

CHAPTER 5



Business Analytics

CHAPTER OUTLINES

1. Managers and Decision Making
2. The Business Analytics Process
3. Business Analytics Tools
4. Business Analytics Models: Descriptive Analytics, Predictive Analytics, and Prescriptive Analytics



LEARNING OBJECTIVES

1. Use a decision support framework to demonstrate how technology supports managerial decision making at each phase of the decision-making process.
 2. Describe each phase of the business analytics process.
 3. Describe each of the various analytics tools and examples of their uses.
 4. Provide a definition and a use case example for descriptive analytics, predictive analytics, and prescriptive analytics.
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- **Business Analytics (BA)**

- the process of developing actionable decisions or recommendations for actions based on insights generated from historical data. Business analytics examines data with a variety of tools and techniques, formulates descriptive, predictive, and prescriptive models, and communicates these results to organizational decision makers.

- **Business Intelligence (BI)**

- has been defined as a broad category of applications, technologies, and processes for gathering, storing, accessing, and analyzing data to help business users make better decisions. Many experts argue that the terms should be used interchangeably.

- **BA versus BI**

5.1 Managers and Decision Making

- The Manager's Job and Decision Making
- Why Managers Need IT Support
- A Framework for Computerized Decision Analysis

The Manager's Job and Decision Making


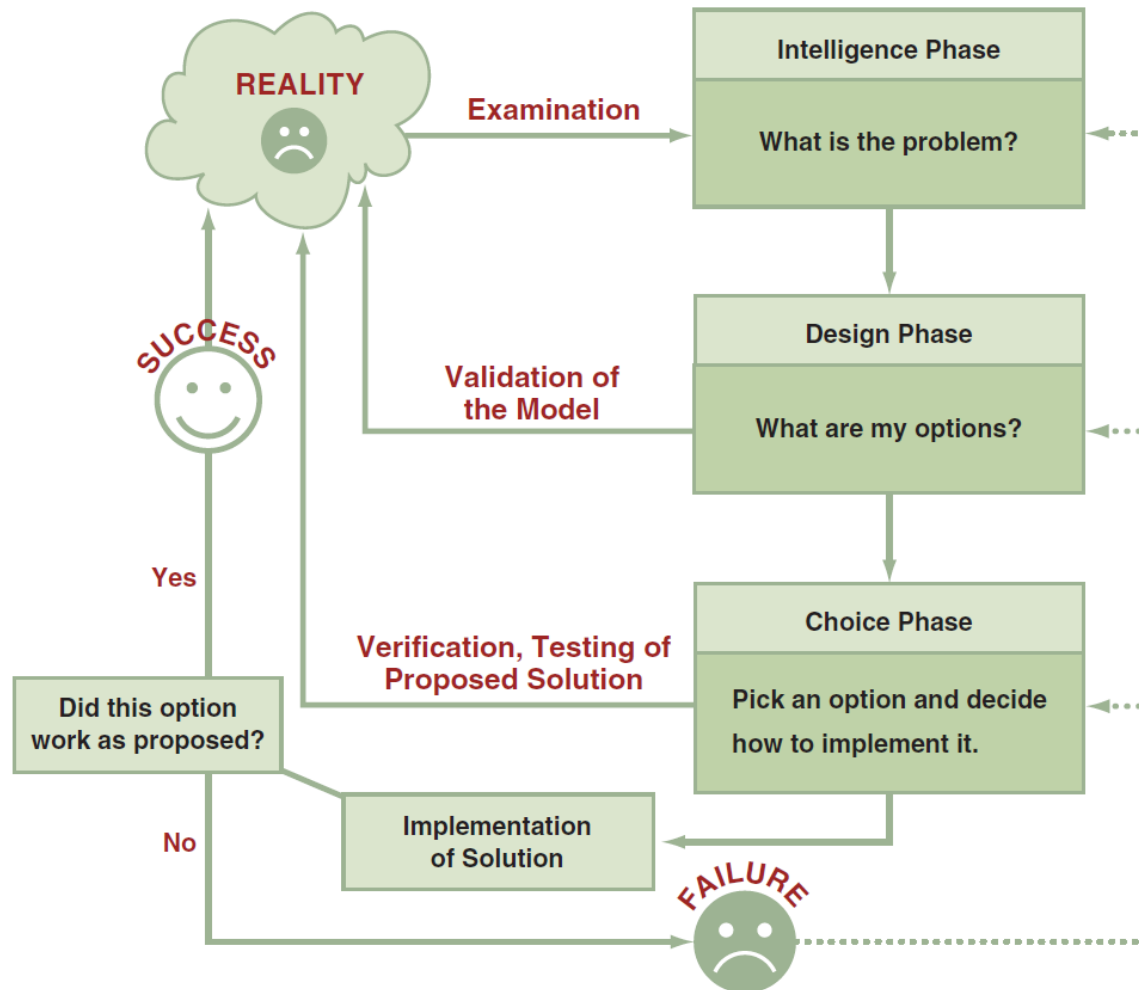
- **Management**
 - a process by which an organization achieves its goals through the use of resources (people, money, materials, and information).
 - **Productivity**
 - The ratio between the inputs and outputs is an indication of the organization's productivity, and is often used to measure a manager's success.
 - **Three Basic Roles of Managers**
 1. *Interpersonal roles*: figurehead, leader, liaison
 2. *Informational roles*: monitor, disseminator, spokesperson, analyzer
 3. *Decisional roles*: entrepreneur, disturbance handler, resource allocator, negotiator
 - **Decision**
 - refers to a choice among two or more alternatives that individuals and groups make. Decisions are diverse and are made continuously. Decision making is a systematic process.
 - **Four Phases of Decision Making**
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Figure 5.1: The Process and Phases in Decision Making



