Solutions for Analytics Data Science and Artificial Intelligence 11th Edition by Sharda

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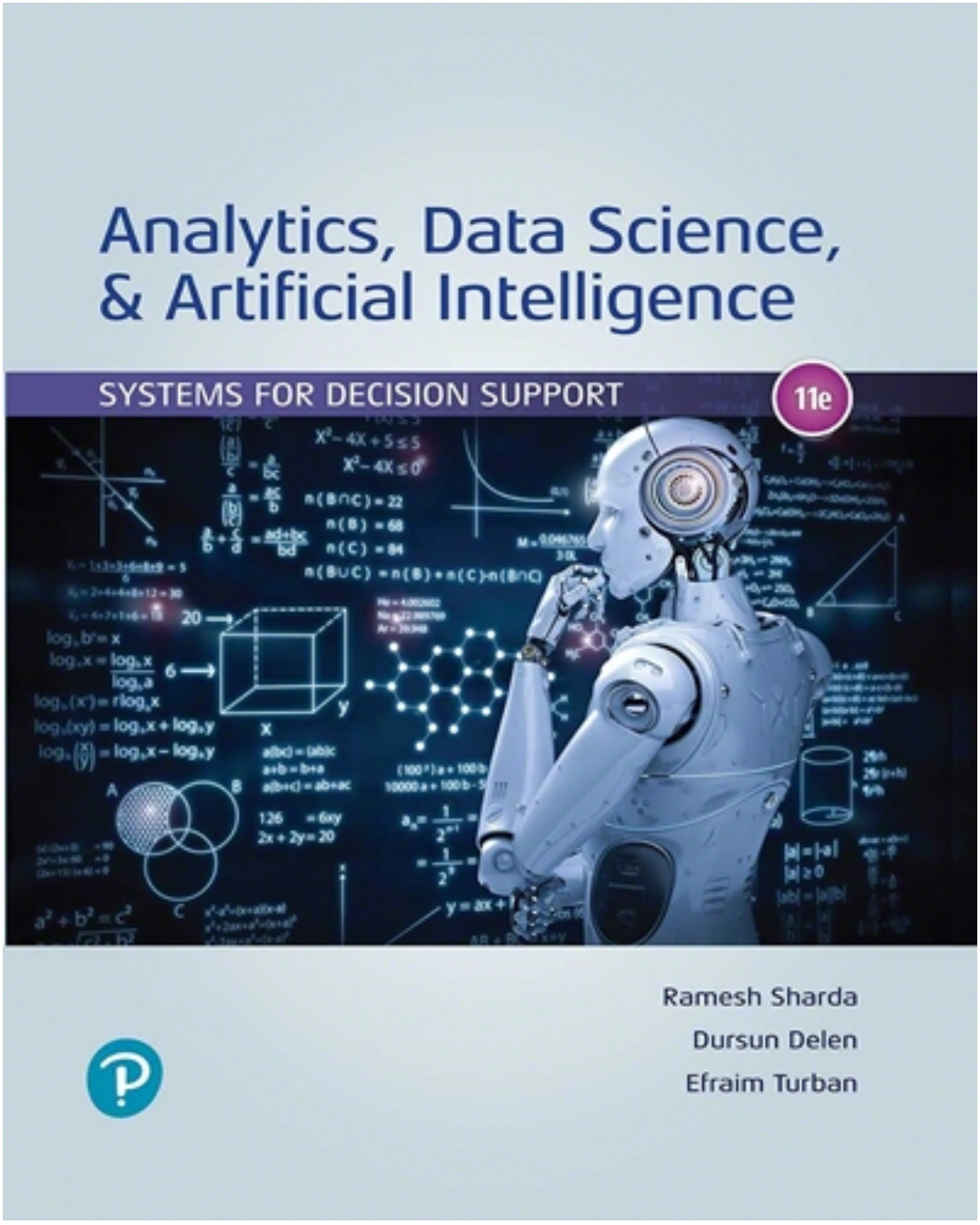

Solutions

Chapter 1:
An Overview of Analytics, and AI

Learning Objectives for Chapter 1

- Understand the need for computerized support of managerial decision making
- Understand the development of systems for providing decision-making support
- Recognize the evolution of such computerized support to the current state of analytics/data science and artificial intelligence
- Describe the business intelligence (BI) methodology and concepts
- Understand the different types of analytics and review selected applications
- Understand the basic concepts of artificial intelligence (AI) and see selected applications
- Understand the analytics ecosystem to identify various key players and career opportunities

