Data Analytics for Accounting

THIRD EDITION

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DATA ANALYTICS FOR ACCOUNTING, THIRD EDITION

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Dedications

My wonderful daughter, Rachel, for your constant love, encouragement, and support. You always make me laugh and smile!

—Vern Richardson

To my three wonderful little Teeter tots, who keep me on my toes.

—Ryan Teeter

To the Mustache Running Club. Over many miles you all have learned more about accounting data analytics than you ever hoped for! Thanks for all of your support—on and off the trail.

—Katie Terrell

Preface

Data Analytics is changing the business world—data simply surround us! So many data are available to businesses about each of us—how we shop, what we read, what we buy, what music we listen to, where we travel, whom we trust, where we invest our time and money, and so on. Accountants create value by addressing fundamental business and accounting questions using Data Analytics.

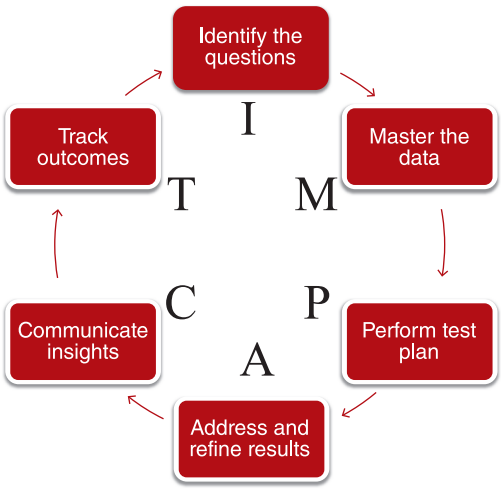
All accountants must develop data analytic skills to address the needs of the profession in the future—it is increasingly required of new hires and old hands. *Data Analytics for Accounting, 3e* recognizes that accountants don't need to become data scientists—they may never need to build a data repository or do the real hardcore Data Analytics or learn how to program a computer to do machine learning. However, there are seven skills that analytic-minded accountants must have to be prepared for a data-filled world, including:

1. Developed analytics mindset—know when and how Data Analytics can address business questions.
2. Data scrubbing and data preparation—comprehend the process needed to clean and prepare the data before analysis.
3. Data quality—recognize what is meant by data quality, be it completeness, reliability, or validity.
4. Descriptive data analysis—perform basic analysis to understand the quality of the underlying data and their ability to address the business question.
5. Data analysis through data manipulation—demonstrate ability to sort, rearrange, merge, and reconfigure data in a manner that allows enhanced analysis. This may include diagnostic, predictive, or prescriptive analytics to appropriately analyze the data.
6. Statistical data analysis competency—identify and implement an approach that will use statistical data analysis to draw conclusions and make recommendations on a timely basis.
7. Data visualization and data reporting—report results of analysis in an accessible way to each varied decision maker and his or her specific needs.

Consistent with these skills, it's important to recognize that Data Analytics is an iterative process. The process begins by identifying business questions that can be addressed with data, extracting and testing the data, refining our testing, and finally, communicating those findings to management. *Data Analytics for Accounting*, *3e* describes this process by relying on an established Data Analytics model called the IMPACT cycle:[1]

1. **I**dentify the questions.
2. **M**aster the data.
3. **P**erform test plan.
4. **A**ddress and refine results.
5. **C**ommunicate insights.
6. **T**rack outcomes.

[1]Jean Paul Isson and Jesse S. Harriott, *Win with Advanced Business Analytics: Creating Business Value from Your Data* (Hoboken, NJ: Wiley, 2013).



Adapted from *Win with Advanced Business Analytics: Creating Business Value from Your Data,* by Jean Paul Isson and Jesse S. Harriott.

The IMPACT cycle is described in the first four chapters, and then the process is illustrated in auditing, managerial accounting, financial accounting, and taxes in Chapters 5 through 9. In response to instructor feedback, *Data Analytics for Accounting, 3e* now also includes two new project chapters, giving students a chance to practice the full IMPACT model with multiple labs that build on one another.

Data Analytics for Accounting, 3e emphasizes hands-on practice with real-world data. Students are provided with hands-on instruction (e.g., click-by-click instructions, screenshots, etc.) on datasets within the chapter; within the end-of-chapter materials; and in the labs at the end of each chapter. Throughout the text, students identify questions, extract and download data, perform testing, and then communicate the results of that testing.

