Data Analytics for Accounting

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DATA ANALYTICS FOR ACCOUNTING

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Dedications

My wonderful eldest daughter, Alison.

–Vernon Richardson

My wife, Erin, and children, Sylvia and Theodore.

–Ryan Teeter

My husband, Kevin. Thank you for your support and patience along the way!

–Katie Terrell

Preface

Data Analytics is changing the business world—data simply surrounds us! With so much data available about each of us (i.e., how we shop, what we read, what we buy, what music we listen to, where we travel, whom we trust, etc.), arguably, there is the potential for analyzing those data in a way that can answer fundamental business and accounting questions and create value.

According to the results of 18th Annual Global CEO Survey conducted by PwC, many CEOs put a high value on Data Analytics, and 80 percent of them place data mining and analysis as the second-most important strategic technology for CEOs. In fact, per PwC's 6th Annual Digital IQ survey of more than 1,400 leaders from digital businesses, the area of investment that tops CEOs' list of priorities is business analytics.[1]

This text addresses what we believe will be a similar impact of Data Analytics on accounting and auditing. For example, we argue that Data Analytics will play an increasingly critical role in the future of audit. In a recent *Forbes* Insights/KPMG report, "Audit 2020: A Focus on Change," the vast majority of survey respondents believe:

1. Auditors must better embrace technology.
2. Technology will enhance the quality, transparency, and accuracy of the audit.

No longer will auditors simply check for errors, misstated accounts, fraud, and risk in the financial statements or merely report their findings at the end of the audit. Through the use of Data Analytics, audit professionals will collect and analyze the company's data similar to the way a business analyst would help management make better business decisions. In our text, we emphasize audit data analytics and all the testing that can be done to perform audit testing.

Data Analytics also potentially has an impact on financial reporting. With the use of so many estimates and valuations in financial accounting, some believe that employing Data Analytics may substantially improve the quality of the estimates and valuations. Likewise, the use of XBRL data gives accountants access to more timely and more extensive accounting data for financial analysis.

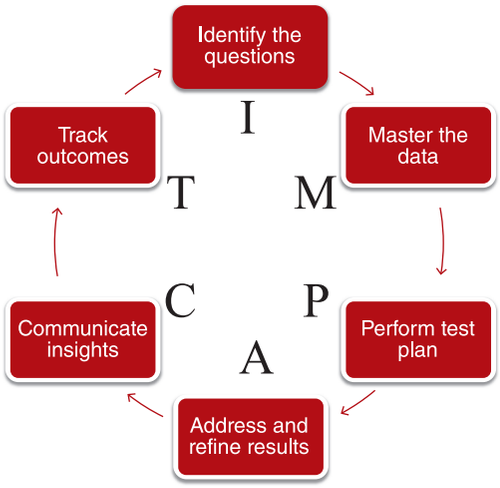
This text recognizes that accountants don't need to become data scientists—they may never need to build a data repository or do the real hard-core Data Analytics or machine learning. However, we do emphasize seven skills that we believe analytic-minded accountants should have:

1. An analytics mindset—recognize 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.
6. Problem solving through statistical data analysis—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.

[1]PwC, "Data Driven: What Students Need to Succeed in a Rapidly Changing Business World," https://www.pwc.com/us/en/faculty-resource/assets/pwc-data-driven-paper-feb2015.pdf posted February 2015, extracted December 14, 2017.

Consistent with these skills we desire in all accountants, we recognize that Data Analytics is a process. The process begins by identifying business questions that can be addressed with data and then testing the data, refining our testing, and finally, communicating those findings to management. We describe our Data Analytics process by using an established data analytics model called the IMPACT cycle, by Isson and Harriott:[2]

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



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

We describe the IMPACT cycle in the first four chapters and then illustrate the process in audit, managerial accounting, and financial reporting in the final four chapters.

We also emphasize hands-on practice. Students will be provided hands-on learning (click-by-click instructions, screenshots, etc.) on datasets within the chapter; within the end-of-chapter materials; and in the four to eight hands-on labs at the end of each chapter, where students identify questions, download data, perform testing, and then communicate the results of that testing. We highlight the use of real-world data from **LendingClub, College Scorecard, Dillard's, the State of Oklahoma,** as well as other data from our labs.

We also emphasize the tools students will use. In this text, we emphasize data analysis using Excel, Access (including SQL), Tableau (free student license), IDEA (free student license), and Weka (free student license). Students will compare and contrast the different tools to determine which one 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 big datasets or big SQL queries, and so on.

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

About the Authors

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 Xi'an Jiaotong Liverpool University. 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, 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, 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.*

Ryan A. Teeter is a Clinical Assistant 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.

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 2019. 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 (Viña 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. 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.

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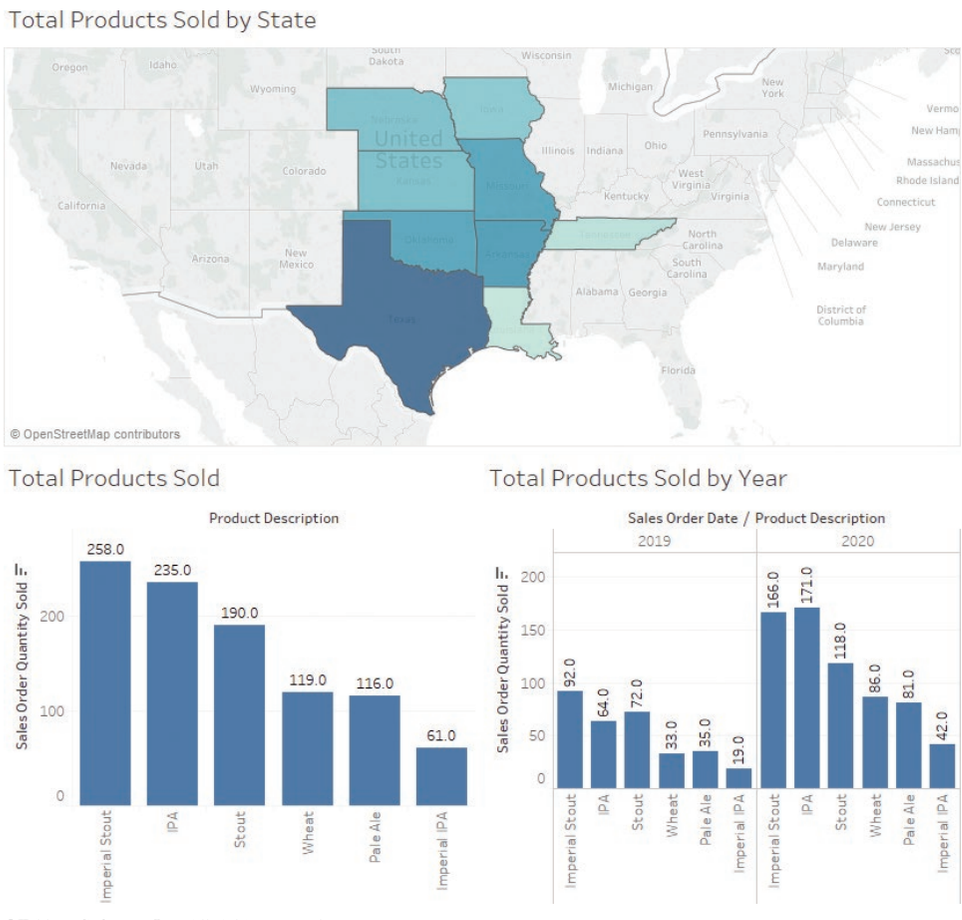
Vernon Richardson

