

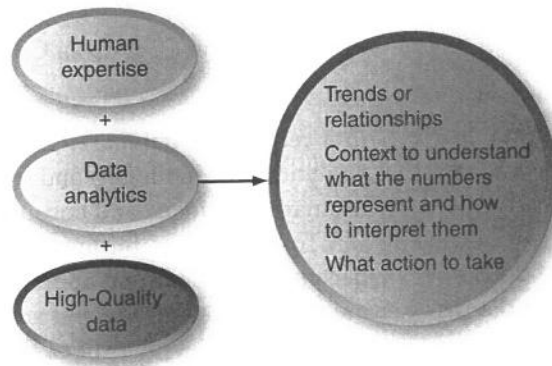
know what action to take; or provide sufficient context to determine what the numbers represent and how to interpret them.

Database, data warehouse, big data, and business intelligence (BI) technologies interact to create a new biz-tech ecosystem. Big data analytics and BI discover insights or relationships of interest that otherwise might not have been recognized. They make it possible for managers to make decisions and act with clarity, speed, and confidence. Big data analytics is not just about managing more or varied data. Rather, it is about asking new questions, formulating new hypotheses, exploration and discovery, and making data-driven decisions. Ultimately, a big part of big data analytic efforts is the use of new analytics techniques.

Mining data or text taken from day-to-day business operations reveals valuable information, such as customers' desires, products that are most important, or processes that can be made more efficient. These insights expand the ability to take advantage of opportunities, minimize risks, and control costs.

While you might think that physical pieces of paper are a relic of the past, in most offices the opposite is true. Aberdeen Group's survey of 176 organizations worldwide found that the volume of physical documents is growing by up to 30 percent per year. Document management technology archives digital and physical data to meet business needs, as well as regulatory and legal requirements (Rowe, 2012).

**Figure 3.1** Data analytics, and human expertise and high-quality data, are needed to obtain actionable information.



## CASE 3.1 OPENING CASE

### *Coca-Cola Manages at the Point That Makes a Difference*

#### COCA-COLA'S DATA MANAGEMENT CHALLENGES

**Petabyte (Pb)** = 1,000  
**Terabytes (Tb)** = 1 million  
**Gigabytes (Gb)**.

The Coca-Cola Company is a Fortune 100 company with over \$48 billion in sales revenue and \$9 billion in profit (Figure 3.2). The market leader manages and analyzes several **petabytes (Pb)** of data generated or collected from more than 500 brands and consumers in 206 countries. Its bottling partners provide sales and shipment data, while retail customers transmit transaction and merchandising data. Other data sources are listed in Table 3.1. From 2003 to spring 2013, data analysts at Coca-Cola knew there were BI opportunities in the mountains of data its bottlers were storing, but finding and accessing all of that data for analytics proved to be nearly impossible. The disparate data sources caused long delays in getting analytics reports from IT to sales teams. The company decided to replace the legacy software at each bottling facility and standardize them on a new BI system, a combination of MicroStrategy and Microsoft BI products.

**Enterprise Data Management** Like most global companies, Coca-Cola relies on sophisticated enterprise data management, BI, and analytic technologies to sustain its performance in fiercely competitive markets (Figure 3.3). Data are managed

