

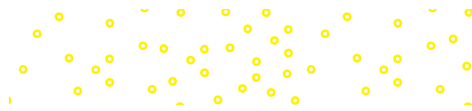
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Introduction to **BUSINESS ANALYTICS**

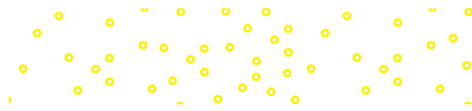
VERNON J. RICHARDSON | MARCIA WEIDENMIER WATSON

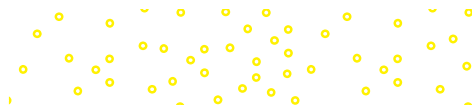


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Introduction to Business Analytics





Introduction to Business Analytics

Vernon J. Richardson

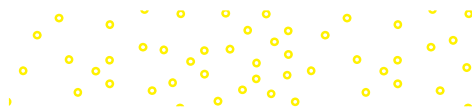
University of Arkansas

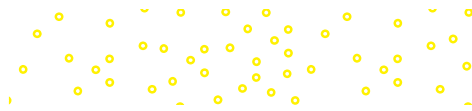
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Marcia Weidenmier Watson

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INTRODUCTION TO BUSINESS ANALYTICS

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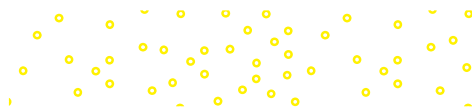
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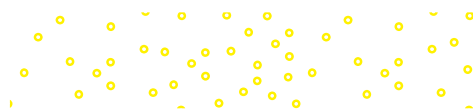
Richardson, Weidenmier Watson
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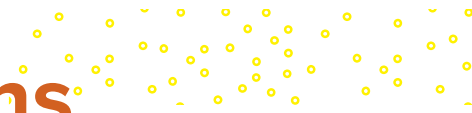
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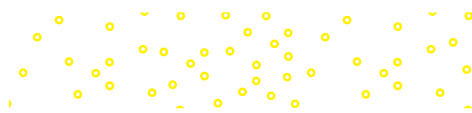


**My most amazing son, Benjamin, who makes me
laugh and recognize that life is for experiencing joy.
Love you!**

—Vern Richardson

**My family, whose love and support allow my dreams
to come true. Thank you!**

—Marcia Weidenmier Watson



About the Authors

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

Dr. Richardson is a member of the American Accounting Association and 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*. He is also a co-author of McGraw Hill’s *Accounting Information Systems*, *Introduction to Data Analytics for Accounting*, and *Data Analytics for Accounting* textbooks.



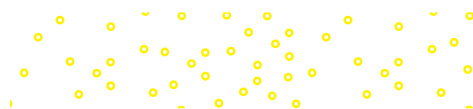
Vernon J. Richardson

Marcia Weidenmier Watson is the Jesse H. Jones Professor Accounting in the Michael Neidorff School of Business at Trinity University. She received her BBA in accounting from the College of William and Mary, and both an MBA in information systems management and accounting and a PhD in accounting from the University of Texas at Austin. She has taught at the University of Texas at Austin, TCU, Mississippi State University, UNC Charlotte, and Trinity University. Prior to receiving her PhD, Dr. Watson was a financial systems consultant for Price Waterhouse, now PricewaterhouseCoopers.

A member of the American Accounting Association, she served as newsletter editor for the American Accounting Association Information Systems section for 16 years. She serves on the editorial boards of *Issues in Accounting Education* and the *Journal of Accounting Education*. She has published articles in *Accounting Horizons*, *Advances in Management Accounting*, *Issues in Accounting Education*, *International Journal of Accounting Information Systems*, *MIS Quarterly*, *Journal of Accountancy*, *Journal of Accounting Education*, *Journal of Information Systems*, and *Strategic Finance*. She also has had several cases published in *Case Studies in Forensic Accounting and Fraud Auditing*.



Marcia Weidenmier Watson



From the Authors

Computerization and automation of many business tasks is combining with the explosion of available data to change the way companies work and make decisions. For this reason, business professionals are increasingly required to have an **analytics mindset** to perform their jobs. We recognize that students need to develop the skills to ask the right questions, learn to use common workplace tools (such as Excel[®], Tableau[®], and Power BI[®]) to examine and analyze data, and interpret results accurately and effectively to make business decisions.

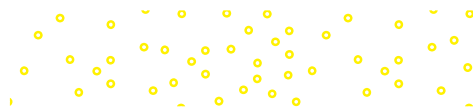
Developing this analytics mindset early in the study of business is crucial in preparing students to meet the demands of today's workplace. It is also critical in terms of developing business acumen and understanding how basic business functions work. In addition, learning multiple software packages develops technical agility. An analytics mindset, business acumen, and technical agility are essential in preparing students not only for future business classes but also for their internships and post-graduation jobs in the real world.

Introduction to Business Analytics provides a framework for developing a business analytics mindset. This framework, which we call the **SOAR analytics model**, is composed of four steps:

1. Specify the question (Chapter 1)
2. Obtain the data (Chapters 2–3)
3. Analyze the data (Chapters 4, 5, and 11)
4. Report the results (Chapter 6)

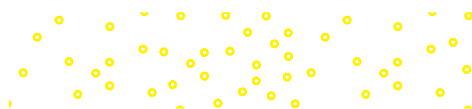


This model is used throughout the text in conjunction with the various types of data analysis that analysts need to perform. The lab activities, which appear at the end of each chapter, follow this framework to reinforce the analytical process.



