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| Chapter 1:  An Overview of Business Intelligence, Analytics, and Decision Support |

Learning Objectives for Chapter 1

1. Understand today’s turbulent business environment and describe how organizations survive and even excel in such an environment (solving problems and exploiting opportunities)
2. Understand the need for computerized support of managerial decision making
3. Understand an early framework for managerial decision making
4. Learn the conceptual foundations of the decision support systems (DSS[[1]](#footnote-1)) methodology
5. Describe the business intelligence (BI) methodology and concepts and relate them to DSS
6. Understand the various types of analytics
7. List the major tools of computerized decision support

CHAPTER OVERVIEW

The business environment (climate) is constantly changing, and it is becoming more and more complex. Organizations, 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. This book is about using business analytics as computerized support for managerial decision making. It concentrates both on the theoretical and conceptual foundations of decision support, as well as on the commercial tools and techniques that are available. This introductory chapter provides more details of these topics as well as an overview of the book. This chapter has the following sections:

CHAPTER OUTLINE

**1.1 OPENING VIGNETTE: MAGPIE SENSING EMPLOYS ANALYTICS TO MANAGE A VACCINE SUPPLY CHAIN EFFECTIVELY AND SAFELY**

🞂 Questions for the Opening Vignette

A. What we can learn from this vignette

**1.2 Changing Business Environments and Computerized Decision Support**

A. The Business Pressures–Responses–Support Model

1. The Business Environment

2. Organizational Responses: Be Reactive, Anticipative, Adaptive, and Proactive

3. Closing the Strategy Gap

🞂 Section 1.2 Review Questions

**1.3 Managerial Decision making**

A. The Nature of Managers’ Work

B. The Decision Making Process

🞂 Section 1.3 Review Questions

**1.4 INFORMATION SYSTEMS Support for decision making**

🞂 Section 1.4 Review Questions

**1.5 an early Framework for computerized Decision Support**

A. The Gorry and Scott-Morton Classical Framework

1. Degree of Structuredness

2. Types of Control

3. The Decision Support Matrix

b. Computer Support for Structured Decisions

C. Computer support for unstructured decisions

D. Computer support for semistructured problems

🞂 Section 1.5 Review Questions

**1.6 The Concept of Decision Support SYSTEMS (DSS)**

A. DSS as an Umbrella Term

B. EVOLUTION OF DSS INTO BUSINESS INTELLIGENCE

🞂 Section 1.6 Review Questions

**1.7 a framework for business intelligence (BI)**

a. Definitions of BI

b. A Brief History OF BI

c. The Architecture of BI

D. Styles of BI

E. THE ORIGINS AND DRIVERS OF BI

⧫ Application Case 1.1: Sabre Helps Its Clients Through Dashboards and Analytics

f. a multimedia exercise in business intelligence

G. The DSS–BI Connection

🞂 Section 1.7 Review Questions

**1.8 BUSINESS ANALYTICS OVERVIEW**

a. DESCRIPTIVE ANALYTICS

⧫ Application Case 1.2: Eliminating Inefficiencies at Seattle Children’s Hospital

⧫ Application Case 1.3: Analysis at the Speed of Thought

B. PREDICTIVE ANALYTICS

⧫ Application Case 1.4: *Moneyball*: Analytics in Sports and Movies

⧫ Application Case 1.5: Analyzing Athletic Injuries

C. PRESCRIPTIVE ANALYTICS

⧫ Application Case 1.6: Industrial and Commercial Bank of China (ICBC) Employs Models to Reconfigure Its Branch Network

D. ANALYTICS APPLIED TO DIFFERENT DOMAINS

E. ANALYTICS OR DATA SCIENCE?

🞂 Section 1.8 Review Questions

**1.9 BRIEF INTRODUCTION TO BIG DATA ANALYTICS**

A. what is big data?

⧫ Application Case 1.7: Gilt Groupe’s Flash Sales Streamlined by Big Data Analytics

