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Predictive Analytics

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- Maximize the value predictive analytics brings to the business
- Gain competitive advantage by using predictive analytics to make smarter decisions

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Michael Wessler, OCP & CISSP

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by Michael Wessler, OCP & CISSP

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Introduction

The power to predict future market conditions and to know customers' wants and needs is the desire of every business leader. Existing computer systems and large databases provide useful *historical* information, but their ability to dramatically help business leaders is limited. Decision makers must make assumptions about the future based on previous events, and that process is an imperfect one. What business leaders yearn for are accurate data-driven predictions for the *future*.

Predictive analytics provides decision makers and analysts with the capability to make accurate predictions about future events based on complex statistical algorithms applied to relevant data. Predictive analytics can predict behaviors such as what customers are likely to purchase, who is likely to respond to sales events, and which insurance claims are fraudulent. Predictive analytics imparts real business value to those companies that know how to find it, and this book shows you how to do that with analytics tools you can actually use.

About This Book

Predictive analytics is a powerful tool because it gives decision makers an accurate glimpse into the future and tells sales and marketing teams what customers need and want — information that is extremely valuable. Historically, the challenge with predictive analytics has been that it is very complex to use, requiring a team of skilled data scientists working long hours to generate results. Fortunately, a new generation of predictive analytics tools is much simpler to use and can be leveraged by business and data analysts on a daily basis.

The focus of this book is how predictive analytics works and what it can provide savvy decision makers and analysts in the marketplace. I identify what to look for in predictive analytics tools and how to make them successful in your business.

Foolish Assumptions

Assumptions have a bad reputation, but they have their place and if they weren't helpful, people wouldn't still make them. I sometimes have to make assumptions too, and writing this book is a prime example. Mainly, I assume that you know something about data, perhaps have heard of Big Data, and know you can apply predictive analytics tools to your data to find useful information. As such, this book is written primarily for business and management folks who understand basic IT principles but want to see how using predictive analytics tools can help them make smarter business decisions.

Icons Used in This Book

Throughout this book, you occasionally see special icons that call attention to important information. You won't find cute little emoticons, but you'll definitely want to take note! Here's what you can expect:

This icon points out things you'll be glad I mentioned later on. This is the stuff you want to remember when you start using the material on your own.

I try to keep the techie stuff to a minimum, but I am a techie person at heart and old habits die hard! These are technical tidbits that aren't essential, but they are nice to know.

This icon points out pieces of sage wisdom that I wish someone had told me when I was learning this subject.

Beyond the Book

Alteryx Analytics is a single solution platform that makes every step in the analytics process easily accessible, from data blending to analysis and sharing. To learn more about Alteryx visit `www.alteryx.com`.

Where to Go from Here

Ever hear about something exciting that may be really good for you or fun, but you think "Oh, I could never do *that*"? Maybe it's a challenging new exercise routine or flying an airplane; both are daunting, but most people can rise to these challenges with the right training, equipment, and effort.

The tough part for most people is to accept the challenge and work through the ups and downs until they reach their goal. The good news is that most goals sound more difficult than they really are, and people shouldn't get discouraged because something sounds complex.

That's certainly true if you are trying to learn about an impressive topic such as predictive analytics, but fortunately with *Predictive Analytics For Dummies,* Alteryx Special Edition, you have help to guide you on this exciting adventure!

If you don't know much about predictive analytics, Chapter 1 would be a good place to start! However, if you see a particular topic that interests you, feel free to jump ahead to that chapter. Each chapter is written to stand on its own, so feel free to start reading anywhere or to skip around. Read this book in any order that suits you (although I wouldn't recommend upside down or backwards). I promise you'll put the book down thinking, "Wow, I didn't know this stuff could be so easy!"

Chapter 1

Understanding Predictive Analytics

In This Chapter

- Exploring predictive analytics and how it impacts business
- Understanding the growth of predictive analytics
- Identifying predictive analytics users
- Introducing the analysts of today in your business

You no doubt base decisions you make on a few different things: information you receive on a topic, your understanding of the environment in which the decision has to be made, and the general set of rules in which you operate. Generally speaking, the more insight you have, the better your decisions will be. Business decision makers and analysts are no different, which is evident by the industries and technologies devoted to data capture, analysis, modeling, and reporting.

In business, the push for improved decision making based on data and analysis techniques is strong, with everyone looking for ways to make decisions faster and better than their competitors. The goal for these analysts is to know what will happen in the future so that they can make the wisest decisions with the most certainty possible — maximizing the benefits for their company. This chapter looks at what predictive analytics is and how analysts can use it.

Taking a Look at Predictive Analytics

How successful would your business be if you could make decisions about the future with certainty? What if you knew your customers' needs before your competitors and with enough lead time to exploit that knowledge? The saying that "knowledge is power" applies to many areas in life, and it certainly applies to business. With predictive analytics, you gain knowledge and more certainty about the future.

Predictive analytics is the process of using a set of sophisticated analytic tools to develop models and estimations of what the environment will do *in the future*.

In addition to the preceding definition of predictive analytics, Gartner Research Director Gareth Herschel says this: "Predictive analytics helps connect *data* to effective *action* by drawing reliable conclusions about current conditions and *future* events."

Businesses use predictive analytics to analyze their data to gain realistic predictions about future environmental conditions. The organization can then make decisions and take action to maximize business opportunities identified by their predictions. Essentially, businesses create a prediction of the future based on their data and then take advantage of opportunities they think will occur.

What kinds of opportunities and advantages does predictive analytics provide to business? At a minimum, you can use your predictive models to:

- Proactively provide better customer service
- More efficiently acquire more profitable customers
- Sell more products and services to existing customers
- Keep profitable customers longer
- Proactively manage risk from fraudulent activity
- Proactively manage your physical resources
- Better plan the use of your human resources

The uses of predictive analytics are limited only by the data you have, the modeling techniques available, and your imagination. The business benefits of predictive analytics fall into these categories:

- Identifying and reaching out to new customers
- Selling more or enhancing your relationship with existing customers
- Gaining a competitive advantage for new or emerging opportunities
- Performing a task smarter or better because you can plan for it in advance
- Finding data patterns to alert you to potential situations you need to address

With predictive analytics, organizations can make better, smarter decisions because they have a vision of what the future market environment will look like.

Why Predictive Analytics Is Different

A wealth of powerful tools is available that tell analysts what has happened previously. The problem is that these tools focus on the *past* rather than the *future* — so analysts don't get that forward-looking, predictive insight they need the most. To fully understand why predictive analytics is so important and to appreciate its value, you need to understand the alternative approaches and what they offer. Data analysis tools have evolved through reporting, analysis, and monitoring, and now through prediction phases:

- **Reporting.** What has happened in the past? The event can be a single event or an aggregation of events, and the timeframe can be specific or over a period of months, quarters, years, or decades. You can get this information from queries and reporting tools.
- **Analysis.** Why did something happen? Knowing what caused an event to happen is important, and many tools can help answer that question. You can find analysis

information via Online Analytical Processing (OLAP) and visualization tools.

