CHAPTER

Business Intelligence

1. Managers and Decision Making
2. What Is Business Intelligence?
3. Business Intelligence Applications for Data Analysis
4. Business Intelligence Applications for Presenting Results

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).

- **Three Basic Roles of Managers (Mintzberg, 1973):**

1. ***Interpersonal roles*:** figurehead, leader, liaison
2. ***Informational roles*:** monitor, disseminator, spokesperson, analyzer
3. ***Decisional roles*:** entrepreneur, disturbance handler, resource allocator, negotiator

- **Decision is** 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.

The Process and Phases in Decision Making

Phases of the Decision Making Process:

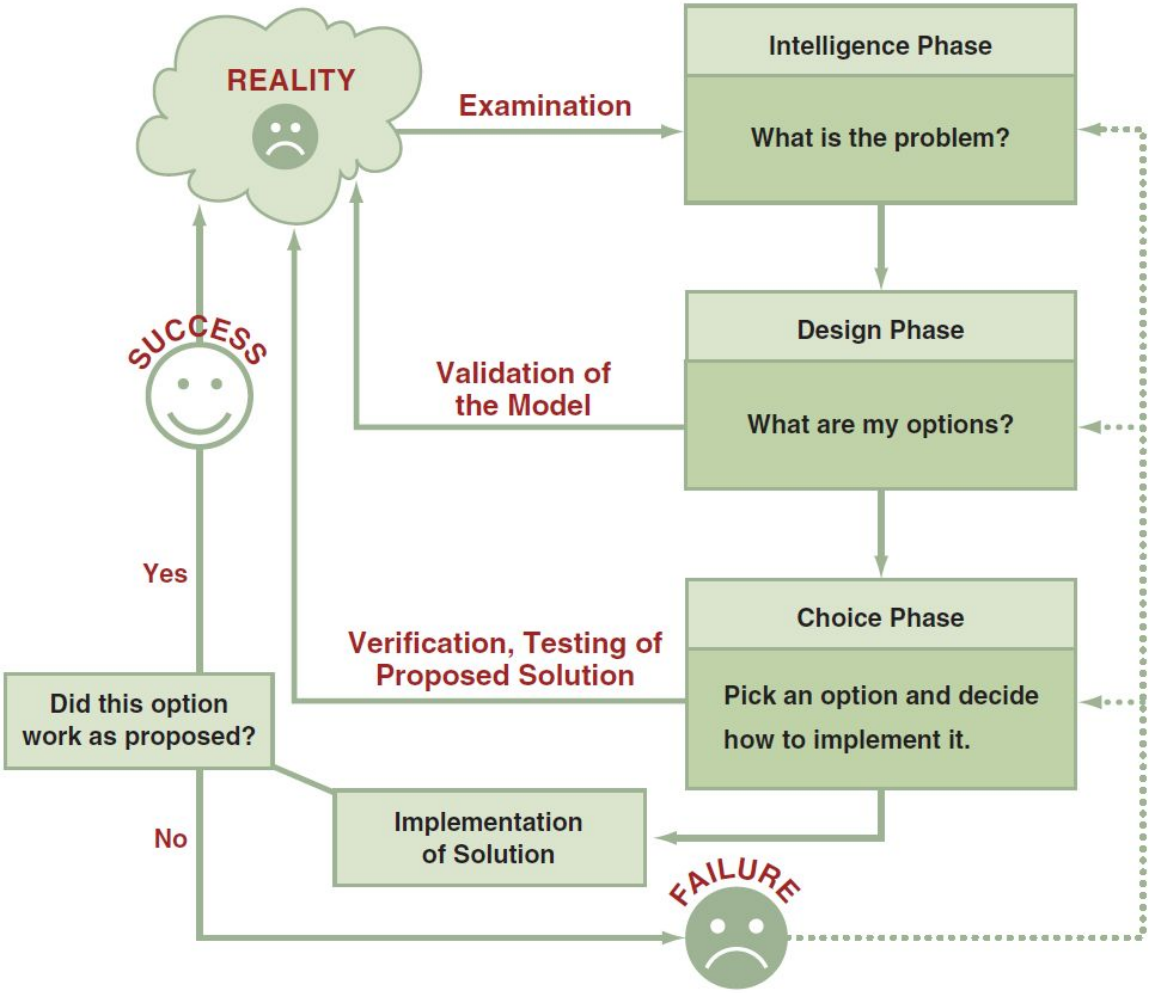
- **Intelligence Phase:** managers examine a situation and then identify and define the problem or opportunity.

