techniques and skills, *Introduction to Data Analytics for Accounting, 2e* offers over 115 hands-on labs, using Excel, Tableau, or Power BI. Each lab has two datasets: the first relates to the step-by-step instructions (with screenshots) presented in the text, and the second, "alternate" dataset gives students the opportunity to apply what was learned using the first dataset. Lab assessment is done in Connect using autogradable multiple choice questions and analysis questions. (Assessment questions are also provided to instructors not using Connect via instructor resource materials.) Video tutorials of labs are also available in Connect for additional support.



LABS ASSOCIATED WITH CHAPTER 2 connect

LAB 2-1 EXCEL	Accounts Receivable Summary by Customer
LAB 2-1 TABLEAU	Accounts Receivable Summary by Customer
LAB 2-1 POWER BI	Accounts Receivable Summary by Customer
LAB 2-2 EXCEL	Inventory Management by Customer Profitability
LAB 2-2 TABLEAU	Inventory Management by Customer Profitability
LAB 2-2 POWER BI	Inventory Management by Customer Profitability
LAB 2-3 EXCEL	Inventory Management by SKU Profitability
LAB 2-3 TABLEAU	Inventory Management by SKU Profitability
LAB 2-3 POWER BI	Inventory Management by SKU Profitability

The multiple choice assessment questions for each lab are assignable via Connect. Materials are also available for courses not utilizing Connect via the Solutions Manual.

Lab 2-1 Excel: Accounts Receivable Summary by Customer

Keywords
PivotTable, accounts receivable aging

Lab Insight
A key part of managing a company is to be able to compute how much each customer owes, summarizing the total accounts receivable by customer. To do so, crosstabulations are performed using PivotTables in Excel.

Required:
1. Summarize the unpaid invoices (accounts receivable) by customer. Show the PivotTable for the first 20 lines.
2. Get the detailed receivables for the customer "eBay."

Ask the Question
How can we use PivotTables on the total detailed accounts receivables balance to get specific detail on invoices due by customer?

Master the Data
Open Excel File Lab 2-1 Data.xlsx.
To begin, we have a list of 200 receivables on specific invoices that are all past their due date as of today's date of 12/31/2025. This is shown in the Excel file Lab 2-1 Data.xlsx. Here's the data dictionary.

Data Dictionary

Customer: Customer Name
Invoice Amount: Invoice Amount
Due Date: Date that payment is due

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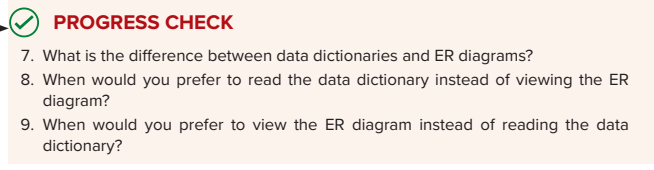
Progress Checks

Periodic progress check questions are posed throughout the chapter and encourage students to stop and consider the concepts presented.

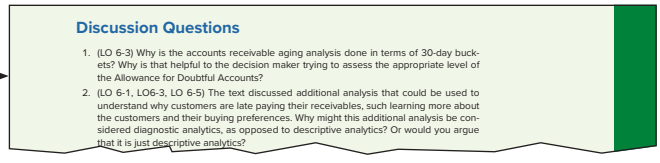


PROGRESS CHECK

7. What is the difference between data dictionaries and ER diagrams?
8. When would you prefer to read the data dictionary instead of viewing the ER diagram?
9. When would you prefer to view the ER diagram instead of reading the data dictionary?

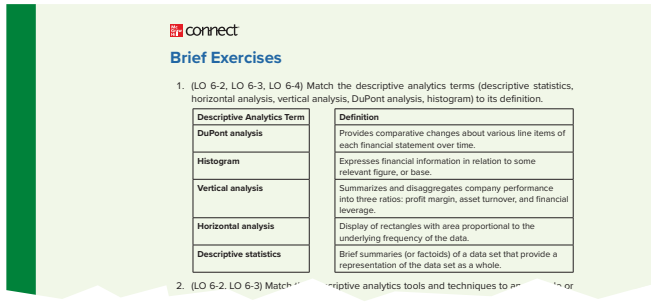
End-of-Chapter Materials

End-of-chapter assignments have real-world application questions, with a special emphasis on skills and tools. Each chapter offers discussion questions, brief exercises, and problems to reinforce learning.