- **Monitoring.** What is happening right now? Situational awareness for the current environment is useful, and many tools exist to provide this information. Dashboard and scorecard software are common examples of tools that provide monitoring information.
- **Prediction.** What might happen? Knowing what is likely to occur in the future is the most valuable information you can have if you need to take action down the road. You can get this type of information via predictive analytics.

At certain times, using historical or current information is appropriate, and reporting, analysis, and monitoring tools are sufficient for these tasks. However, a gap occurs when a decision maker knows what *has* occurred but is struggling to make a decision based on what *will* occur in the future. Analysts often need to get more value out of current and historical data than reporting, analysis, and monitoring tools provide. Often, the analyst lacks information and models and is left with a "best guess" or "rules of thumb" application with unsuccessful results. Predictive analytics fills the information gap and allows the analyst to operate on historical and current information as well as predicting the likely future environment. This predictive insight promotes much better decision making and improved results.

Predictive Analytics Users: Traditional versus New

Analysts have longed for the benefits of predictive analytics for years, but the evolution of its supporting technology has confined its usage. With improvements in the information technology and with the influx of Big Data, a flood of new opportunities for predictive analytics has appeared. For more information about Big Data, see the nearby sidebar "Big Data: What it is."

With the first generations of predictive analytics tools, the process to generate results was long, expensive, and difficult. Highly skilled and expensive data scientists would work with PhD level statisticians and IT professionals to obtain and massage data, develop complex analytic models, and

Big Data: What it is

Big Data is a major force in today's computing and business environment, so what specifically is Big Data? As defined by Gartner, Big Data is "high-volume, high-velocity, and/or high-variety information assets that require new forms of processing to enable enhanced decision making, insight discovery, and process optimization."

Big Data is the huge amount of structured and unstructured data coming from multiple sources such as online access, mobile devices, social media, scientific devices, and other inputs in addition to existing, traditional data sources. This data is often unstructured, generated very quickly and in vast quantities, and requires specialized technology and techniques to process.

For example, consider the vast number of Twitter Tweets that are generated every day. Marketing, sales, and customer information is certainly buried in those Tweets, but it will take Big Data processes to gain that information.

ultimately generate the analytic results. This process yielded results, but its high cost, complexity, and long duration reduced the usefulness of the information. Additionally, only well-funded companies could afford analytic technology.

Fortunately, a move to make predictive analytics more practical and to put it into the hands of more people has taken place. Improvements with IT hardware and software, the impact of Big Data, increased online access, mobile devices, and social media have all come together to make predictive analytics more necessary in business. No longer is a team of data scientists and highly educated statisticians working long hours with specialized technology required to generate analytic results. Companies such as Alteryx provide simplified predictive analytics and are placing analytic tools into the hands of analysts and the decision makers they support.

At a high level, bringing analytic technology into the hands of business provides these benefits:

- Faster access to answers to complex questions, allowing organizations the ability to take opportunities faster.
- More ubiquitous use of predictive capabilities, improving the accuracy and certainty of decision making.

- A reduction in the cost of using predictive analytics because it now enables business analysts to use predictive analytics. This means less reliance on expensive coding specialists or statistical experts with PhDs.

The evolution of predictive analytics technology has empowered more analysts at every level to leverage the benefits of predictive models to make better decisions.

The Changing Role of the Analyst

As predictive analytics becomes more practical and is used throughout a company, the role of the data analyst is evolving. While a traditional data analyst uses traditional IT tools to generate reports on historical data, today's analyst extends that capability with their detailed business insight and natural creativity to find the information the analysts really need.

Today's analysts are empowered not only by modern analytic tools that allow them to access data from traditional internal sources, but also by Big Data and third-party data providers. These analysts are able to perform data analysis with predictive analytics without advanced technical or statistical training because of the enhanced tools they have available.

The challenge for these analysts is to evolve based on new requirements and technological capabilities. Rather than being replaced by data scientists, today's analyst must evolve to perform roles previously performed by specialists. With the new capabilities of predictive analytic tools, the job of today's analyst has evolved to take advantage of those new technological capabilities.

Chapter 2

Making Use of Predictive Analytics in Business

In This Chapter

- Turning predictive analytics into real business value
- Bettering your business processes with predictive analytics
- Making predictive analytics more usable by everyone

The market place is fast moving and competitive. To be successful, you must move faster, be smarter, and have greater forward-looking business insight than your competitors. Many flashy computer technologies, management processes, and so on, promise to improve a company's bottom line but in reality are expensive and yield minimal positive results.

Predictive analytics is different from many technologies because its impact is readily apparent and quantifiable. You can quantify the money you save because predictive analytics improves business processes and increases sales and marketing effectiveness. When you can attribute good numbers to a specific technology such as predictive analytics, you can easily see the value of that technology.

This chapter looks at how using predictive analytics results in savings and increased business opportunities.

Getting Business Value from Predictive Analytics

Unless a new technology shows you a business value, you're not likely to use it. Business value can be either qualitative or quantitative. Predictive analytics provides both qualitative and quantitative benefits:

- **Qualitative.** Creating a complete picture of the targeted customer demographic. Understanding what customers need, what they like, and what they don't like has important value, but assigning a dollar value to this knowledge isn't easy.
- **Quantitative.** Identifying tangible growth in sales, revenue, or the customer base, which can be assigned a numeric value or percentage. Alternatively, experiencing lower costs, fewer complaints, better customer retention, or fewer problems overall translates to cost savings for an organization.

That predictive analytics promotes *better* decision making is a qualitative statement. Associating increased sales or decreased expenses with predictive analytics provides the quantitative benefits that business leaders relish, which is — business people like cold, hard numbers!

The effect that predictive analytics has on a business is determined by how widely and how aggressively the business uses it. Specifically, the wider the area to which a company applies predictive analytics, the greater the potential impact. The use cases for predictive analytics vary, but they can include

- **Prospecting.** Identifying potential new customers and converting prospects into actual customers.
- **Cross-selling and segmentation.** Segmenting customers based on past purchasing behavior to better target future promotional offers.
- **Customer retention.** Analyzing the reasons behind losing customers and enacting cost-effective practices to increase retention and reduce loss.