Four Phases of Decision Making

- **Intelligence Phase:** managers examine a situation and then identify and define the problem or opportunity.
 - **Design Phase:** decision makers construct a model for addressing the situation. They perform this task by making assumptions that simplify reality and by expressing the relationships among all of the relevant variables. Managers then validate the model by using test data. Finally, decision makers set criteria for evaluating all of the potential solutions that are proposed.
 - **Choice Phase:** involves selecting a solution or course of action that seems best suited to resolve the problem. This solution (the decision) is then implemented.
 - **Implementation Phase:** is successful if the proposed solution solves the problem or seizes the opportunity. If the solution fails, then the process returns to the previous phases. Computer-based decision support assists managers in the decision-making process.
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Why Managers Need IT Support

- The number of alternatives is constantly increasing
 - Most decisions are made under time constraints
 - Increased uncertainty requires sophisticated analyses
 - Group decision making required without incurring major expenses
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A Framework for Computerized Decision Analysis

- **Problem Structure**
 - where decision-making processes fall along a continuum ranging from highly structured to highly unstructured.
 - **The Nature of Decisions**
 - All managerial decisions fall into one of three broad categories:
 - Operational Control
 - Management Control
 - Strategic Planning
 - **Decision Matrix**
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Figure 5.2: Decision Support Framework

THE NATURE OF DECISIONS				
PROBLEM STRUCTURE		Operational Control	Management Control	Strategic Planning
	Structured	Accounts receivable Accounts payable Order entry 1	Budget analysis Short-term forecasting Personnel reports Make-or-buy analysis 2	Financial management Investment portfolio Warehouse location 3
	Semistructured	Production scheduling, Inventory control 4	Credit evaluation Budget preparation Plant layout Project scheduling Reward system Design 5	Building a new plant Mergers and acquisitions New product planning Compensation planning HR policies 6
	Unstructured	Building software Approving loans Operating a help desk 7	Negotiating Recruiting an executive Lobbying 8	R & D planning New technology development Social responsibility planning 9

5.2 The Business Analytics Process

- **Business analytics (BA):**
 - the process of developing actionable decisions or recommendations for actions based on insights generated from historical data.
 - Business analytics examines data with a variety of tools and techniques, formulates descriptive, predictive, and prescriptive models, and communicates these results to organizational decision makers.
 - Business analytics encompasses not only applications, but also technologies and processes.
 - It includes both “getting data in” (to a data mart or warehouse) and “getting data out” (through BA applications).
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Figure 5.3: The Business Analytics Process