- **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.

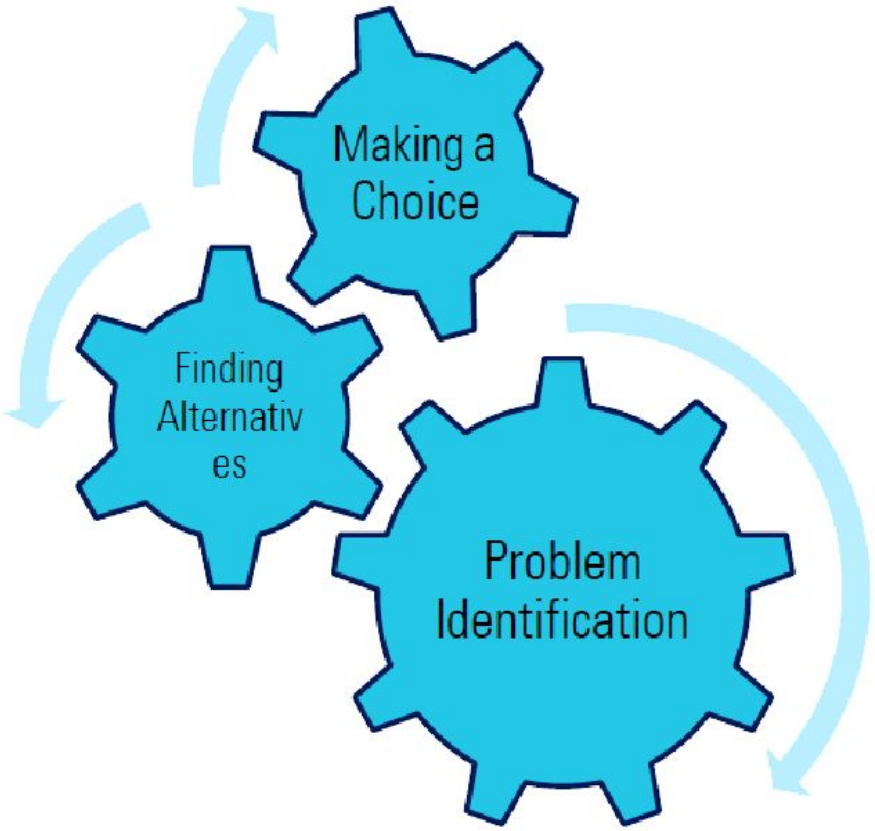
- **Choice Phase:** involves selecting a solution or course of action that seems best suited to resolve the problem. This solution (the decision) is then implemented.

- **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.

The Process and Phases in Decision Making



Decision Making Basics



"Information and knowledge form the backbone of the decision making process"

Why Managers Need IT Support?

Decision making is difficult due to the following trends:

- The number of alternatives is constantly increasing
- Most decisions are made under time constraints
- Uncertainty in the decision environment
- Group decision making required

What IT are Available to Support Managers

- **Business Intelligence (BI):** is a broad category of applications, technologies, and processes for gathering, storing, accessing, and analyzing data to help business users make better decisions.
- BI applications enable decision makers to quickly ascertain the status of a business enterprise by examining key information.

A Framework for Computerized Decision Analysis

Problem Structure: where decision-making processes fall along a range from highly structured to highly unstructured.

Nature of Decisions:

- All managerial decisions fall into one of three broad categories:
  - **Operational Control:** executing specific tasks efficiently and effectively.
  - **Management Control:** acquiring and using resources efficiently in accomplishing organizational goals.
  - **Strategic Planning:** the long-range goals and policies for growth and resource allocation.