CHAPTER OVERVIEW

The business environment (climate) is constantly changing, and it is becoming more and more complex. Organizations, both private and public, are under pressures that force them to respond quickly to changing conditions and to be innovative in the way they operate. Such activities require organizations to be agile and to make frequent and quick strategic, tactical, and operational decisions, some of which are very complex. Making such decisions may require considerable amounts of relevant data, information, and knowledge. Processing these in the framework of the needed decisions must be done quickly, frequently in real time, and usually requires some computerized support. As technologies are evolving, many decisions are being automated, leading to a major impact on knowledge work and workers in many ways. This book is about using business analytics and artificial intelligence (AI) as a computerized support portfolio for managerial decision making. It concentrates on the theoretical and conceptual foundations of decision support as well as on the commercial tools and techniques that are available. The book presents the fundamentals of the techniques and the manner in which these systems are constructed and used. We follow an EEE (exposure, experience, and exploration) approach to introducing these topics. The book primarily provides exposure to various analytics/AI techniques and their applications. The idea is that students will be inspired to learn from how various organizations have employed these

technologies to make decisions or to gain a competitive edge. We believe that such exposure to what is being accomplished with analytics and that how it can be achieved is the key component of learning about analytics. In describing the techniques, we also give examples of specific software tools that can be used for developing such applications. However, the book is not limited to any one software tool, so students can experience these techniques using any number of available software tools. We hope that this exposure and experience enable and motivate readers to explore the potential of these techniques in their own domain. To facilitate such exploration, we include exercises that direct the reader to Teradata University Network (TUN) and other sites that include team-oriented exercises where appropriate. In our own teaching experience, projects undertaken in the class facilitate such exploration after students have been exposed to the myriad of applications and concepts in the book and they have experienced specific software introduced by the professor. This chapter has the following sections:

CHAPTER OUTLINE

1.1 Opening Vignette: How Intelligent Systems Work for KONE Elevators and Escalators Company
1.2 Changing Business Environments and Evolving Needs for Decision Support and Analytics
1.3 Decision-Making Processes and Computer Decision Support Framework
1.4 Evolution of Computerized Decision Support to Business Intelligence/ Analytics/Data Science
1.5 Analytics Overview
1.6 Analytics Examples in Selected Domains
1.7 Artificial Intelligence Overview
1.8 Convergence of Analytics and AI
1.9 Overview of the Analytics Ecosystem
1.10 Plan of the Book
1.11 Resources, Links, and the Teradata University Network Connection

ANSWERS TO END OF SECTION REVIEW QUESTIONS• • • • • •

Opening Vignette Questions

1. It is said that KONE is embedding intelligence across its supply chain and enables smarter buildings. Explain.

   KONE uses a variety of IoT applications to record and communicate a wide variety of systems status and performance information that can then be used to identify issues and collect important data for future applications.

2. Describe the role of IoT in this case.

   IoT allows for the collection of multiple discrete points of data throughout the systems that can be used in a variety of applications.

3. What makes IBM Watson a necessity in this case?

   IBM Watson serves to both collect and analyze the wide variety of information presented. It can then communicate this information to other systems and establish patterns based on the data collected.

4. Check IBM Advanced Analytics. What tools were included that relate to this case?

   The tools available have many possible applications to the case, specifically the ability to evaluate the data collected across a large number of systems and different parameters.

5. Check IBM cognitive buildings. How do they relate to this case?

   This solution uses many similar technologies that appears to focus primarily on the ability to detect issues and potential issues within the building.

Section 1.2 Review Questions

1. Why is it difficult to make organizational decisions?

   Organizational decisions may be difficult to make due to a complex process necessary to both identify and define the problem as well as evaluate the host of different possible solutions.

2. Describe the major steps in the decision-making process.

   - 1.Define the problem (i.e., a decision situation that may deal with some difficulty or with an opportunity).
   - 2. Construct a model that describes the real-world problem.
   - 3. Identify possible solutions to the modeled problem and evaluate the solutions.
   - 4. Compare, choose, and recommend a potential solution to the problem.

3. Describe the major external environments that can impact decision making.

   - Political factors. Major decisions may be influenced by both external and internal politics. An example is the 2018 trade war on tariffs.
   - Economic factors. These range from competition to the genera and state of the economy. These factors, both in the short and long run, need to be considered.

- Sociological and psychological factors regarding employees and customers. These need to be considered when changes are being made.
- Environment factors. The impact on the physical environment must be assessed in many decision-making situations.

4. What are some of the key system-oriented trends that have fostered IS-supported decision making to a new level?

   Computer applications have shifted from merely processing transaction and monitoring activities to actively analyzing and seeking solution to problems through cloud-based systems.