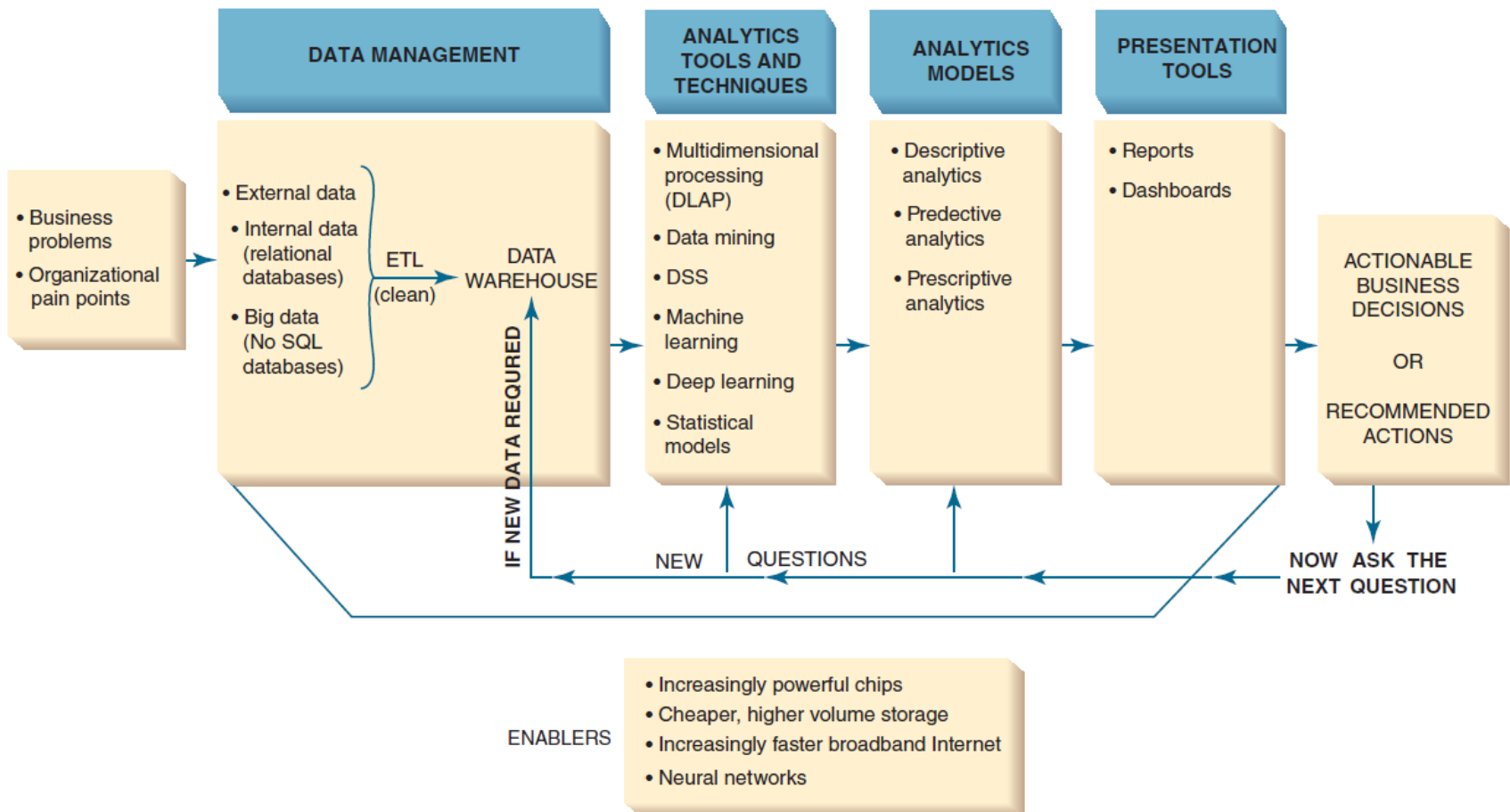


FIGURE 5.3 The Business Analytics Process

The Scope of Business Analytics

- The Development of One or a Few Related Analytics Applications
 - The Development of Infrastructure to Support Enterprisewide Analytics
 - Support for Organizational Transformation
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5.3 Business Analytics Tools