The use of real-world data is highlighted by using data from **Avalara**, **LendingClub**, **College Scorecard**, **Dillard's**, the **State of Oklahoma**, as well as other data from our labs. In particular, we emphasize the rich data from **Dillard's** sales transactions that we use in more than 15 of the labs throughout the text (including Chapter 11).

Data Analytics for Accounting, 3e also emphasizes the various data analysis tools students will use throughout the rest of their career around two tracks—the Microsoft track (Excel, Power BI) and a Tableau track (Tableau Prep and Tableau Desktop—available with free student license). Using multiple tools allows students to learn which tool is best suited for the necessary data analysis, data visualization, and communication of the insights gained—for example, which tool is easiest for internal controls testing, which is best for analysis or querying (using SQL) big datasets, which is best for data visualizations, and so on.

About the Authors

Vernon J. Richardson

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 Visiting Professor at Baruch College. He received his BS, Master 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, Baruch College, University of Illinois, Brigham Young University, Aarhus University, and University of Kansas, and internationally at the China Europe International Business School (Shanghai), Xi'an Jiaotong Liverpool University, Chinese University of Hong Kong–Shenzhen, 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 an author of McGraw Hill's *Accounting Information Systems* and *Introduction to Data Analytics for Accounting* textbooks.

Ryan A. Teeter

Ryan A. Teeter is a Clinical Associate Professor of Accounting in the Katz Graduate School of Business at the University of Pittsburgh. He teaches accounting information systems, auditing, and accounting data analytics. Prior to receiving his PhD in accounting information systems from Rutgers University, he worked at Google in Mountain View, California. He has since worked with internal audit organizations at Siemens, Procter & Gamble, Alcoa/Arconic, and FedEx, helping to develop robotic process automation programs and Data Analytic solutions.

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 an author of McGraw Hill's *Introduction to Data Analytics for Accounting* textbook.

Katie L. Terrell

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 2021. 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 by being the recipient of 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. Terrell is also an author of McGraw Hill's *Introduction to Data Analytics for Accounting* textbook.

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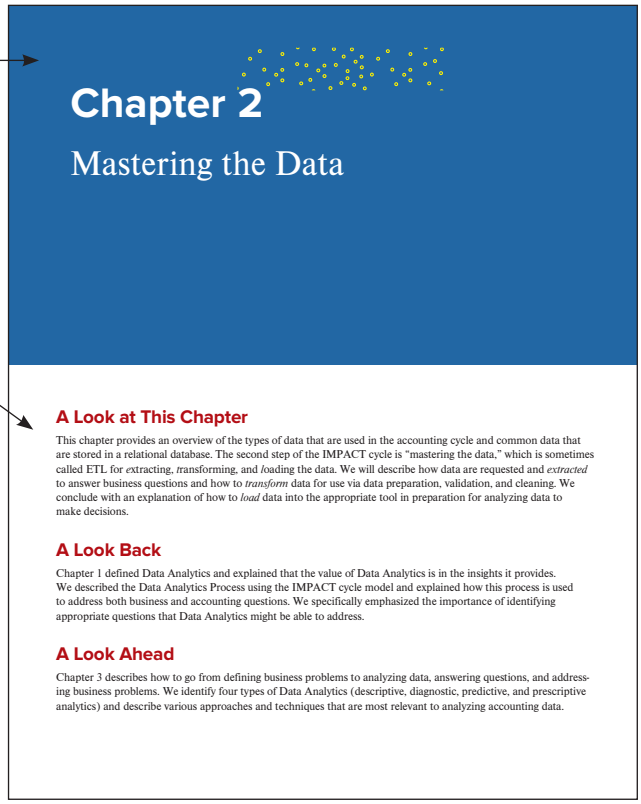
Key Features