- **Capacity planning.** Correctly allocating shared infrastructure resources to allow for appropriate usage without overpaying for unused, excessive capacity.
- **Market basket analysis.** Determining the right combination of products and services to promote, merchandise, price, and bundle together to maximize sales.
- **Market optimization.** Determining the optimal marketing campaign by audience segment.
- **A/B analysis.** Testing different changes (such as new or different products) and comparing the results against a baseline example.
- **Churn analysis.** Determining which customers are most likely to churn and taking steps to prevent them from doing so. ***Note:*** *Churn rate* is most applicable to the subscribers of a service (such as cell phone service) and is the percentage of customers who discontinue their subscription. When discontinuing a subscription, a subscriber generally goes to a competitor.
- **Sales forecasting.** Forecasting sales for stores based on location, demographics, and past sales.
- **Assortment planning.** Delivering the right products at the right time to the right stores.

Applying predictive analytics to a business or functional area will have an impact. The degree to which predictive analytics is applied and to what area within the business will determine the overall impact.

Once you've determined that you want to use predictive analytics, you need to determine the specific areas where you want to apply the technology. Generally speaking, predictive analytics is applied to business or functional areas where perceived problems or shortcomings exist, or to areas where you hope to realize greater benefits.

Before implementing any changes or applying new processes or tools, you need to collect performance statistics. These statistics form the baseline on which to gauge the impact of the new processes and analytic tools.

As you apply predictive analytics to an area, chart the quantifiable metrics of that area to determine the impact it is having. Compare the new results against the numbers you had before using predictive analytics. Based on the improvements you have quantified, you can determine your improved Return on Investment (ROI). Using the improved ROI allows you to quantify the business value of predictive analytics.

Improving Business with Predictive Analytics

Companies often find that the greatest use of predictive analytics is to increase sales through customer analytics. Companies exist to sell products and services, so deploying predictive analytics to boost sales makes good business sense. Specifically, companies leverage predictive analytics to:

- **Acquire customers:** Identify and obtain new customers for first-time sales in an efficient manner while reducing marketing and advertising costs.
- **Retain customers:** Keep existing customers longer and reduce the likelihood they will shop with competitors.
- **Grow customer relationships:** Expand sales with existing customers to larger and more frequent purchases.

At its core, predictive analytics allows companies to more closely and accurately identify and understand the needs of their customers. With this specific customer information, targeted sales, marketing, and promotional campaigns become less expensive while generating increased revenue.

If you want to see an example of targeted marketing, be sure to pay attention to the nature of the commercials that run during your favorite TV show or sporting event. Odds are that the products you see advertised during a football game are not the same products advertised during Saturday morning children's cartoons. Companies must target their advertising efforts to the audiences most likely to purchase their products or services.

The scope of how predictive analytics is used in various industries is expansive. Almost all industries can use predictive analytics to increase their sales and better understand their customer relationships. So, how can predictive analytics be used in business? Consider these real-life examples of combining predictive analytics with Big Data:

- Taking a proactive rather than a reactive position based on real-time data trends and predictions to ensure the leadership position in the market. For example, if a company knows that the demand for a product will increase in several months, that company can fill its inventory for that impending demand.
- Suggesting additional products to customers, similar to what they've shown interest in or may not feel they need. Many online sales catalogs alert customers to products related to those in their shopping carts or for necessary support products such as batteries and maintenance items. Increasing sales while helping customers purchase everything they need is a benefit for everyone.
- Quantifying and leveraging the actual value of social media comments on the business. Blend the context of Big Data with user sentiment analysis and quantitative data to gain an accurate picture of the environment and market direction.

Predictive analytics puts companies in the driver's seat in terms of knowing how to better understand their customers and proactively meet their customers' needs. Some industries also use predictive analytics for non-sales purposes. For example, both insurance and banking and finance industries use predictive analytics to help detect fraud among customers. Some industries use predictive analytics to forecast growth and resource management requirements. Industries such as health care use predictive analytics to improve patient care and treatment while reducing complications.

Figure 2-1 shows you how some industries can leverage predictive analytics in different ways to reduce their costs, increase sales, and improve the products and services offered to their customers.

Industry/ Application	Question
Horizontal/Customer Analytics	
• Segment	How do I place my customers in similar groups based on certain characteristics?
• Acquire	What customers should I be going after?
• Retain	What customers are most likely to leave for a competitor?
• Grow	What customers are most likely to respond to an offer?
Retail	
• Market Basket Anaysis	What product are customers most likely to buy together?
• Assortment Planning	How much of certain products in different categories should I carry?
• Revenue Optimization	How do I optimize my revenue generation, based on my customers shopping behaviors?
• Merchandise Planning	What are the right products, assortment and pricing to meeting the company requirements?
• RFID Analysis	How do I improve the tracking of my products throughout the supply chain?
• Consolidation Planning	How do I determine which stores to close? Or combine wlth others?
Communications	
• Capacity Forecasting	How much bandwidth do I need on my network or cell sites?
• Resource Optimization	How do I allocate my resource to minimize outages?
• Payment Risk Analysis	How do I know if my customer is likely to miss payments?
• Planning and Pricing	How do I know if I am pricing myself out of a market?
Insurance	
• Claims Analytics	How do I reduce my loss adjustment expenses?
• Risk Assessment	How likely is this customer going to be involved in future claims?
• Fraud Detection	How do I determine if a customer's activity is related to fraud?
• Underwriting	How expensive will someone be to cover?
Banking & Finance	
• Fraud Detection	How do I detect suspicious activities to prevent fraud?
• Asses Credit Risk	How likely is this person to default on a loan?
• Regulatory Compliance	How do I stay within compliance of regulations for monitoring suspicious behavior?
Healthcare	
• Preventative Fraud	How do I detect the likelihood of fraud before it takes place?
• Patient Readmissions	How do I optimize my hospital spaces, and patient turnaround time?
• Improving Patient Outcomes	How can we improve treatment plans to minimize complications?
• Resource Planning	How can we better allocate nurses, clinicians, machinery?

Figure 2-1: Using predictive analytics across multiple industries.

Case study: Targeted catalog mailings

Companies often attempt predictive analytics with mismatched tools such as spreadsheets, which results in wasted resources and missed opportunities. That situation was the case with Southern Statues Cooperative before Alteryx improved the effectiveness of their direct catalog mailings in 2011.

Southern States Cooperative is a large farming cooperative with 1,200 retail stores in 23 states selling products to farmers and rural American customers. Southern States Cooperative lacked actual analytic tools and was attempting to use generic productivity tools such as spreadsheets to determine which customers would benefit from direct-mail product catalogs.

Cooperative business leaders realized that their antiquated software and processes were ineffective at targeting the most likely customers for catalog mailings. They also realized that a large amount of money was wasted on catalog mailings to people who didn't buy via mail, and revenue opportunities were missed by not mailing to people who do or would use a paper catalog.