Discussion Questions

1. (LO 6-3) Why is the accounts receivable aging analysis done in terms of 30-day buckets? Why is that helpful to the decision maker trying to assess the appropriate level of the Allowance for Doubtful Accounts?
2. (LO 6-1, LO6-3, LO 6-5) The text discussed additional analysis that could be used to understand why customers are late paying their receivables, such learning more about the customers and their buying preferences. Why might this additional analysis be considered diagnostic analytics, as opposed to descriptive analytics? Or would you argue that it is just descriptive analytics?



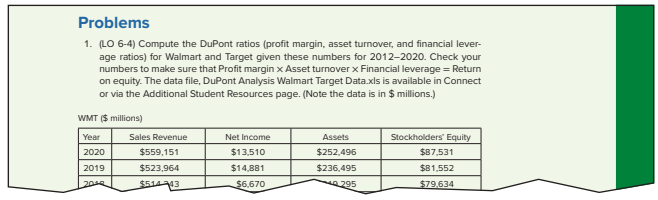
connect

Brief Exercises

1. (LO 6-2, LO 6-3, LO 6-4) Match the descriptive analytics terms (descriptive statistics, horizontal analysis, vertical analysis, DuPont analysis, histogram) to its definition.

Descriptive Analytics Term	Definition
DuPont analysis	Provides comparative changes about various line items of each financial statement over time.
Histogram	Expresses financial information in relation to some relevant figure, or base.
Vertical analysis	Summarizes and disaggregates company performance into three ratios: profit margin, asset turnover, and financial leverage.
Horizontal analysis	Display of rectangles with area proportional to the underlying frequency of the data.
Descriptive statistics	Brief summaries (or factoids) of a data set that provide a representation of the data set as a whole.

2. (LO 6-2, LO 6-3) Match [illegible] riptive analytics tools and techniques to ar[illegible] or



Problems

1. (LO 6-4) Compute the DuPont ratios (profit margin, asset turnover, and financial leverage ratios) for Walmart and Target given these numbers for 2012–2020. Check your numbers to make sure that Profit margin x Asset turnover x Financial leverage = Return on equity. The data file, DuPont Analysis Walmart Target Data.xls is available in Connect or via the Additional Student Resources page. (Note the data is in $ millions.)

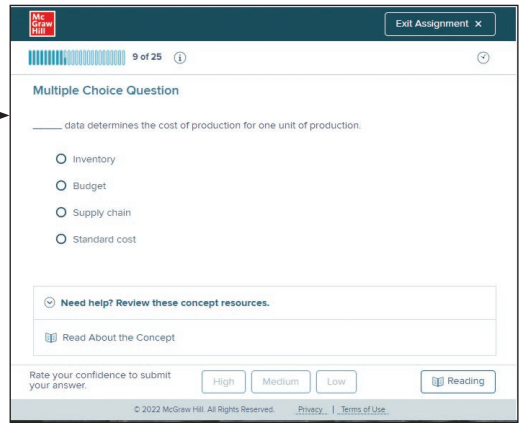
WMT ($ millions)

Year	Sales Revenue	Net Income	Assets	Stockholders' Equity
2020	$559,151	$13,510	$252,496	$87,531
2019	$523,964	$14,881	$236,495	$81,552
[illegible]	$514,343	$6,670	[illegible],295	$79,634

Available in Connect

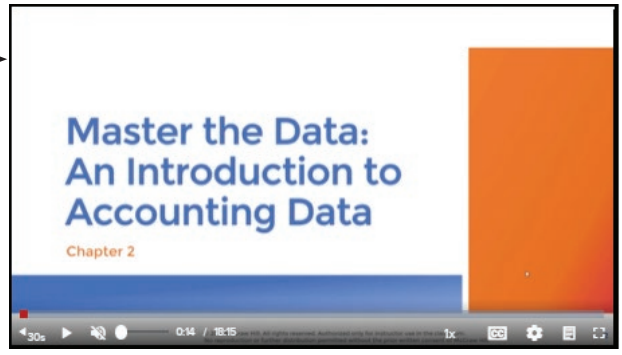
SmartBook 2.0®

SmartBook is the market-leading adaptive study resource that is proven to strengthen memory recall, increase retention, and boost grades. SmartBook 2.0 identifies and closes knowledge gaps through a continually adapting reading and questioning experience that helps students master the key concepts in the chapter.