- **NEW! Color Coded Multi-Track Labs:** Instructors have the flexibility to guide students through labs using the Green Track: Microsoft tools (including Excel, Power Query, and Power BI); Blue Track: Tableau tools (including Tableau Prep Builder and Tableau Desktop); or both. Each track is clearly identified and supported with additional resources.
- **NEW! Lab Example Outputs:** Each lab begins with an example of what students are expected to create. This provides a clear reference and guide for student deliverables.
- **NEW! Auto-Graded Problems:** The quantity and variety of auto-graded problems that are assignable in McGraw Hill Connect have been expanded.
- **NEW! Discussion and Analysis:** Now available as manually graded assignments in McGraw Hill Connect.
- **Emphasis on Skills:** Working through the IMPACT cycle framework, students will learn problem assessment, data preparation, data analysis, data visualization, control contesting, and more.
- **Emphasis on Hands-On Practice:** Students will be provided hands-on learning (click-by-click instructions with screenshots) on datasets within each chapter, within the end-of-chapter materials, and in the labs and comprehensive cases.
- **Emphasis on Datasets:** To illustrate data analysis techniques and skills, multiple practice datasets (audit, financial, and managerial data) will be used in every chapter. Students gain real-world experience working with data from **Avalara**, **LendingClub**, **Dillard's**, **College Scorecard**, the **State of Oklahoma**, as well as financial statement data (via XBRL) from S&P100 companies.
- **Emphasis on Tools:** Students will learn how to conduct data analysis using Microsoft and Tableau tools. Students will compare and contrast the different tools to determine which are best suited for basic data analysis and data visualization, which are easiest for internal controls testing, which are best for SQL queries, and so on.

Main Text Features

Chapter Maps

These maps provide a guide of what we're going to cover in the chapter as well as a guide of what we've just learned and what's coming next.



Chapter-Opening Vignettes

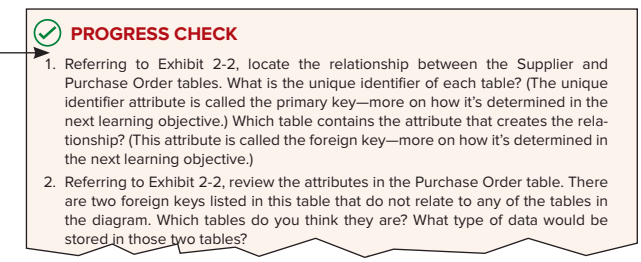
Because companies are facing new and exciting opportunities with their use of Data Analytics to help with accounting and business decisions, we detail what they're doing and why in our chapter-opening vignettes.

Learning Objectives

We feature learning objectives at the beginning of each chapter. Having these learning objectives provides students with an overview of the concepts to be taught in the chapter and the labs.

Progress Checks

Periodic progress check questions are posed to the students throughout each chapter. These checks provoke the student to stop and consider the concepts presented.



End-of-Chapter Materials

Answers to Progress Checks

The answers allow students to evaluate if they are on track with their understanding of the materials presented in the chapter.

ANSWERS TO PROGRESS CHECKS

1. The unique identifier of the Supplier table is [Supplier ID], and the unique identifier
   Purchase Order table is [PO Number]. The Purchase Order table contains the foreig
2. The foreign key attributes in the Purchase Order table that do not relate to any t
   in the view are EmployeeID and CashDisbursementID. These attributes probably
   to the Employee table (so that we can tell which employee was responsible for
   Purchase Order) and the Cash Disbursement table (so that we can tell if the Pur
   Orders have been paid for yet, and if so, on which check). The Employee table woul
   complete listing of each employee, as well as containing the details about each emp
   (for example, phone number, address, etc.). The Cash Disbursement table would be
   ing of the payments the company has made.

Multiple Choice Questions

The multiple choice questions quickly assess student's knowledge of chapter content.

Multiple Choice Questions

1. **(LO 2-3)** Mastering the data can also be described via the ETL process. The E
   cess stands for:
   a. extract, total, and load data.
   b. enter, transform, and load data.
   c. extract, transform, and load data.
   d. enter, total, and load data.

Discussion and Analysis—Now in Connect!

This feature provides questions for group discussion and analysis. Now available as manually graded assignments in McGraw Hill Connect!

Discussion and Analysis

1. **(LO 2-2)** The advantages of a relational database include limiting the amount of re
   dant data that are stored in a database. Why is this an important advantage? Wha
   go wrong when redundant data are stored?
2. **(LO 2-2)** The advantages of a relational database include integrating business
   cesses. Why is it preferable to integrate business processes in one information sys
   rather than store different business process data in separate, isolated databases?
3. **(LO 2-2)** Even though it is preferable to store data in a relational database, storing
   across separate tables can make data analysis cumbersome. Describe three reas
   is worth the trouble to store data in a relational database.
4. **(LO 2-2)** Among the advantages of using a relational database is enforcing busi
   rules. Based on your understanding of how the structure of a relational database h
   prevent data redundancy and other advantages, how does the primary key/fo
   key relationship structure help enforce a business rule that indicates that a com
   shouldn't process any purchase o rs from suppliers who don't st in the datab

Problems

The problems challenge the student's ability to see relationships in the learning objectives with analysis options that employ higher-level thinking and analytical skills. The quantity of auto-graded problems has been expanded. The manually graded analysis problems are also now assignable in McGraw Hill Connect.