After laying the foundation in Chapters 1–6, we apply the SOAR model in Chapters 7–10 to marketing, accounting, finance, and operations questions. Chapter 11 introduces advanced analytics and discusses how powerful machine learning and other algorithms can improve business analytics. Chapter 12 acts as a capstone, providing three projects that apply the complete SOAR model. The first project asks students to identify the factors that affect Airbnb rental rates, and the second project asks students to analyze LendingClub loans. The third project asks students to use the SOAR framework to address a business question that they have posed.

Vernon J. Richardson
Marcia Weidenmier Watson



Key Features

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

Students learn how to conduct business analytics using Excel, Tableau, and Power BI—three software tools that are widely used by businesses today.

CHAPTER 7 LABS

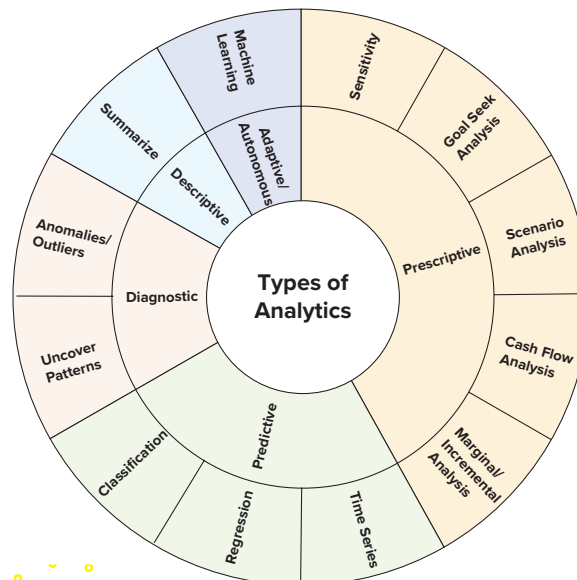
- LAB 7.1 **Excel:** Descriptive Analytics: Analyzing Company Historical Performance
- LAB 7.2 **Excel:** Descriptive Analytics: Using a Pivot Table to Analyze Historical Performance by Product Size and Year
- LAB 7.3 **Tableau:** Descriptive Analytics: Using a Histogram to Evaluate Process Time
- LAB 7.3 **Power BI:** Descriptive Analytics: Using a Histogram to Evaluate Process Time
- LAB 7.4 **Excel:** Diagnostic Analytics: Analyzing the Steps in the Sales Process with a Sales Funnel Chart
- LAB 7.5 **Tableau:** Diagnostic Analytics: Examining Pricing Strategy with Cluster Analysis
- LAB 7.6 **Excel:** Predictive Analytics: Predicting Sales Revenue from Advertising Expense
- LAB 7.6 **Tableau:** Predictive Analytics: Predicting Sales Revenue from Advertising Expense
- LAB 7.7 **Excel:** Prescriptive Analytics: Calculating Internet CPM Rate Using Goal Seek
- LAB 7.8 **Excel:** Prescriptive Analytics: Calculating Product Price Using Goal Seek

Focus on Building Critical Thinking Skills.

From learning to ask the right questions to interpreting and presenting results, *Introduction to Business Analytics* fosters critical thinking and develops business analysis skills. It teaches students how to use descriptive, diagnostic, predictive, prescriptive, and advanced analytics to answer the following business questions:

1. **Descriptive analytics:** What happened? What is happening? (Chapter 4)
2. **Diagnostic analytics:** Why did it happen? What are the causes of past results? Why are the results different than expectations? (Chapter 4)
3. **Predictive analytics:** Will it happen in the future? What is the probability something will happen? Can we forecast what will happen? (Chapter 5)
4. **Prescriptive analytics:** What should we do, based on what we expect will happen? How do we optimize our performance based on potential constraints? (Chapter 5)
5. **Adaptive/autonomous analytics:** How can we continuously learn using artificial intelligence? Can we learn from past and current events with adaptive learning? (Chapter 11)

The following diagram summarizes the techniques taught.



Emphasis on the Real-World Use of Data.

Mini Cases in each chapter ask students to consider real-world companies and how they can use data to inform their decision-making.

MINI CASE: Tide PODS and Data Types

How are data types identified and included in a product database like the one Amazon maintains? Exhibit 2.11 is a screenshot from Amazon showing a listing for Tide PODS. It identifies the type of data for each field and suggests how each data type could be stored in a structured table.

As you read the different callout boxes, you will recognize terms that you learned earlier in the chapter, including numerical data and categorical data. You will also notice a new term: flag. Two data types in Exhibit 2.11 are denoted as a flag, which is a term used when there are only two options for a given field. Here, Amazon denotes two database items as flags: whether an item is prime or not, and whether the item is currently in stock or out of stock.




Exhibit 2.11
Tide-PODS Amazon: Customer View
(Source: Amazon.com.)

Focus on Data Visualization.

The text emphasizes the creation and interpretation of various types of data visualizations useful in summarizing data and making decisions, including histograms, line graphs, pie charts, and scatterplots.