Decision Support Framework

	Operational Control	Management Control	Strategic Planning	IS Support
Structured	Accounts receivable, order entry 1	Budget analysis, short-term forecasting, personnel reports, make-or-buy analysis 2	3	MIS, statistical models (management science, financial, etc.)
Semistructured	Production scheduling, inventory control 4	Credit evaluation, budget preparation, plant layout, project scheduling, reward systems design 5	Building a new plant, mergers and acquisitions, planning (product, quality assurance, compensation, etc.) 6	Decision support systems, business intelligence
Unstructured	7	Negotiating, recruiting an executive, buying hardware, lobbying 8	New technology development, product R&D, social responsibility planning 9	Decision support systems, expert systems, enterprise resource planning, neural networks, business intelligence, big data

Problem Structure:

Structured decisions deal with routine and repetitive problems for which standard solutions exist, such as inventory control. In a structured decision, the first three phases of the decision process—intelligence, design, and choice—are laid out in a particular sequence, and the procedures for obtaining the best (or at least a good enough) solution are known.

-Two basic criteria used to evaluate proposed solutions are minimizing costs and maximizing profits.

-These types of decisions are candidates for decision automation.

Unstructured decisions: These decisions are intended to deal with "fuzzy," complex problems for which there are no cut-and-dried solutions.

-An unstructured decision is one in which there is no standardized procedure for carrying out any of the three phases. In making such a decision, human intuition and judgment often play an important role.

-Typical **unstructured decisions** include planning new service offerings, hiring an executive, and choosing a set of research and development (R&D) projects for the coming year.

Although BI cannot make unstructured decisions, it can provide information that assists decision makers

Semistructured decisions require a combination of standard solution procedures and individual judgment.

-Examples of semistructured decisions are evaluating employees, setting marketing budgets for consumer products, performing capital acquisition analysis, and trading bonds

The Decision Matrix: The three primary classes of problem structure and the three broad categories of the nature of decisions can be combined in a decision-support matrix that consists of nine cells, as diagrammed in Figure 12.2.

-Lower-level managers usually perform tasks in cells 1, 2, and 4.

-The tasks in cells 3, 5, and 7 are usually the responsibility of middle managers and professional staff.

-Finally, tasks in cells 6, 8, and 9 are generally carried out by senior executives.

Decision Support Framework

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What is Business Intelligence

Technology that Allows:

- Gathering, storing, accessing & analyzing data to help business users make better decisions

Set of Applications that Allow:

- Decision support systems
- Query and reporting
- online analytical processing (OLAP)
- Statistical analysis, forecasting, and data mining

Help in analyzing business performance through data-driven insight:

- Understand the past & predict the future

The Scope of Business Intelligence

- The use of BI in organizations varies considerably. In smaller organizations, BI may be limited to Excel spreadsheets. In larger ones, BI often is enterprise wide, and it includes applications such as data mining/predictive analytics, dashboards, and data visualization.

- It is important to recognize that the importance of BI to organizations continues to grow.

The Scope of Business Intelligence

BI often is enterprise wide, and it includes applications such as data mining/predictive analytics, dashboards, and data visualization.

In this section you will examine three specific BI targets that represent different levels of change:

- The Development of One or a Few Related BI Applications
- The Development of Infrastructure to Support Enterprise Wide BI
- Support for the Organizational Transformation

The Development of One or a Few Related BI Applications.

- This BI target often is a point solution for a departmental need, such as campaign management in marketing.

- Sponsorship, approval, funding, impacts, and benefits typically occur at the departmental level. For this target, organizations usually create a data mart to store the necessary data.

The Development of Infrastructure to Support Enterprise wide BI.

- This BI target supports both current and future BI needs.

- A crucial component of BI at this level is an enterprise data warehouse. Because it is an enterprisewide initiative, senior management often provides sponsorship, approval, and funding. In addition, the impacts and benefits are felt throughout the organization

Support for Organizational Transformation

- BI is used to fundamentally transform the ways in which a company competes in the marketplace.

- BI supports a new business model, and it enables the business strategy. Because of the scope and importance of these changes, critical elements such as sponsorship, approval, and funding originate at the highest organizational levels.

- The impact on personnel and processes can be significant, and the benefits are organization wide.