Problems

1. **(LO 2-2)** Match the relational database function
   term:
   - Composition primary key
   - Descriptive attribute
   - Foreign key
   - Primary key
   - Relational database

NEW! Color Coded Multi-Track Labs

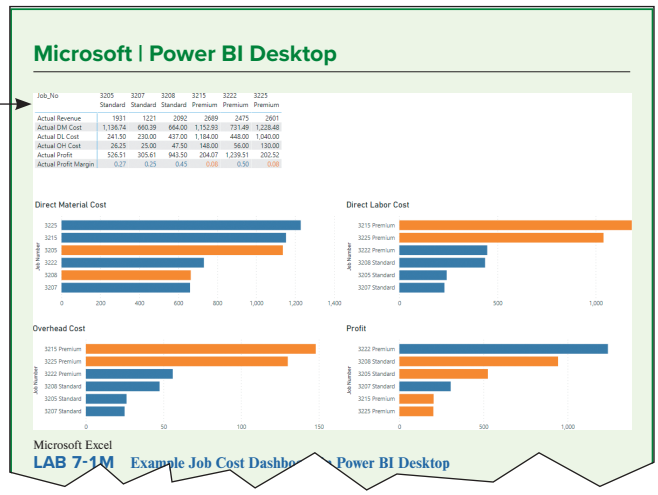
The labs give students hands-on experience working with different types of data and the tools used to analyze them. Students complete labs using the instructor-led track and answer common questions. Clear step-by-step directions help model the expected output of each lab exercise.

The Green Track—Microsoft/ Power BI: Example Output

The Green Track—Microsoft / Power BI: Easy to Follow Step-by-Step Lab Instruction

Microsoft | Power BI Desktop

1. Open Power BI Desktop and connect to your data:
   a. Click **Home > Get Data > Excel.**
   b. Browse to find the **Lab 7-1 Slainte Job Costs.xlsx** file and click **O**
   c. Check all of the tables and click **Load.**
   d. Click **Modeling > Manage relationships** to verify that the tables l correctly. For example, if you see an issue with the relationship b

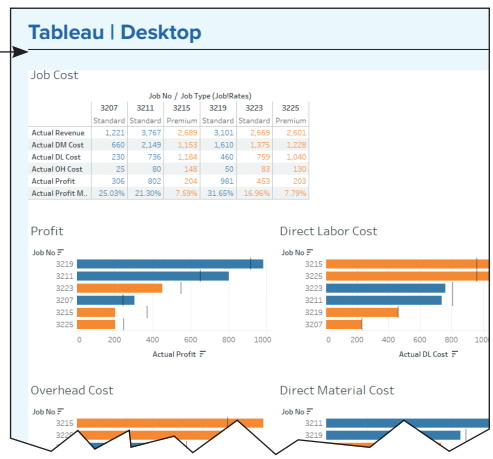


The Blue Track—Tableau: Example Output

The Blue Track—Tableau: Easy to Follow Step-by-Step Lab Instruction

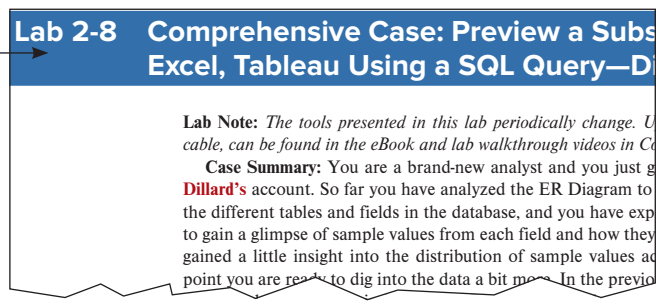
Tableau | Desktop

1. Open Tableau Desktop and connect to your data:
   a. Click **Connect to Data > Microsoft Excel.**
   b. Browse to find the **Lab 7-1 Slainte Job Costs.xlsx** file and click **Open.**
   c. Drag the **Job_Orders** table to the data model panel, then connect the **Customers, Time_Record, Material_Requisition,** and **Job_Rates** tables to right of it.
   d. Finally, drag the **Employees** table to the right of the **Time_Record** table.