5. List some capabilities of information technologies that can facilitate managerial decision making.
   - Group communication and collaboration
   - Improved data management.
   - Managing giant data warehouses and Big Data
   - Analytical support.
   - Overcoming cognitive limits in processing and storing information
   - Knowledge management.
   - Anywhere, anytime support.

Section 1.3 Review Questions

1. List and briefly describe Simon's four phases of decision making.

   Simon's four phases of decision making are intelligence, design, choice, and implementation.
   - Intelligence consists of gathering information by examining reality, then identifying and defining the problem. In this phase problem ownership should also be established.
   - Design consists of determining alternatives and evaluating them. If the evaluation will require construction of a model, that is done in this phase as well.
   - The choice phase consists of selecting a tentative solution and testing its validity.
   - Implementation of the decision consists of putting the selected solution into effect.

2. What is the difference between a problem and its symptoms?

Problems arise out of dissatisfaction with the way things are going. It is the result of a difference or gap between what we desire and what is or is not happening. A symptom is how a problem manifests itself. A familiar personal example is a high temperature (symptom) and an illness (problem). It is necessary to diagnose and treat the underlying illness. Attempting to relieve the temperature works if the illness is one which the body's defenses can cure, but, can be disastrous in other situations. A business example: high prices (problem) and high unsold inventory level (symptom). Another is quality variance in a product (symptom) and poorly calibrated or worn-out manufacturing equipment (problem).

3. Why is it important to classify a problem?

Classifying a problem enables decision makers to use tools that have been developed to deal with problems in that category, perhaps even including a standard solution approach.

4. Define *implementation*.

Implementation involves putting a recommended solution to work, but not necessarily implementing a computer system.

5. What are structured, unstructured, and semistructured decisions? Provide two examples of each.

- Structured problem, the procedures for obtaining the best (or at least a good enough) solution are known. Examples would include commonly and historically addressed issues and problems within a business or industry.
- Unstructured decisions are fuzzy, complex problems for which there are no cut-and-dried solution methods. Examples would include issues or problems within a business or industry that combined multiple structured problems or problems where the necessary data or research is not readily available.
- Unstructured problem is one where the articulation of the problem or the solution approach may be unstructured in itself. Examples would include problems within the business or industry where the definition of the problem itself is not agreed upon where the data is not readily available and there may currently exist no ability to collect that data.

6. Define *operational control*, *managerial control*, and *strategic planning*. Provide two examples of each.

- Operational control focuses on the day to day monitoring and control over plans with existing measures and defined actions. Examples may include monitoring Accounts Receivable or controlling inventory.
- Managerial control focuses on short-term control over existing plans where existing actions and measures may be defined, that may also require individual

or group decision-making to apply or amend to meet the required result. Examples may include preparing budgets and negotiating contracts.

- Strategic planning focuses on mid and long term planning that directs the core activities and initiatives of the business. Examples may include decisions to make major purchases or conduct research and development.

7. What are the nine cells of the decision framework? Explain what each is for.

   The nine cells of the decision framework (see figure 1.2) aligns the three types of decisions (structured, semistructured and unstructured) with the three types of control (operational, managerial and strategic). Each of these cells can provide information about the types of decisions that need to be made based on the availability of information on past decisions or data for decision-making as well as the level of the decision-making involved.

8. How can computers provide support for making structured decisions?

   Computers can be instrumental in providing information for structured decisions because they can be used to collect the underlying data needed for the decision as well as providing a known system to abstract analyze and classify possible actions or results.

9. How can computers provide support for making semistructured and unstructured decisions?

   In these situations, computers can be used to collect the underlying information needed for decision as well as potentially applying some of the learnings from past solutions that may exist. Additionally they may provide the computational ability to conduct a thorough analysis of the identified problem.

Section 1.4 Review Questions

1. List three of the terms that have been predecessors of analytics.

   These terms include decision support systems (DSS), executive information systems (EIS) and business intelligence (BI).

2. What was the primary difference between the systems called MIS, DSS, and Executive Information Systems?

   The primary differences between the systems are the amount of information available for analysis as well as the sophistication of the display and problem solving capabilities of each.

3. Did DSS evolve into BI or vice versa?

   Systems and products referred to as DSS transitioned into the BIA label, although both are content free expressions and mean different things to different professionals.

4. Define *BI*.

   Business intelligence (BI) is an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies.

5. List and describe the major components of BI.

   There are three major components to BI:

   - the data warehouse environment that organizes summarizes and standardizes business data
   - the business analytic environment which uses the data warehouse to access and manipulate data to display results
   - the performance and strategy component that utilizes information from the analytic environment to create more detailed analyses and strategy

6. Define *OLTP*.

   Online transaction processing (OLTP) systems handle a company's routine ongoing business.

7. Define *OLAP*.

   Online analytical processing (OLAP) systems are used to process information and research requests.