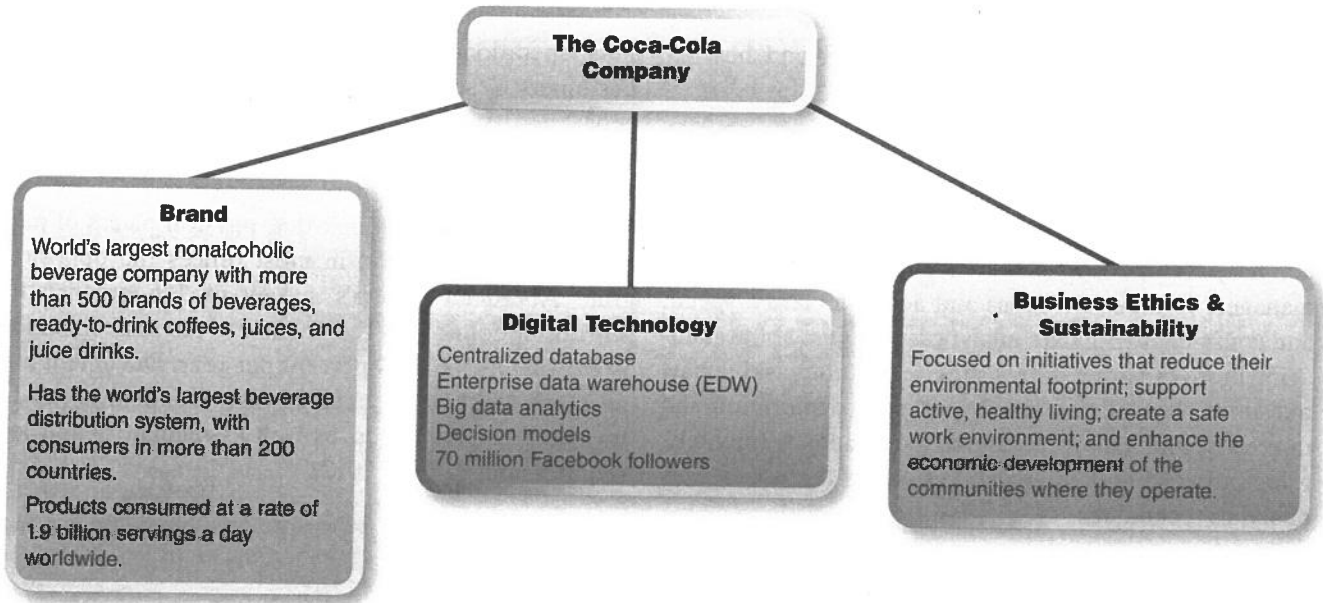


Figure 3.2 The Coca-Cola Company overview.

**Centralized database** stores data at a single location that is accessible from anywhere. Searches can be fast because the search engine does not need to check multiple distributed locations to find responsive data.

**Data warehouses** that integrate data from databases across an entire enterprise are called enterprise data warehouses (EDW).

in a **centralized database**, as illustrated in Figure 3.4. **Data warehousing**, big data, analytics, data modeling, and social media are used to respond to competitors' activity, market changes, and consumer preferences.

To support its business strategy and operations, Coca-Cola changed from a decentralized database approach to a centralized database approach. Now its data are combined centrally and accessible via shared platforms across the organization (Figure 3.5). Key objectives of the data management strategy are to help its retail customers such as Walmart, which sells \$4 billion of Coca-Cola products annually, sell



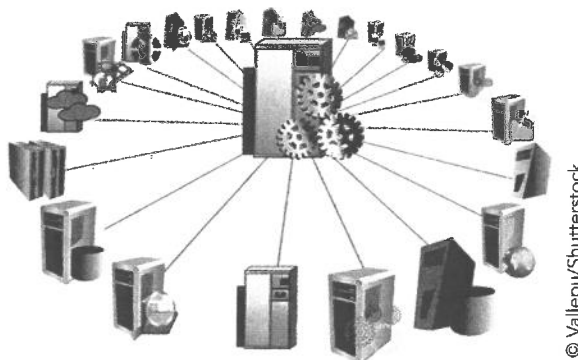
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Figure 3.3 Coca-Cola World Headquarters in Atlanta, GA, announced on January 25, 2010, that new packaging material for plastic bottles will be made partially from plants—as part of its sustainability efforts.