Comprehensive Case Labs

Use a real-life Big Data set based on **Dillard's** actual company data. This dataset allows students to build their skills and test their conclusions across concepts covered in each chapter. The Comprehensive Cases can be followed continuously from the first chapter or picked up at any later point in the book; enough information is provided to ensure students can get right to work.



Data Analytics for Accounting, 3e
Content Updates

General Updates for the 3rd Edition

- Color coded multi-track labs now emphasize two tracks: The green Microsoft Track (including Excel, Power Query, and Power BI) and blue Tableau Track (including Tableau Prep Builder and Tableau Desktop).
- Added additional End-of-Chapter Multiple Choice Questions throughout the text that are auto-graded in Connect.
- Significantly revised many End-of-Chapter Problems for availability and auto-grading within Connect. Analysis Problems in Connect are manually graded.
- Linked chapter content to lab content using Lab Connections within the chapter content.

Chapter by Chapter Updates

Specific chapter changes for *Data Analytics for Accounting, 3e* are as follows:

Chapter 1

- Added new opening vignette regarding a recent IMA survey of finance and accounting professionals and their use of Big Data and Data Analytics.
- Added discussion on how analytics are used in auditing, tax, and management accounting.
- Included introduction to the variety of analytics tools available and explanation of dual tracks for labs including Microsoft Track and Tableau Track.
- Added "Data Analytics at Work" box feature: What Does an Analyst Do at a Big Four Accounting Firm.
- Added six new Connect-ready problems.
- Implemented lab changes:
  - All-new tool connections in Lab 1-5.
  - Revised Labs 1-0 to 1-4.

Chapter 2

- Edited opening vignette to include current examples regarding data privacy and ethics.
- Added a discussion on ethical considerations related to data collection and use.
- Added exhibit with potential external data sources to address accounting questions.
- Expanded the data extraction section to first include data identification, including the use of unstructured data.
- Added "Data Analytics at Work" box feature: Jump Start Your Accounting Career with Data Analytics Knowledge.
- Added six new Connect-ready problems.
- Implemented lab changes:
  - Revised Labs 2-1 to 2-8.

Chapter 3

- Refined the discussion on diagnostic analytics.
- Improved the discussion on the differences between qualitative and quantitative data and the discussion of the normal distribution.
- Refined the discussion on the use of regression as an analytics tool.
- Added examples of time series analysis in the predictive analytics section.
- Added "Data Analytics at Work" box feature: Big Four Invest Billions in Tech, Reshaping Their Identities as Professional Services Firm with a Technology Core.
- Added six new Connect-ready problems.
- Implemented lab changes:
  - All-new cluster analysis in Lab 3-2.
  - Revised Labs 3-1, 3-3 to 3-6.

Chapter 4

- Added discussion of statistics versus visualizations using Anscombe's quartet.
- Updated explanations of box plots and Z-scores.
- Added "Data Analytics at Work" box feature: Data Visualization: Why a Picture Can Be Worth a Thousand Clicks.
- Added six new Connect-ready problems.
- Implemented lab changes:
  - All-new dashboard in Lab 4-3.
  - Revised Labs 4-1, 4-2, 4-4, 4-5.

Chapter 5

- Improved and clarified content to match the focus on descriptive, diagnostic, predictive, and prescriptive analytics.
- Added "Data Analytics at Work" box feature: Citi's $900 Million Internal Control Mistake: Would Continuous Monitoring Help?
- Added six new Connect-ready problems.
- Implemented lab changes:
  - Revised Labs 5-1 to 5-5.

Chapter 6

- Clarified chapter content to match the focus on descriptive, diagnostic, predictive, and prescriptive analytics.
- Added "Data Analytics at Work" box features: Do Auditors Need to Be Programmers?
- Added six new Connect-ready problems.
- Implemented lab changes:
  - Major revisions to Labs 6-1 to 6-5.

Chapter 7

- Added new exhibit and discussion that maps managerial accounting questions to data approaches.
- Added "Data Analytics at Work" box feature: Maximizing Profits Using Data Analytics
- Added five new Connect-ready problems.
- Implemented lab changes:
  - All-new job cost, balanced scorecard, and time series dashboards in Lab 7-1, 7-2, 7-3.
  - Revised Lab 7-4, 7-5.