DATA VISUALIZATION



Lab Exhibit 6.5P.6
Microsoft Power BI

Hands-on Labs.

Introduction to Business Analytics offers more than 60 hands-on labs, each using Excel, Tableau, or Power BI. Each lab has two data sets. The first is used with the step-by-step instructions (with screenshots) presented in the text. The second, alternate data set gives students the opportunity to apply what they learned by using the first data set. Lab assessment appears in Connect through the use of multiple-choice questions. Video tutorials of the Labs are also available in Connect.

Lab 7.2 Excel

Lab Note: The tools presented in this lab periodically change. Updated instructions, if applicable, can be found in the student and instructor support materials.

Descriptive Analytics: Using a Pivot Table to Analyze Historical Performance by Product Size and Year

Keywords

Descriptive Analytics, Pivot Table

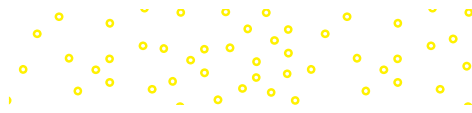
Decision-Making Context

Understanding what happened in the past is an important first step in harnessing the power of business analytics. Descriptive analytics answers the questions “What happened?” and “What is happening?” Lab 7.1 used the Analysis ToolPak in Excel to generate descriptive analytics for marketing data. This lab uses Excel pivot tables to summarize the data at different levels, allowing drill down and drill up (also known as roll up).

Several years ago, Rob built a table for his son to use in building LEGO creations. The table allowed his son to stand while building, provided a frame to hold LEGO base plates, and got the LEGOs off the floor. Several of Rob’s neighbors saw the table and asked him to build tables for their children. The tables grew in popularity and Rob eventually quit his job in 2018 and founded LeTable Inc. He now works full-time building custom LEGO tables.

Customers select from four different sizes of tables:

1. Small, which holds 4 base plates
2. Medium, which holds 8 base plates
3. Large, which holds 16 base plates
4. Deluxe, which has multiple levels as well as conduits for electric lights



Progress Checks.

Progress Check questions posed at key points in each chapter encourage students to consider and apply the concepts presented.

PROGRESS CHECK

- Which types of data that are internal to the company would be useful in preparing a sales forecast for the next quarter? Which types of data that are external to the company would be meaningful for the same purpose?
- How can a business analyst use data from the U.S. Census Bureau to understand the demographics of a company's customer base?
- How can companies improve their traditional business analytics by including Big Data sources such as social media or data from the Internet of Things?



ETHICS

Ethical Use of Data.

Each chapter includes a discussion of important questions related to the ethical collection, use, and sale of data.

Checklist for Creating Effective Charts That Clearly Answer Business Questions

In *How Charts Lie*, Alberto Cairo describes the many ways that a chart might lie, confuse, manipulate, and mislead.⁴ Culprits include:

- poor design
- the use of incorrect or an inappropriate amount of data
- the concealment of data
- the suggestion of misleading patterns
- support for pre-existing desired outcomes, opinions, or assumptions
- unclear communication of uncertainty.

For example, the cone of uncertainty used by the U.S. National Hurricane Center (USNC) indicates the likelihood of a hurricane path. The less certain meteorologists are of the hurricane's path, the wider the cone. However, most people incorrectly interpret the map as depicting how the hurricane will strengthen over time, which means that the USNC's chart is problematic.

To become a skilled and ethical creator of data visualizations, Cairo recommends examining many charts and graphs while "being aware of . . . biases and learning to see what charts and graph *don't* necessarily show."⁵ He also recommends applying the Golden Rule when you are creating charts: If you don't like being tricked, don't trick other people.

As you think about the data visualizations that you will use to convey information, consider the following questions: How often do you think people deliberately use charts and other data visualizations to mislead or deceive others? What questions should you ask about charts created by others? What questions should you ask about your own charts before you make them public? How might your chart be misinterpreted? Why should you look at the data underlying a chart?

End-of-Chapter Assessment.

The end-of-chapter assignments include real-world application questions, with an emphasis on skills and tools. Each chapter offers discussion questions, exercises, and problems to reinforce learning.

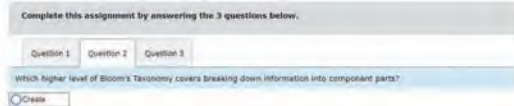
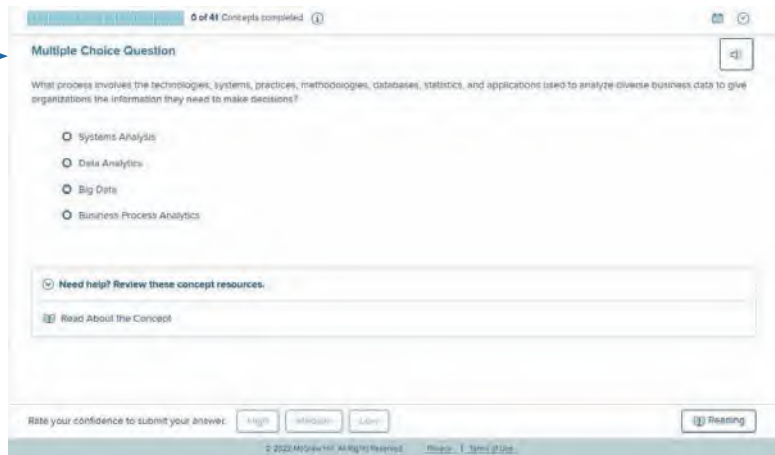
Problems