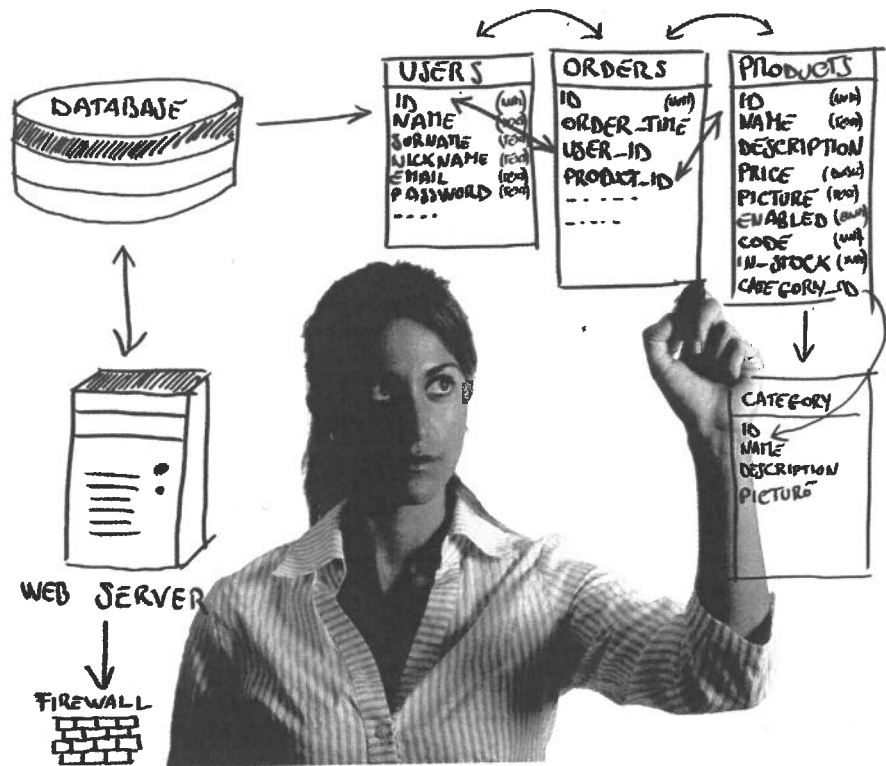
**TABLE 3.1** Opening Case Overview

Company	<ul style="list-style-type: none"> <li>• The Coca-Cola Company, coca-cola.com</li> <li>• Sustainability: www.coca-colacompany.com/sustainability</li> <li>• \$48 billion in sales revenue and profits of \$9 billion, 2013</li> </ul>
Industry	<ul style="list-style-type: none"> <li>• The global company manufactures, sells, and distributes nonalcoholic beverages.</li> </ul>
Product lines	<ul style="list-style-type: none"> <li>• More than 500 brands of still and sparkling beverages, ready-to-drink coffees, juices, and juice drinks.</li> </ul>
Digital technology	<ul style="list-style-type: none"> <li>• Enterprise data warehouse (EDW)</li> <li>• Big data and analytics</li> <li>• Business intelligence</li> <li>• In 2014, moved from a decentralized approach to a centralized approach, where the data are combined centrally and available via the shared platforms across the organization.</li> </ul>
Business challenges	<ul style="list-style-type: none"> <li>• In 2010, Coca-Cola had 74 unique databases, many of them used different software to store and analyze data. Dealing with incompatible databases and reporting systems remained a problem from 2003 to 2013.</li> <li>• Chief Big Data Insights Officer Esat Sezer has stated that Coca-Cola took a strategic approach instead of a tactical approach with big data.</li> </ul>
Global data sources	<ul style="list-style-type: none"> <li>• Transaction and merchandising data</li> <li>• Data from nationwide network of 74 bottlers</li> <li>• Multichannel retail data</li> <li>• Customer profile data from loyalty programs</li> <li>• Social media data</li> <li>• Supply chain data</li> <li>• Competitor data</li> <li>• Sales and shipment data from bottling partners</li> </ul>

more Coca-Cola products and to improve the consumer experience. The company has implemented a data governance program to ensure that cultural data sensitivities are respected.