Chapter 8

- Added new exhibit and discussion that maps financial statement analysis questions to data approaches.
- Added four new Connect-ready problems.
- Implemented lab changes:
  - All-new sentiment analysis in Lab 8-4.
  - Revised Labs 8-1 to 8-3.

Chapter 9

- Added new exhibit and discussion that maps tax questions to data approaches.
- Added four new Connect-ready problems.
- Implemented lab changes:
  - Revised Labs 9-1 to 9-5.

Chapter 10

- Updated project chapter that evaluates different business processes, including the order-to-cash and procure-to-pay cycles, from different user perspectives with a choice to use the Microsoft track, the Tableau track, or both.
- Added extensive, all-new set of objective and analysis questions to assess analysis and learning.

Chapter 11

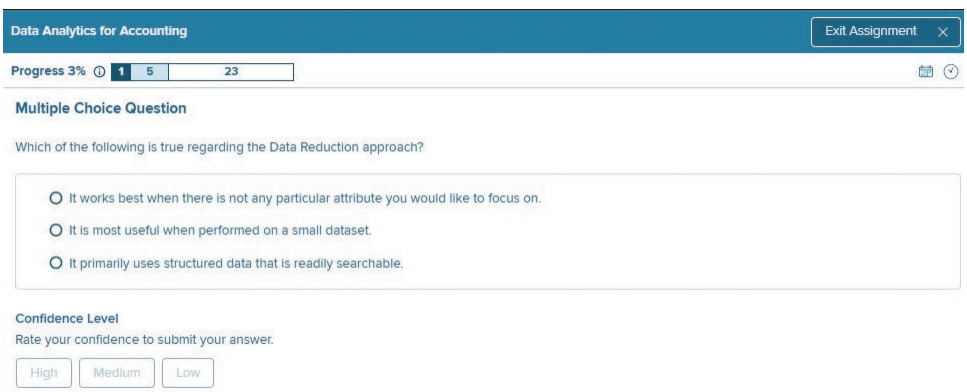
- Updated project chapter, estimating sales returns at **Dillard's** with three question sets highlighting descriptive and exploratory analysis, hypothesis testing, and predictive analytics with a choice to use the Microsoft track, the Tableau track, or both.
- Added extensive, all-new set of objective and analysis questions to assess analysis and learning.

Connect for *Data Analytics for Accounting*

With **McGraw Hill Connect** for *Data Analytics for Accounting,* your students receive proven study tools and hands-on assignment materials, as well as an adaptive eBook. Here are some of the features and assets available with Connect.

Proctorio: New remote proctoring and browser-locking capabilities, hosted by Proctorio within Connect, provide control of the assessment environment by enabling security options and verifying the identity of the student. Seamlessly integrated within Connect, these services allow instructors to control students' assessment experience by restricting browser activity, recording students' activity, and verifying students are doing their own work. Instant and detailed reporting gives instructors an at-a-glance view of potential academic integrity concerns, thereby avoiding personal bias and supporting evidence-based claims.

SmartBook 2.0: A personalized and adaptive learning tool used to maximize the learning experience by helping students study more efficiently and effectively. Smartbook 2.0 highlights where in the chapter to focus, asks review questions on the materials covered, and tracks the most challenging content for later review recharge. Smartbook 2.0 is available both online and offline.

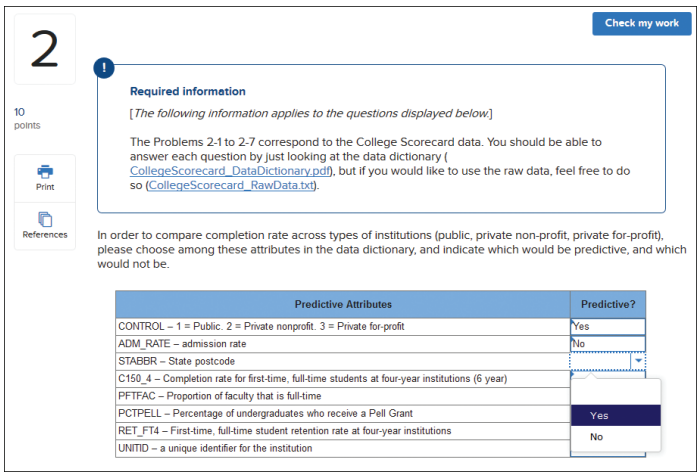


Orientation Videos: Video-based tutorial assignments are designed to train students via an overview video followed by a quiz for each of the assignment types they will find in McGraw Hill Connect.