8. List some of the implementation topics addressed by Gartner's report.

   The Gartner report proposed splitting planning and executing into four categories; business organization functionality and infrastructure components.

9. List some other success factors of BI.

   Other success factors may include ease of availability of software and solutions for self-service, integration of DI into the corporate culture and appropriate integration between various BI tools.

Section 1.5 Review Questions

1. Define *analytics*.

   The term replaces terminology referring to individual components of a decision support system with one broad word referring to business intelligence. More precisely, analytics is the process of developing actionable decisions or recommendations for actions based upon insights generated from historical data. Students may also refer to the eight levels of analytics and this simpler descriptive language: "looking at all the data to understand what is happening, what will happen, and how to make the best of it."

2. What is descriptive analytics? What various tools are employed in descriptive analytics?

   Descriptive analytics refers to knowing what is happening in the organization and understanding some underlying trends and causes of such occurrences. Tools used in descriptive analytics include data warehouses and visualization applications.

3. How is descriptive analytics different from traditional reporting?

   Descriptive analytics gathers more data, often automatically. It makes results available in real time and allows reports to be customized.

4. What is a DW? How can DW technology help in enabling analytics?

   A data warehouse, introduced in Section 1.7, is the component of a BI system that contains the source data. As described in this section, developing a data warehouse usually includes development of the data infrastructure for descriptive analytics—that is, consolidation of data sources and making relevant data available in a form that enables appropriate reporting and analysis. A data warehouse serves as the basis for developing appropriate reports, queries, alerts, and trends.

5. What is predictive analytics? How can organizations employ predictive analytics?

   Predictive analytics is the use of statistical techniques and data mining to determine what is likely to happen in the future. Businesses use predictive analytics to forecast whether customers are likely to switch to a competitor, what customers are likely to buy, how likely customers are to respond to a promotion, and whether a customer is creditworthy. Sports teams have used predictive analytics to identify the players most likely to contribute to a team's success.

6. What is prescriptive analytics? What kind of problems can be solved by prescriptive analytics?

Prescriptive analytics is a set of techniques that use descriptive data and forecasts to identify the decisions most likely to result in the best performance. Usually, an organization uses prescriptive analytics to identify the decisions or actions that will optimize the performance of a system. Organizations have used prescriptive analytics to set prices, create production plans, and identify the best locations for facilities such as bank branches.

7. Define modeling from the analytics perspective.

As Application Case 1.6 illustrates, analytics uses descriptive data to create models of how people, equipment, or other variables operate in the real world. These models can be used in predictive and prescriptive analytics to develop forecasts, recommendations, and decisions.

8. Is it a good idea to follow a hierarchy of descriptive and predictive analytics before applying prescriptive analytics?

As noted in the analysis of Application Case 1.5, it is important in any analytics project to understand the business domain and current state of the business problem. This requires analysis of historical data, or descriptive analytics. Although the chapter does not discuss a hierarchy of analytics, students may observe that testing a model with predictive analytics could logically improve prescriptive use of the model.

9. How can analytics aid in objective decision making?

As noted in the analysis of Application Case 1.4, problem solving in organizations has tended to be subjective, and decision makers tend to rely on familiar processes. The result is that future decisions are no better than past decisions. Analytics builds on historical data and takes into account changing conditions to arrive at fact-based solutions that decision makers might not have considered.

10. What is Big Data analytics?

The term *Big Data* refers to data that cannot be stored in a single storage unit. Typically, the data is arriving in many different forms, be they structured, unstructured, or in a stream. Big Data analytics is analytics on a large enough scale, with fast enough processing, to handle this kind of data.

11. What are the sources of Big Data?

Major sources include clickstreams from Web sites, postings on social media, and data from traffic, sensors, and the weather.

12. What are the characteristics of Big Data?

Today Big Data refers to almost any kind of large data that has the characteristics of volume, velocity, and variety. Examples include data about Web searches, such as the billions of Web pages searched by Google; data about financial trading, which operates in the order of microseconds; and data about consumer opinions measured from postings in social media.

13. What processing technique is applied to process Big Data?

One computer, even a powerful one, could not handle the scale of Big Data. The solution is to push computation to the data, using the MapReduce programming paradigm.

Section 1.6 Review Questions

1. What are three factors that might be part of a PM for season ticket renewals?
Examples might include ticket cost, marketing and team success.

2. What are two techniques that football teams can use to do opponent analysis?
Examples might include frequency of running plays and individual athlete trends and matchups.

3. What other analytics uses can you envision in sports?
Many examples exist including maintenance of facilities and accuracy of referees.