Ryan Teeter

Katie Terrell

Key Features

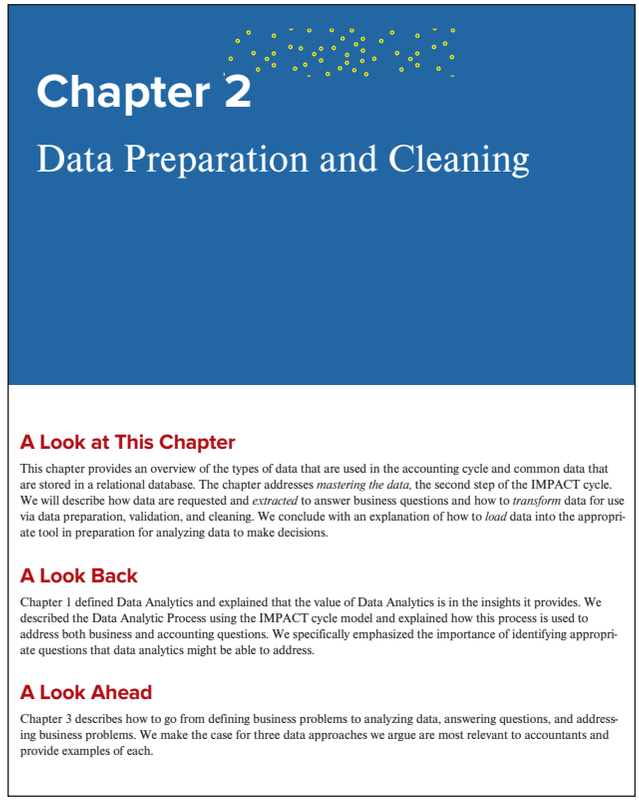
- **Emphasis on Skills:** Working through the IMPACT cycle framework, students will learn problem assessment, data preparation, data analysis, data visualization, control contesting, and more.
- **Emphasis on Hands-On Practice:** Students will be provided hands-on learning (click-by-click instructions 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 **LendingClub, Dillard's, College Scorecard, the State of Oklahoma,** as well as financial statement data (via XBRL) from *Fortune* 100 companies.
- **Emphasis on Tools:** Students will learn how to conduct data analysis using Excel Access (including SQL), Tableau (free student license), IDEA (free student license), and Weka (free student license). 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 2

Data Preparation and Cleaning

A Look at This Chapter

This chapter provides an overview of the types of data that are used in the accounting cycle and common data that are stored in a relational database. The chapter addresses *mastering the data*, the second step of the IMPACT cycle. We will describe how data are requested and *extracted* to answer business questions and how to *transform* data for use via data preparation, validation, and cleaning. We conclude with an explanation of how to *load* data into the appropriate tool in preparation for analyzing data to make decisions.

A Look Back

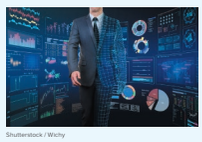
Chapter 1 defined Data Analytics and explained that the value of Data Analytics is in the insights it provides. We described the Data Analytic Process using the IMPACT cycle model and explained how this process is used to address both business and accounting questions. We specifically emphasized the importance of identifying appropriate questions that data analytics might be able to address.

A Look Ahead

Chapter 3 describes how to go from defining business problems to analyzing data, answering questions, and addressing business problems. We make the case for three data approaches we argue are most relevant to accountants and provide examples of each.

Chapter-Opening Vignettes

Because companies are facing the 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.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We are lucky to live in a world in which data are abundant. However, even with rich sources of data, when it comes to being able to analyze data and turn them into useful information and insights, very rarely can an analyst hop right into a dataset and begin analyzing. Datasets almost always need to be cleaned and validated before they can be used. Not knowing how to clean and validate data can, at best, lead to frustration and poor insights and, at worst, lead to horrible security violations. While this text takes advantage of open source datasets, these datasets have all been scrubbed not only for accuracy, but also to protect the security and privacy of any individual or company whose details were in the original dataset.

In 2015, a pair of researchers named Emil Kirkegaard and Julius Daugbjerg Bjerrekaer scraped data from **OkCupid**, a free dating website, and provided the data onto the "Open Science Framework," a platform researchers use to obtain and share raw data. While the aim of the Open Science Framework is to increase transparency, the researchers in this instance took that a step too far—and a step into illegal territory. Kirkegaard and Bjerrekaer did not obtain permission from **OkCupid** or from the 70,000 **OkCupid** users whose identities, ages, genders, religions, personality traits, and other personal details maintained by the dating site were provided to the public without any work being done to anonymize or sanitize the data. If the researchers had taken the time to not just validate that the data were complete but also to sanitize them to protect the individuals' identities, this would not have been a threat or a news story. On May 13, 2015, the Open Science Framework removed the **OkCupid** data from the platform, but the damage of the privacy breach had already been done.[1]

OBJECTIVES

After reading this chapter, you should be able to:

- **LO 2-1** Understand how data are organized in an accounting information system
- **LO 2-2** Understand how data are stored in a relational database
- **LO 2-3** Explain and apply extraction, transformation, and loading (ETL) techniques

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.

PROGRESS CHECK

1. Referring to Exhibit 2-1, locate the relationship between the Employee and Purchase Order tables. What is the unique identifier of each table? (The unique identifier attribute is called the primary key—more on how it's determined in the next learning objective.) Which table contains the attribute that creates the relationship? (This attribute is called the foreign key—more on how it's determined in the next learning objective.)
2. Referring to Exhibit 2-1, review the attributes in the Suppliers table. There is a foreign key in this table that doesn't relate to any of the tables in the diagram. Which table do you think it is? What type of data would be stored in that table?

End-of-Chapter Materials

Answers to Progress Checks

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 Employee table is [EmployeeID], and the
fier of the Purchase Order table is [PO No.]. The Purchase Order tabl
foreign key.
2. The foreign key attribute that doesn't appear to belong in the Suppliers ta
Type]. This attribute probably relates to the Supplier Type table. The data
be descriptive, categorical data about the suppliers.
3. The purpose of the primary key is to uniquely identify each record in a
pose of a foreign key is to create a relationship between two tables. Th
descriptive attribute is to provide meaningful information about each re
Descriptive attributes aren't required for a database to run, but they are
people to gain business information about the data stored in their databa

Multiple Choice Questions

Quickly assess student's knowledge of chapter content.

Multiple Choice Questions

1. Mastering the data can also be described via
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.
2. The goal of the ETL process is to:
   a. Identify which approach to data analytics s
   b. Load the data into a relational database fo
   c. Communicate the results and insights foun

Discussion Questions

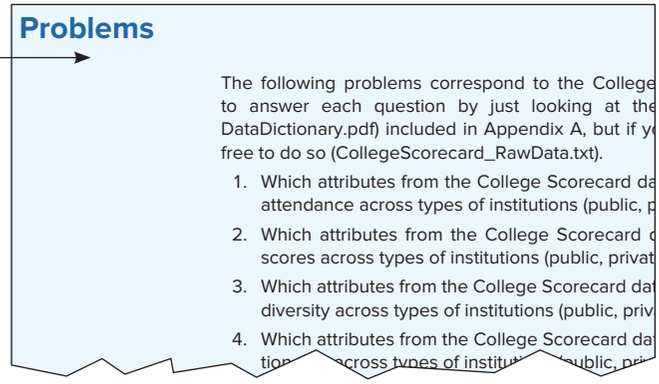
Provide questions for group discussion.

Discussion Questions

1. The advantages of a relational database include limiting the amount of r
that are stored in a database. Why is this an important advantage? What
when redundant data are stored?
2. The advantages of a relational database include integrating business p
is it preferable to integrate business processes in one information syste
store different business process data in separate, isolated databases?
3. Even though it is preferable to store data in a relational database, stori
separate tables can make data analysis cumbersome. Describe three re
worth the trouble to store data in a relational database.
4. Among the advantages of using a relational database is enforcing busine
on your understanding of how the structure of a relational database help
redundancy and other advan[illegible]s, how does the prima[illegible]ey/foreign k

Problems

Challenge the student's ability to see relationships in the learning objectives by employing higher-level thinking and analytical skills.



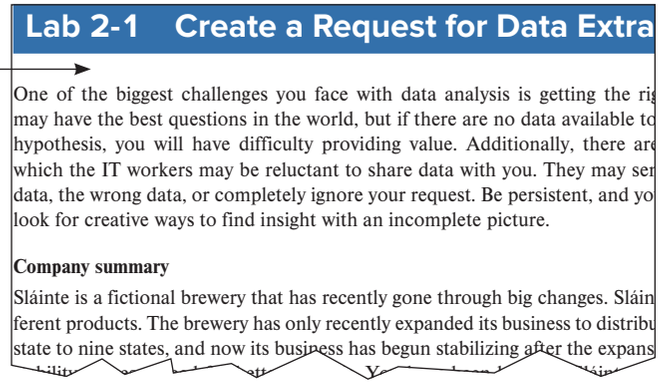
Problems

The following problems correspond to the College
to answer each question by just looking at the
DataDictionary.pdf) included in Appendix A, but if y
free to do so (CollegeScorecard_RawData.txt).