IT'S ABOUT BUSINESS 5.1

- **Predicting Airplane Arrivals More Accurately**
  1. Do you think that satellite-based navigation will meet resistance among air traffic controllers? Why or why not?
  2. Do you think that pilots will object to having "smart assistants" help them make decisions? Why or why not?
  3. Do you think the overall response of the airlines to satellite-based navigation and smart assistants for pilots will be positive or negative? Support your answer.
  4. What is the relationship between analytics and smart assistants for pilots?

’S ABOUT BUSINESS 5.2

Cardlytics Analyzes Customer Buying Behaviors


© Juanmonino / iStockphoto

1. Discuss the advantages and disadvantages of Cardlytics’s data analyses for the customer. Use specific examples in your answers.
2. Discuss the advantages and disadvantages of Cardlytics’s data analyses for the merchants. Use specific examples in your answers.

Business Intelligence Applications for Data Analysis

- A good strategy to study the ways in which organizations use business intelligence applications is to consider how the users analyze data, how they present the results of their analyses, and how managers and executives (who can also be users) implement these results.
- As we know that the data are stored in a data warehouse or data mart.
- The user community analyzes these data employing a variety of BI applications given below:
  - Multidimensional Analysis or Online Analytical Processing
  - Data Mining
  - Decision Support Systems

Multidimensional Analysis or Online Analytical Processing

- **Online Analytical Processing** (OLAP - also referred to as **multidimensional analysis)** capabilities.
- OLAP involves "slicing and dicing" data stored in a dimensional format, drilling down in the data to greater detail, and aggregating the data.

Example:Figure 3.5: Relational Databases

(a) 2012

Product	Region	Sales
Nuts	East	50
Nuts	West	60
Nuts	Central	100
Screws	East	40
Screws	West	70
Screws	Central	80
Bolts	East	90
Bolts	West	120
Bolts	Central	140
Washers	East	20
Washers	West	10
Washers	Central	30

