Decision Support Systems

- In reality, any technology-based system that helps you make decisions could be classified as a decision support system; even something as simple as an inventory report that highlights inventory with low stock can be called a decision support system. However, in the IT field there is a long-standing definition of what constitutes a decision support system.

- A Decision Support System (DSS) is a highly flexible and interactive system that is designed to support decision making *when the situation included nonstructured elements*. Thus, a DSS is definitely a part of the analytics professional’s tool set. The primary objective of a DSS include providing you with:
  1. A simple and easy-to-use graphical user interface (GUI)
  2. Access to large amounts of information
  3. Models and tools (statistical and analytical) that you can use to massage the information.

- So, DSS typically has three components, with each focusing on one of the three objectives above. See Figure 4.4. As we discuss these components, think of Microsoft Excel. Excel is perhaps the most powerful and easy-to-use analytics tools you can use.

![Figure 1.4: Components of a Decision Support System](image-url)
Components of a Decision Support System [Page 101]

1. **User Interface Management Component** [Page 101]
   - The component that allows you to communicate with the DSS.
   - It is the part of the DDS you see. Through it you enter the commands, information, and models.
   - For Excel, the user interface management component includes things like buttons, menu options, formulas and functions, your ability to enter information into cells, and your ability to manipulate and change the properties of a graph or table.
   - In a digital dashboard, a type of DSS, you can easily click on a graph of sales by year and see further detail that might include a graphical depiction of sales by month.
   - Whatever the case, the user interface of a DSS should be easy-to-use and intuitive.

2. **Data Management Component** [Page 101]
   - Performs the functions of storing and manipulating information you want your DSS to use.
   - In Excel, you can build, store, and retrieve workbooks, and each workbook can contain many worksheets. Also, you can import data from a variety of other resources like a database or perhaps external information in an XML format, common what is find now on the Web.
   - Information is key in the world of analytics, as it is the basis from which you will generate business intelligence. Information you use in your DSS comes from one or more of three sources:
     1. *Organizational information*: Comes from your company’s databases, data warehouses, and a host of specialized systems such as CRM and SCM.
     2. *External information*: Input that comes from external sources, such as government or Internet.
     3. *Personal information*: Decision maker’s own insights, experience into your DSS.

3. **Model Management Component**
   - The *Model Management Component* consists of a wide variety of statistical and analytical tools, techniques, and models.
• The tools, techniques, and models you choose to use will vary greatly depending of the decision-making at hand.

• Think of Excel. It contains basic descriptive statistic tools, goal-seek, solver, financial functions, math and trigonometry functions, engineering functions, and a host of others too many to mention.

• You can even create your own models by writing macros in Visual Basic directly in Excel.

**Geographic Information Systems** [Page 103]

• GIS is a DSS designed to analyze spatial information. **Spatial information** is any kind of information that can be shown on a map form, such as roads, buildings, cell towers, the path of a hurricane, railroads, or the path of a river.

• GISs are an important addition to the analytics tool set.

• Business uses GIS to analyze information, generate BI, and make decisions.

• When business uses GIS to generate maps showing information of interest, we call it **business geography**. Business geography has many dimensions or layers called themes. With themes, you can show any combination of layers you need according to the decision at hand.

• In Figure 4.5, you can see a GIS through Google Earth showing Eiffel Tower in Paris. In the bottom left corner, you can see various options (like Places), all of which represent themes. By selecting or unselecting the various options, information will appear or disappear on the screen.

• GIS information is becoming increasingly interesting to the business world, especially for those companies that have individual consumers like you and me. Recall social locationing and location-based services in Chapter 2. Social locationing systems are in fact GIS systems that use GPS technology to gather information regarding people’s location.

• When knowing where you are, companies can offer you discounts and special deals in surrounding area.

• Companies employ GIS and other sophisticated analytics to predict consumer movement, indentify the best places for new stores, and a host of other GIS-related activities.
Data-Mining Tools and Models [Page 104]

- In Chapter 3, we discussed several of the many data-mining tools commonly associated with data warehouses. However, the complete and broad spectrum of data-mining tools and models are not just limited to their application in a data warehouse environment. To categorize all data-mining tools and models, we offer the following:
  1. Databases and DBMSs—the heart of every organization and any analytics initiative. These help gather, store, and organize a wealth of information from which business intelligence can be derived.
  2. Query-and-reporting tools—similar to QBE tools, SQL, and report generators in the typical database environment (we discussed them in Chapter 3).
  3. Multidimensional analysis (MDA) tools—slice-and-dice techniques that allow you to view multidimensional information from different perspectives (Chapter 3).
  4. Digital dashboards—display key information gathered from several sources on a computer screen in a format tailored to the needs and wants of an individual knowledge worker (Chapter 3).
5. Statistical tools—help you apply various mathematical models to information to discover new information.

6. GISs—decision support systems designed specifically to analyze spatial information.

7. Specialized analytics (such as predictive analytics and text analytics)—these have broad application to all industries and a variety of business domains.

8. Artificial intelligence—the science of making machines imitate human thinking and behavior.

- We are already familiar with the first five, as we covered them in Chapter 3. Also, you have probably already completed a course in statistics which included things like descriptive statistics, probability, hypothesis testing, ANOVA, regression, and chi-square tests. In the rest of this section we will cover predictive analytics and text analytics, two highly specialized analytics tools that the business world is quickly embracing.

- In terms of decision making, each and all of the data-mining tools and models in the list above are designed to help you with intelligence-related tasks such as:

1. **Association or Dependency Modeling**—for example, a grocery store may find that one product is mostly bought in conjunction with another product. Think of how powerful this type of business intelligence is in terms of coupon offerings and cross-selling opportunities, not to mention recommendation engine effectiveness.

2. **Clustering**—discovering groups of entities (such as customers) that are similar without using any a priori and known structures.

3. **Classification**—also known as prediction (although the two are not the same). Here, you attempt to evaluate historical, known data to derive future inferences that can be applied to newly gathered or perhaps future data.

4. **Regression**—the goal here is to find corollary and often causal relationships between sets of data.

5. **Summarization**—this is the most basic, yet often the most powerful, form of data mining. Sums, averages, standard deviations, histograms, frequency distributions, and many other forms of descriptive statistics can be very revealing, often eliminating the need to perform any further data mining.