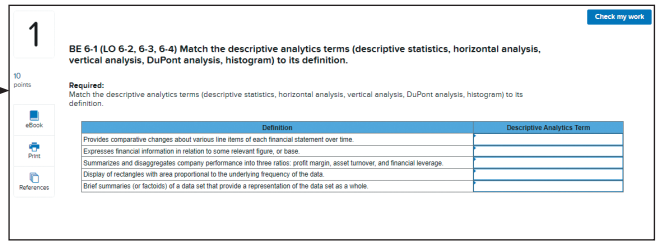
Lecture Videos

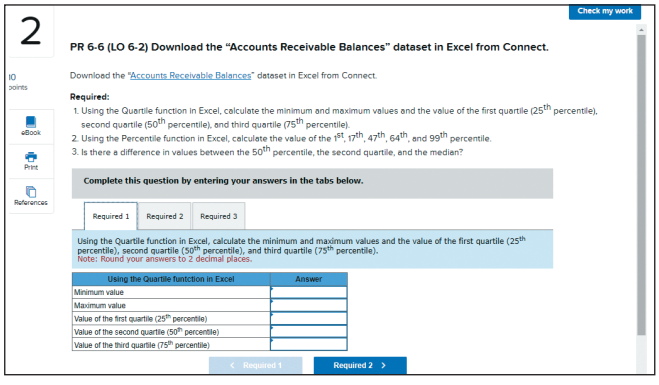
Video-based tutorials are available for each chapter to reinforce select concepts.



Brief Exercises/Problems

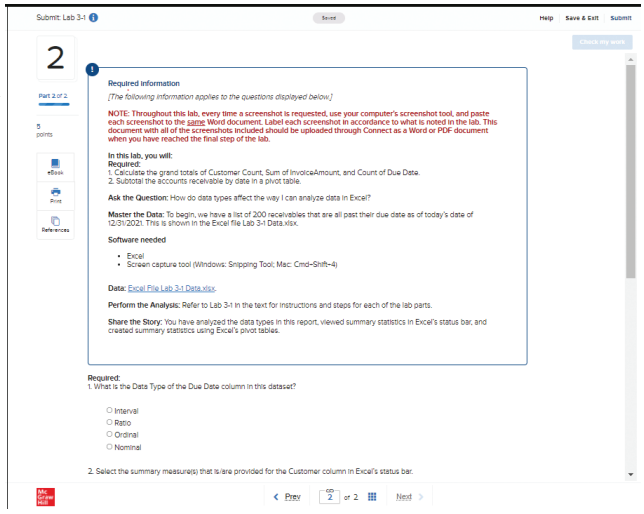
Select Brief exercises and problems from the text are available for assignment in Connect to ensure students are building an analytical skill set.





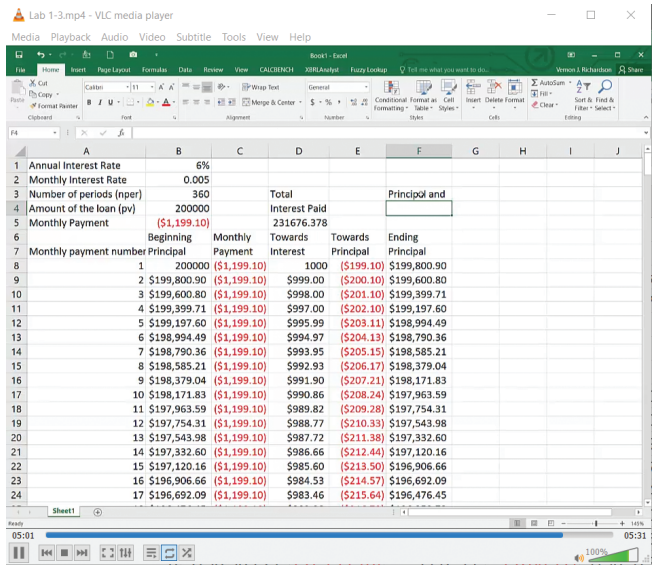
Labs with Lab Assessments

Connect allows to students to upload their results and answer both auto-graded assessment and manual-graded analysis questions designed to reinforce the lessons from the chapter. Alternate algo labs allow for additional assignment options.



Lab Tutorial Videos

Tutorial videos are offered for all labs, providing a step-by-step tutorial walking students through featured Excel, Tableau, and Power BI functions. These videos are now also embedded within regular lab assignments.