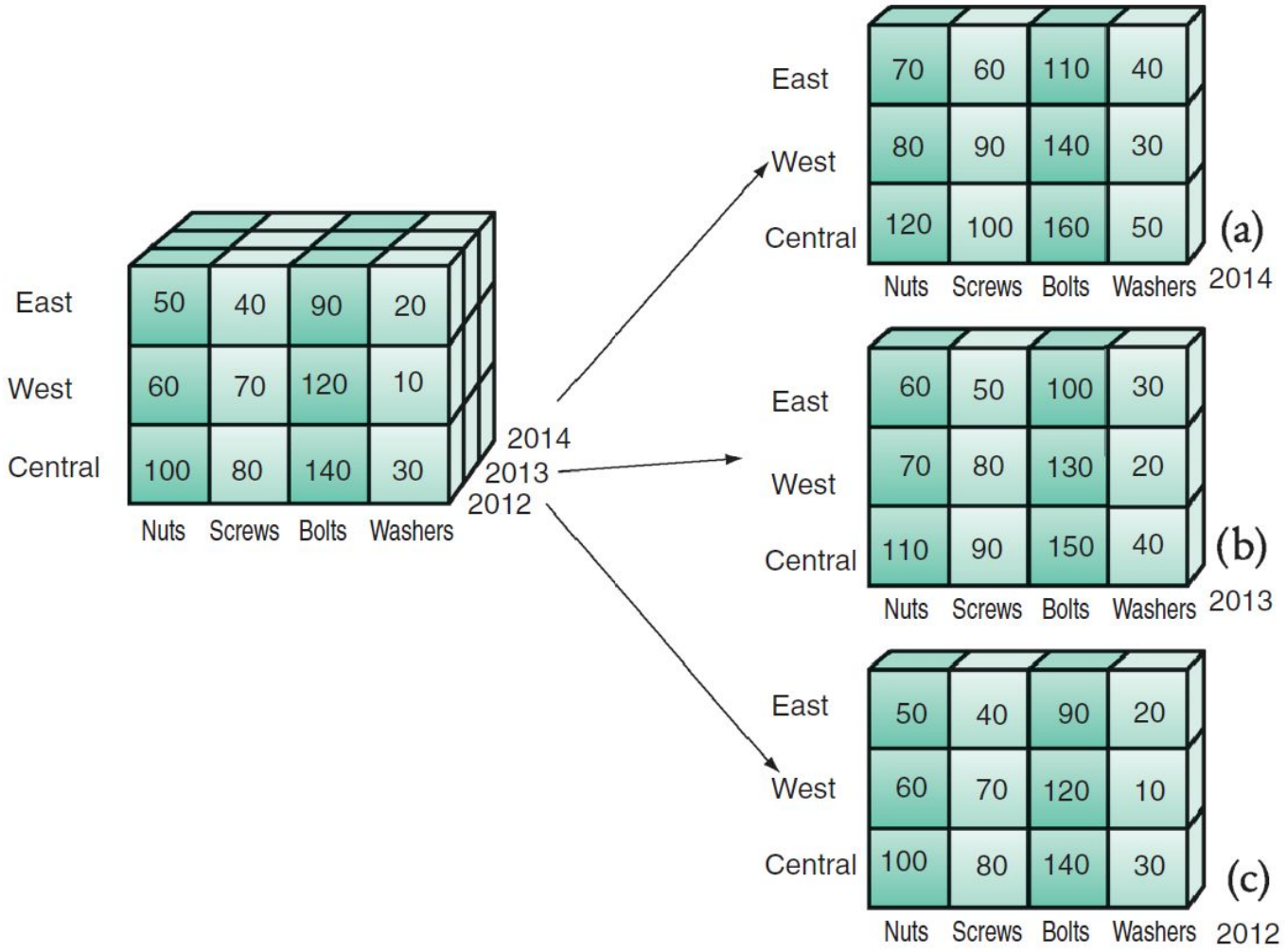
(b) 2013

Product	Region	Sales
Nuts	East	60
Nuts	West	70
Nuts	Central	110
Screws	East	50
Screws	West	80
Screws	Central	90
Bolts	East	100
Bolts	West	130
Bolts	Central	150
Washers	East	30
Washers	West	20
Washers	Central	40

(c) 2014

Product	Region	Sales
Nuts	East	70
Nuts	West	80
Nuts	Central	120
Screws	East	60
Screws	West	90
Screws	Central	100
Bolts	East	110
Bolts	West	140
Bolts	Central	160
Washers	East	40
Washers	West	30
Washers	Central	50

Figure 3.6: Data Cube



Data Mining

- **Data Mining:** 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

  (2) identifying previously unknown patterns

- Elaborate with egs

- Data mining automates the process of finding predictive information in large databases.
- Questions that traditionally required extensive hands-on analysis now can be answered directly and quickly from the data.
- For example, targeted marketing relies on predictive information.
- Numerous data mining applications are used in business and in other fields. According to a Gartner report (www.gartner.com), most Fortune 1000 companies worldwide currently use data mining, as the following representative examples illustrate.
- Note that in most cases the purpose of data mining is to identify a business opportunity to create a sustainable competitive advantage.

- **Retailing and sales**
- **Banking**
- **Manufacturing and production**
- **Insurance**
- **Policework**
- **Healthcare**
- **Marketing**

Decision Support Systems (DSS)

- Decision support systems (DSS) are interactive software-based systems that help managers in decision-making by accessing large volumes of information generated from various related information systems
- DSS uses the summary information, exceptions, patterns, and trends using the analytical models.
- A decision support system helps in decision-making but does not necessarily give a decision itself.
- The decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.

DSS Capabilities

- **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:** This analysis attempts to predict impact of assumptions (input data) on the proposed solution. 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.