🞂 Section 1.9 Review Questions

**1.10 Plan of the Book**

A. Part I: business analytics: an overview

B. Part II: descriptive analytics

C. Part III: predictive analytics

D. Part IV: PRESCRIPTIVE ANALYTICS

E. Part V: BIG DATA AND FUTURE DIRECTIONS FOR BUSINESS ANALYTICS

**1.11 resources, links, and the teradata university network connection**

A. Resources and Links

B. Vendors, Products, and Demos

C. Periodicals

D. The Teradata University Network Connection

E. The Book’s Web site

Chapter Highlights

Key Terms

Questions for Discussion

Exercises

Teradata University Network (TUN) and Other Hands-On Exercises

End of Chapter Application Case: Nationwide Insurance Used BI to Enhance Customer Service

🞂 Questions for the Case

References

TEACHING TIPS/ADDITIONAL INFORMATION • • • • • • • •

It is important to stress the frameworks when covering this chapter. The specifics of each subject are less important at this stage, as they will be revisited in more detail in the chapters to come. Going into detail about, say, BI or integration at this stage will mean taking longer on this chapter than the course has time for or skimping on the perspective that students should get from the start.

It can also be useful at this stage to position DSS in the overall context of organizational information systems. They stand above transaction processing systems in the dual sense of typically being used higher up in the organization and having greater impact on it each time they are used. However, they are not independent of other systems: Transaction processing is a major source of data for decision support, in general, and for data warehouses, in particular. External information sources are vital to any DSS. This point is brought out repeatedly throughout the chapter, but it doesn’t always jump out at the typical student reader so you may have to draw attention to it.

Some of the frameworks in the chapter relate more to decision making, while others are more on the information systems side. Specifically, Sections 1.2, 1.3, 1.6, and 1.8 are more about decision making as a managerial activity independent of how it is supported through technology. Sections 1.4 and 1.9 are more on the technology side. Sections 1.5 and 1.7 have elements of both in different subsections. (Sections 1.1 and 1.10 cannot be positioned along this dimension.) It will help students put the material in perspective if you position the topics for them: “This is process, this is technology, and now we’re back to process.”

You may find some transitions from one section to the next abrupt. This is efficient in terms of content density but may leave students wondering how things are related. For example, Section 1.3 (Managerial Decision Making) jumps right into the importance of decision making as a managerial activity without explaining its importance to the study of DSS. This is obvious, of course, to any instructor who thinks about it: How can one develop systems to support decision making, if one doesn’t understand how decisions are made? It may not be equally obvious to younger students. You will have to make some of the transitions among sections explicit where they are implicit in the book.

You may also be used to a more rigorous distinction between *decision making* and *problem solving* than is used here. This book uses the two terms interchangeably. You should be aware of their usage from the start to inform how you discuss what the book says.

A secondary purpose of any introductory chapter is to motivate students to be interested in the remainder of the course (and book). The real-life cases, beginning with Magpie Sensing and continuing with the others, will show students that decision support and analytics are not just academic subjects; they are things real companies use that make a noticeable difference to their bottom line. So, try to relate the subject matter to these cases. For example, consider the types of actions managers take to counter pressures (Section 1.2), especially the list of organizational responses. The opening case about Magpie illustrates several of the options available to health care companies, such as innovation, partnerships with others in the cold chain, and the use of IT to improve data access. The other cases in the chapter offer other examples of managerial actions taken in response to pressure. By referring back to this list when discussing other cases, you demonstrate the unity of the analytics field.

All this should show students that a new professional who understands how information systems can support decision making, and can help his or her employer obtain those benefits, has a bright career path. Since students in this course are typically within a year of graduation, that will get their attention!

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

Section 1.1 Review Questions

1. What information is provided by the descriptive analytics employed at Magpie Sensing?

The descriptive analytics monitor and report the properties of the cold storage system, including the set point of each thermostat, the typical range of temperatures in the system, and the duty cycle of each compressor. These values tell trained personnel whether each storage unit is properly configured for storing particular products.

1. What type of support is provided by the predictive analytics employed at Magpie Sensing?

The predictive analytics use the descriptive data to alert users when a unit is not configured properly for storing the products. It also sends an alert when average temperature and compressor cycle runs signal that a temperature may go out of range (for example, after a power failure) or that there may have been a human error, such as failure to shut a door. These analytics tell users about a problem that may occur, giving them time to prevent the problem.