Southern States Cooperative turned to Alteryx to use spatial functionality to identify customers most likely to benefit from direct catalog mailings. The results were impressive; the company was able to reduce their catalog mailings by 63 percent while increasing their customer response rate by 34 percent. Alteryx saved the company money while increasing revenues for direct mailings.

Furthermore, Southern States Cooperative reports that Alteryx is easy to use without the need to be a programmer or database specialist. They also state that Alteryx allows a close connection to customers' needs and wants, which is a win-win for both its customers and Southern States Cooperative.

For additional details on how Southern States Cooperative leveraged Alteryx to reduce costs and increase revenue, you can read the complete case study at `www.alteryx.com/resources/southern-states-cooperative`.

You can see in Figure 2-1 how predictive analytics is used across multiple industries to improve multiple aspects of their business. The limits of how predictive analytics can be used are defined only by the imaginations of the analysts.

Making Predictive Analytics More Practical

As predictive analytics becomes more mainstream in organizations, vendors make predictive analytics practical for businesses to use; otherwise, companies won't use the toolset or fully realize or utilize the benefits of predictive analytics. Historically, analytic tools have been too complex for business users without relying on a team of highly trained IT professionals and statisticians to perform the data access and integration, as well as the analysis and predictive modeling work.

However, companies such as Alteryx have designed a new generation of predictive analytics tools that remain powerful, yet are usable by experienced business users who do not have statistical training. To be proficient in using these modern tools, you need the following prerequisites:

- You understand at a high level that data comes from different sources and can be modeled to answer questions and provide models.
- You have a general knowledge of statistical techniques and what they can mean in a given situation, for example, when to use linear regression versus clustering.
- You or your analysts understand your business and what kind of data you need to make decisions.

The vast majority of data analysts and business analysts easily meet the requirements necessary to use predictive analytics tools provided by companies such as Alteryx.

Giving a new, powerful analytic tool such as Alteryx Analytics to data analysts who previously struggled with antiquated, cumbersome tools is likely to yield unexpected positive results. Be sure to give the analysts the freedom to use their creativity and explore the possibilities made available with their new analytic tools. Your analysts are highly likely to identify opportunities that upper management never even considered.

Modern predictive analytics tools such as Alteryx Analytics are so powerful because they provide the data analyst with the following:

- A rich library of powerful predictive analytics tools that is available for immediate use.
- A visual drag-and-drop approach to building each step of the analytic process. Intuitive, visual displays enable faster development by analysts with fewer mistakes.
- The eliminated need to understand complex programming languages. Advanced degrees in statistics or computer science are *not* required to use Alteryx analytic tools.
- The complete analytics process and steps are delivered in a single environment rather than across multiple environments.
- The eliminated need to wait for highly trained and overworked statisticians and IT specialists to build out necessary data infrastructure.

Alteryx's predictive analytics tools are built on the R programming language, which is open source software. Alteryx eliminates the need for programming by delivering the R scripts in the form of a predictive tool that users can drag and drop into an analytic workflow. Technically-savvy users still have the ability to access and customize the Alteryx-provided tools written in R to extend their functionality. For more information on the R programming language, go to the R open source project at `www.r-project.org/`.

The benefits of simplifying predictive analytics tools and putting them in the hands of analysts in a company include the following:

- Complex business questions are solved in a fraction of the time previously required. Providing answers to questions enables companies to capitalize quickly on emerging business opportunities.
- Exactly the right data required to make key decisions is available at the right time. Access to current and relevant data ensures that the best information is used to make key decisions.
- A greater understanding of where customers are, what they want and need, and why they buy or don't buy a product or service occurs. This understanding allows much more effective sales and marketing campaigns at lower cost.

Making predictive analytics practical and easy to use has moved the predictive toolset forward to analysts positioned at an organization's leading edge. Both operational and executive-level decision makers easily can enjoy the benefits of predictive analytics.

Chapter 3

Getting Started with Predictive Analytics

In This Chapter

- Preparing to use predictive analytics
- Becoming more effective by using analytic procedures
- Unleashing the power of the predictive model

Understanding how to properly use a tool or methodology is essential to getting the most benefit out of that tool or methodology. Working with predictive analytics is no different.

Using predictive analytics involves understanding and preparing the data, defining the predictive model, and following the predictive process. Knowing what analytic procedures are available and when to use them saves you time and improves efficiency. A solid understanding of these models, steps, and procedures will enable you to leverage predictive analytics more effectively, faster, and with fewer issues to gain an advantage over your competition.

This chapter guides you through the components and processes of predictive analytics to ensure that your predictive analytics initiative is successful.

How to Get Started with Predictive Analytics

Before diving into the fancy wizards and graphical workflows of your analytic tool, it's important to understand what information you'll need to get the most out of predictive analytics. Analytic tools require specific input from you so you need to know what you want to achieve before you start. What questions are you trying to answer for your company? The answer can be as simple as, "Where do my customers live, and what do they do for a living?"

As you become more experienced with predictive analytics, your questions may evolve and become more focused, such as:

- How much will my wealthiest customers spend for my product or service?
- If my customers buy product A, what percentage will also buy product B?
- If I offer an online customer a discount for a product related to what's in their shopping cart, will they buy it?
- What impact did the economic downturn of city A have on customers from that city and on customers from surrounding cities B and C?

Even though the level of detail and complexity of your questions will increase as you become more comfortable with the analytic process, the first seemingly simple questions with predictive analytics have value, so start with reasonable questions and expand as your experience increases.

Performing Predictive Analytics

Actually performing predictive analytics is not difficult when you understand the data required by your business and have a tool that easily supports predictive modeling. You should first understand how to use the predictive analytics process and then learn how to leverage analytic procedures into the process.

Understanding the predictive analytics process

The steps in the predictive analytics process are

- Business understanding
- Data understanding
- Data preparation
- Modeling
- Evaluation
- Deployment

Each step is iterative and can be revisited as needed. As with almost all computer technologies, data is at the core of the processing efforts. In Figure 3-1, you see a graphical representation of the industry standard process that analysts follow when implementing predictive analytics.

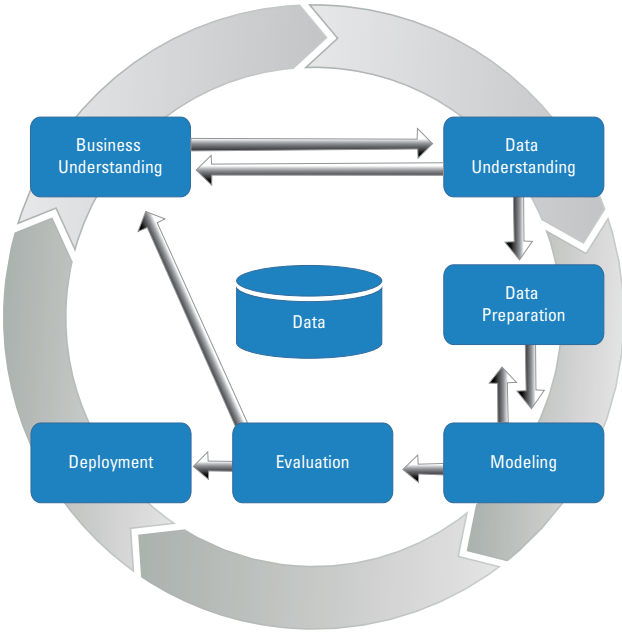

Figure 3-1: Understanding the predictive analytics process.