- (LO 7.1, 7.4, 7.5, 7.6, 7.7) This chapter focuses on the traditional four Ps of the marketing mix (product, price, place, and promotion) and briefly introduced additional Ps: planning, process, people, and physical evidence. Process is the flow of activities that takes place when the company interacts with a customer. For example, the activities to return a product to **Home Depot** include: (1) Customer enters the Customer Service Desk line; (2) employee listens to customer request; (3) customer presents an item to return; (4) employee verifies the receipt and the item condition; (5) employee approves the return, obtaining manager help/approval when necessary; (6) employee enters information into the system including the reason for the return; and (7) employee provides the customer with a refund. Identify questions related to this process that Home Depot could ask that would require descriptive, diagnostic, predictive, and prescriptive analytics (one question for each type).
- (LO 7.1, 7.4, 7.5, 7.6, 7.7) This chapter focuses on the traditional four Ps of the marketing mix (product, price, place, and promotion) and briefly introduced additional Ps: planning, process, people, and physical evidence. People refers to having the proper employees with appropriate skills sets or leadership skills. For example, the **Ford Motor Company** needs great salespeople to sell its cars and trucks. Identify questions related to the sales force that Ford could ask that would require descriptive, diagnostic, predictive, and prescriptive analytics to answer (one question for each type).
- (LO 7.4, 7.5, 7.6, 7.7) **Panera Bread** sends out emails to customers to entice them to come and purchase food. Companies can tell if (and when) customers open emails. Assume that Panera Bread wants to use regression to determine if email open rates are related to subsequent food purchases. What are the independent and dependent variables in the regression? What additional variables would you suggest adding to the regression?
- (LO 7.5, 7.6) This chapter describes sources of marketing data, including customers' web search history, social media posts, and purchase history. Analyzing this information can reveal private information, such as financial problems, illness, and pregnancy. The following story appeared in both *Fortune* and *The New York Times*, but it has never been confirmed by **Target**. The story provides a good opportunity to understand what could potentially be done with marketing data. A father found out that his teenage daughter was pregnant when Target began sending coupons for baby products to her (based on her purchases).²⁸ What type of diagnostic and predictive analytics could Target have used to determine that the teenager was pregnant? How can each of these techniques be used in marketing?

Available in Connect

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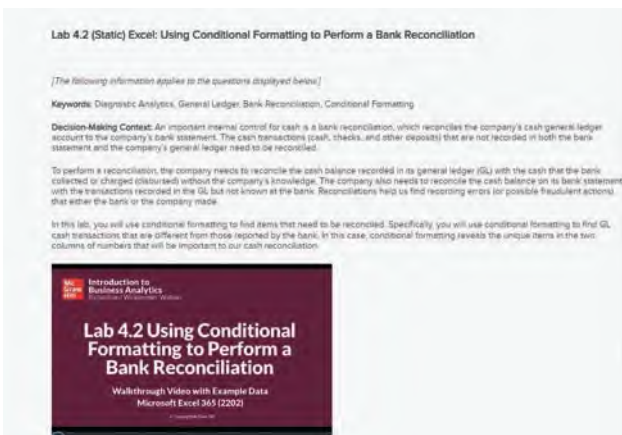
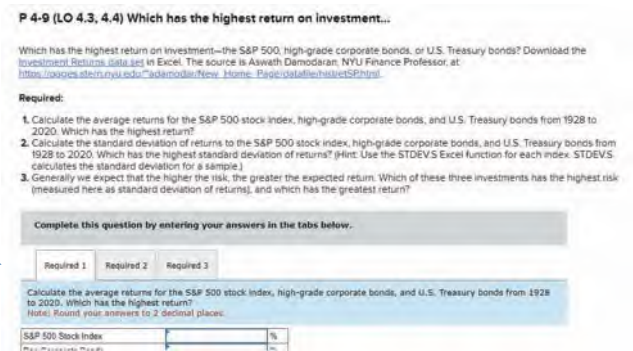


Exercises/Problems:

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

Lecture Videos:

These video-based tutorials are designed to reinforce select chapter concepts.

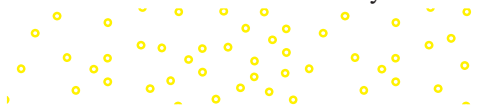


Labs with Lab Assessments:

While the labs require students to work outside of Connect in Excel, Tableau, and/or Power BI, Connect allows students to upload their results and answer analytical questions designed to reinforce the lessons from each chapter.

Lab Help Videos:

Help videos for each lab provide a step-by-step tutorial that walks students through the assigned analysis tasks in Excel, Tableau, and Power BI.