4. Why would a health insurance company invest in analytics beyond fraud detection? Why is it in its best interest to predict the likelihood of falls by patients?
There are many possible applications, for example insurance companies may want to evaluate causes for conditions so that those conditions can be avoided. An excellent example of this is patient falls. Having this information allows for preventive measures to be taken before a fall occurs.

5. What other applications similar to prediction of falls can you envision?
Student responses will vary that may include prediction of other conditions such as cancer.

6. How would you convince a new health insurance customer to adopt healthier lifestyles (Humana Example 3)?

Data can be used to demonstrate to a customer that adoption of a healthier lifestyle may limit the negative experiences associated with various conditions or diseases.

7. Identify at least three other opportunities for applying analytics in the retail value chain beyond those covered in this section.

Student responses will vary.

8. Which retail stores that you know of employ some of the analytics applications identified in this section?

Student responses will vary.

9. What is a common thread in the examples discussed in image analytics?

In each analysis a detailed understanding of both the image data and other supplementary data sources were used to create solutions.

10. Can you think of other applications using satellite data along the lines presented in this section?

Student responses will vary.

Section 1.7 Review Questions

1. What are the major characteristics of AI?
   - Technology that can learn to do things better over time.
   - Technology that can understand human language.
   - Technology that can answer questions.
2. List the major benefits of AI.
   - Significant reduction in the cost of performing work. This reduction continues over time while the cost of doing the same work manually increases with time.
   - Work can be performed much faster.
   - Work is consistent in general, more consistent than human work.
   - Increased productivity and profitability as well as a competitive advantage are the major drivers of AI.
3. What are the major groups in the ecosystem of AI? List the major contents of each.
   - Major Technologies include machine learning, deep learning and intelligent agents.

- Knowledge-based technologies include expert systems, recommendation engines, chat bots, virtual personal assistants and robo advisors.
- Biometric related technologies include natural language processing and other biometric recognition technologies
- support theories, tools and platforms include a variety of disciplines such as computer science, cognitive science, control theory, linguistics, mathematics, neuroscience, philosophy, psychology, and statistics.
- Tools and platforms include the various software applications and systems available from a wide number of vendors.

4. Why is machine learning so important?

Machine learning presents the promise of creating more effective and accurate solutions to problems without the direct intervention of individuals.

5. Differentiate between narrow and general AI.

Narrow AI focuses on a specific, defined domain whereas general AI may cross multiple domains and become more powerful as it is refined.

6. Some say that no AI application is strong. Why?

No AI currently performs the full range of human cognitive capabilities.

7. Define *assisted intelligence*, *augmented intelligence*, and *autonomous intelligence*.

- Assisted intelligence is the equivalent of week AI and works within narrow domains.
- Augmented intelligence use computer abilities to extend human cognitive abilities.
- Automated intelligence perform a broad range of functions without human intervention.

8. What is the difference between traditional AI and augmented intelligence?

These systems are designed to extend human capabilities as opposed to replacing them.

9. Relate types of AI to cognitive computing.

Not addressed in this chapter, but students may note that both can be designed to perform tasks.

10. List five major AI applications for increasing the food supply.

Examples include increasing productivity of farm equipment, improved planting and harvesting, improving food nutrition, reducing the cost of food processing, driverless machines, picking fruits and vegetables, pest control improvements and weather monitoring.

11. List five contributions of AI in medical care.
Examples include disease prediction, tracking medication intake, telepresence, improved diagnostics, more efficient supply chains, personal diagnoses, providing medical information and others.

Section 1.8 Review Questions

1. What are the major benefits of intelligent systems convergences?
This convergence allows for a greater number of overall features and applications to more complex problems as multiple systems can be combined.

2. Why did analytics initiatives fail at such a high rate in the past?
Responses will vary but may focus on a lack of availability of data, lack of processing tools and complexity of the required analysis.

3. What synergy can be created by combining AI and analytics?
AI may be used to automatically locate, visualize and narrate important items and can be used to create predictions that can be compared to actual performance. These activities will free up time for more analytics.

4. Why is Big Data preparation essential for AI initiatives?
AI works best when it has access to robust data sources. Properly preparing big data for use in AI allows data to be used completely and effectively.

5. What are the benefits of adding IoT to intelligent technology applications?
The primary benefit is the inclusion of additional data that can be used for various types of analysis.

6. Why it is recommended to use blockchain in support of intelligent applications?
The use of block chain technology can add security to data in a distributed network.

Section 1.9 Review Questions

(This section has no review questions.)

Section 1.10 Review Questions

(This section has no review questions.)

ANSWERS TO APPLICATION CASE QUESTIONS FOR DISCUSSION• •

Application Case 1.1: Making Elevators Go Faster!