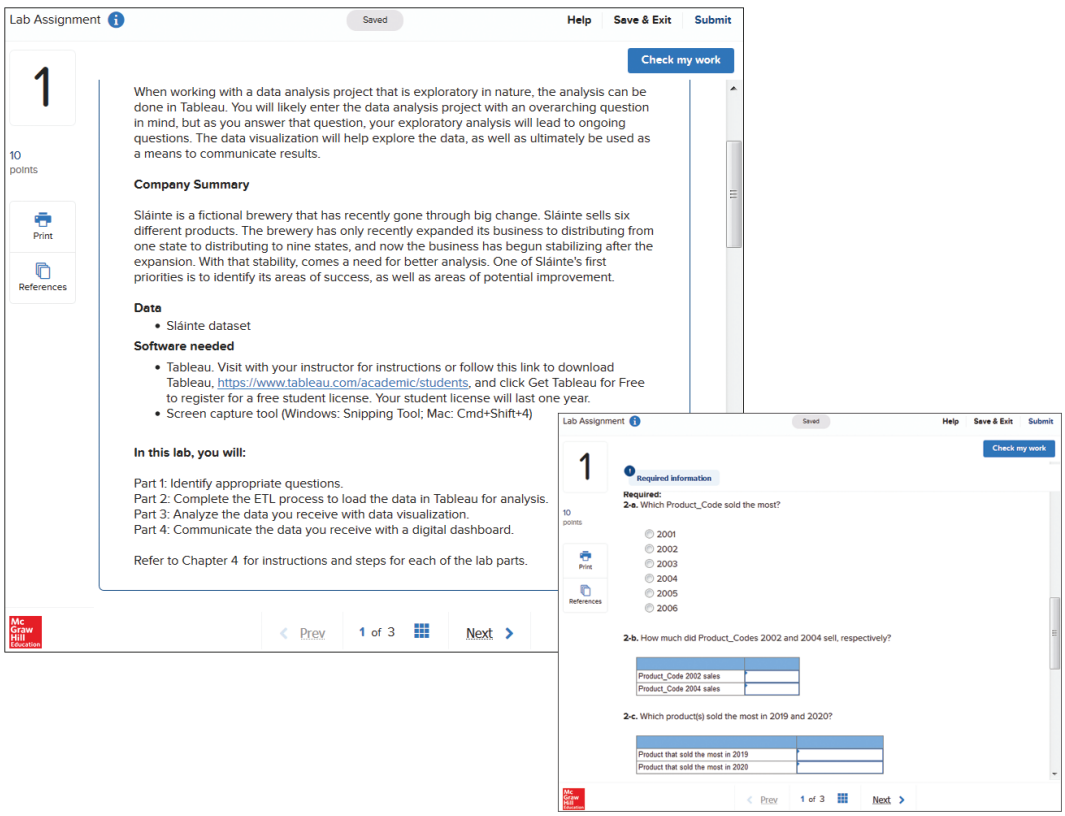
Multiple Choice Questions: The multiple choice questions from the end-of-chapter materials are assignable and auto-gradable in McGraw Hill Connect, with the option to provide students with instant feedback on their answers and performance.

Discussion and Analysis Questions: We have added the Discussion and Analysis questions into McGraw Hill Connect as manually graded assignments for convenience of assignment organization. These can be utilized for small group or in-class discussion.

Problems: Select problems from the text are auto-graded in McGraw Hill Connect. Manually graded analysis problems are also now available to ensure students are building an analytical skill set.

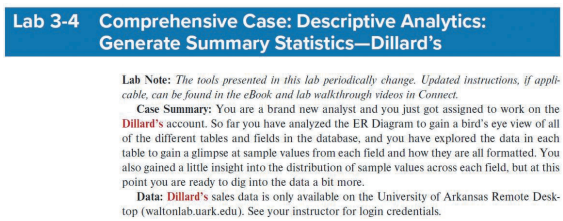


Color Coded Multi-Track Labs: Labs are assignable in McGraw Hill Connect as the green Microsoft Track (including Excel, Power Query, and Power BI) and blue Tableau Track (including Tableau Prep Builder and Tableau Desktop).