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- Jordan Cunningham,
Eastern Washington University

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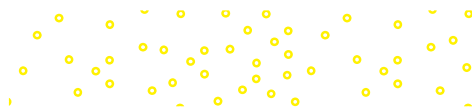
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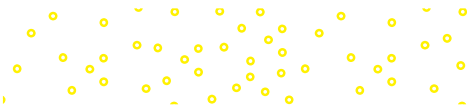
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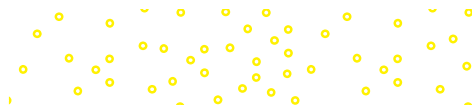
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- easily pinpoint the most relevant content through robust filtering options.
- manipulate the order of questions or scramble questions and/or answers.
- pin questions to a specific location within a test.
- determine your preferred treatment of algorithmic questions.
- choose the layout and spacing.
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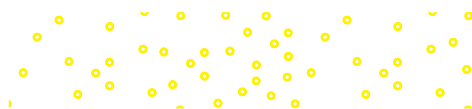
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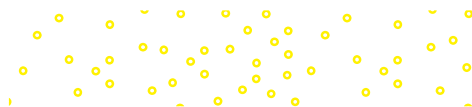
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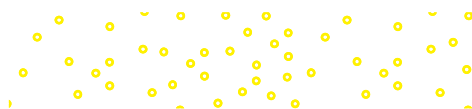


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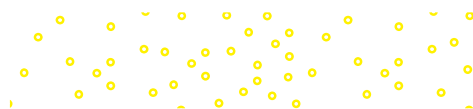
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*Indicates Connect only material

Introduction to Business Analytics

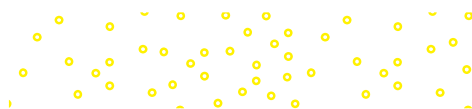
Specify the Question: Using Business Analytics to Address Business Questions

A Look at This Chapter

- Businesses, which exist to create value, collect and have access to enormous amounts of data related to their business processes.
- Business analysts use data to help managers answer questions about value creation and other business functions.
- The SOAR analytics model is a useful framework for performing business analytics and advising managers.
- The first step of the SOAR model is SPECIFY THE QUESTION.

A Look Ahead

- To address business questions, we must know what data are available, how to access those data, and how to evaluate those data.
- Chapter 2 introduces the second step in the SOAR model: OBTAIN THE DATA. It summarizes the sources of business data, the various types of data, and key data management tools.





Joe Marino-Bill Cantrell/UPI/Alamy Stock Photo

Discovering the Value in Data

Tesla recently announced it had made significant mistakes in calculating the true cost of its Solar Roof, which is composed of solar-powered roofing tiles for houses. The Solar Roof tiles are more appealing to the eye than traditional solar panels. The result was short-term losses for Tesla and ultimately significant price hikes for Tesla customers.¹

Business analysts use data to address management's questions. Perhaps Elon Musk, the CEO of Tesla, should have asked different or better questions to determine the correct cost for its solar roofs to help determine the pricing that would have generated profits instead of losses. Could business analysts at Tesla have performed more or better data analysis to avoid the company's expensive mistake?

In this chapter, we define the role of business analysts, who analyze data to address management questions for use in decision-making.

¹*Business Insider*, <https://www.businessinsider.com/elon-musk-tesla-solar-roof-price-mistakes-calculating-cost-2021-4>, accessed 04/30/2021.

LEARNING OBJECTIVES

After reading this chapter, you should be able to:

- LO 1.1:** Define a business process and explain why increased data availability has given rise to the role of the business analyst.
- LO 1.2:** Differentiate between data and information.
- LO 1.3:** Summarize the role of the business analyst.
- LO 1.4:** Describe how the various business functions use business analytics.
- LO 1.5:** Identify the components of the SOAR analytics model.
- LO 1.6:** Describe the use of exploratory data visualizations and explanatory data visualizations.

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- LAB 1.2 Excel:** Assessing Customer Profitability
- LAB 1.2 Tableau:** Assessing Customer Profitability
- LAB 1.2 Power BI:** Assessing Customer Profitability
- LAB 1.3 Excel:** Assessing Product (SKU) Profitability
- LAB 1.3 Tableau:** Assessing Product (SKU) Profitability
- LAB 1.3 Power BI:** Assessing Product (SKU) Profitability

LO 1.1

Define a business process and explain why increased data availability has given rise to the role of the business analyst.

1.1 BUSINESSES CREATE VALUE

A company earns revenue by using inputs such as raw materials, talented workers, buildings, and equipment to produce and then sell a more valuable output, such as completed architectural plans or laptop computers. Consider **Apple** as an example. By designing, manufacturing, and selling iPhones to the general public, Apple creates value because the iPhone is a powerful computing and communications device. If Apple did not create value, ultimately it would not survive.

Also consider some other examples. Manufacturing companies such as **Tesla** create value by procuring and processing raw materials to produce more valuable products, including electric



Sundry Photography/Shutterstock

cars, for their customers. Retailers such as **Amazon** create value by procuring products and selling them in a way that's convenient for customers, either at a physical location or on an e-commerce platform (website). Amazon enhances the customer experience by providing information about these products through customer reviews and by facilitating convenient payment processes and delivery possibilities. **Bank of America** uses technology and access to capital to create value by offering mortgages and other financial services to its customers.

As you can see, businesses provide value to their customers in many ways. **Business value** refers to all the items, events, and interactions that determine a company's financial health. This value may come from the company's suppliers, customers, employees, and/or information systems. A common measure of a business's value is its increase in long-term profitability. This metric incorporates not only the revenues associated with a product or service but also the cost of producing that product or service because, to stay in business, a firm must earn more in revenues than it incurs in expenses.