1. Which attributes from the College Scorecard da
attendance across types of institutions (public, p
2. Which attributes from the College Scorecard d
scores across types of institutions (public, privat
3. Which attributes from the College Scorecard dat
diversity across types of institutions (public, priv
4. Which attributes from the College Scorecard da
tion across types of institu ublic, pri

Labs

Give students hands-on experience working with different types of data and the tools used to analyze them. Students will conduct data analysis using Excel, Access (including SQL), Tableau, IDEA, XBRL, and Weka.



Lab 2-1 Create a Request for Data Extra

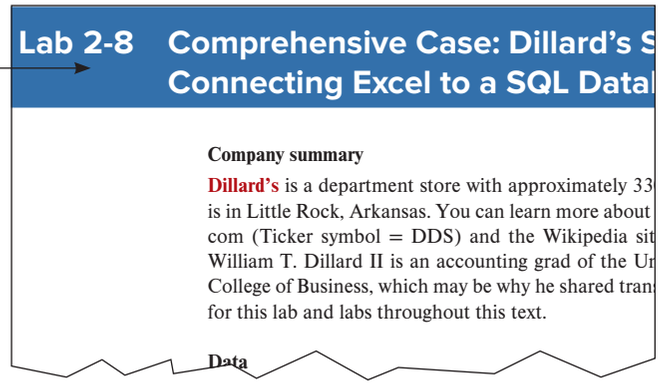
One of the biggest challenges you face with data analysis is getting the ri
may have the best questions in the world, but if there are no data available to
hypothesis, you will have difficulty providing value. Additionally, there are
which the IT workers may be reluctant to share data with you. They may ser
data, the wrong data, or completely ignore your request. Be persistent, and yo
look for creative ways to find insight with an incomplete picture.

Company summary

Sláinte is a fictional brewery that has recently gone through big changes. Sláin
ferent products. The brewery has only recently expanded its business to distribu
state to nine states, and now its business has begun stabilizing after the expans

Comprehensive Cases

Use a real-life Big Data set based on **Dillard's** actual company data from 2014 to 2016. 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.



**Lab 2-8 Comprehensive Case: Dillard's S
Connecting Excel to a SQL Datal**

Company summary

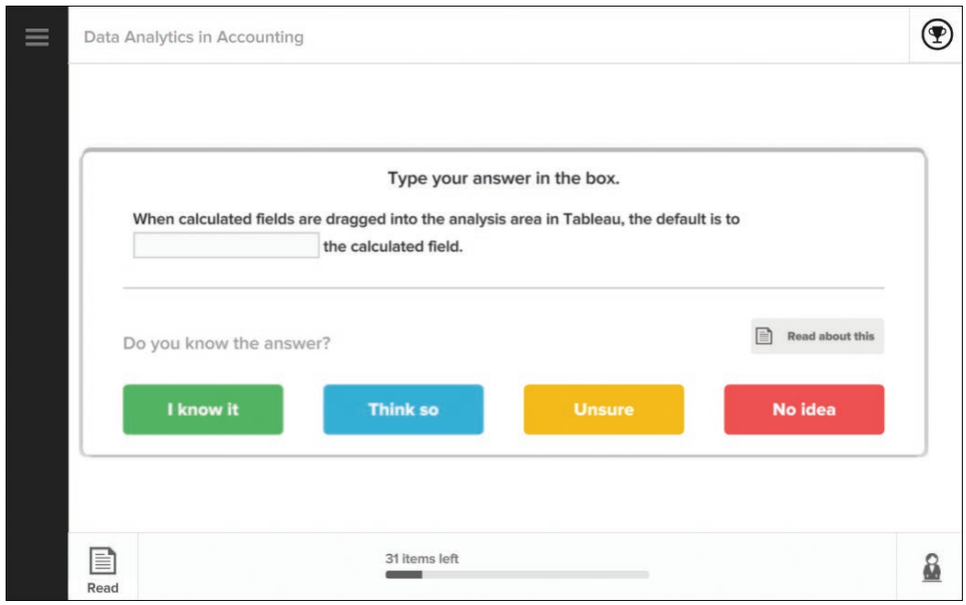
Dillard's is a department store with approximately 33
is in Little Rock, Arkansas. You can learn more about
com (Ticker symbol = DDS) and the Wikipedia sit
William T. Dillard II is an accounting grad of the Ur
College of Business, which may be why he shared tran
for this lab and labs throughout this text.

Data

Connect for Data Analytics for Accounting

With **Connect** for Data Analytics in Accounting, your students receive proven study tools and hands-on assignment materials as well as an adaptive eBook. All of the following assets are assignable in Connect.

SmartBook: SmartBook provides adaptive reading assignments that require students to answer questions; it then provides feedback to direct a student learning and ensure mastery of concepts.

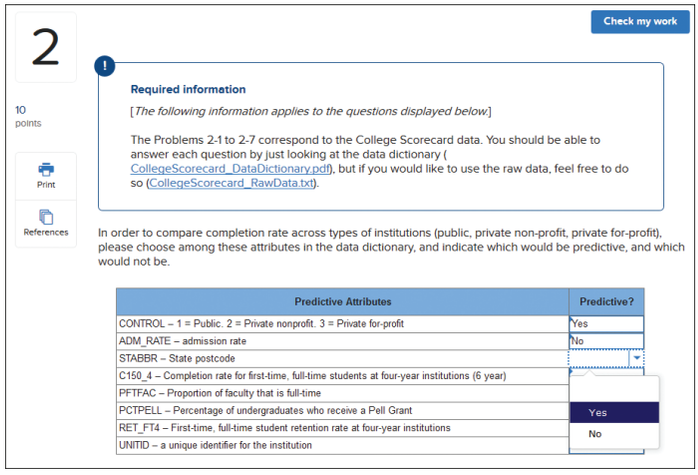


Orientation Videos: Video-based tutorial assignments are designed to train students via an overview video followed by a quiz for each of the assignment types they will find in Connect.

Multiple Choice Questions: The multiple choice questions from the end-of-chapter materials are assignable in Connect, providing students with instant feedback on their answers.

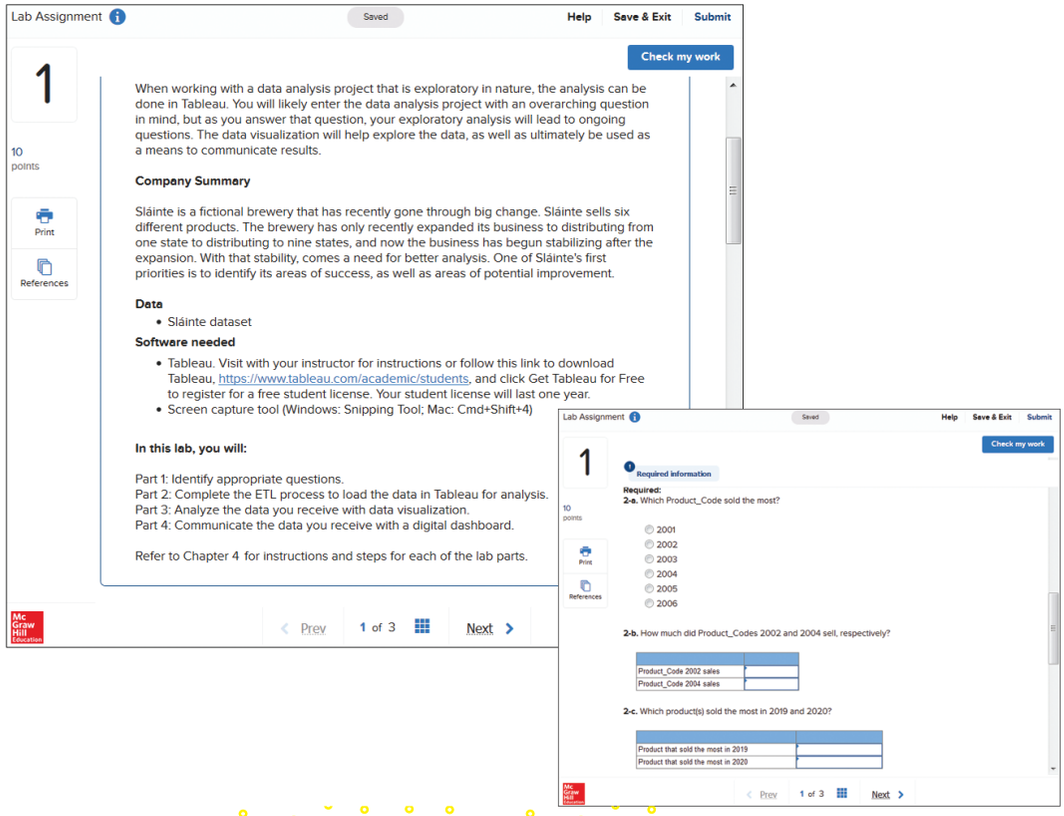
Test Bank: The test bank includes auto-graded multiple choice and true/false assessment questions. It is available in Connect and TestGen.