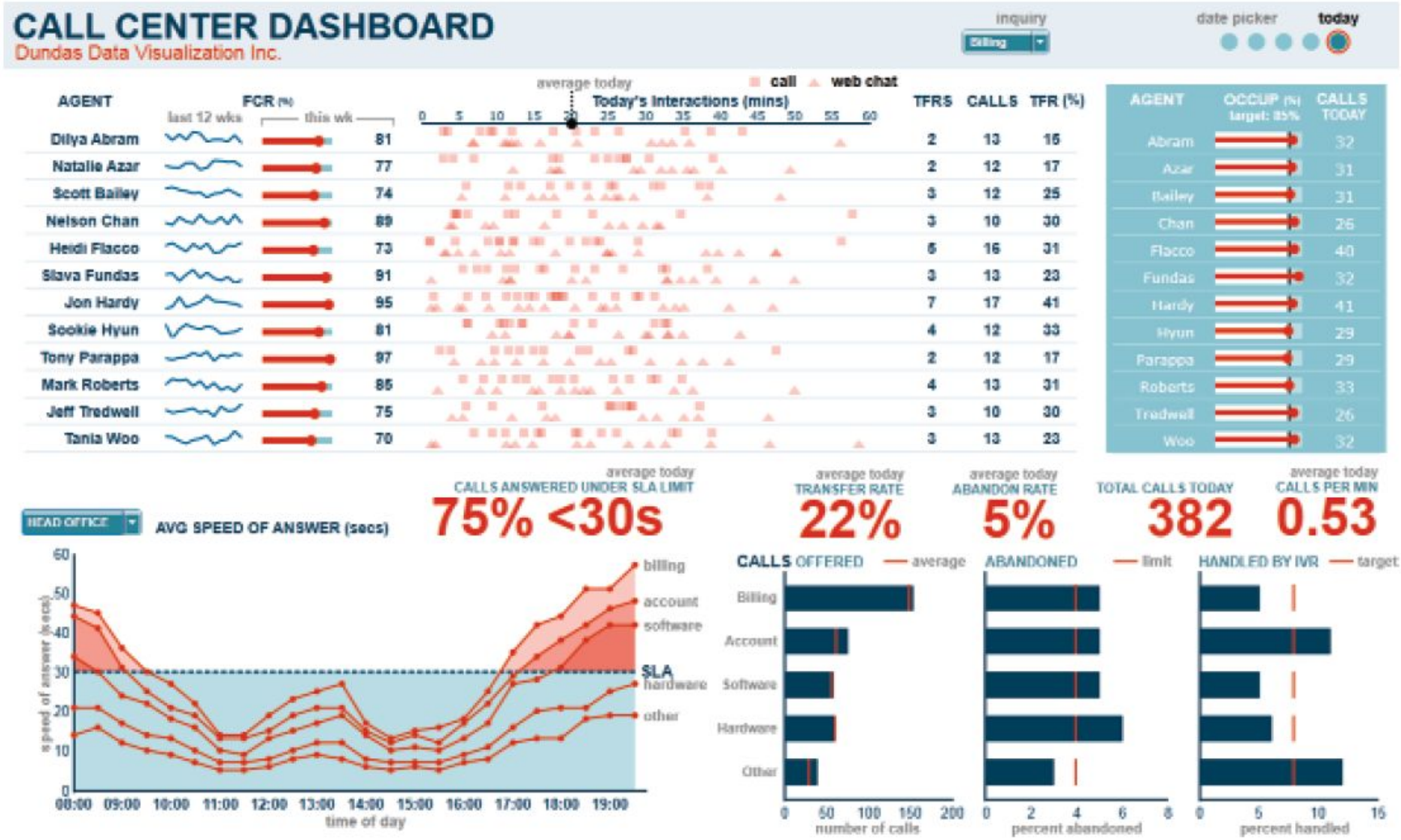
Business Intelligence Applications for Presenting Results

- **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
- **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.
- **Real-Time Business Intelligence:** includes the use of real time data for analysis as it is created rather than using historical data for analysis.

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 that highlight deviations larger than certain thresholds. Reports may include only deviations.

Sample Performance Dashboard



Sample Performance Dashboard

Carlos Osorio/Toronto Star/Zuma Press

FIGURE 12.4 A Bloomberg terminal.

Sample Performance Dashboard

FIGURE 12.5 A human resources dashboard/scorecard. (*Source:* MicroStrategy.)

Sample Performance Dashboard

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

FIGURE 12.6 Management Cockpit.

Data Visualization Technologies

- **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.