To consider how value is created, we begin by looking at the specific activities, or business processes, that a company performs. A **business process** is a coordinated, standardized set of activities conducted by both people and equipment to accomplish a specific business task. Consider the following examples of business processes at various companies.

- **Amazon** accepts an order for a *New York Times* bestseller.
- **KPMG** offers tax advice to client.
- **TruGreen** bills a customer for herbicide sprayed on that customer's lawn.
- **Tesla** produces an electric vehicle to sell in China.
- **Fulton Homes** writes a contract with a customer to build a house with materials printed by a 3D printer.
- **eBay** advertises a hard-to-find classic toy to potential buyers.
- **Toyota** procures parts that will be used in producing its Camry model.
- **DoorDash** pays its drivers, who are independent contractors, for making deliveries.
- **Procter & Gamble (P&G)** addresses customer complaints, sometimes by giving refunds.
- **Boston Consulting Group** summarizes various management compensation packages for a client.

Companies perform thousands, and sometimes millions, of processes each day. Management's challenge is to identify the processes that create the most value and minimize the costs of those processes. To help them with decision-making, managers increasingly seek the assistance of business analysts, who use data to answer managers' questions. A **business analyst** is a data specialist who curates and uses data to help an organization make effective business decisions.

The Increasing Availability of Data and the Role of Business Analyst

The amount of data we generate as a society is enormous. About 2.5 quintillion bytes of data are created each day, and the rate of data growth continues to accelerate. Exhibit 1.1 summarizes this surge of data, which is projected to expand from about 1 zettabyte (ZB) in 2010 to approximately 175 ZB by 2025. (One zettabyte equals one sextillion, or 1,000,000,000,000,000,000, bytes of data.) At this rate, how much data we will have by 2050?

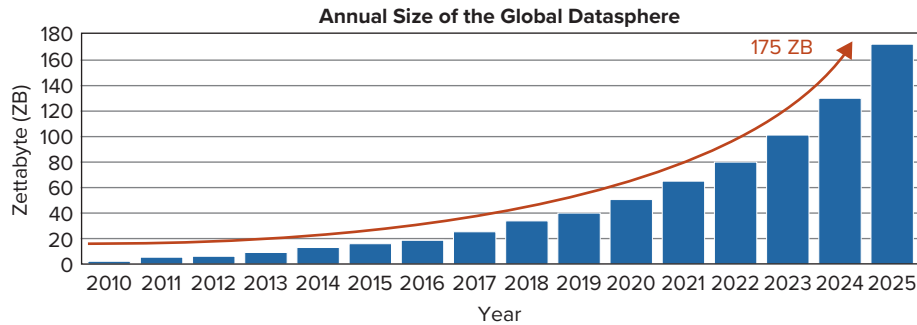


Exhibit 1.1 Data Growth Since 2010 (Actual and Projected)

(Source: IDC Global Data-Sphere, Nov. 2018, page 6, <https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-data-age-whitepaper.pdf>, accessed 12/30/2020)

The enormous amount of available data can both help and hinder the work of business analysts. On the positive side, the abundance of data can be invaluable in helping them address managers' questions and offer insight into the company's problems and challenges. On the negative side, the vast amount of data may result in **data overload**, which can prevent business analysts from properly synthesizing and interpreting the data.

With so much data available and computers doing much of the basic collection and simple data analysis, it is increasingly critical that businesses train their employees to develop an **analytics mindset**. This mindset entails the willingness and ability to specify which business questions need to be addressed, find and extract pertinent data that might address those questions, analyze those data, and then report the results to decision-makers. Business analysts are uniquely positioned to perform this type of analysis because they typically understand (1) the questions that their business and its decision-makers are asking and (2) the nature and quality of the business's data. Indeed, according to the consulting firm **EY**, "Analytics is at the heart of every business decision."² In this text, you will work to develop an analytics mindset and prepare yourself to take on the new and evolving role of business analyst.



Data Analytics and Your Career

Business analysis is a vibrant career opportunity. According to the U.S. Bureau of Labor Statistics (BLS), 907,600 people were employed as management or business analysts in 2020, with this number expected to grow 14 percent annually from 2020 to 2030. This rate is much faster than the average for all occupations in the United States. In May 2020, the median income for all management analysts, including business analysts, was \$87,660.³



PROGRESS CHECK

1. How does increasing the amount of data available to address business questions both help and hinder the business analyst's role?
2. Why are business analysts uniquely positioned to address an organization's business questions?

²Ernst & Young Foundation: EY Academic Resource Center (EYARC). 2017. The Analytics Mindset. Available online on November 17, 2018, at <http://aaahq.org/Education/Webinars/6-7-17-EY-Academic-Resource-Center-An-Overview-of-Analytics-Mindset-Competencies-and-Case-Offerings>.

³U.S. Bureau of Labor Statistics, May 2020, <https://www.bls.gov/ooh/business-and-financial/management-analysts.htm>. Accessed September 2021.

LO 1.2

Differentiate between data and information.

1.2 THE DIFFERENCE BETWEEN DATA AND INFORMATION

Data are widely available; what is scarce is the ability to extract wisdom from them.