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



Labs: Select labs are assignable in Connect but will require students to work outside of Connect to complete the lab. Once completed, students 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.

Comprehensive Cases: Select comprehensive labs/cases are assignable in Connect but will require students to 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.



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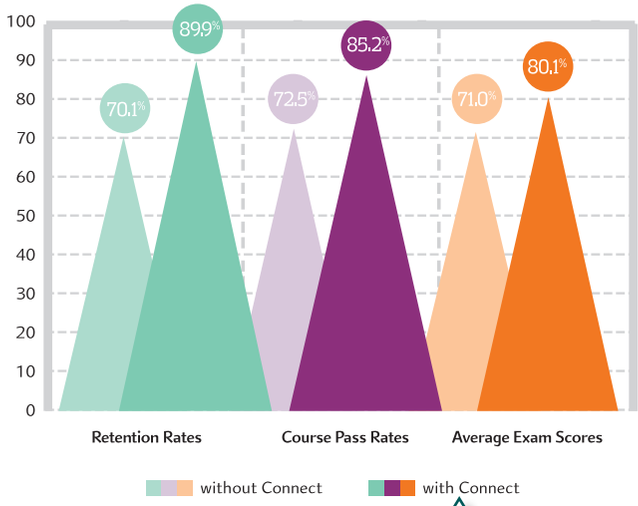

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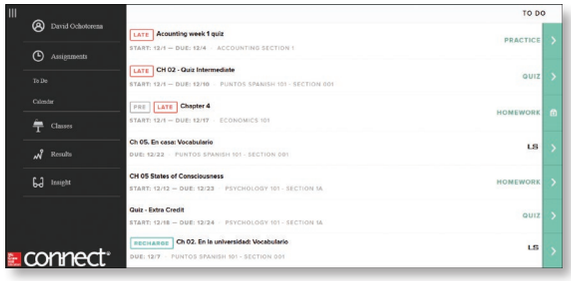

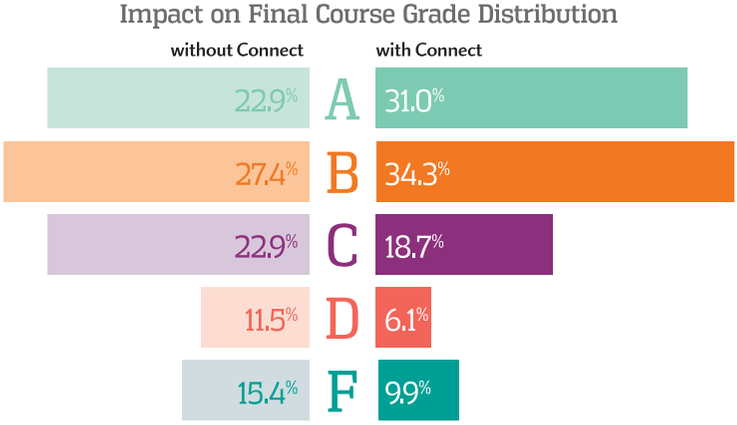

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Brief Table of Contents

Detailed TOC

Data Analytics for Accounting

Chapter 5

The Modern Audit and Continuous Auditing

A Look at This Chapter

Most of the focus of Data Analytics in accounting is focused on auditing. This is partly due to the demand for high-quality data and the need for enhancing trust in the assurance process. In this chapter, we look at how both internal and external auditors are using technology in general, and audit analytics specifically, to evaluate firm data and generate support for management assertions. We also introduce how Data Analytics helps facilitate continuous auditing.

A Look Back

Chapter 4 completed our discussion of the IMPACT model by explaining how to communicate your results through data visualization and through written reports. We discussed how to choose the best chart for your dataset and your purpose. We also helped you learn how to refine your chart so that it communicates as efficiently and effectively as possible. The chapter wrapped up by describing how to provide a written report tailored to specific audiences who will be interested in the results of your data analysis project.

A Look Ahead

In chapter 6, you will learn how to use audit software to perform substantive audit tests, including when and how to select samples and how to confirm account balances. Specifically, we discuss the use of different types of descriptive, diagnostic, predictive, and prescriptive analytics as they are used to generate computer-assisted auditing techniques.

The large public accounting firms offer a variety of analytical tools to their customers. Take **PwC**'s Halo, for example. This tool allows auditors to interrogate a client's data and identify patterns and relationships within the data in a user-friendly dashboard. By mapping the data, auditors and managers can identify inefficiencies in business processes, discover areas of risk exposure, and correct data quality issues by drilling down into the individual users, dates and times, and amounts of the entries. Tools like Halo allow auditors to develop their audit plan by narrowing their focus and audit scope to unusual and infrequent issues that represent high audit risk.

EXHIBIT 5-1

Source: http://halo.pwc.com

OBJECTIVES

After reading this chapter, you should be able to:

LO 5-1 Understand modern auditing techniques
LO 5-2 Evaluate an audit plan
LO 5-3 Understand the nature, extent, and timing of audit tests
LO 5-4 Select appropriate audit tasks and approaches
LO 5-5 Evaluate audit alarms as part of continuous auditing
LO 5-6 Understand working paper platforms

LO 5-1

Understand modern auditing techniques

THE MODERN AUDIT

You'll recall from your auditing course that assurance services are crucial to building and maintaining trust within the capital markets. In response to increasing regulation in the United States, the European Union, and other jurisdictions, both internal and external auditors have been tasked with providing enhanced assurance while also attempting to reduce (or at least maintain) the audit fees. This has spurred demand for more audit automation along with an increased reliance on auditors to use their judgment and decision-making skills to effectively interpret and support their audit findings with managers, shareholders, and other stakeholders.

Auditors have been applying simple Data Analytics for decades in evaluating risk within companies. Think about how an evaluation of inventory turnover can spur a discussion on inventory obsolescence or how working capital ratios are used to identify significant issues with a firm's liquidity. From an internal audit perspective, evaluating cost variances can help identify operational inefficiencies or unfavorable contracts with suppliers.

The audit concepts of professional skepticism and reasonable assurance are as much a part of the modern audit as in the past. There has been a shift, however, of simply providing reasonable assurance on the processes to the additional assurance of the robots that are performing a lot of the menial audit work. Where, before, an auditor may have looked at samples and gathered evidence to make inferences to the population, now that same auditor must understand the controls and parameters that have been programmed into the robot. In other words, as these automated bots do more of the routine analytics, auditors will be free to exercise more judgment to interpret the alarms and data while refocusing their effort on testing the parameters used by the robots.

Auditors use Data Analytics to improve audit quality by more accurately assessing risk and selecting better substantive procedures and tests of controls. While the exercises the auditors conduct are fairly routine, the models can be complex and require auditor judgment and interpretation. For example, if an auditor receives 1,000 notifications of a control violation during the day, does that mean there is a control weakness or that the settings on the automated control are too precise? Are all those notifications actual control violations that require immediate attention, or are most of them false positives—transactions that are flagged as exceptions but are normal and acceptable?