1. How does prescriptive analytics help in business decision making?

Prescriptive analytics guides decision makers to the alternative with the greatest benefits. In Magpie’s cold chain system, prescriptive analytics uses data about storage unit performance to help buyers select the best storage units. And based on data about storage system efficiency and product sensitivity, prescriptive analytics guides decisions about where to distribute particular products in the supply chain.

1. In what ways can actionable information be reported in real time to concerned users of the system?

The system uses shippable wireless monitors. These continuously measure temperature, humidity, and location and transmit the data to the computer that analyzes the data.

1. In what other situations might real-time monitoring applications be needed?

Answers will vary, but students should consider other systems where current performance provides information about changes or decisions that would improve future performance. Examples include monitoring inventory levels at a manufacturing company to determine when to replenish stocks, monitoring sales in a store to identify when and how to adjust the mix of products, and monitoring patient status in a hospital to identify situations where different treatment is required or devices are malfunctioning. (If students have difficulty with this question, it suggests a need to devote some class time to discussing practical applications of data and analytics in business, government, and nonprofit sectors.)

Section 1.2 Review Questions

1. List the components of and explain the Business Pressures–Responses–Support model.

The components of the pressure-response-support model are business **pressures**, companies’ **responses** to these pressures, and computerized **support**. The model suggests that responses are made to counter the pressures or to take advantage of opportunities, support facilitates monitoring the environment (e.g., for opportunities) and enhances the quality of the responses.

1. What are the major factors in today’s business environment?

The major factors in today’s business environment are:

* + (**Markets**)strong competition, expansion of global markets, booming electronic markets on the Internet, innovative marketing methods, opportunities for outsourcing with IT support, and need for real time on-demand transactions
  + (**Consumer demand**) wanting customization; wanting quality, diversity of products, and speed of delivery; and customers becoming powerful and less loyal
  + (**Technology**)more innovations, new products and services, increasing obsolescence rate, increasing information overload, social networking, Web 2.0 and beyond
  + (**Societal**)growth of government regulations and deregulation; work force becoming more diversified, older, and composed of more women; prime concerns of homeland security and terrorist attacks; necessity of compliance with the Sarbanes-Oxley Act and other reporting-related legislation; increasing social responsibility; greater emphasis on sustainability

1. What are some of the major response activities organizations take?

Responses taken by organizations include, but are not limited to:

* + Employ strategic planning
  + Use new and innovative business models
  + Restructure business processes
  + Participate in business alliances
  + Improve corporate information systems
  + Improve partnership relationships
  + Encourage innovation and creativity
  + Improve customer service and relationships
  + Move to electronic commerce (e-commerce)
  + Move to make-to-order production and on-demand manufacturing and services
  + Use new IT to improve communication, data access (discovery of information), and collaboration
  + Respond quickly to competitors’ actions (e.g., in pricing, promotions, new products and services)
  + Automate many tasks of white-collar employees
  + Automate certain decision processes, especially those dealing with customers
  + Improve decision making by employing analytics

(Since the question reads “some,” a correct answer need not list all of these.)

Section 1.3 Review Questions

**1**. Describe the three major managerial roles, and list some of the specific activities in each.

Managerial roles fall into the three major categories:

* *Interpersonal activities.* Examples of interpersonal activities include being a figurehead, a leader and a liaison.
* *Informational activities.* Examples of informational activities include monitoring, disseminating, and acting as a spokesperson.
* *Decisional activities.* Examples of decisional roles include being an entrepreneur, handling disturbances, allocating resources, and negotiating.
  1. Why have some argued that management is the same as decision making?

Some argue that decision making is consistently rated as either the most important or one of the most important components of managing. However, as also seen in this section, others have defined many managerial roles besides decision making.

* 1. Describe the four steps managers take in making a decision.

Step 1. Define the problem (i.e., a decision situation that may deal with some difficulty or with an opportunity).

Step 2. Construct a model that describes the real-world problem.

Step 3. Identify possible solutions to the modeled problem and evaluate the solutions.

Step 4. Compare, choose, and recommend a potential solution to the problem.

Section 1.4 Review Questions

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

Important trends include the development of software for problem analysis and solution applications, the availability of networking, especially with Web-based technologies and mobile devices, and the creation of tools for analytics and business intelligence. Social media platforms also have contributed to taking IS-supported decision making to a new level. (Since the question reads “some,” a correct answer should include at least three of these.)