Although the steps to performing predictive analysis are cyclical and iterative, the data and analytical components are the focal point. As a general guideline, users spend the following percentages of time on each step:

- Business understanding: 5–15 percent
- Data understanding: 5–10 percent
- Data preparation: 50–60 percent
- Modeling: 5–15 percent
- Evaluation: 5–10 percent
- Deployment: 10–15 percent

Notice how a great deal of time is spent on data preparation. Technology should be used to reduce the time spent on data preparation and move that time to modeling and prediction, which are where you can discover business opportunities.

To help save time on data preparation and simplify data integration from multiple sources, Alteryx assists the analyst with preparing and including the right data in the workflow for analysis. The data can come from third-party sources, traditional internal data sources, or as Big Data input.

Within the predictive analytics process, the most critical steps are those dealing with data, modeling, and evaluation. Tools such as those from Alteryx streamline the predictive analytics process via automation, graphical workflows, and the easy-to-use interface to assist with all steps.

Figure 3-2 depicts how Alteryx provides graphical data flows to work with data and modeling steps.

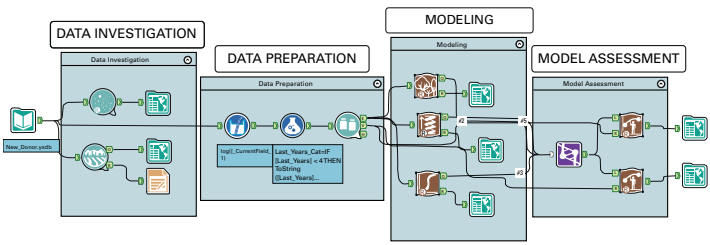

Figure 3-2: Understanding the predictive analytics process.

You can see in Figure 3-2 the natural progression from data investigation and data preparation to modeling and model assessment. High-quality predictive analytics tools enable the analyst to move through the analytic process in a logical, straightforward manner.

With the Alteryx Analytics toolset, predefined analytic procedures are provided to the user via intuitive graphical icons. Tools to assist with predictive functions are provided out of the box and can be customized as needed to meet specific requirements. New analytic procedures and tools are continually being developed by data scientists and included in the Alteryx toolset.

Rather than reinventing the wheel, the advantage of prebuilt analytic procedures and tools is that they save time and reduce frustration.

The benefit of the Alteryx predefined procedures and functions is that they simplify the overall predictive analytics process so that the analyst can spend less time struggling with data and statistical models and spend more time performing analysis.

Incorporating predictive procedures to perform analysis

In the modeling and evaluation steps of the predictive analytics process, the analyst uses predefined procedures and tools to perform the critical analysis that yields the key information you need.

The following procedures are commonly used to assist with modeling and evaluation during the prediction analysis phase:

- Decision trees
- Regression (count, linear, and logistic)
- Cluster analysis
- Time series
- Association analysis
- AB analysis
- Scoring

The following section talks about procedures that are commonly used to assist with modeling and evaluation during the prediction analysis phase.

Defining a Predictive Model

The predictive model organizes the vast universe of raw data into a format that analysts can use. The model categorizes raw data into known attributes about a subject (person or entity), assumptions about a subject, and that subject's likely behaviors.

Specifically, the predictive model is composed of:

- **Attributes.** Facts about a person or entity. Not all attributes are useful but in their totality, they build a picture of the subject.
- **Predicted attributes.** Likely facts about a person or entity. These values are predicted based on the data available about the subject's characteristics.
- **Predicted behavior.** Likely behavior of a person or entity based on their attributes and predicted attributes. The subject's wants, needs, and desires are a component of their predicted behavior, and that is what effective sales and marketing campaigns must target.

You can apply predictive analytics to many things: people, organizations, processes, events, and so on. The examples in this book focus on the individual consumer who may represent a potential customer for a company's product or service. However, the capabilities of predictive analytics are not limited to sales only; you can apply predictive analytics to many areas of research.

To be useful for sales, the analyst develops a predictive model about the targeted customer base using the vast array of data sources available. The targeted customer base involves the people the company is attempting to sell a product or service to. Once a predictive model is developed, the sales team targets a sales and marketing campaign toward people who most closely meet the criteria identified in the predictive model.

The power of the predictive model is how it derives predicted behavior out of a universe of raw data that otherwise would be unintelligible. In Figure 3-3, you see how raw data is translated into attributes, predicted attributes, and predicted behaviors for a specific use case involving middle-aged consumers in the suburbs of Indianapolis.

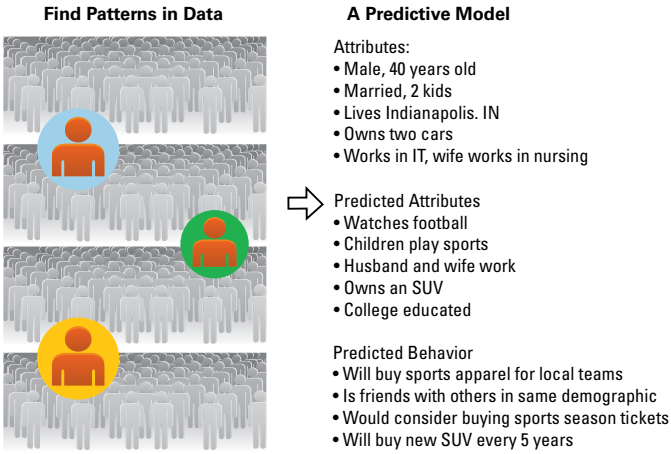

Figure 3-3: Moving from raw data to predicted behavior.

By applying the predictive model to raw data, the sales team now knows the wants, needs, and desires (predicted behavior) of the targeted customer profile. With this information, it is possible to more accurately target marketing and sales campaigns towards customers in that demographic. In this case, the sales team knows there is a likely desire to buy sports apparel, particularly for local professional and college football teams, a new SUV every five years because of their children, season tickets perhaps for football games, and things other members of their peer group also purchase.

The golden business value that predictive analytics brings to companies is in providing predicted behaviors based on the demographics of their desired customers. The ability to identify the wants, needs, and desires of a specific customer profile, and to identify that information faster than competitors, is what companies using predictive analytics strive to achieve.