The auditors' role is to make sure that the appropriate analytics are used and that the output of those analytics—whether a dashboard, notifications of exceptions, or accuracy of predictive models—correspond to management's expectations and assertions.

The Increasing Importance of the Internal Audit

If you look at the assurance market, there are many trends that are affecting the profession. First, the major applications of Data Analytics in auditing are not solely focused on the financial statements as evaluated by public accounting firms. Rather, these tend to focus on data quality, internal controls, and the complex information systems that support the business process—areas typically reserved for the internal audit department at a firm. Second, the risk and advisory practices of the public accounting firms are experiencing greater growth, in large part due to firms' outsourcing or co-sourcing of the internal audit function. Third, external auditors are permitted to rely on the work of internal auditors to provide support for their opinion of financial statements.

For these reasons, most of the innovations in Data Analytics have originated in internal audit departments, where there is constant pressure to enhance business value while minimizing costs. In the recent past, many companies' experience with Data Analytics in the internal audit department have come from internal auditors who have investigated Data Analytics on their own. These individuals then find a champion with management and are encouraged to continue their work. Under the guidance of the chief audit executive (CAE)

or another manager, these individuals build teams to develop and implement analytical techniques to aid the following audits:

1. Process efficiency and effectiveness.
2. Governance, risk, and compliance, including internal controls effectiveness.
3. Information technology and information systems audits.
4. Forensic audits in the case of fraud.
5. Support for the financial statement audit.

Internal auditors are also more likely to have working knowledge of the various enterprise resource planning systems that are in use at their companies. They are familiar with how the general journals from a product like JD Edwards actually reconcile to the general ledger in SAP. Because implementation of these systems varies across organizations (and even within organizations), internal auditors can understand how analytics are not simply a one-size-fits-all type of strategy.

PROGRESS CHECK

1. How do auditors use Data Analytics in their audit testing?
2. Make the case for why an internal audit is increasingly important in the modern audit. Why is it also important for external auditors and the scope of their work?

Auditing Data

LO 5-2

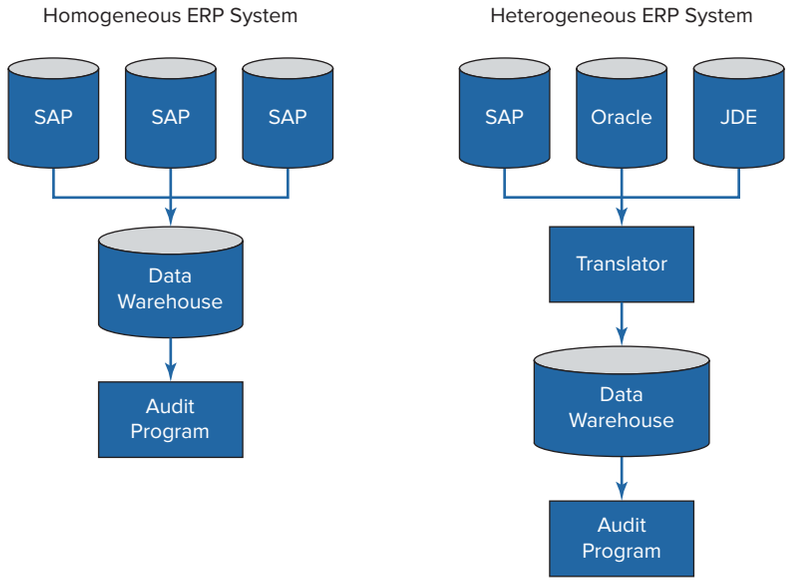
Evaluate an audit plan

While organizations have become more data-centric as they have adopted ERP systems over the past few decades, these systems can vary greatly among organizations. Some companies will take a **homogeneous systems approach** by ensuring that all of its divisions and subsidiaries use a uniform installation of SAP. This approach allows management to consolidate the information from various locations and roll them up into the financial statements. Other companies that grow through acquisition, take a **heterogeneous systems approach**, where they attempt to integrate the existing systems of companies that they acquire and use a series of translators to convert the output of those systems (such as PeopleSoft, JD Edwards, and others) into usable financial information. **Systems translator software** attempts to map the various tables and fields from these varied ERP systems and create a **data warehouse**, where all of the data can be analyzed centrally, as shown in Exhibit 5-2.

One of the primary obstacles auditors face is access to appropriate data. As noted in chapter 2, auditors typically request **flat files** or extracts from an IT manager. In some cases, these files may be incomplete, unrelated, limited in scope, or delayed when they are not considered a priority by IT managers. Ideally, auditors will have read-only access to the data warehouse that pulls in not only transaction data, such as purchases and sales, but also the related master data, such as employees and vendors. Thus, they can analyze multiple relationships and explore other patterns in a more meaningful way. In either case, the auditors will work with duplicated data, rather than querying the **production or live systems** directly.

The AICPA's **audit data standards (ADSs)** define common tables and fields that are needed by auditors to perform common audit tasks. They make recommendations to ERP vendors to standardize the output of common data that auditors are likely to use. The goal of the standards is to reduce efforts of the auditors with loading and transforming the data so they can work with the analytics more quickly and have support for more real-time or continuous analytics through access to data warehouses. These standards are voluntary, and actual implementation is currently limited, but they provide a good basis for data needed to audit specific company functions.

EXHIBIT 5-2
Homogeneous Systems, Heterogeneous Systems, and Software Translators

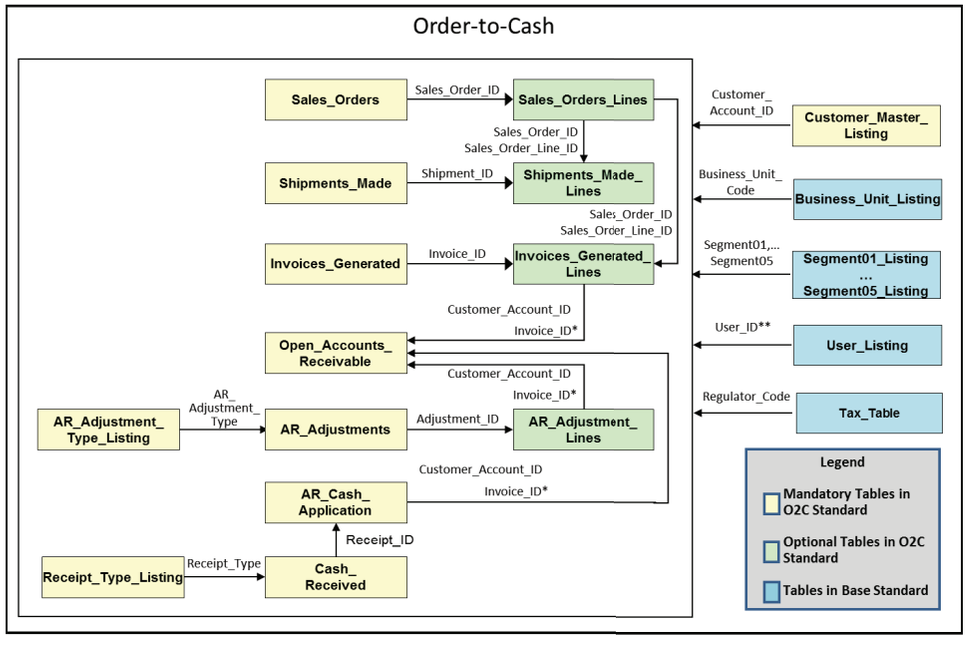


The current set of audit data standards defines the following standards:

- The *Base Standard* defines the format for files and fields as well as some master data for users and business units.
- The *General Ledger Standard* adds the chart of accounts, source listings, trial balance, and GL (journal entry) detail.
- The *Order to Cash Subledger Standard* focuses on sales orders, accounts receivable, shipments, invoices, cash receipts and adjustments to accounts, shown in Exhibit 5-3.

EXHIBIT 5-3
Audit Data Standards
The audit data standards define common elements needed to audit the order-to-cash or sales process.