1. List some capabilities of computing that can facilitate managerial decision making*.*

These include group communication and collaboration, improved data management, managing giant data warehouses and Big Data, analytical support, overcoming cognitive limits in information processing and storage, knowledge management, and the ability to access information anywhere, anytime. (Since the question reads “some,” a correct answer need not list all of these.)

1. How can a computer help overcome the cognitive limits of humans?

Computers can store, access, and process vast amounts of information, beyond the limited ability of the human mind to do these.

Section 1.5 Review Questions

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

An *unstructured decision* is one in which none of the three decision phases (intelligence, design, choice) is structured. Examples: writing a corporate mission statement, selecting a location for a company picnic.

A *structured decision* is one in which all phases are structured. Examples: finding an appropriate inventory level, choosing an optimal investment strategy.

*Semistructured decisions* fall between structured and unstructured problems, having some structured elements and some unstructured elements. Examples: trading bonds, setting marketing budgets for consumer products, performing capital acquisition analysis.

(Other correct examples are possible.)

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

*Operational control* is the efficient and effective execution of specific tasks. Examples: scheduling computer storage backups, planning next week’s company cafeteria menu.

*Management control*is the acquisition and efficient use of resources to accomplish organizational goals. Examples: hiring a production coordinator, planning an advertising program.

*Strategic planning*is defining long-range goals and policies for resource allocation. Examples: choosing which of three new products to develop, deciding whether or not to outsource customer telephone support to a region with lower labor costs than where it is now based.

(Other correct examples are possible.)

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

Each of the nine cells represents a combination of one degree of decision structure with one type of management control. Cell 1 represents a structured decision that falls within the span of operational control, and so on.

**4.** How can computers provide support for making structured decisions?

The high level of structure that structured problems have makes it possible to abstract them, analyze them, and classify them into specific categories. For each category, it is possible to develop a standard solution approach, usually with a standard quantitative model. This model can then be implemented in easy-to-apply software.

**5.** How can computers provide support to semistructured and unstructured decisions?

Unstructured decisions can be only partially supported by standard computerized quantitative methods. Usually it is necessary to develop a customized solution. Intuition and judgment play a large role in this type of decision. They may benefit from computerized communication and collaboration technologies and from knowledge management.

Making semistructured decisions may involve a combination of both standard solution procedures and human judgment. Management science can provide models for the portion of the decision-making problem that is structured. For the unstructured portion, a DSS can improve the quality of the information on which the decision is based by providing, for example, not only a single solution but also a range of alternative solutions along with their potential impacts. These capabilities help managers to better understand the nature of problems and thus to make better decisions.

Section 1.6 Review Questions

1. Provide two definitions of DSS.

The two definitions of DSS given in the text are:

* + Interactive computer-based systems, which help decision makers utilize *data* and *models* to solve unstructured problems.
  + [They] couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semistructured problems.

(Other correct definitions are possible. Students who provide different definitions, unless they wrote those definitions themselves, should be expected to cite their sources.)

**2.** Describe *DSS* as an umbrella term.

Used in this way, *DSS* describes any computerized system that supports decision making in an organization. An organization may have (for example) a knowledge management system to guide all its personnel in their problem solving, it may have separate support systems for marketing, finance, and accounting, a supply chain management (SCM) system for production, and several expert systems for product repair diagnostics and help desks. The term *DSS* encompasses them all.

Section 1.7 Review Questions

1. Define BI.

*Business Intelligence* (BI) is an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies. Its major objective is to enable interactive access (sometimes in real time) to data, enable manipulation of these data, and to provide business managers and analysts the ability to conduct appropriate analysis.

**2.** List and describe the major components of BI.

BI systems have four major components: the data warehouse (with its source data), business analytics (a collection of tools for manipulating, mining, and analyzing the data in the data warehouse), business performance management (for monitoring and analyzing performance), and the user interface (e.g., a dashboard).

**3.** What are the major similarities and differences of DSS and BI?

* + BI uses a data warehouse, whereas DSS can use any data source (including a data warehouse).
  + Most DSS are built to support decision making directly, whereas most BI systems are built to provide information that it is believed will lead to improved decision making.
  + BI has a strategy/executive orientation whereas DSS are usually oriented toward analysts.
  + BI systems tend to be developed with commercially available tools, whereas DSS tend to use more custom programming to deal with problems that may be unstructured.
  + DSS methodologies and tools originated largely in academia, whereas BI arose largely from the software industry. Many BI tools, such as data mining and predictive analysis, have come to be considered DSS tools as well.