Chapter 4

Using Predictive Analytics Tools

In This Chapter

- Knowing which analytics tools to use in a situation
- Identifying key features of good predictive analytics tools
- Looking at Alteryx Analytics and the Alteryx Analytics Gallery

Different predictive analytics tools exist, but they're not all the same. Tools differ in their data requirements, capability, and usability, and the savvy consumer needs to know what to look for during the evaluation process. Striking a balance between being too complex for users versus not providing necessary analytic capabilities is a difficult challenge for analytic software vendors. By carefully combining powerful analytic procedures and data integration capabilities with an intuitive user interface, the analysts can be equipped with highly effective predictive analytics tools.

This chapter identifies what to look for in predictive analytics tools and highlights several key features.

Categorizing Predictive Analytics

Analysts know their data and business needs; the challenge is to identify the predictive analytics procedures and algorithms that best support their environment. Categorizing the data that is available to the analyst will determine which predictive procedures are applicable to your business. Based

on which predictive procedures you identify, you can select the tools that best support your specific needs and data characteristics.

Figure 4-1 can help you determine which predictive analytic technique to use based on your data and the problem you want to solve.

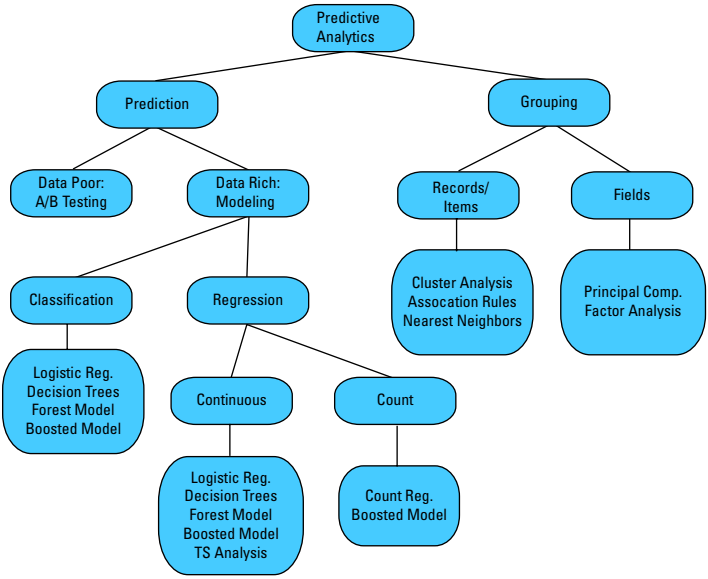

Figure 4-1: Categorizing predictive analytic techniques.

You see in Figure 4-1 how the characteristics of the data can help you determine what predictive analytic techniques might best meet the analyst's needs. For example:

- If only limited or poor quality data is available, A/B testing is an appropriate method to improve the quality and quantity of your data.
- In an environment with a large amount of data or highly relevant data, you can start to determine which modeling techniques are most appropriate.

- In data rich environments, look to see whether a large amount of natural variability exists in the data to identify the condition you are searching for. Additionally, determine whether the data spans a long enough time period to contain the information you need.
- Use classification techniques to separate the data into classes belonging to the response variable, which is usually a Yes or a No class.
- Using regression techniques is recommended when the response variable is numeric or continuous. Regression is best used when attempting to make a prediction rather than a classification.
- Grouping data is used as an alternative to predicting based on data. Grouping can be composed of two categories: records and fields. *Records* are similar to rows in a database table while *fields* are similar to columns.
- In situations where data is grouped by records, a variety of tools including cluster analysis, association rules, and nearest neighbors is usually the best option.

Using the correct techniques identified in the preceding list helps the analyst apply the best predictive procedures to the problem being solved.

What to Look for in Predictive Analytics Tools

Quality predictive analytics tools provide a wide variety of predictive procedures and algorithms to support all the data characteristics that customers encounter. However, before purchasing any predictive analytics software package, have your software evaluators catalog the predictive procedures and algorithms supported by the software and make sure that they match their data characteristics and will indeed benefit your analysts.

Developing a set of required criteria and nice-to-have's is a wise approach when evaluating any product, including predictive analytics tools. You want any tool to be powerful enough to do the job required and easy enough to use effectively.

Providing predictive analytics horsepower

First, consider the processing capabilities of the analytics tool. If the tool can't supply the necessary predictive analytics procedures and algorithms to perform the necessary tasks, the tool will fail to provide the results needed. One set of analytics tools that packs the punch needed by competitive companies is available from Alteryx (see Figure 4-2).

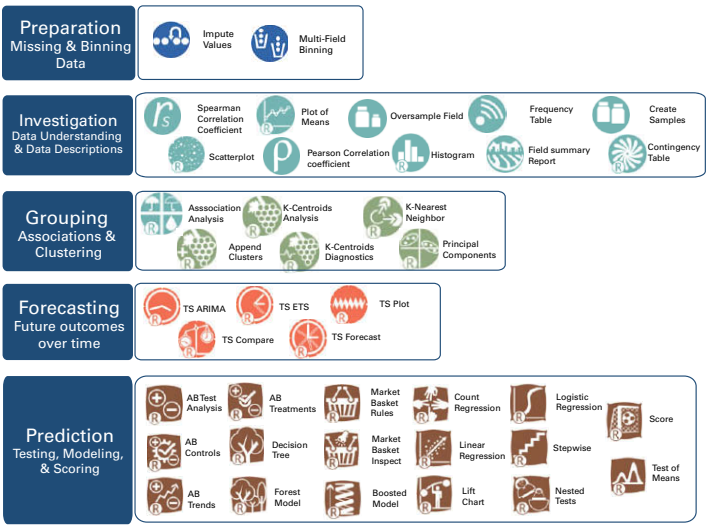

Figure 4-2: Alteryx capabilities and tools for predictive analytics.

In Figure 4-2, you can see how some of the tools in Alteryx, like data understanding, time-consuming data preparation tasks, and predictive modeling techniques such as forecasting, clustering, and scoring, aid the analyst in the predictive analytics cycle. Alteryx provides a prebuilt library, which it

continually enhances, of powerful predictive analytics tools that leverage the power of the R programming language. These tools are available for immediate use by analysts.

Predictive analytics tools, such as those in Alteryx, simplify the user's navigation of the analytic cycle. Much of the difficult work is automated and simplified by predefined procedures and tools. Combining the analyst's business and data knowledge with easy-to-access data sources, predefined procedures and tools, and graphical workflows, the path from preparation to prediction is streamlined and simplified.