**Figure 3.4** Centralized data architecture.



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**Figure 3.5** Data from online and offline transactions are stored in databases. Data about entities such as customers, products, orders, and employees are stored in an organized way.

**SUSTAINING BUSINESS PERFORMANCE**

All data are standardized through a series of master data management (MDM) processes, as discussed in Chapter 2. An enterprise data warehouse (EDW) generates a single view of all multichannel retail data. The EDW creates a trusted view of customers, sales, and transactions, enabling Coca-Cola to respond quickly and accurately to changes in market conditions.

Throughout Coca-Cola’s divisions and departments, huge volumes of data are analyzed to make more and better time-sensitive, critical decisions about products, shopper marketing, the supply chain, and production. Point-of-sale (POS) data are captured from retail channels and used to create customer profiles. Those profiles are communicated via a centralized iPad reporting system. POS data are analyzed to support collaborative planning, forecasting, and replenishment processes within its supply chain. (Supply chain management, collaborative planning, forecasting, and replenishment are covered in greater detail in Chapter 10.)

**Coca-Cola’s Approach to Big Data and Decision Models** Big data are treated as a strategic asset. Chief Big Data Insights Officer Esat Sezer has stated that Coca-Cola takes a strategic approach instead of a tactical approach with big data. The company is far advanced in the use of big data to manage its products, sales revenue, and customer experiences in near real time and to reduce costs. For example, it cut overtime costs almost in half by analyzing the service center data. Big data help Coca-Cola relate to its 70 million Facebook followers—many of them bolster the Coke brand.

Big data play a key role in ensuring that its orange juice tastes the same year-round and is readily available anywhere in the world. Oranges used by Coca-Cola have a peak growing season of only three months. Producing orange juice with a consistent taste year-round despite the inconsistent quality of the orange supply is complex. To deal with the complexity, an orange juice decision model was developed, the *Black Book model*. A **decision model** quantifies the relationship between variables, which reduces uncertainty. Black Book combines detailed data on the 600+ flavors that make up an orange, weather, customer preferences, expected crop yields, cost pressures, regional consumer preferences, and acidity or sweetness rate. The model specifies how to blend the orange juice to create a consistent taste. Coke's Black Book juice model is considered to be one of the most complex business analytics apps. It requires analyzing up to 1 quintillion (10E18) decision variables to consistently deliver the optimal blend.

With the power of big data and decision models, Coca-Cola is prepared for disruptions in supply far in advance. According to Doug Bippert, Coca-Cola's vice president of business acceleration, "If we have a hurricane or a freeze, we can quickly re-plan the business in five or 10 minutes just because we've mathematically modeled it" (BusinessIntelligence.com, 2013b).

#### Questions

1. Why does the Coca-Cola Company have petabytes of data?
2. Why is it important for Coca-Cola to be able to process POS data in near real time?
3. How does Coca-Cola attempt to create favorable customer experiences?
4. What is the importance of having a trusted view of the data?
5. What is the benefit of a decision model?
6. What is the Black Book model?
7. Explain the strategic benefit of the Black Book model.

Sources: Compiled from Burns (2013), Fernandez (2012), BusinessIntelligence.com (2013a, 2013b), CNNMoney (2014), Big Data Startups (2013), and Teradata (2012).

## 3.1 Database Management Systems

Data are the driving force behind any successful business. Operations, planning, control, and all other management functions rely largely on processed information, not raw data. And, no one wants to wait for business-critical reports or specific answers to their questions. Data management technologies that keep users informed and support the various business demands are the following:

**Databases** are collections of data sets or records stored in a systematic way.

**Volatile** refers to data that change frequently.

- **Databases** store data generated by business apps, sensors, operations, and transaction-processing systems (TPS). Data in databases are extremely **volatile**. Medium and large enterprises typically have many databases of various types.
- **Data warehouses** integrate data from multiple databases and data silos, and organize them for complex analysis, knowledge discovery, and to support