- **Excel**
 - The most popular BA tool by far is Excel. For years, BA vendors “fought” against the use of Excel. Eventually, however, they decided to “join it” by designing their software so that it interfaces with Microsoft Excel. Users download plug-ins that add functionality (e.g., the ability to list the top 10 percent of customers, based on purchases) to Excel
 - Pivot Table
- **Multidimensional Analysis or Online Analytical Processing**
 - Involves “slicing and dicing” data stored in a dimensional format, drilling down in the data to greater detail, and aggregating the data.
- **Data Mining**
 - refers to the process of searching for valuable business information in a large database, data warehouse, or data mart. Data mining can perform two basic operations: (1) predicting trends and behaviors and (2) identifying previously unknown patterns. Business analytics applications typically provide users with a view of what has happened; data mining helps to explain why it is happening, and it predicts what will happen in the future.

Data Mining

- Two Basic Data Mining Operations
 - Predicting trends and behaviors
 - data mining automates the process of finding predictive information in large databases.
 - *targeted marketing*
 - forecasting of bankruptcy and other forms of default
 - detecting fraudulent credit card transactions
 - Identifying previously unknown patterns
 - It can analyze retail sales data to discover seemingly unrelated products that people often purchase together.
 - Data mining found that young men tend to buy beer and diapers at the same time when shopping at convenience stores.
 - the purpose of data mining is to identify a business opportunity in order to create a sustainable competitive advantage.
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Data-Mining Applications Used in Business and Other Fields

- Retailing and Sales
 - Predicting sales, preventing theft and fraud, and determining correct inventory levels and distribution schedules among outlets.
 - Banking
 - Forecasting levels of bad loans and fraudulent credit card use, predicting credit card spending by new customers, and determining which kinds of customers will best respond to (and qualify for) new loan offers.
 - Manufacturing & Production
 - Predicting machinery failures and finding key factors that help optimize manufacturing capacity.
 - Insurance
 - Forecasting claim amounts and medical coverage costs, classifying the most important elements that affect medical coverage, and predicting which customers will buy new insurance policies
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Data-Mining Applications Used in Business and Other Fields

- Policework
 - Tracking crime patterns, locations, and criminal behavior; identifying attributes to assist in solving criminal cases.
 - Healthcare
 - Correlating demographics of patients with critical illnesses and developing better insights on how to identify and treat symptoms and their causes.
 - Marketing
 - Classifying customer demographics that can be used to predict which customers will respond to a mailing or buy a particular product.
 - Politics
 - In his FiveThirtyEight blog, Nate Silver famously analyzed polling and economic data to predict the results of the 2008 presidential election, calling 49 out of 50 states correctly.
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Data-Mining Applications Used in Business and Other Fields

- Weather
 - The National Weather Service is predicting weather with increasing accuracy and precision.
 - Higher Education
 - Desire2Learn (www.desire2learn.com) provides an application called Degree Compass that recommends courses based on students' majors, transcripts, and past course success rates.
 - Social Good
 - Simpa Networks sells solar-as-a-service to poor households and small businesses. Simpa partnered with DataKind (www.datakind.org) whose data scientists analyzed Simpa's historical customer data to help Simpa assess potential customers.
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Decision Support Systems (DSS)

- They combine models and data to analyze semistructured problems and some unstructured problems that involve extensive user involvement. *Decision support systems* enable business managers and analysts to access data interactively, to manipulate these data, and to conduct appropriate analyses.
 - they have the related capabilities of sensitivity analysis, what—if analysis, and goal-seeking analysis
 - **Sensitivity Analysis**
 - Sensitivity analysis is the study of the impact that changes in one or more parts of a decision-making model have on other parts.
 - **What-If Analysis**
 - A model builder must make predictions and assumptions regarding the input data, many of which are based on the assessment of uncertain futures. The results depend on the accuracy of these assumptions, which can be highly subjective.
 - **Goal-Seeking Analysis**
 - represents a “backward” solution approach. It attempts to calculate the value of the inputs necessary to achieve a desired level of output.
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5.4 Business Analytics Models: Descriptive, Predictive, and Prescriptive Analytics