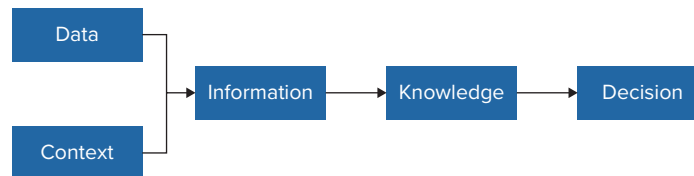
—Hal Varian (UC Berkeley and Chief Economist, Google)

In the previous section, we saw that a vast amount of data is available. But what exactly are data? The term **data** refers to raw numbers and facts that have little meaning on their own. In contrast, **information** is data that are organized in a way that is meaningful to the user in a given context. **Context** is the setting, event, statement, or situation in which the data can be more fully understood and evaluated. In other words, information is data with context.

A brief example will help clarify these key terms. Suppose **Walmart** wants to understand the initial demand for and consumer reaction to a new product, such as the Apple Watch Series 7. Here, context is the seven days immediately after the Apple Watch Series 7 becomes available for sale. The available data are all the individual product reviews on Walmart.com. Information is an organized set of data that helps Walmart assess consumers' reactions to the watch. For example, business analysts may have compiled a list of the words most often used to describe the watch, such as “amazing,” “fun,” “awesome,” “complicated,” or “life-changing.”

The **information value chain** is composed of the events and processes going all the way from the collection of data to the compilation of information to the ultimate business decision (Exhibit 1.2). To transform data into information, business analysts process the data in some way (for example, by aggregating, sorting, calculating, manipulating, or analyzing it) and then combine it with the appropriate business context (such as time of year, location, or specific business need). Some of the information ultimately becomes knowledge that is helpful in making decisions. **Knowledge** is understanding or familiarity with information gained through learning, and **decisions** are conclusions reached after consideration of the knowledge gained.

Exhibit 1.2
The Information Value Chain



MINI CASE: Tide PODS, Social Media Data, and the Information Value Chain

For an example of the information value chain, consider a data dump of a full year's worth of Instagram posts and Twitter tweets. Without context, these posts and tweets would be data. Now imagine a specific context: You are a business analyst who works for **Procter & Gamble (P&G)**, and the brand manager for Tide (detergent) PODS wants to understand how social media users feel about the product. To provide relevant information to the brand manager, you will need to identify all the Instagram posts and tweets with content related to Tide PODS. Analysis of this information may lead to new knowledge about consumers' preferences regarding product features. The brand manager may then use this knowledge

to make a decision about a proposed new package design. For example, social media users may have objected to the Tide PODS' large plastic container, complaining about its environmental impact. Here, the data may ultimately lead P&G to begin selling Tide PODS in more environmentally conscious packaging.

In addition, P&G may make other decisions based on data gathered from other social media. For example, if social media posts complain about the price of Tide PODS (which are a premium product), managers may decide to develop a budget version of Tide PODS. They may also decide to focus on internet promotions and coupons rather than, say, printed coupons in newspapers, magazines, and mailers.

■ Decision-Making with Data

Search the Web for social media posts about Tide PODS. Do you see any threads running through the posts, perhaps regarding price, product quality, packaging, or any other aspect of the product? Based on these posts, what recommendations might you make to the brand manager? How would you emphasize the safe use of Tide PODS, given recent headlines about children eating Tide PODS because they look like candy?



PROGRESS CHECK

3. How could a set of tweets about the quality of a new-model **Toyota** RAV4 turn into knowledge capable of affecting decisions at Toyota?
4. How might **Amazon** use the product ratings data on an **Apple** Watch Series 7 to turn data into knowledge? What kind of decisions might this new knowledge help Amazon's managers make?

1.3 SUMMARIZING THE ROLE OF THE BUSINESS ANALYST

Managers and other decision-makers need reliable, relevant information and knowledge to make decisions. As we've seen, business analysts provide this information and knowledge. Often, however, they are not skilled in the advanced statistical and mathematical methods that yield the best, most reliable results. Thus, as Exhibit 1.3 shows, business analysts often serve as intermediaries between decision-makers and data scientists. A **data scientist** is a data specialist who knows how to work with, manipulate, and statistically test data. The business analyst serves as a sort of interpreter, converting the data scientist's technical language into "plain English" for decision-makers.

Business analysts understand the decisions that management must make, but they are also intimately familiar with the characteristics of the data. In addition, they have a working knowledge of data quality, statistical tools, and computer programming—which are all critical to business analysis. Ultimately, the business analyst's job is to bring data-derived knowledge to decision-makers.

Note: Some people prefer the term *liaison* to business analyst, to suggest that the job's key function is to help decision-makers and data scientists communicate with each other.

LO 1.3

Summarize the role of the business analyst.