Easy integration with key data sources

Data is what feeds the analytic processes, and any tool must have easy integration with the data sources required to answer critical business questions. Alteryx supports rapid data integration and enrichment from these sources:

- Structured data sources such as traditional databases and data warehouses already within the company
- Unstructured, fast-moving, and ever-changing Big Data sources such as social media input and the Cloud
- External third-party data included from vendors such as Experian and Dun & Bradstreet

A great deal of the analyst's time is already spent on data identification and preparation, so any analytic tool must make the analyst's job simpler and faster. Alteryx makes integration with multiple data sources fast and easy without the need for exhaustive work by IT professionals and data scientists.

Driven via a friendly and intuitive interface

A requirement of moving predictive analytics from dedicated IT professionals, data scientists, and statisticians is that the resulting predictive tool must be readily usable by users

without these backgrounds. Specifically, the tool must be easy to use and intuitive so that analysts can drive the predictive analytics process quickly and efficiently from their desktops.

Alteryx tools bring the power of predictive analytics to analysts by:

- Simplifying and automating, or semi-automating key analytic processes
- Leveraging drag-and-drop workflows to create relationships, access data, and build processes
- Incorporating prebuilt predictive analytic procedures, libraries, and easy-to-use tools to provide immediate access to powerful analytic algorithms
- Supporting the easy customization of R developed tools
- Providing easy, graphically driven access to commonly used functions via an intuitive gallery interface

Users will not use a tool if they are intimidated by it, which is not the case with Alteryx's tools.

Alteryx Analytics Deployed via Analytics Gallery

A predictive analytics tool that successfully combines powerful predictive analytics capabilities with an easy-to-use interface for the analyst is Alteryx Analytics deployed in the form of an Analytic Application via the Alteryx Analytics Gallery.

Being deployed via the Alteryx Analytics Gallery, the analyst can search for, create, and even securely share powerful analytic applications. Providing the analyst with a gallery of powerful analytic applications ensures that the company gets the benefits of analytic processing quickly and easily.

As shown in Figure 4-3, users are greeted with a friendly gallery of applications that is easy to navigate.

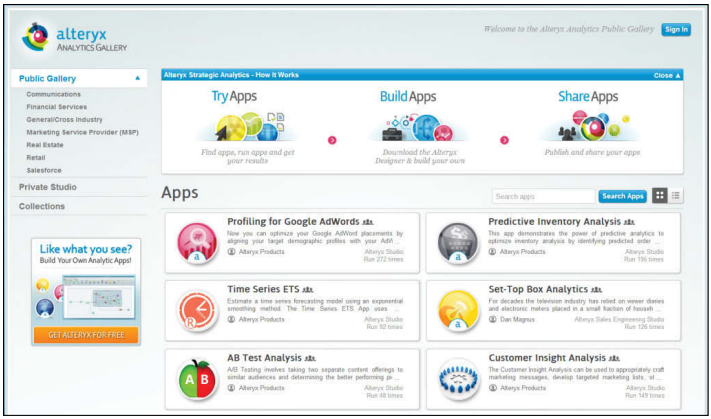

Figure 4-3: Exploring the Alteryx Analytics Gallery.

From the gallery interface, analysts can easily access preexisting analytic applications or develop and share their own analytic applications via the Alteryx Designer. Developing complex processes and workflows can be daunting for non-IT people, and long, complex processes are a hindrance to agility and efficiency. An analytic app removes all this complexity by making analytics available anytime and anywhere with just a few clicks.

A powerful feature of the Alteryx Analytics Gallery is the ability for analysts to download and open analytic applications in the Alteryx Designer tool before they run the application. This allows the analyst to review and modify the application to fit the analyst's specific requirements. Figure 4-4 provides details of the Predictive Inventory Analysis application available in the Alteryx Analytics Gallery.

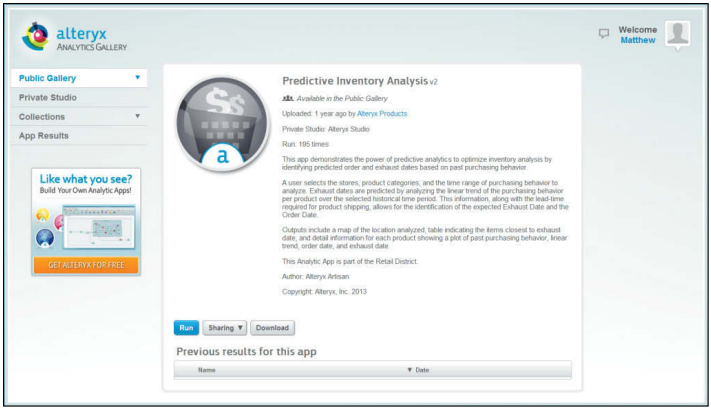

Figure 4-4: Examining details of the Predictive Inventory Analysis application.

A powerful feature of Alteryx Designer is the ability to open and modify the underlying workflow for applications. In Figure 4-5, the Predictive Inventory Analysis application is opened in Alteryx Designer for review and modification.

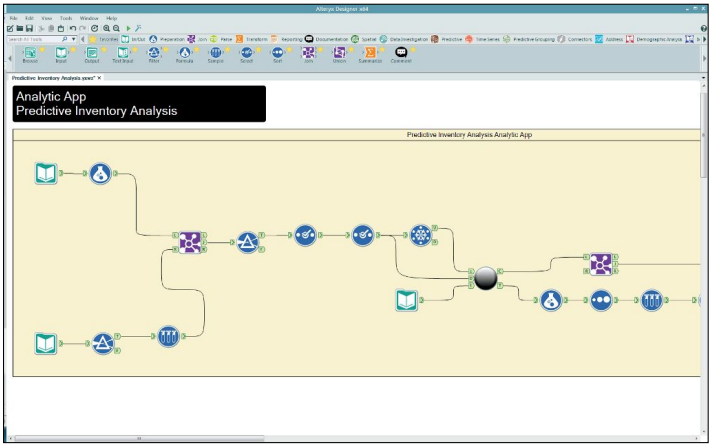

Figure 4-5: Opening predictive analytics applications with Alteryx Designer.

As you can see in Figure 4-5, the graphical workflow is both functional and intuitive. Building a new complex workflow or updating the workflow for existing applications that previously took a team of data scientists and statisticians many hours to create can now be done quickly by an analyst.

Alteryx Analytics deployed via the Analytics Gallery gives the analyst the ability to quickly and easily use predictive analytics applications to benefit the business.

To learn more about Alteryx predictive analytics, visit `www.alteryx.com/predictive-analytics`.

Chapter 5

Ten Things to Consider with Predictive Analytics

In This Chapter

- Being successful when implementing predictive analytics
- Ensuring the usability of predictive analytics technology
- Getting the most from predictive analytics in a real-world business environment

Understanding the fundamentals of any technology is essential to getting the most out of that technology. Beyond understanding the fundamentals, knowing the tips, tricks, and special techniques of how to best use a technology will pay further dividends once you've implemented and put it in use.