- **Reality Mining:** Graphical Information Systems (GIS) and Geographic Positioning Systems (GPS) together to produce an interesting new type of technology which allows analysts to extract information from the usage patterns of mobile phones and other wireless devices.

Real-Time BI

- Until recently, BI focused on the use of historical data. This focus has changed with the emergence of technology for capturing, storing, and using real-time data.
- Real-time BI enables users to employ multidimensional analysis, data mining, and decision support systems to analyze data in real time. In addition, it helps organizations to make decisions and to interact with customers in new ways.

Support Center Operations Dashboard

Support Center Operations Dashboard

Figure presents a typical operator's dashboard.

The gauges on the left are for the current day, and they indicate how the operator is performing on three critical metrics: the closing ratio, average sale, and calls/hour.

The bar charts to the right indicate how the agent is performing throughout the day.

The straight line displays the agent's average performance for the month for the three metrics. You can see that the operator is exceeding his monthly average on closing ratio and average sale. However, he has scored higher on calls/hour only in the 1:00 PM hour. The ribbon at the bottom of the screen identifies the top five performers

IT's [about business]

12.4 Analytics Helps to Reduce Injuries to Rugby Players

POM HRM

Professional sports are much more than just a game. Instead, they are increasingly becoming a scientific undertaking that is driven by data and numbers. Gone are the days of relying on raw talent and gut instinct to succeed. Although sports organizations have used analytics for years—the book and film *Moneyball* highlights the use of analytics to make player decisions in major league baseball in the 1990s—analytics software is becoming ever-more sophisticated. The use of analytics is now spreading to professional rugby, a popular sport in Great Britain that bears some resemblance to U.S. football.

Rugby historically has been a brutal contact sport in which players use minimal protective equipment. In fact, about 25 percent of all players are injured during a typical season, and some suffer season-ending injuries. For the players, the injuries are frustrating and can cause them to sit out games, sometimes even an entire season. For the teams, the absence of key players on the field frequently results in lost games, as well as diminished ticket sales and attendance.

Teams such as the Leicester Tigers in the United Kingdom are now embracing analytics to conduct deep analyses of raw injury data. The Tigers worked with IBM to develop more efficient methods to understand why injuries occur and how the organization can reduce their frequency. Analysts studied a variety of factors, including fatigue and game intensity levels, to detect hidden patterns and anomalies that provide insights into which players were likely to get injured and what types of injuries they would suffer.

For example, if a player displays a statistically significant change in one or more of his fatigue parameters (e.g., the level of lactic acid in his blood is statistically too high) and the current intensity level of training is high, these data might indicate that his chances of being injured are 80 percent greater than normal. One of his teammates might register a 60 percent greater risk. This level of real-time information makes it possible for the team to adjust each player's training regimen as well as the team's substitution patterns in games to reduce the risk of injury.

Going further, analytics allows the Tigers to analyze psychological data to reveal other key factors that could affect their players' performance. These factors include the additional stress of playing on the road, as well as social or environmental elements (e.g., family problems) that could impact the way players perform during a match. The goal is to tailor the team's training programs to each player's physical and psychological state.

Sources: Compiled from A. Smith, "Sports Analytics: How 'Moneyball' Meets Big Data," ZDNet, March 14, 2013; R. Bluey, "From 'Moneyball' to Money Bombs: What Sports Analytics Can Teach Political Nerds," *The Atlantic*, March 8, 2013; P. Dizikes, "Sports Analytics: A Real Game-Changer," *MIT News*, March 4, 2013; S. Greengard, "Putting Predictive Analytics Into Play," *Baseline Magazine*, May 2, 2012; B. Alamar and V. Mehrotra, "Beyond Moneyball: The Future of Sports Analytics," *Analytics Magazine*, February 24, 2012; www.leicestertigers.com, accessed April 3, 2013.

Questions

1. If you were a player for the Leicester Tigers, would you want to have that much personal data analyzed? Is there a "creepiness" factor here? Support your answer.
2. What are some potential disadvantages of Leicester's analytics system? Provide specific examples.
3. Would you encourage your favorite U.S. sports teams to adopt a similar analytics system? Why or why not?