- Data Reduction: the conversion of raw data into a smaller amount of more useful information.
- Descriptive Analytics
 - summarize what has happened in the past and allow decision makers to learn from past behaviors. Common examples of descriptive analytics are reports that provide historical insights regarding an organization's production, financials, operations, sales, finance, inventory, and customers.
 - Fandango (www.fandango.com), the leading online ticket seller for movie theaters, which sells millions of tickets to approximately 20,000 movie theaters across the United States
 - Fandango captures data about customers, movie theaters, ticket sales, and show times.
 - Fandango analysts can investigate the correlations among total sales for different movies. Using a sample of moviegoers, they can calculate the average ticket sales for a week, the most popular movie, the distribution of customers among the movie genres, the busiest hours of the day in the movie theater, and many other analyses.
 - These descriptive analyses help Fandango set ticket prices, offer discounts for certain movies or show times, and assign show times of the same movie in different theaters

5.4 Business Analytics Models: Descriptive, Predictive, and Prescriptive Analytics

- **Predictive Analytics**

- utilize a variety of analytics techniques and tools to examine recent and historical data in order to detect patterns and predict future outcomes and trends. Predictive analytics provide estimates about the likelihood of a future outcome.
- Tesco (www.tesco.com)
 - predicts which discounts will be redeemed in order to target more than 100 million personalized coupons annually at cash registers in 13 countries. This process increased coupon redemption rates by a factor of 3.6 over previous
- dating companies Match (www.match.com), OKCupid (www.okcupid.com), and eHarmony (www.eharmony.com) methods.
 - predict which prospect on your screen will be the most compatible with you.
- Allstate Insurance
 - tripled the accuracy of predicting bodily injury liability from car crashes based on the characteristics of the insured vehicle. This process results in approximately \$40 million annual savings.
- Stanford University data scientists
 - used predictive analytics to diagnose breast cancer better than human physicians by discovering an innovative method that takes into account a greater number of contributing factors in a tissue sample.

5.4 Business Analytics Models: Descriptive, Predictive, and Prescriptive Analytics

- **Prescriptive Analytics**

- go beyond descriptive and predictive models by recommending one or more courses of action and showing the likely outcome of each decision. Predictive analytics does not predict one possible future, but rather multiple future outcomes based on the decision maker's actions.
- Prescriptive analytics attempt to quantify the effect of future decisions in order to advise on possible outcomes before the decisions are actually made.
- Prescriptive analytics requires a predictive model with two additional components: actionable data and a feedback system that tracks the outcome produced by the action taken.
- Fandango
 - The company uses prescriptive analytics to be able to change ticket price offerings every hour. Fandango has learned when the most desirable movie times are by analyzing millions of show times instantaneously. This data is then used to set an optimal price at any given time, based on the supply of show times and the demand for movie tickets. This process maximizes profits.

5.4 Business Analytics Models: Descriptive, Predictive, and Prescriptive Analytics

- **Data Visualization:**
 - data presented to users in visual formats such as text, graphics, and tables following data processing. Data Visualization makes IT applications more attractive and understandable to users.
 - Dashboard:
 - provides easy access to timely information and direct access to management reports. They evolved from executive information systems, which were information systems designed specifically for the information needs of top executives
 - Geographic Information System (GIS):
 - a computer based system for capturing, integrating, manipulating, and displaying data using digitized maps. Its most distinguishing characteristic is that every record or digital object has an identified geographical location. This process, called geocoding, enables users to generate information for planning, problem solving, and decision making.
 - **Real-Time Business Analytics:**
 - includes the use of real time data for analysis as it is created rather than using historical data for analysis.
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Presentation Tools

- Dashboards
- Geographic Information Systems

Table 5.1: The Capabilities of Dashboards

TABLE 5.1 The Capabilities of Dashboards

Capability	Description
Drill down	The ability to go to details, at several levels; it can be done by a series of menus or by clicking on a drillable portion of the screen.
Critical success factors (CSFs)	The factors most critical for the success of business. These can be organizational, industry, departmental, or for individual workers.
Key performance indicators	The specific measures of CSFs.
Status access	The latest data available on KPI or some other metric, often in real time.
Trend analysis	Short-, medium-, and long-term trend of KPIs or metrics, which are projected using forecasting methods.
Exception reporting	Reports highlight deviations larger than certain thresholds. Reports may include only deviations.