1. Why this is an example relevant to decision making?
   This is an example of how the symptoms may not directly reveal the problem (perceived versus actual wait time being the issue).

2. Relate this situation to the intelligence phase of decision making.
   This situation demonstrates how the intelligence phase of decision-making is important because detailed problem identification is necessary in order to create a satisfactory solution.

Application Case 1.2: SNAP DSS Helps OneNet Make Telecommunications Rate Decision

(No questions in this case)

Application Case 1.3: Silvaris Increases Business with Visual Analysis and Real-Time Reporting Capabilities

1. What was the challenge faced by Silvaris?
   Material prices changed rapidly and it was necessary to receive a real-time view of data without moving that data to a separate reporting format.

2. How did Silvaris solve its problem using data visualization with Tableau?
   Tableau allow the company to easily connect and visualize live data and create dashboards for reporting purposes.

Application Case 1.4: Siemens Reduces Cost with the Use of Data Visualization

1. What challenges were faced by Siemens visual analytics group?
   The group needed to provide a wide range of reports for different organizational needs while maintaining consistency and self-service ability.

2. How did the data visualization tool Dundas BI help Siemens in reducing cost?

The system allowed them to create highly interactive dashboards that enabled early detection of issues.

Application Case 1.5: Analyzing Athletic Injuries

1. What types of analytics are applied in the injury analysis?
   In this example both reporting and predictive analysis were included.

2. How do visualizations aid in understanding the data and delivering insights into the data?
   These visualizations made understanding and depicting the information easier by displaying healing time based on position, severity of injury or injuries healing time treatment offered in the associated healing time etc.

3. What is a classification problem?
   An issue that occurs in this case when the type of healing category is incorrectly identified, leading to an incorrect prediction of healing time.

4. What can be derived by performing sequence analysis?
   Student responses may vary, but in this example it may be possible to predict how one injury may result in other injuries later.

Application Case 1.6: A Specialty Steel Bar Company Uses Analytics to Determine Available-to-Promise Date

1. Why would reallocation of inventory from one customer to another be a major issue for discussion?
   This action may require a discount to the first customer or may result in the delay that may jeopardize the customer relationship.

2. How could a DSS help make these decisions?
   A DSS system would provide greater visibility into actual inventories, expected inventories and potential customer implications of reallocation of inventory.

Application Case 1.7: A Specialty Steel Bar Company Uses Analytics to Determine Available-to-Promise Date

1. What is the purpose of knowing how much ground is covered by green foliage on a farm? In a forest?
   In a farm setting, this may indicate the level of plant growth. In a forest setting, this may provide details on how the forest is evolving.

2. Why would image analysis of foliage through an app be better than a visual check?
   It will provide a more consistent quantitative estimate than individual qualitative perceptions of growth.

3. Explore research papers to understand the underlying algorithmic logic of image analysis. What did you learn?

Student research and responses will vary. Results may indicate that there are different methods of analysis and that this is a rapidly changing field.

4. What other applications of image analysis can you think of?

Student responses will vary.

Application Case 1.8: AI Increases Passengers' Comfort and Security in Airports and Borders

1. List the benefits of AI devices to travelers.

Benefits will include faster processes such as recognition, more accurate processes and providing additional services.

2. List the benefits to governments and airline companies.

Benefits will include more accurate, faster and more cost efficient services being provided.

3. Relate this case to machine vision and other AI tools that deal with people's biometrics

This case provides an example of how machine vision and other AI tools can be used as a part of biometric recognition systems that more quickly and accurately identify individuals as they enter an airport.

Application Case 1.9: Robots Took the Job of Camel-Racing Jockeys for Societal Benefits

1. It is said that the robots eradicated the child slavery. Explain.

This is because robots have replaced children who in the past may have been kidnapped to act as jockeys.

2. Why do the owners need to drive by their camels while they are racing?

This is necessary for the camels to react and run. Additionally owners can vary their interaction with the camel based on how the camel is performing in comparison to the others in the race.

3. Why not duplicate the technology for horse racing?

Student opinions and responses will vary, but may focus on the lack of child slavery in Western horseracing.

4. Summarize ethical aspects of this case (Read Boddington, 2017). Do this exercise after you have read about ethics in Chapter 14.

Student responses will vary.

Application Case 1.10: Amazon Go Is Open for Business

1. Watch the video. What did you like in it, and what did you dislike?
Student preferences will vary.

2. Compare the process described here to a selfcheck available today in many supermarkets and "big box" stores (Home Depot, etc.).
The major difference is that products are scanned as they are added to a bag, as opposed to using a checkout kiosk.

3. The store was opened in downtown Seattle. Why was the downtown location selected?
This location was selected because of the proximity of a large number of potential customers.