This chapter looks at ways to maximize your predictive analytics investment and to ensure that the implementation within your business is highly successful.

Integrating Predictive Analytics with Big Data

Big Data is, well, big, and so is its impact on business. Big Data provides companies with a wealth of information, and its impact cannot be overstated. Companies realize the benefit of Big Data and are positioning their IT departments to take advantage of this emerging data paradigm.

Companies need to include predictive analytics technologies whenever they develop Big Data programs to help maximize the value of these programs — and the time to include such analytics is at the start of the Big Data project, not at the end.

Embracing Social Media Input

Social media has taken society by storm and while specific sites come and go, social media will remain relevant and a large part of people's lives. Various IT products already plug in to social media, but the overall social media analysis technology is still relatively young.

When evaluating predictive analytics toolsets, you need to consider their ability to incorporate a wide range of social media input. If an analytic tool doesn't support social media or is hardcoded to limited social media input, that tool is likely missing a big part of the data picture. Choose analytic tools that fully embrace social media and can add additional social media input as society's social preferences evolve.

Accessing and Integrating Data from Multiple Sources

We've all heard the saying that "there are two sides to every story" but in data analysis, there are many more sides to the complete data picture. Data now comes from third-party data brokers, social media, technical devices such as inventory control tags, and of course traditional internal databases. All of these data sources are valuable and relevant to predictive analysis.

You need to be sure that any predictive analytics tool you use can easily access and integrate data from multiple data sources. Furthermore, the technology not only needs to access multiple data sources, but its integration also must be *simple* and *practical* for the business user. If data is not easily accessed, that data will often be ignored. Drag-and-drop visual workflows that allow the easy inclusion of data sources are good features to have in predictive analytics tools.

Looking to the Cloud

Cloud computing is changing the way people use computers and will continue to do so for the foreseeable future. Cloud computing software offers companies greater flexibility and lower costs.

Predictive analytics tools should be built from the ground up to leverage cloud technology. While a predictive analysis tool may have an installation footprint on users' workstations, integration into the cloud for data access and storage is a good indicator of the tool's capabilities. When predictive analytics tools have cloud access, they gain processing and data access capabilities not found in traditional computer architectures. When evaluating predictive analytic tools, evaluators should ensure that cloud capability is built into the tool as a core component.

Finding Customers through Spatial Analysis

No one catches fish in an empty lake so why open a business where there are no customers? Before a company opens in a new location, a great deal of market research goes into where customers live and shop and which competitors are in a specific area.

Smartphones and other mobile devices are routinely equipped with location tracking devices. Geotagging is the process of adding the users' locations to pictures, Short Message Service (SMS) texts, social media posts, and Rich Site Summary (RSS) feeds. The result is that Big Data now contains location data about potential customers as they go about their normal lives, shop at stores, and comment about products they like or don't like.

Predictive analytics tools can tap into Big Data containing a treasure trove of data about where customers live, shop, what they like to buy, and what they don't like. Leveraging this customer information allows for more accurate targeting of sales and marketing campaigns while reducing the risk of opening new business locations.

Making Agility Your Strength

Computer technology can accomplish almost any impressive feat, but the downside is usually the time and resources necessary to complete the project. IT has long suffered a well-deserved reputation of being expensive and taking too long to meet the needs of businesses in a competitive environment. The expense and long time frames have impacted every area of IT including traditional predictive analytics tools.

Fortunately, improvements in hardware and software processing capabilities, cloud computing architecture, the emergence of Big Data, and more flexible software design have allowed predictive analytics to move from slow and expensive to agile and obtainable for the common business user. Companies that shed their old predictive analytics tools and embrace the new generation of predictive analytics tools will experience a considerable advantage of speed and agility over their competitors.

Leveraging Your Business Analyst

Business owners often make the big decisions for a company, but the operational business and data analysts are usually the people who know what data is most important to the company. These people who are close to the data are the true experts for their particular business, and giving these people the best predictive analytics tools will yield great benefits for a company.

Providing the experts closest to the data with powerful tools to enable their creativity transforms them into business and data analysts. Business and data analysts are able to meld their deep knowledge of the business with Big Data via easy-to-use tools and explore new opportunities to benefit the business. However, the key to this empowerment is that the predictive analytics tools must be practical and intuitive for non-IT users. Tools, such as those provided by Alteryx, make predictive analytics usable by analysts and ensure that the true data experts are getting the full benefit of predictive analytics.

Enabling Decisions Anytime, Anywhere

Good ideas and business opportunities don't always come during normal business hours, and golden opportunities are often fleeting. Businesses that empower their people with agile technologies to quickly explore new opportunities and take advantage of market conditions will have a powerful advantage over their competitors.

Predictive analytics tools that are deployed via the cloud and enable analysts to get the right answers to business questions in just a few mouse clicks are what companies need in order to be competitive in a continually changing market.

Tools such as Alteryx Analytics are cloud-enabled, access Big Data quickly, and are easy to use for non-IT people. These key technological features ensure powerful predictive analytics technology is available any time a potential business opportunity presents itself.

Seeing What's Behind the Curtain

A key driver of modern predictive analytics technology is simplicity — so that non-statistical savvy business users can utilize it. For the majority of situations, the easy-to-use screens, wizards, and graphical interfaces meet the user's needs.

However, in some cases a greater degree of control beyond the easy-to-use features is required by power users. Unfortunately, many modern tools lock the user out of advanced settings and programming options because the underlying code is proprietary. This results in the users not being able to do what they need to do with their tools.

Fortunately, Alteryx predictive analytics is built on the open source programming language R (refer to Chapter 2). The impact of using the R language is that more technically-savvy power users can write their own R program code and import

that code into Alteryx to meet their needs. Alternatively, they can edit existing Alteryx tools (which are written in R) to customize the tool for their particular business need. The capability to update and supplement the R language used by Alteryx means that typical business users still enjoy an easy-to-use toolset while more advanced power users are not constrained.

Making Big Data More Manageable

Big Data by definition is large, quickly evolving, and can often become overwhelming. The unstructured nature of many Big Data input feeds (such as social media posts) makes harnessing the data extremely challenging for a database professional attempting to use traditional tools designed for structured data. For a nontechnical business user, attempts to divine useful information from unstructured Big Data in its raw format without appropriate tools would likely end in frustration and failure for the user and the data being ignored.

Modern predictive analytics tools are designed to streamline the relevant information from Big Data into a format that analysts can easily use. Tools such as those provided by Alteryx remove the complexity with Big Data and provide the analysts feeds into Big Data with minimal effort. You don't have to depend on having a team of data scientists to capture, format, and cleanse the data before giving it to the analyst; Alteryx automatically does the complex Big Data work for the user.