Section 1.8 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 data warehouse? How can data warehousing 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.

Section 1.9 Review Questions

1. 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.

**2.** 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.

**3.** 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.

**4.** 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 1.10 Review Questions

(This section has no review questions.)

Section 1.11 Review Questions

(This section has no review questions.)

ANSWERS TO APPLICATION CASE QUESTIONS FOR DISCUSSION• •

Application Case 1.1: Sabre Helps Its Clients Through Dashboards and Analytics

**1.** What is traditional reporting? How is it used in organizations?

The traditional reporting process is a manual process of collecting and aggregating financial and other information. Organizations have used this time-consuming process as a way to obtain information for making decisions. However, the resulting presentations may be flat, slow to develop, and difficult to apply to specific situations.

**2.** How can analytics be used to transform traditional reporting?

Analytics can enable real-time decision support and deliver information to a user-friendly dashboard. Users of a dashboard such as the one provided by Sabre’s Enterprise Travel Data Warehouse can see at a glance a 360-degree view of the company’s overall health generated from various data sources. Many stakeholders in the organization can request data needed for particular types of decisions, and the graphical user interface makes the information easily understandable.

**3.** How can interactive reporting assist organizations in decision making?

When a system incorporates interactive drill-down capabilities, users can select the data they need for evaluating a specific kind of performance and making decisions in a particular function or situation. For example, the airlines using the Sabre system can focus on data about sales performance (ticketing, seats sold, etc.) and operational performance (flight movement, inventory, etc.). This flexibility encourages decision makers to use data in support of their decisions.

Application Case 1.2: Eliminating Inefficiencies at Seattle Children’s Hospital

**1.** Who are the users of the tool?

The business intelligence application at Seattle Children’s Hospital is used by data analysts, business managers, financial analysts, clinicians, doctors, and researchers.

**2.** What is a dashboard?

A dashboard is a user interface that displays information in some type of visual system. For example, it shows current performance measured against standards.

**3.** How does visualization help in decision making?

Visualizations help users gain insights into existing data. Exploring data visually can help users identify the root causes of problems and provide a basis for working toward solutions.

**4.** What are the significant results achieved by the use of Tableau?

Tableau’s business intelligence application lets users create monthly and daily dashboards that have helped users significantly improve day-to-day decision making. Visualizing data about patient wait-times helped the hospital improve overall waiting time and improve the availability of beds. The hospital also saved about $3 million from the supply chain and has made processes more efficient.

Application Case 1.3: Analysis at the Speed of Thought

**1.** What are the desired functionalities of a reporting tool?

A reporting tool should generate reports that make visualizations easily discernible. It should help users make sense out of the reports, identify problem areas, and contribute to improvements. It also should be able to handle the volume of data required and prepare reports within the necessary time frame.

**2.** What advantages were derived by using a reporting tool in this case?

At Kaleida Health, Tableau’s reporting tool handles more data faster than its traditional reporting tools did. Also, the analytic capability is deeper. The reports provide detailed data for analyzing efficiency and comparing the performance of Kaleida’s hospitals with other hospitals nationwide.

Application Case 1.4: *Moneyball:* Analytics in Sports and Movies

**1.** How is predictive analytics applied in *Moneyball*?

The Oakland Athletics hired an assistant general manager with a background in economics and computer expertise. He followed a Sabermetric approach, which uses baseball statistics to analyze the game. He built a prediction model that selected players based on their on-base percentage, which measures how often a batter reaches base for any reason other than fielding error, fielder’s choice, dropped or uncaught third strike, fielder’s obstruction, or catcher’s interference. This strategy built a team that won 20 consecutive games and set a league record.

**2.** What is the difference between objective and subjective approaches in decision making?

Subjective decision making relies on experience and intuition; in this case, the team’s scouts applied their experience to select players. An objective approach identifies measures associated with success to create a predictive model for decision making based on data.