4. What are the benefits to customers? To Amazon?
Customers benefit from the ability to quickly purchase items without a shipping time. Amazon is able to capture additional sales that may not have been available before due to immediate needs.

5. Will customers be ready to trade privacy for convenience? Discuss.
Student responses will vary, but may focus on the lack of privacy in existing web-based sales.

ANSWERS TO END OF CHAPTER QUESTIONS FOR DISCUSSION• • •

1. Survey the literature from the past six months to find one application each for DSS, BI, and analytics. Summarize the applications on one page, and submit it with the exact sources.
Student responses and research will vary.

2. Your company is considering opening a branch in China. List typical activities in each phase of the decision (intelligence, design, choice, and implementation) regarding whether to open a branch.
While student responses may vary, typical answers may include:
   - Intelligence - data collection on customers and markets, identification of overall objective, statements of problems to be solved prior to opening the branch
   - Design - setting criteria for the decisions to be made, creating a decision model, identification of alternatives and outcomes
   - Choice - sensitivity analysis of choices, selection of solution to the problems planning for implementation
   - Implementation - opening the new branch in China

3. You are about to buy a car. Using Simon's (1977) four phase model, describe your activities at each step in making the decision.

While student responses may vary, typical answers may include:

- Intelligence - understanding needs for a car, collection of information on different models, definition of the problem
- Design - setting selection criteria for a car, generating a decision model based on criteria
- Choice - using the model to make a selection
- Implementation - purchasing the car

4. Explain, through an example, the support given to decision makers by computers in each phase of the decision process.
   While student responses may vary, typical answers may include:
   - Intelligence - collection and formatting of data
   - Design - identification of potential criteria and calculations required for a model
   - Choice - calculation of the model and sensitivity analysis

5. Comment on Simon's (1977) philosophy that managerial decision making is synonymous with the whole process of management. Does this make sense? Explain. Use a real-world example in your explanation.
   Student responses and opinions will vary. Students may note that much of management is the understanding of challenges and the creation of solutions to those challenges. Some students may note that managing others may not be approached in this fashion, although it may be. Student examples will vary based on their own types of experience in or with management roles.

6. Review the major characteristics and capabilities of DSS. How does each of them relate to the major components of DSS?
   A DSS includes a variety of characteristics with associated capabilities. Each of these capabilities may be housed in one or more DSS system components. The arrangement of this architecture will vary based on system. The characteristics of the DSS are listed below:
   - Provides support for semistructured or unstructured problems
   - Supports managers at all levels
   - Supports individuals and groups
   - Supports interdependent or sequential decisions
   - Supports intelligence, design, choice, and implementation
   - Support variety of decision processes and styles
   - Is adaptable and flexible
   - Provides interactivity, ease of use
   - Improves effectiveness and efficiency
   - Provides complete human control of the process
   - Provides ease of development by end users

- Provides models and analysis
- Provides data access
- Can be standalone, integrated, and Web-based tool

7. List some internal data and external data that could be found in a DSS for a university's admissions office.

   Student responses will vary, but may include some of the following examples:
   - internal data - application information, results of application essays
   - external data - high school GPA, results from standardized tests

8. Distinguish BI from DSS.

   A DSS is typically built to support the solution of a certain problem or to evaluate an opportunity. This is a key difference between DSS and BI applications. In a very strict sense, business intelligence (BI) systems monitor situations and identify problems and/or opportunities using analytic methods. Business intelligence (BI) is an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies. It is, like DSS, a content-free expression, so it means different things to different people.

9. Compare and contrast predictive analytics with prescriptive and descriptive analytics. Use examples.

   Predictive analytics aims to determine what will likely happen in the future, whereas descriptive analytics describe what has happened in the past. Prescriptive analytics seeks to recognize what is currently going on as well as creating forecasts. Student examples will vary, but may include:
   - predictive analytics - using existing data from a DW to create a forecast of future events
   - descriptive analytics - using existing data from DW to describe what is happened in the past
   - prescriptive analytics - using live or current data to understand current operations and forecast future results to aid in decision-making

10. Discuss the major issues in implementing BI.

    Student responses will vary, but may focus on several issues that have occurred in implementing BI. These issues may include:
    - availability of data
    - ability to format and use data
    - ability to use data from multiple sources
    - ability to determine root problems
    - time required for analysis

- ability to quickly create ongoing analyses

ANSWERS TO END OF CHAPTER EXCERCISES• • •

Teradata University Network and Other Hands-On Exercises

1. Go to the TUN site **teradatauniversitynetwork.com**. Using the site password your instructor provides, register for the site if you have not already previously registered. Log on and learn the content of the site. You will receive assignments related to this site. Prepare a list of 20 items on the site that you think could be beneficial to you.

