prepared with the specific intention of converting data into information and knowledge and relaying that information in an easily understandable/digestible format. Today, these reports are visually oriented, often using colors and graphical icons that collectively look like a dashboard to enhance the information content. Therefore, the latter part of the chapter is dedicated to subsections that present the design, implementation, and best practices regarding information visualization, storytelling, and information dashboards.

This chapter has the following sections:

- 3.1 Opening Vignette: SiriusXM Attracts and Engages a New Generation of Radio Consumers with Data-Driven Marketing 154
- **3.2** Nature of Data 157
- **3.3** Simple Taxonomy of Data 161
- **3.4** Art and Science of Data Preprocessing 165
- **3.5** Statistical Modeling for Business Analytics 175
- **3.6** Regression Modeling for Inferential Statistics 187
- **3.7** Business Reporting 199
- **3.8** Data Visualization 202
- **3.9** Different Types of Charts and Graphs
- **3.10** Emergence of Visual Analytics
- **3.11** Information Dashboards

OPENING VIGNETTE: SiriusXM Attracts and Engages 3.1 a New Generation of Radio Consumers with **Data-Driven Marketing**

SiriusXM Radio is a satellite radio powerhouse, the largest radio company in the world with \$3.8 billion in annual revenues and a wide range of hugely popular music, sports, news, talk, and entertainment stations. The company, which began broadcasting in 2001 with 50,000 subscribers, had 18.8 million subscribers in 2009, and today has nearly 29 million.

Much of SiriusXM's growth to date is rooted in creative arrangements with automobile manufacturers; today, nearly 70 percent of new cars are SiriusXM enabled. Yet the company's reach extends far beyond car radios in the United States to a worldwide presence on the Internet, on smartphones, and through other services and distribution channels, including SONOS, JetBlue, and Dish.

BUSINESS CHALLENGE

Despite these remarkable successes, changes in customer demographics, technology, and a competitive landscape over the past few years have posed a new series of business challenges and opportunities for SiriusXM. Here are some notable ones:

- As its market penetration among new cars increased, the demographics of its buyers changed, skewing toward younger people with less discretionary income. How could SiriusXM reach this new demographic?
- As new cars become used cars and change hands, how could SiriusXM identify, engage, and convert second owners to paying customers?
- · With its acquisition of the connected vehicle business from Agero—the leading provider of telematics in the U.S. car market—SiriusXM gained the ability to deliver its service via satellite and wireless networks. How could it successfully use this acquisition to capture new revenue streams?

PROPOSED SOLUTION: SHIFTING THE VISION TOWARD **DATA-DRIVEN MARKETING**

SiriusXM recognized that to address these challenges, it would need to become a highperformance, data-driven marketing organization. The company began making that shift by establishing three fundamental tenets. First, personalized interactions—not mass marketing—would rule the day. The company quickly understood that to conduct more personalized marketing, it would have to draw on past history and interactions as well as on a keen understanding of the consumer's place in the subscription life cycle.

Second, to gain that understanding, information technology (IT) and its external technology partners would need the ability to deliver integrated data, advanced analytics, integrated marketing platforms, and multichannel delivery systems.

And third, the company could not achieve its business goals without an integrated and consistent point of view across the company. Most important, the technology and business sides of SiriusXM would have to become true partners to best address the challenges involved in becoming a high-performance marketing organization that draws on data-driven insights to speak directly with consumers in strikingly relevant ways.

Those data-driven insights, for example, would enable the company to differentiate between consumers, owners, drivers, listeners, and account holders. The insights would help SiriusXM to understand what other vehicles and services are part of each household and create new opportunities for engagement. In addition, by constructing a coherent and reliable 360-degree view of all its consumers, SiriusXM could ensure that all messaging in all campaigns and interactions would be tailored, relevant, and consistent across all channels. The important bonus is that a more tailored and effective marketing is typically more cost-efficient.