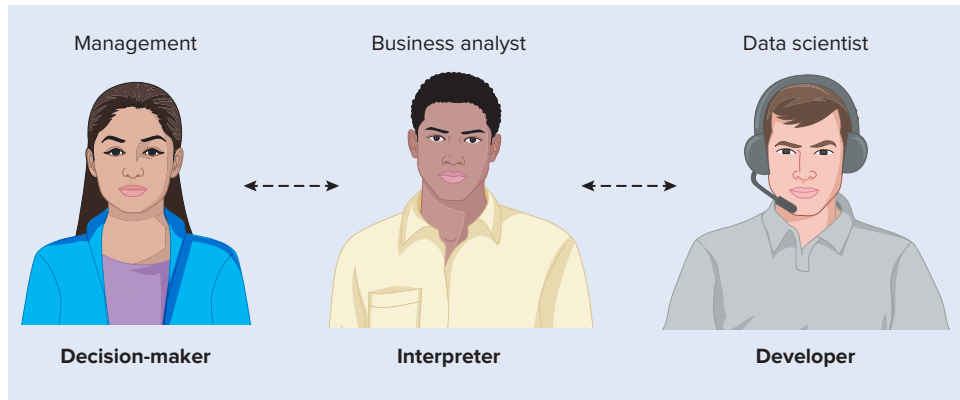


Exhibit 1.3
The Business Analyst Serves as Interpreter Between the Data Scientist and the Decision-Maker

✓ **PROGRESS CHECK**

5. Who is more likely to know which data will most directly address business questions, a data scientist or a business analyst?
6. If **McGraw Hill**, the publisher of this textbook, wants to determine the most effective ways to market this book, what would the business analyst explain to the data scientist regarding the ideal data sources to consult and potential analysis to perform?

LO 1.4

Describe how the various business functions use business analytics.

1.4 BUSINESS ANALYTICS ACROSS THE DIFFERENT BUSINESS FUNCTIONS

Business analytics refers generally to the use of data to make knowledge, draw conclusions, and address business questions. However, the business analytics for making marketing decisions differs from the business analytics needed to make decisions regarding accounting, finance, and operations. Let's now consider the analytics used in these key business functions.

Marketing focuses on promoting and selling products and services. **Marketing analytics** uses business analytics to measure and improve marketing performance. Perhaps the most important aspect of marketing analytics is providing insights into customer preferences and trends. For example, **Amazon** uses marketing analytics to determine which products to offer, which products to promote/advertise, and which price to charge its customers. Chapter 7 is devoted to defining, explaining, and performing marketing analytics.

Finance is the management of money through investing, borrowing, lending, budgeting, saving, and forecasting. **Financial analytics** uses business analytics to help a company measure, evaluate, and improve its financial performance. Financial analytics also evaluates future investments, such as investments in new equipment, based on risk and expected performance. **American Airlines** uses financial analytics to determine whether it should lease or buy its airplanes, and whether to finance its business with debt or some other means of financing. Chapter 9 is devoted to defining, explaining, and illustrating how financial analytics addresses finance questions.

Operations consists of all the actions needed to run the company and generate income. **Operations analytics** uses business analytics to measure and improve the efficiency and effectiveness of the company's operations. Indeed, achieving one the key goals of any business—"the right product in the right place at the right time"—requires extensive data analysis to ensure product fulfillment through the *supply chain*. Operations analytics also allows the evaluation of a company's human resources (for example, in terms of employee efficiency and turnover), IT operations, sourcing, manufacturing, distribution, and logistics. **Wayfair**, an e-commerce company selling furniture and home goods, uses operations analytics to ensure it has sourced the right furniture products from manufacturers to the Wayfair warehouse, ready for sale and shipping to the final customer. Chapter 10 is devoted to defining, explaining, and providing examples of operations analytics.

Finance, marketing, and operations all generate accounting transactions. *Accounting* measures and records those transactions, and it then communicates the outcomes of those transactions by reporting financial performance. **Accounting analytics** employs business analytics to evaluate financial performance and to address accounting questions related to financial accounting, managerial accounting, auditing, and taxation. For example, during an audit, business analytics are used to detect whether a company committed fraud. **KPMG**, one of the largest accounting firms in the world, uses accounting analytics to evaluate the companies it audits to find errors and look for fraud. In terms of tax planning, accounting analytics helps the company evaluate potential tax deductions to minimize future taxes owed. Chapter 8 is devoted to defining, explaining, and performing accounting analytics.

To emphasize these business functions further, this book provides examples of business analytics in marketing, finance, operations, and accounting in each chapter.



PROGRESS CHECK

7. Which business function would use analytics to suggest the most efficient way to source a car air freshener from Shenzhen, China to a convenience store on Green Street in Champaign, Illinois?
8. Which business function would use analytics to suggest the most efficient way to evaluate whether a company should invest in more efficient manufacturing equipment or a new delivery truck?

1.5 AN INTRODUCTION TO THE SOAR ANALYTICS MODEL

The well-known accounting and advisory firm **EY** argues that all of its existing professionals and new hires need an analytics mindset, which we defined in Section 1.1. In other words, it asks its employees to understand and appreciate the role of business analysts and to develop a similar set of skills. This approach to data is not limited to EY. Businesses across the globe are now asking their employees to develop an analytics mindset.

According to EY, those with an analytics mindset are able to:

- Ask the right questions.
- Extract, transform, and load relevant data.
- Apply appropriate business analytics techniques.
- Interpret and share the results with stakeholders.⁴

LO 1.5

Identify the components of the SOAR analytics model.

⁴Source: Ernst & Young Foundation: E&Y Academic Resource Center (EYARC). 2017. The Analytics Mindset. Available online at <http://aaahq.org/Education/Webinars/6-7-17-EY-Academic-Resource-Center-An-Overview-of-Analytics-Mindset-Competencies-and-Case-Offerings>.