   Student reports will vary based on interest.

2. Go to. Explore the Sports Analytics page, and summarize at least two applications of analytics in any sport of your choice.

   Student reports will vary based on selection of applications.

3. Go to. The TUN site, and select "Cases, Projects, and Assignments." Then select the case study "Harrah's High Payoff from Customer Information." Answer the following questions about this case:
   a. What information does the data mining generate?
   b. How is this information helpful to management in decision making? (Be specific.)
   c. List the types of data that are mined.
   d. Is this a DSS or BI application? Why?

   Student reports will vary.

4. Go to **teradatauniversitynetwork.com** and find the paper titled "Data Warehousing Supports Corporate Strategy at First American Corporation" (by Watson, Wixom, and Goodhue). Read the paper, and answer the following questions:
   a. What were the drivers for the DW/BI project in the company?
   b. What strategic advantages were realized?
   c. What operational and tactical advantages were achieved?
   d. What were the critical success factors for the implementation?
   e. What data analysis techniques are employed in the project? Comment on some initiatives that resulted from data analysis.
   f. What are the different prediction problems answered by the models?
   g. List some of the actionable decisions taken that were based on the prediction results.
   h. Identify two applications of Big Data analytics that are not listed in the article.

   Student evaluation of the paper will vary.

5. Go to http://analytics-magazine.org/issues/digitaleditions and find the January/February 2012 edition titled "Special Issue: The Future of Healthcare." Read the article "Predictive Analytics—Saving Lives and Lowering Medical Bills." Answer the following questions:
a. What problem is being addressed by applying predictive analytics?
b. What is the FICO Medication Adherence Score?
c. How is a prediction model trained to predict the FICO Medication Adherence Score HoH? Did the prediction model classify the FICO Medication Adherence Score?
d. Zoom in on Figure 4, and explain what technique is applied to the generated results.
e. List some of the actionable decisions that were based on the prediction results.

Student analysis of the report will vary.

6. Go to http://analytics-magazine.org/issues/digitaleditions, and find the January/February 2013 edition titled "Work Social." Read the article "Big Data, Analytics and Elections," and answer the following questions:
a. What kinds of Big Data were analyzed in the article's Coo? Comment on some of the sources of Big Data.
b. Explain the term integrated system. What is the other technical term that suits an integrated system?
c. What data analysis techniques are employed in the project? Comment on some initiatives that resulted from data analysis.
d. What are the different prediction problems answered by the models?
e. List some of the actionable decisions taken that were based on the prediction results.
f. Identify two applications of Big Data analytics that are not listed in the article.

Student analysis of the report will vary.

6. Search the Internet for material regarding the work of managers and the role analytics plays in it. What kinds of references to consulting firms, academic departments, and programs do you find? What major areas are represented? Select five sites that cover one area, and report your findings.

Student searches and reports will vary

7. Explore the public areas of **dssresources.com**. Prepare a list of its major available resources. You might want to refer to this site as you work through the book.

Student list will vary based on the time the search is conducted.

8. Go to **microstrategy.com**. Find information on the five styles of BI. Prepare a summary table for each style.

   Student summaries will vary.

9. Go to **oracle.com**, and click the Hyperion link under Applications. Determine what the company's major products are. Relate these to the support technologies cited in this chapter.

   Student reports will vary based on the time the analysis is conducted.

10. Go to the TUN questions site. Look for BSI videos. Review the video of "Case of Retail Tweeters." Prepare a one-page summary of the problem, proposed solution, and the reported results. You can also find associated slides on **slideshare.net**.

    Student papers will vary.

11. Review the Analytics Ecosystem section. Identify at least two additional companies in at least five of the industry clusters noted in the discussion.

    Student selection of companies will vary.

12. The discussion for the analytics ecosystem also included several typical job titles for graduates of analytics and data science programs. Research Web sites such as **datasciencecentral.com** and **tdwi.org** to locate at least three similar job titles that you may find interesting for your career.

    Student research and career interests will vary.

13. Go to Brainspace at MIT lab **brainspace.com**. View the video about "Augmented Human Intelligence." Find the activities that deal with the enabling of meaningful combination of people and machines. Write a report.

    Student reports will vary.

14. Find information about IBM Watson's activities in the healthcare field. Write a report.

    Student reports will vary based on the date the research is conducted.

15. Examine Daniel Power's DSS Resources site at **dssresources.com** . Take the Decision Support Systems Web Tour (**dssresources.com/tour/index.html**).

Explore other areas of the Web site. List at least three recent resources related to analytics. What topics do these cover?

Student perceptions of the resources will vary.