New to the Second Edition

Overall Updates

- **New!** eBook only Chapter 12 Financial Statement Analysis and Chapter 13 Managerial Accounting Analytics help students apply the AMPS model to a single accounting topic. The chapters feature 15 new labs (7 labs in Ch. 12 and 8 labs in Ch. 13) using Excel, Tableau, and Power BI.
- Added Power BI labs throughout text and Power BI tutorial Appendix C.
- Added two analysis questions (with open-ended response) to each lab to reinforce critical thinking skills.
- Revised assessments for all primary and alternative labs. Alternative labs now have algorithmic questions.
- **New!** Lab videos embedded in assignments for all regular labs that walk students through lab processes for Excel, Tableau, and Power BI.
- **New!** Test bank lab questions added for select labs to enable testing of lab concepts.
- **New!** Discussion questions now available in Connect as manual-graded assignments.

Chapter by Chapter Updates

Chapter 1

- Added a learning objective on common visualization types, moving the initial discussion of visualizations earlier in the text.
- Reworked the discussion of analysis and visualization tools used at each component of the AMPS model, emphasizing Excel, Tableau, and Power BI and their capabilities.
- Added two additional problems with datasets to the end-of-chapter assessment.
- Changed chapter title to be consistent with the AMPS model.

Chapter 2

- Added a learning objective defining data ethics and a description of how to gather, protect, and use personally identifiable information in an ethical manner.
- Added three Power BI labs to illustrate ways to analyze and visualize data.
- Updated examples of XBRL data, conference calls, and social media data.
- Added three additional problems with datasets to the end-of-chapter assessment.

Chapter 3

- Rewrote all labs and added two Power BI labs.
- Changed chapter title to be consistent with the AMPS model.

Chapter 4

- Expanded and reworked the section on connecting to external databases. The example now features connecting to Reuters and a new section discussing Calcbench.
- Rewrote all labs and added one Power BI lab.

Chapter 5

- Added four additional problems with datasets to the end-of-chapter assessment.
- Added one Tableau and one Power BI lab.

Chapter 6

- Enhanced discussion of descriptive statistics of large datasets, including definitions, examples, and assessment of deciles and percentiles.
- Added four additional problems with datasets to the end-of-chapter assessment.
- Added one Power BI lab.

Chapter 7

- Added explanation of chi-square test as a statistical test for Benford's Law.
- Added four additional problems with datasets to the end-of-chapter assessment.
- Added one Tableau and two Power BI labs.

Chapter 8

- Added four additional problems with datasets to the end-of-chapter assessment.
- Enhanced discussion/image of the tradeoff between investment risk taken and expected investment returns.
- Added one Power BI lab.

Chapter 9

- Restructured the discussion of prescriptive analytics to better explain its capabilities.
- Revised cash flow analysis section to enhance clarity.
- Enhanced discussion of sensitivity analysis and added illustration.
- Added a learning objective regarding optimization as a prescriptive analytics technique.
- Revised multiple choice questions and enhanced discussion questions.
- Added three additional problems with datasets to the end-of-chapter assessment.

Chapter 10

- Added a learning objective regarding executive summaries.
- Added one Power BI lab.

Chapter 11

- Revised introduction to Project 1.
- Enhanced list of data sources available for Project 2, addressing students' own analytics questions.

This second edition of *Introduction to Data Analytics for Accounting* has been revised using Microsoft Excel® 365 (2022), Tableau Desktop version (2022.2), and Microsoft Power BI version (Aug 2022). Please note that the software used is dynamic, where updates are a regular feature. While changes are often more cosmetic than functional, updates may also change textbook screen exhibits from the time of publication. This may help students be flexible and further develop the analytics mindset when determining differences between the software and text instructions and exhibits. Major known updates will be noted on the Text Updates section of the Connect Library.

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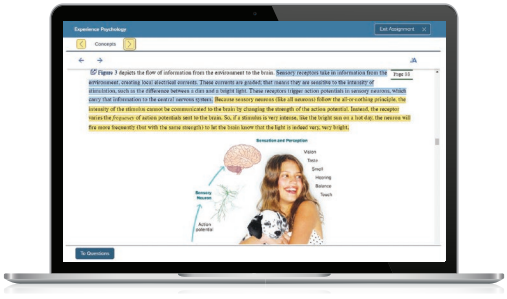

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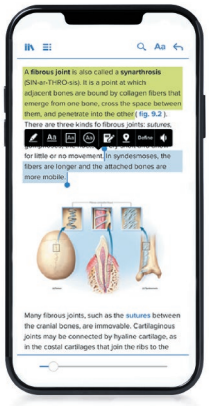

"I really liked this app—it made it easy to study when you don't have your textbook in front of you."

- Jordan Cunningham, Eastern Washington University

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Introduction to Data Analytics for Accounting

SECOND EDITION