Source: https://www.aicpa.org/InterestAreas/FRC/AssuranceAdvisoryServices/DownloadableDocuments/AuditDataStandards/AuditDataStandards.O2C.July2015.pdf



** If receivable balances are tracked by customer only (not by invoice), then Customer_Account_ID is used as a key to join tables to the Open_Accounts_Receivable table instead of both Customer_Account_ID and Invoice_ID*

*** The User_Listing table can be joined to three fields, all of which contain a user ID – Entered_by, Approved_By , Last_Modified_By*

- The *Procure to Pay Subledger Standard* identifies data needed for purchase orders, goods received, invoices, payments, and adjustments to accounts.
- The *Inventory Subledger Standard* defines product master data, location data, inventory on hand data, and inventory movement.

With standard data elements in place, not only will auditors streamline their access to data, but they also will be able to build analytical tools that they can share with others within their company or professional organizations. This can foster greater collaboration among auditors and increased use of Data Analytics across organizations. These data elements will be useful when performing substantive testing in chapter 6.

PROGRESS CHECK

3. What are the advantages of the use of homogeneous systems? Would a merger target be more attractive if it used a similar financial reporting system as the potential parent company?
4. How does the use of audit data standards facilitate data transfer between auditors and companies? How does it save time for both parties?

AUTOMATING THE AUDIT PLAN

LO 5-3

Understand the nature, extent, and timing of audit tests

LO 5-4

Select appropriate audit tasks and approaches

So far, we've discussed many of the tools available to auditors as well as the changing audit environment. The main impact of automation and Data Analytics on the audit profession comes through optimization of the audit plan. When beginning an engagement—whether to audit the financial statements, certify the enterprise resource planning system, or make a recommendation to improve a business process—auditors generally follow a standardized audit plan. The benefit of a standardized audit plan is that newer members of the audit team can jump into an audit and contribute. They also identify the priorities of the audit.

An audit plan consists of the one or more of the following elements:

- A *methodology* that directs that audit work.
- The *scope of the audit,* defining the time period, level of materiality, and expected time for the audit.
- *Potential risk* within the area being audited.
- *Procedures and specific tasks* that the audit team will execute to collect and analyze evidence. These typically include tests of controls and substantive tests of transaction details.
- *Formal evaluation* by the auditor and supervisors.

Because audit plans are formalized and standardized, they lend themselves to the use of Data Analytics and, consequently, automation. For example,

- The methodology may be framed by specific standards, such as the Public Company Accounting Oversight Board's (PCAOB) auditing standards, the Committee of Sponsoring Organizations's (COSO) Enterprise Risk Management framework, or the Information Systems Audit and Control Association's (ISACA) Control Objectives for Information and Related Technologies (COBIT) framework. Data Analytics may be used to analyze the standards and determine which requirements apply to the organization being audited.
- The scope of the audit defines parameters that will be used to filter the records or transactions being evaluated.
- Simple to complex Data Analytics can be applied to a client's data during the planning stage of the audit to identify which areas the auditor should focus on. This may include outlier detection or other substantive tests of suspicious or risky transactions.

- Audit procedures themselves typically identify data, locations, and attributes that the auditors will evaluate. These are the variables that will provide the input for many of the substantive analytical procedures discussed in chapter 6.
- The evaluation of audit data may be distilled into a risk score. This may be a function of the volume of exceptional records or level of exposure for the functional area. If the judgment and decision making is easily defined, a rule-based analytic could automatically assign a score for the auditor to review. For more complex judgment, the increasing prevalence of artificial intelligence and machine learning discussed in chapter 3 may be of assistance. After all, if we have enough observations of the scores auditors assign to specific cases and outcomes, we can create models that will provide accurate enough classification for these tasks.

Typical internal audit organizations that have adopted Data Analytics to enhance their audit have done so when an individual on the team has begun tinkering with Data Analytics. They convince their managers that there is value in using the data to direct the audit and get a champion in the process. Once they show the value proposition of Data Analytics, they are given more resources to build the program and adapt the existing audit program to include more data-centric evaluation where appropriate.

Because of the potential disruption to the organization, it is more likely that an auditor will adapt an existing audit plan than develop a new system from scratch. Automating the audit plan and incorporating data analytics involve the following steps, which are similar to the IMPACT model:

1. *Identify* the questions or requirements in the existing audit plan.
2. *Master* the data by identifying attributes and elements that are automatable.
3. *Perform* the test plan, in this case by developing analytics (in the form of rules or models) for those attributes identified in step 2.
4. *Address* and refine results. List expected exceptions to these analytics and expected remedial action by the auditor, if any.
5. *Communicate* insight by testing the rules and comparing the output of the analytics to manual audit procedures.
6. *Track* outcomes by following up on alarms and refining the models as needed.

Let's assume that an internal auditor has been tasked with implementing data analytics to automate the evaluation of a segregation of duties control within SAP. The auditor evaluates the audit plan and identifies a procedure for testing this control. The audit plan identifies which tables and fields contain relevant data, such as an authorization matrix, and the specific roles or permissions that would be incompatible. The auditor would use that information to build a model that would search for users with incompatible roles and notify the auditors.

LO 5-5

Evaluate audit alarms as part of continuous auditing

CONTINOUS AUDITING TECHNIQUES

Data Analytics and audit automation allow auditors to continuously monitor and audit the systems and processes within their companies. Whereas a traditional audit may have the internal auditors perform a routine audit plan once every 12 to 36 months or so, the continuous audit evaluates data in a form that matches the pulse of the business. For example, purchase orders can be monitored for unauthorized activity in real time, while month-end adjusting entries would be evaluated once a month. When exceptions occur—for example, a purchase order is created with a customer whose address matches an employee's—the auditors are alerted immediately and given the option to respond right away to resolve the issue.

Continuous auditing is a process that provides real-time assurance over business processes and systems. It involves the application of rules or analytics that perform a *continuous monitoring* function that constantly evaluates internal controls and transactions. It also generates *continuous reporting* on the status of the system so that an auditor can know at any given time whether the system is operating within the parameters set by management or not.

Implementing continuous auditing procedures is similar to automating an audit plan with the additional step of scheduling the automated procedures to match the timing and frequency of the data being evaluated and notifying the auditor when exceptions occur.

Alarms and Exceptions

Whenever an automated or continuous auditing rule is violated, an *exception* occurs. The record is flagged and systems generate an *exception report* that typically identifies the record and the date of the exception.

Alarms are essentially a classification problem. A data value is sent through a simple decision tree based on a series of rules and classified as a positive event (alarm) or a negative event (no alarm). Remember we talked about accuracy of models in chapter 3: These alarms will not always be correct.

Once the notification of the alarm or exception arrives, auditors follow a set of procedures to resolve the issue. First, they must determine whether the alarm represents a *true positive,* a transaction that is problematic, such as an error or fraud, or a *false positive,* where a normal transaction is classified as problematic. When too many alarms are false positive, auditors face *information overload,* where there are too many incorrect alarms that distract them from adequately evaluating the system. Because auditors are mostly concerned with true positives, they should attempt to train or refine the models to minimize the potential *flood of alarm*s that occurs when too many alarms are false positives. This is summarized in Table 5-1.

TABLE 5.1
Four Types of Alarms That an Auditor Must Evaluate

	Normal Event	Abnormal Event
Alarm	*False positive*	*True positive*
No Alarm	True negative	False negative

WORKING PAPERS AND AUDIT WORKFLOW

LO 5-6

Understand working paper platforms

As audit procedures become increasingly technical, documentation continues to be essential as a way for auditors to increase their reliance on automated controls and procedures. The idea of a black-box audit is no longer sufficient; rather, auditors must have a better understanding of the tools they use and the output of those tools. This is where working papers come into play.

Working papers are essential to audit planning, performance, and evaluation. They provide the documentation for the procedures the auditors follow, evidence they collect, and communication with the audit client. As they relate to Data Analytics, working papers should contain the following items:

- Work programs used to document the audit procedures to collect, manipulate, model, and evaluate data.
- IT-related documentation, including flowchart and process maps that provide system understanding.