Students complete their lab work outside of Connect in the lab track selected by their professor. Students answer assigned lab questions designed to ensure they understood the key skills and outcomes from their lab work. Both auto-graded lab objective questions and manually graded lab analysis questions are assignable in Connect.

Comprehensive Cases: Comprehensive case labs are assignable in McGraw Hill Connect. Students work outside of Connect to complete the lab using the **Dillard's** real-world Big Data set. Once students complete the comprehensive lab, they will go back into Connect to answer questions designed to ensure they completed the lab and understood the key skills and outcomes from their lab work.



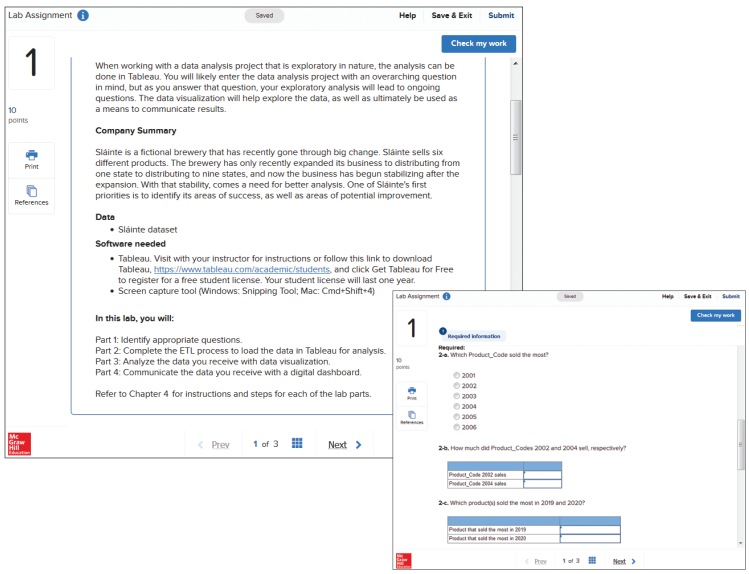
Lab 3-4 Comprehensive Case: Descriptive Analytics: Generate Summary Statistics—Dillard's

Lab Note: *The tools presented in this lab periodically change. Updated instructions, if applicable, can be found in the eBook and lab walkthrough videos in Connect.*

Case Summary: You are a brand new analyst and you just got assigned to work on the Dillard's account. So far you have analyzed the ER Diagram to gain a bird's eye view of all of the different tables and fields in the database, and you have explored the data in each table to gain a glimpse at sample values from each field and how they are all formatted. You also gained a little insight into the distribution of sample values across each field, but at this point you are ready to dig into the data a bit more.

Data: Dillard's sales data is only available on the University of Arkansas Remote Desktop (waltonlab.uark.edu). See your instructor for login credentials.

Lab Walkthrough Videos: These author-led lab videos in McGraw Hill Connect explain how to access and use the tools needed to complete the processes essential to the labs. Lab videos improve student success and minimize student questions!



Author Lecture Videos: Lecture Videos assignable in McGraw Hill Connect teach each chapter's core learning objectives and concepts through an author-developed, hands-on presentation, bringing the text content to life. The videos have the touch and feel of a live lecture, rather than a canned presentation, so you can learn at your own pace.

Writing Assignment: The Writing Assignment tool delivers a learning experience to help students improve their written communication skills and conceptual understanding. As an instructor you can assign, monitor, grade, and provide feedback on writing more efficiently and effectively in McGraw Hill Connect.

Test Bank: The test bank includes auto-graded multiple choice and true/false assessment questions. The test bank can be assigned directly within McGraw Hill Connect or exported from Test Builder.

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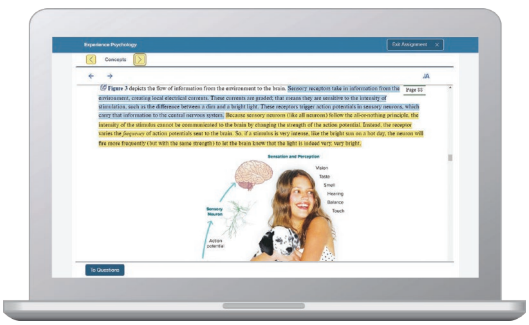

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>
> - Jordan Cunningham, Eastern Washington University

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