Figure 5.3: Sample Performance Dashboard

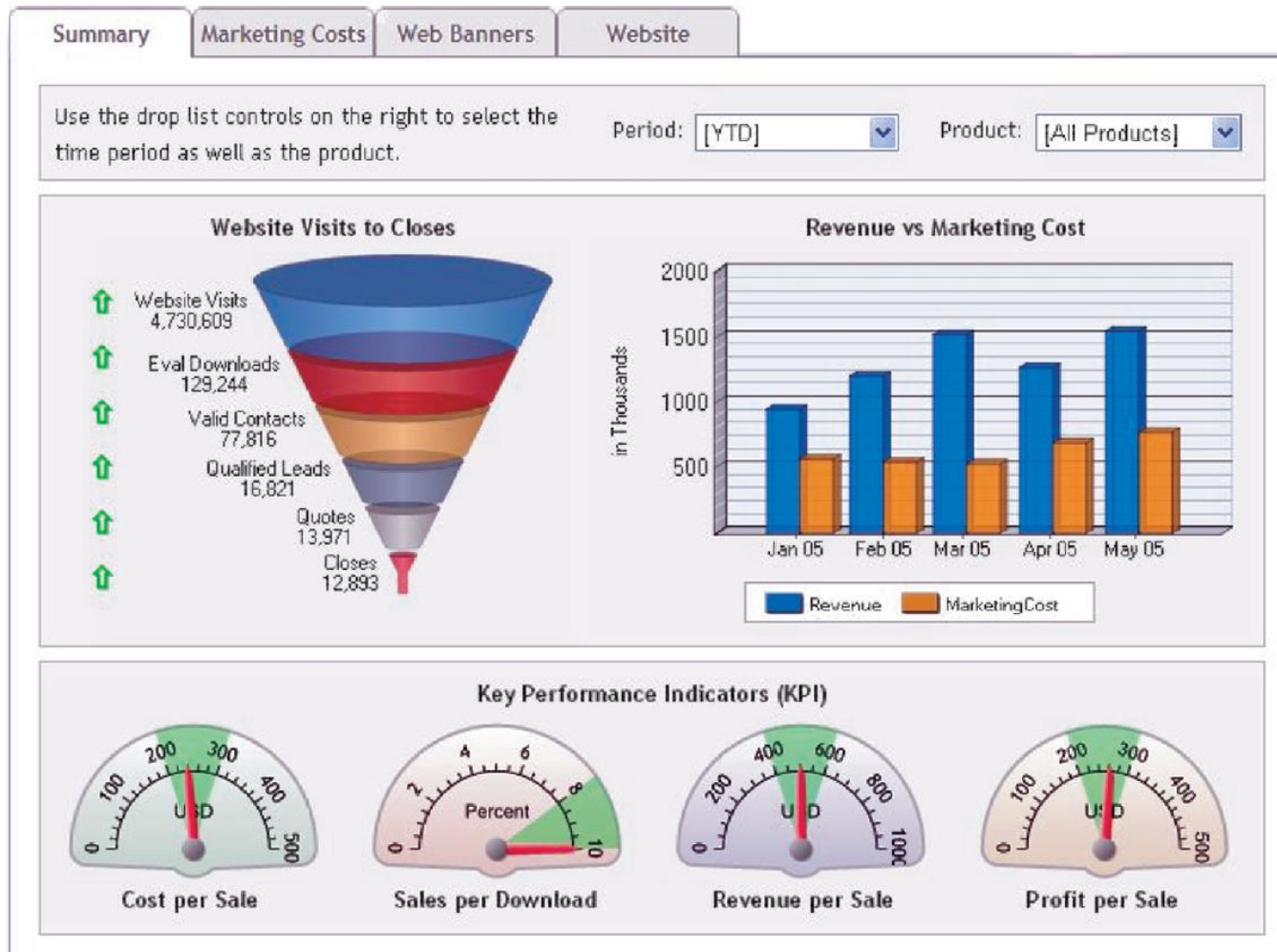
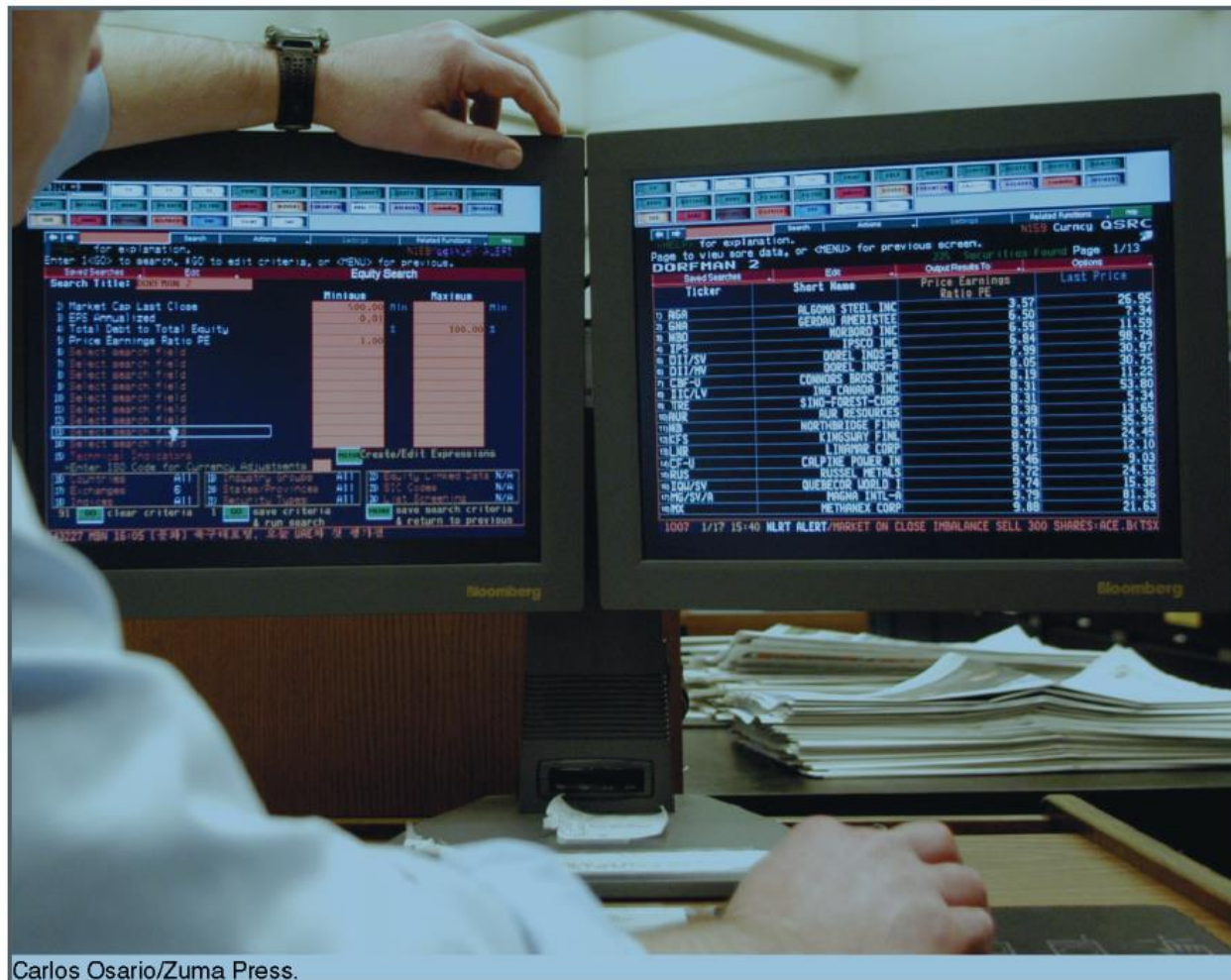


Figure 5.5: Bloomberg Terminal



Carlos Osario/Zuma Press.

Figure 5.6: Management Cockpit



The Management Cockpit is a registered trademark of SAP, created by Professor Patrick M. Georges.