- Database maps (such as UML diagrams) and data dictionaries that define the location and types of data auditors will analyze.
- Documentation about existing automated controls, including parameters and variables used for analysis.
- Evidence, including data extracts, transformed data, and model output, that provides support for the functioning controls and management assertions.

Policies and procedures that help provide consistent quality work are essential to maintaining a complete and consistent audit. The audit firm or chief audit executive is responsible for providing guidance and standardization so that different auditors and audit teams produce clear results. These standardizations include consistent use of symbols or tick marks and a uniform mechanism for cross-referencing output to source documents or data.

Electronic Working Papers and Remote Audit Work

As audit teams embrace a variety of information and communication technologies to enable collaboration from different locations, audit firms have done so, as well. Increasingly, internal and external audit teams consist of more specialized onsite auditors who interact with a team of experts and data scientists remotely at locations around the world. Many of the routine tasks are offloaded to the remote or seasonal workers, freeing up onsite auditors to use more professional judgment and expertise during the engagement. This results in cost savings for the firm through increased efficiency at the firm level.

The glue that holds the audit team together is the electronic workpaper platform as well as other collaboration tools, such as Microsoft Teams or Slack. The electronic workpaper platforms, such as TeamMate or Xero, automate the workflow of evidence collection, evaluation, and opinion generation on the part of the audit teams. The large accounting firms have proprietary systems that accomplish a similar purpose. For example, **PwC** uses three systems to automate its audit process. Aura is used to direct the audit by identifying which evidence to collect and analyze, Halo performs Data Analytics on the collected evidence, and Connect provides the workflow process that allows managers and partners to review and sign off on the work. Most of these platforms are hosted in the cloud, so members of the audit team can participate in the various functions from any location. Smaller audit shops can build ad hoc workpaper repositories using OneDrive with Office 365, though there are fewer controls over the documents.

PROGRESS CHECK

5. Continuous audit uses alarms to identify exceptions that might indicate an audit issue and require additional investigation. If there are too many alarms and exceptions based on the parameters of the continuous audit system, will continuous auditing actually help or hurt the overall audit effectiveness?
6. **PwC** uses three systems to automate its audit process. Aura is used to direct the audit by identifying which evidence to collect and analyze, Halo performs Data Analytics on the collected evidence, and Connect provides the workflow process that allows managers and partners to review and sign off on the work. How does that line up with the steps of the IMPACT model we've discussed throughout the text?

Summary

As auditing has evolved over the past few decades, Data Analytics has driven many of the changes. The ability to increase coverage of the audit using data has made it less likely that key elements are missed. Data Analytics has improved auditors' ability to assess risk, inform their opinions, and improve assurance over the processes and controls in their organizations.

Key Words

audit data standards (ADSs) (***193***) The audit data standards define common tables and fields that are needed by auditors to perform common audit tasks. The AICPA developed these standards.

data warehouse (***193***) A data warehouse is a repository of data accumulated from internal and external data sources, including financial data, to help management decision making.

flat file (***193***) A flat file is a single table of data with user-defined attributes that is stored separately from any application.

homogeneous systems approach (***193***) Homogeneous systems represent one single installation or instance of a system. It would be considered the opposite of a heterogeneous system.

heterogeneous systems approach (***193***) Heterogeneous systems represent multiple installations or instances of a system. It would be considered the opposite of a homogeneous system.

production or live systems (***193***) Production (or live systems) are those active systems that collect and report and are directly affected by current transactions.

systems translator software (***193***) Systems translator software maps the various tables and fields from varied ERP systems into a consistent format.

ANSWERS TO PROGRESS CHECKS

1. Auditors use Data Analytics to improve audit quality by more accurately assessing risk and selecting better substantive procedures and tests of controls.
2. There are many reasons for this trend, with perhaps the most important being that external auditors are permitted to rely on the work of internal auditors to provide support for their opinion of financial statements.
3. A homogeneous system allows effortless transmission of accounting and auditing data across company units and international borders. It also allows company executives (including the chief executive officer, chief financial officer, and chief information officer), accounting staff, and the internal audit team to intimately know two systems.
4. The use of audit data standards allows an efficient data transfer of data in a format that auditors can use in their audit testing programs. It can also save the company time and effort in providing its transaction data in a usable fashion to auditors.
5. If there are too many alarms and exceptions, particularly with false negatives and false positives, continuous auditing becomes more of a burden than a blessing. Work must be done to ensure more true positives and negatives to be valuable to the auditor.
6. PwC's Aura system would help identify the questions and master the data, the first two steps of the IMPACT model. PwC's Halo system would help perform the test plan and address and refine results, the middle two steps of the IMPACT model. Finally, PwC's Connect system would help communicate insights and track outcomes, the final two steps of the IMPACT model.

connect

Multiple Choice Questions

1. Under the guidance of the chief audit executive (CAE) or another manager, these individuals build teams to develop and implement analytical techniques to aid all of the following audits *except*:
   a. Process efficiency and effectiveness.
   b. Governance, risk, and compliance, including internal controls effectiveness.
   c. Tax compliance.
   d. Support for the financial statement audit.
2. Which audit data standards ledger defines product master data, location data, inventory on hand data, and inventory movement?
   a. Order to Cash Subledger
   b. Procure to Pay Subledger
   c. Inventory Subledger
   d. Base Subledger
3. Which audit data standards ledger identifies data needed for purchase orders, goods received, invoices, payments, and adjustments to accounts?
   a. Order to Cash Subledger
   b. Procure to Pay Subledger
   c. Inventory Subledger
   d. Base Subledger
4. A company has two divisions, one in the United States and the other in China. One uses Oracle and the other uses SAP for its basic accounting system. What would we call this?
   a. Homogeneous systems
   b. Heterogeneous systems
   c. Dual data warehouse systems
   d. Dual lingo accounting systems
5. Which of the following defines the time period, the level of materiality, and the expected time for an audit?
   a. Audit scope
   b. Potential risk
   c. Methodology
   d. Procedures and specific tasks
6. All of the following may serve as standards for the audit methodology *except*:
   a. PCAOB's auditing standards
   b. COSO's ERM framework
   c. ISACA's COBIT framework
   d. FASB's accounting standards
7. When there is an alarm in a continuous audit, but it is associated with a normal event, we would call that a:
   a. False negative.
   b. True negative.
   c. True positive.
   d. False positive.

8. When there is no alarm in a continuous audit, but there is an abnormal event, we would call that a:
   a. False negative.
   b. True negative.
   c. True positive.
   d. False positive.
9. If purchase orders are monitored for unauthorized activity in real time while month-end adjusting entries are evaluated once a month, those transactions monitored in real time would be an example of a:
   a. Traditional audit.
   b. Periodic test of internal controls.
   c. Continuous audit.
   d. Continuous monitoring.
10. Who is most likely to have a working knowledge of the various ERP systems that are in use in the company?
   a. Chief executive officer
   b. External auditor
   c. Internal auditor
   d. IT staff

Discussion Questions

1. Why has most innovation in Data Analytics originated more in an internal audit than an external audit? Or if not, why not?
2. Is it possible for a firm to have general journals from a product like JD Edwards actually reconcile to the general ledger in SAP? Why or why not?
3. Is it possible for multinational firms to have many different financial reporting systems and ERP packages all in use at the same time?
4. How does the systems translator software work? How does it store the merged data into a data warehouse?
5. Why is it better to extract data from a data warehouse than a production or live system directly?
6. Would an auditor view heterogeneous systems as an audit risk? Why or why not?
7. Why would audit firms prefer to use proprietary workpapers rather than just storing working papers on the cloud?

Problems

1. What are the advantages of the use of homogeneous systems? Would a merger target be more attractive if it used a similar financial reporting system as the potential parent company?
2. Consider Exhibit 5-3. Looking at the audit data standards order-to-cash process, what function is there for the AR_Adjustments transaction table—that is, adjustments to the Accounts Receivable? Why is this an audit data standard, and why is it important for an auditor to see?
3. Who developed the audit data standards? In your opinion, why is it the right group to develop and maintain them rather than, say, the Big 4 firms or a small practitioner?