IMPLEMENTATION: CREATING AND FOLLOWING THE PATH TO HIGH-PERFORMANCE MARKETING

At the time of its decision to become a high-performance marketing company, SiriusXM was working with a third-party marketing platform that did not have the capacity to support SiriusXM's ambitions. The company then made an important, forward-thinking decision to bring its marketing capabilities in-house—and then carefully plotted what it would need to do to make the transition successfully.

- Improve data cleanliness through improved master data management and governance. Although the company was understandably impatient to put ideas into action, data hygiene was a necessary first step to create a reliable window into consumer behavior.
- 2. Bring marketing analytics in-house and expand the data warehouse to enable scale and fully support integrated marketing analytics.
- 3. Develop new segmentation and scoring models to run in databases, eliminating latency and data duplication.
- 4. Extend the integrated data warehouse to include marketing data and scoring, leveraging in-database analytics.
- 5. Adopt a marketing platform for campaign development.
- 6. Bring all of its capability together to deliver real-time offer management across all marketing channels: call center, mobile, Web, and in-app.

Completing those steps meant finding the right technology partner. SiriusXM chose Teradata because its strengths were a powerful match for the project and company. Teradata offered the ability to:

- · Consolidate data sources with an integrated data warehouse (IDW), advanced analytics, and powerful marketing applications.
- Solve data-latency issues.

- Significantly reduce data movement across multiple databases and applications.
- Seamlessly interact with applications and modules for all marketing areas.
- Scale and perform at very high levels for running campaigns and analytics in-database.
- Conduct real-time communications with customers.
- Provide operational support, either via the cloud or on premise.

This partnership has enabled SiriusXM to move smoothly and swiftly along its road map, and the company is now in the midst of a transformational, five-year process. After establishing its strong data governance process, SiriusXM began by implementing its IDW, which allowed the company to quickly and reliably operationalize insights throughout the organization.

Next, the company implemented Customer Interaction Manager—part of the Teradata Integrated Marketing Cloud, which enables real-time, dialog-based customer interaction across the full spectrum of digital and traditional communication channels. SiriusXM also will incorporate the Teradata Digital Messaging Center.

Together, the suite of capabilities allows SiriusXM to handle direct communications across multiple channels. This evolution will enable real-time offers, marketing messages, and recommendations based on previous behavior.

In addition to streamlining the way it executes and optimizes outbound marketing activities, SiriusXM is also taking control of its internal marketing operations with the implementation of Marketing Resource Management, also part of the Teradata Integrated Marketing Cloud. The solution will allow SiriusXM to streamline workflow, optimize marketing resources, and drive efficiency through every penny of its marketing budget.

RESULTS: REAPING THE BENEFITS

As SiriusXM continues its evolution into a high-performance marketing organization, it already is benefiting from its thoughtfully executed strategy. Household-level consumer insights and a complete view of marketing touch strategy with each consumer enable SiriusXM to create more targeted offers at the household, consumer, and device levels. By bringing the data and marketing analytics capabilities in-house, SiriusXM achieved the following:

- Campaign results in near real time rather than four days, resulting in massive reductions in cycle times for campaigns and the analysts who support them.
- Closed-loop visibility, allowing the analysts to support multistage dialogs and in-campaign modifications to increase campaign effectiveness.
- Real-time modeling and scoring to increase marketing intelligence and sharpen campaign offers and responses at the speed of their business.

Finally, SiriusXM's experience has reinforced the idea that high-performance marketing is a constantly evolving concept. The company has implemented both processes and the technology that give it the capacity for continued and flexible growth.

QUESTIONS FOR THE OPENING VIGNETTE

- 1. What does SiriusXM do? In what type of market does it conduct its business?
- 2. What were its challenges? Comment on both technology and data-related challenges.
- **3.** What were the proposed solutions?
- **4.** How did the company implement the proposed solutions? Did it face any implementation challenges?
- 5. What were the results and benefits? Were they worth the effort/investment?
- 6. Can you think of other companies facing similar challenges that can potentially benefit from similar data-driven marketing solutions?