Application Case 1.5: Analyzing Athletic Injuries

**1.** What types of analytics are applied in the injury analysis?

The analytics used data about the type of injury, action taken, healing start and end dates, players’ position, activity, onset, and game location. The data were used to classify healing time into five periods and to associate healing time with players’ positions, severity of injury, and treatment offered. That provided information for creating neural network models using player and injury data to predict healing time in terms of the five categories.

**2.** How do visualizations aid in understanding the data and delivering insights into the data?

Visualizations provide a great tool for gaining the initial insights into data, which can be further refined based on expert opinions. Visualizations also aid in generating ideas for obscured business problems, which can be pursued in building predictive models.

**3.** What is a classification problem?

Classification is a technique used in developing predictive analytical applications. In this example, various kinds of data, such as severity of injury and healing time, were classified for purposes of making decisions about how to handle injuries and which players might be available to play in the future.

**4.** What can be derived by performing sequence analysis?

Drawing sequence rules can predict the relationship among types of data—in this case, the relationship among the injuries and the various body parts afflicted with injuries.

Application Case 1.6: Industrial and Commercial Bank of China (ICBC) Employs Models to Reconfigure Its Branch Network

**1.** How can analytical techniques help organizations to retain competitive advantage?

In this case, analytical techniques use geographic and customer behavioral segmentation to isolate the profitability of customers and employ optimization techniques to locate the branches that deliver high profitability in each geographic segment. Encourage students to apply this example to the basics of competition in business: Organizations that know their customers better can better target their goods and services. They can operate more efficiently. They can sell the most profitable products to the most profitable customers. In these ways, they can outperform the competition.

**2.** How can descriptive and predictive analytics help in pursuing prescriptive analytics?

Descriptive analytics tell the organization what is happening, and predictive analytics tell what is likely to happen. When an organization has a good view of what is happening and what is likely to happen, it can also employ other techniques—prescriptive analytics—to make the best decisions under the circumstances. According to one view, these types of analytics are somewhat independent steps, with one type of analytics leading to another. In another view, the types of analytics overlap somewhat.

**3.** What kinds of prescriptive analytic techniques are employed in the case study?

At ICBC, a branch reconfiguration system uses a market potential calculation model, a branch network optimization model, and a branch site evaluation model. The branch network optimization model uses mixed integer programming to locate branches where they cover the areas with the largest market potential. Using the model’s recommendations has increased deposits in the branches by $21.2 billion.

**4.** Are the prescriptive models once built good forever?

No, because conditions change, and new knowledge can improve a model. In the ICBC example, the branch reconfiguration tool has been improved through an iterative process.

Application Case 1.7: Gilt Groupe’s Flash Sales Streamlined by Big Data Analytics

**1.** What makes this case study an example of Big Data analytics?

Big Data is data that cannot be stored in a single storage unit and typically is arriving in many different forms or in a stream. Although the case does not describe the volume of data that Gilt Groupe is analyzing, it does say the company is receiving a stream of data because it is measuring every click on the company’s website, as well as references to Gilt on Twitter. Also, the software the company uses is based on Teradata Aster’s technology solution that includes Big Data analytics technologies.

**2.** What types of decisions does Gilt Groupe have to make?

Gilt Groupe must decide what to order—both the selection of brands and styles and the quantity of each item—to minimize inventory costs. It makes personalized recommendations, so it needs to decide what items to recommend to each customer. It needs to decide on the timing of e-mails that communicate the offers.

ANSWERS TO END OF CHAPTER QUESTIONS FOR DISCUSSION• • •

1. Give examples for the content of each cell in Figure 1.2.
   * Structured/Operational: Ordering materials to maintain an appropriate inventory level
   * Semistructured/Operational: Bond trading
   * Unstructured/Operational: Selecting a location for the company picnic
   * Structured/Managerial: Selecting the optimum mix of financial investments
   * Semistructured/Managerial: Planning a consumer marketing campaign
   * Unstructured/Managerial: How should offices be arranged in a new building?
   * Structured/Strategic: Deciding how to finance a take-over offer
   * Semistructured/Strategic: Which applicant should be chosen as the new CFO?
   * Unstructured/Strategic: Writing a corporate mission statement

(Other correct examples are possible.)