4. Simple to complex Data Analytics can be applied to a client's data during the planning stage of the audit to identify which areas the auditor should focus on. Which types of techniques or tests might be used in this stage?
5. What approach should a company make if its continuous audit system has too many alarms that are false positives? How would that approach change if there are too many missed abnormal events (such as false negatives)?
6. Implementing continuous auditing procedures is similar to automating an audit plan with the additional step of scheduling the automated procedures to match the timing and frequency of the data being evaluated and the notification to the auditor when exceptions occur. In your opinion, will the traditional audit be replaced by continuous auditing?

Answers to Multiple Choice Questions

1. C
2. C
3. B
4. B
5. A
6. D
7. D
8. A
9. C
10. C

Lab 5-1 Set Up a Cloud Folder

Auditors collect evidence in electronic workpapers that include a permanent file with information about policies and procedures and a temporary file with evidence related to the current audit. These files could be stored locally on a laptop, but the increased use of remote communication makes collaboration through the cloud more necessary. There are a number of commercial workpaper applications, but we can simulate some of those features with consumer cloud platforms, like Microsoft OneDrive.

Company summary

You have rotated into the internal audit department at a mid-sized manufacturing company. Your team is still using company e-mail to send evidence back and forth, usually in the form of documents and spreadsheets. There is a lot of duplication of these files, and no one is quite sure which version is the latest. You see an opportunity to streamline this process using OneDrive.

Technique

- Gather documents, explore document history and revisions

Software needed

- A modern web browser

In this lab, you will:

Part 1: Create a shared folder.

Part 2: Upload files.

Part 3: Review revisions.

Part 1: Create a Shared Folder

Note: These instructions are specific to the free consumer version of Microsoft OneDrive. The approach is similar for competing products, such as Box, Dropbox, Google Drive, or other commercial products.

1. Go to OneDrive.com.
2. Click **Sign in** in the top right corner.
3. Sign in with your Microsoft account. (If your organization subscribes to Office 365, use your school or work account here.)
4. On the main OneDrive screen, click **New > Folder**.
5. Name your folder **DA Audit Working Papers**.
6. Open your new folder and click **Share** from the bar at the top of the screen.
7. Add the e-mail address of one of your classmates or your instructor, as directed. Choose **Allow editing** from the drop-down box next to the addresses, then click **Share**.
8. Take a screenshot (label it 5-1A).

Q1. What advantage is there to sharing files in one location rather than e-mailing copies back and forth?

Part 2: Upload Files

Now that you have folders, you can upload some documents that will be useful for labs in this chapter and the next.

9. From Connect, download the **Audit Analytics Lab Files 1**, as directed by your instructor.
10. Unzip the file you downloaded to your computer. You should see two folders: **Master Audit File** and **Current Audit File**.

11. Return to your OneDrive **DA Audit Working Papers** folder, and upload the two folders:
    a. Click **Upload > Folders** in OneDrive and navigate to the folder where you unzipped the lab files.
    b. Or drag and drop the two folders from your desktop to the OneDrive window in your browser.
12. You should see two new folders in your OneDrive. Because you added them to a shared folder, the people you shared the folder with can now see these as well.
13. Take a screenshot (label it 5-1B).

Q2. Explore the two folders you just uploaded. What kinds of documents and files do you see?

Q3. How do you think these files can be used for data analysis?

End of Lab

Lab 5-2 Review Changes to Working Papers (OneDrive)

See Lab 5-1 for background information on this lab. The goal of a shared folder is that other members of the audit team can contribute and edit the documents. Commercial software provides an approval workflow and additional internal controls over the documents to reduce manipulation of audit evidence, for example. For consumer cloud platforms, one control appears in the versioning of documents. As revisions are made, old copies of the documents are kept so that they can be reverted to, if needed.

In this lab, you will:

Part 1: Upload revised documents.

Part 2: Review document revision history.

Part 1: Upload Revised Documents

Let's start by making changes to files in your **DA Working Papers**.

1. From Connect, download **Audit Analytics Lab Files 2**, as directed by your instructor.
2. Unzip the file you downloaded to your computer. You should see two files: **Audit Plan** and **Employee File**.
3. Return to your OneDrive **DA Audit Working Papers** folder, and upload the **Audit Plan** into your **Master Audit File** and the **User_Listing** into your **Current Audit File**. You will be prompted to **Replace** or **Keep Both** files. Click **Replace** for each.
4. Take a screenshot (label it 5-2A).

Part 2: Review Document Revision History

Now let's look at the history of the document.

5. Right-click on one of the newly uploaded files, and choose **Version history** from the menu that appears. The document will open with a version pane appearing on the left.
6. Click the older version of the file from the **Older Versions** list.
7. Take a screenshot (label it 5-2B).
8. Move between the old version of the file and the current version by clicking the time stamp in the panel on the left.

Q1. What has changed between these two versions?

End of Lab

Lab 5-3 Identify Audit Data Requirements

As the new member of the internal audit team, you have introduced your team to the shared folder and are in the process of modernizing the internal audit at your firm. The chief audit executive is interested in using Data Analytics to make the audit more efficient. Your internal audit manager agrees and has tasked you with reviewing the audit plan. She has provided three "audit action sheets" with procedures that they have been using for the past three years to evaluate the procure-to-pay (purchasing) process and is interested in your thoughts for modernizing them.

Technique

- Review the audit plan, look for procedures involving data, and identify the locations of the data.

Software needed

- A modern web browser

In this lab, you will:

Part 1: Look for audit procedures that evaluate data.

Part 2: Identify the location of the data.

Part 1: Look for Audit Procedures That Evaluate Data

1. Open your **DA Audit Working Papers** folder on OneDrive.
2. Look inside the **Master Audit File** for the document titled **Audit Action Sheets** and open it to edit it.
3. Use the **Yellow highlighter** to identify any master or transaction tables, such as "Vendors" or "Purchase Orders."
4. Use the **Green highlighter** to identify any fields or attributes, such as "Name" or "Date."
5. Use the **Blue highlighter** to identify any specific values or rules, such as "TRUE," "January 1st," "Greater than . . ."
6. Create a new spreadsheet called **Audit Automation Summary** in your **Master Audit File** and summarize your highlighted data elements from the three audit action sheets. Use the following headers:

AAS#	Table	Attributes	Values/Rules	Step(s)	Notes

7. Take a screenshot (label it 5-3A).

Q1. Read the first audit action sheet. What other data elements that are not listed in the procedures do you think would be useful in analyzing this account?

Part 2: Identify the Location of the Data

Now that you have analyzed the action sheets, look through the systems documentation to see where those elements exist.

8. In the **Master Audit File**, open the **UML System Diagram** and **Data Dictionary** files.
9. Using the data elements you identified in your **Audit Automation Summary** file, locate the actual names of tables and attributes and acceptable data values. Add them in three new columns in your summary:

Database Table	Database Attribute	Acceptable Values

10. Take a screenshot (label it 5-3B).

    Q2. Which attributes were difficult to locate or in unexpected places in the database?

11. Save and close your file.

End of Lab

Lab 5-4 Prepare Audit Plan

With the data elements identified, you can formalize your internal audit plan. In the past, your internal audit department performed each of the three action sheets once every 24 months. You have shared how increasing the frequency of some of the tests would provide a better control for the process and allow the auditor to respond quickly to the exceptions. Your internal audit manager has asked you to propose a new schedule for the three audit action sheets.

Technique

- Review the audit plan, identify procedures that must be completed manually, and identify those that can be automated and scheduled.
- Also determine when the procedures should occur.

Software needed

- A modern web browser

In this lab, you will:

- Evaluate the timing and scheduling of audit procedures.

1. Open your **Audit Automation Summary** spreadsheet in OneDrive.
2. Add two new columns:

Auto/Manual	Frequency

3. For each element and rule, determine whether it requires manual review or can be performed automatically and alter auditors when exceptions occur. Add either "Auto" or "Manual" to that column.
4. Finally, determine how frequently the data should be evaluated. Indicate "Daily," "Weekly," "Monthly," "Annually," or "During Audit." Think about when the data are being generated. For example, transactions occur every day, but new employees are added every few months.
5. Take a screenshot (label it 5-4A).
6. Save and close your file.

End of Lab