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

There is no single correct answer to this question. Answers will depend on when the question is posed and on the student’s online or library search strategy. The correctness of an answer can be evaluated by examining the sources cited in it or submitted with it.

1. Observe an organization with which you are familiar. List three decisions it makes in each of the following categories: strategic planning, management control (tactical planning), and operational planning and control.

There is no single correct answer to this question. Answers will depend on the organization that the student observes. The correctness of an answer can be evaluated by comparing characteristics of the nine decisions with the criteria in Section 1.5 for the levels in which they are placed.

**4.** Distinguish BI from DSS.

* + BI uses a data warehouse, whereas DSS can use any data source (including a data warehouse).
  + Most DSS are built to support decision making directly, whereas most BI systems are built to provide information which it is believed will lead to improved decision making.
  + BI has a strategy/executive orientation whereas DSS are usually oriented toward analysts.
  + BI systems tend to be developed with commercially available tools, whereas DSS tend to use more custom programming to deal with problems that may be unstructured.
  + DSS methodologies and tools originated largely in academia, whereas BI arose largely from the software industry. Many BI tools, such as data mining and predictive analysis, have come to be considered DSS tools as well.

**5.** Compare and contrast predictive analytics with prescriptive and descriptive analytics. Use examples.

Predictive analytics is the use of statistical techniques and data mining to determine what is likely to happen in the future. For example, an airline might use predictive analytics to forecast the impact on sales and profits if it raises baggage fees by $10. It applies information from descriptive analytics, applying historical or real-time data to know what is happening in the organization and understand some underlying trends and causes of such occurrences. In the airline example, descriptive analytics would include data about ticket prices, baggage fees, ticket sales, baggage volume, and so on, applied to find relationships among these variables. Predictive analytics may be applied to prescriptive analytics, which is a set of techniques that use descriptive data and forecasts to identify the decisions most likely to result in the best performance. For example, predictive analytics could forecast the impact on profits of different baggage fees. It might show, for example, that raising baggage fees by $5 will lead to the greatest profits after the airline takes into account fee revenues, ticket sales, the amount of baggage carried, and the cost to transport the baggage. (Students may use different examples, as long as they illustrate the definitions.)

ANSWERS TO END OF CHAPTER APPLICATION CASE QUESTIONS• •

**1.** Why did Nationwide need an enterprise-wide data warehouse?

With more than 100 business units offering a variety of products, Nationwide experienced duplication of effort in gathering data, analyzing it, and generating reports. Data-processing environments were widely dissimilar, and there was extreme data redundancy, resulting in higher expenses. Mergers and acquisitions only added to the difficulty and cost. A single, authoritative data warehouse would apply best practices and provide clean, consistent, and complete data.

**2.** How did integrated data drive the business value?

Integrated data about customers improved marketing campaigns and better targeted communications, which improved customer satisfaction and retention, as well as contributing to a gain in sales. Integrated financial data made financial reporting faster and more efficient and added tools for better risk assessment and decision support. Integrated data following mergers fostered smoother integration of businesses. Integrated data for reporting gave agents easy access to reports within seconds rather than days, significantly improving productivity.

**3.** What forms of analytics are employed at Nationwide?

It uses the three basic types of business analytics. The company’s data warehouse supports descriptive analytics for all functions. For example, the data describes customer behavior, financial performance, and policy information. It uses predictive analytics in the Customer Knowledge Store to identify the kinds of customer interaction that are important for customers at different points in their lives. At the level of prescriptive analytics, the Financial Performance Management system applies financial data to a decision support system. (Students may identify additional examples of these three categories.) Optionally, students may also refer to analytics applied to different domains, such as marketing analytics, financial analytics, and even insurance analytics.

**4.** With integrated data available in an enterprise data warehouse, what other applications could Nationwide potentially develop?

This would be a good question for class discussion, as answers will vary, and students can apply any work experience they have, including internships, as well as the cases in this chapter, to identify areas of business where analytics adds value. The case described customer relationships and financial reporting. Other areas of decision making for an insurance business would include the development and pricing of products, regulatory compliance, hiring, risk management, and the location of facilities. Accept any reasonable answers.

1. The acronym *DSS* is treated as both singular and plural throughout this book. Similarly, other acronyms, such as *MIS* and *GSS*, designate both plural and singular forms. [↑](#footnote-ref-1)