PART

I

Business Intelligence Foundations

In the first part of *Business Intelligence: Making Better Decisions Faster,* we lay some very important foundations for the executive, the manager, or the analyst who wants to learn what business intelligence is and what value it offers to the organization.

As a prologue to Chapter 1, we start with a short story about a woman named Lisa who finds herself in a bind. She wants to make a mark at Fabrikam, the company for whom she works, but the path to success is quite bumpy until she starts using business intelligence to overcome some difficult problems. The story illustrates the main message of Chapter 1, "Understanding Business Intelligence," that business intelligence is an attitude toward problem solving. The process starts with analysis, which leads to insight, action, and then measurement of the results. In this chapter we also look at the enablers of business intelligence—how technology, people, and culture come together to facilitate business intelligence.

Chapter 2, "Bridging the Analysis Gap," examines how systems designed for business intelligence transform the mountains of raw data within an organization into valuable information that is understandable and useful to decision makers. We describe the power of multidimensional analysis and discuss the *top-down*, *slice and dice* approach that decision makers use to analyze business problems. We explain how technologies optimized to support this form of business analysis can provide answers to ad hoc lines of questioning almost as quickly as the questions occur, thus providing a quantum breakthrough in the quality of business analysis—something we call *analysis at the speed of thought*.

Chapter 3, "Defining BI Technologies," provides a detailed discussion of the essential structures and technologies used to construct business intelligence systems. While this chapter contains technical information, it is presented in an easy-to-read format to help business decision makers understand where data comes from, where data is stored, how data is integrated, and how data gets into the hands of business users.

Prologue

The Mystery on Lovesick Lake

By the time she noticed, it was too late. Her four-year-old half-ton pickup gave a resounding "thunk" as the right front tire slammed into a pothole. She gripped the steering wheel with both hands and eased up on the accelerator. Hitting a pothole at 100 feet per second is dangerous in any vehicle, much less an aging truck.

Lisa Jacobson checked the clock and did a quick mental calculation. The gift shop wouldn't open for two hours. She had plenty of time. She slowed down. She'd been zipping along out of habit rather than necessity.

Lisa reflected on the irony of having plenty of time this morning. The greater truth was that she was completely out of time. Four months earlier she was the hero at Fabrikam, the second largest wholesaler of specialty gift and novelty items in Canada. Now she was fighting to keep her job. She had exactly two weeks before the start of a long July weekend. If sales didn't show a major improvement after this weekend, she was toast, and her job as director of imports would be an embarrassment on her resume rather than a source of pride. Her biggest campaign ever was on the brink of failure. The thought of screwing up so badly infuriated her.

She took a deep cleansing breath and tried to relax. She had wasted five weeks because of her own stubbornness, hanging onto a bad model of how this campaign should be run. Worse still, she had successfully managed to get everyone else, including Charlie, her boss, and Roger, the chief executive officer (CEO), to buy into the model. She had done her job too well. She was too persuasive about something that now looked not just wrong but stupid. The investment in inventory and promotion costs for the Peruvian doll campaign was over half a million dollars. Another half million was at risk from the channel expansion.

She needed answers right now. Though she had never visited the store before, Lisa was certain that the key answers could be found this morning at the gift shop on Lovesick Lake in Peterville. "Stay calm, think clearly," she murmured to herself. "You *will* solve the mystery of Store 9841." Lecturing to herself sometimes worked.

The sign at the entrance to town showed *Township of Peterville, Population 72,000.* The highway widened and was banked by gas stations and restaurants on both sides. She thought about pulling over for breakfast. She could also go over the numbers one more time.

Lisa pulled into a restaurant that had no advertising other than a big red neon sign that said "DINER." She focused a lot on branding in her job. She found it amusing that in choosing a restaurant in a new town, she consistently ignored the fancy signage and chain images and looked instead for the place with the fullest parking lot. She wondered if anyone ever studied parking lot metrics.

Entering the diner, she was conscious of the waitress staring at her faded jeans. A university sweatshirt and old tennis shoes completed her attire—not her normal business suit for a customer visit. This was her disguise for snooping around incognito. Lisa then realized that it wasn't her jeans. The waitress was focusing on her bulging laptop carrying case.

"You'll be wanting one of our booths with Internet access," the waitress said as she led Lisa to a booth near the back. "I'll be back in a minute with the coffee."

Lisa slid into the booth and snapped open the laptop. She pulled out a well-scribbled notepad and flipped to a clean page. At the top she wrote, "Distributor 9841: Lovesick." She then double-clicked an icon on her desktop and starting drilling into the database structure that opened up. This was the Fabrikam store database that she had refreshed from her apartment early this morning. Four clicks and she was at the complete profile, inventory, and sales history for store 9841. She already knew which store record to drill into.

* * *

Fabrikam was well known in the trade, but that was it. While sales were close to $200 million per year, the company was largely invisible to end customers. Specialty gift retailing is a fragmented industry, with most outlets being single stores owned and operated by sole proprietors. Gift shoppers are typically searching for something unusual, so individual stores with their aura of uniqueness have some advantage over retail chains, where consumers expect to see similar merchandise from one outlet to another.

But individual store operators, like Linda Mitchell who owned the gift shop at Lovesick Lake, lack the economies of scale and access to overseas

manufacturers that larger chains enjoy, which is what Fabrikam provided. By delivering a wide range of products to a large number of gift shops, Fabrikam had the buying power and could deal directly with the manufacturers, most of whom were overseas. Fabrikam's catalog listed over 400 items being sold in 350 stores in Ontario and Quebec—the two largest markets in Canada.

Lisa had worked for Fabrikam for five years. She joined Fabrikam after completing her MBA. A fast rising star, she had moved from merchandising analyst to director of imports in just three years. Lisa had so improved the process of getting products through the maze of government import regulations that what had been a five-month ordeal was now a five-week systematic process. Overseas manufacturers loved Fabrikam, and especially Lisa, because their products got onto store shelves faster than with other distributors. Many dangled offers of deep price cuts if Fabrikam stepped up volumes. With distribution restricted to Ontario and Quebec, however, it was tough to make the business case for higher quantity purchases. So that's when Lisa went on her mission to change the way Fabrikam looked at its business.

Sixty percent of Fabrikam's volume came from imported goods. The company incurred high fixed costs in product research and infrastructure to support its import purchasing. Because Fabrikam distributed to only two of ten provinces in Canada, Lisa saw her opening. Fabrikam should expand to other provinces because of the leverage of higher purchase volumes and broader coverage of fixed costs. She acknowledged that expansion would involve challenges in geography, logistics, regional preferences, language, and local government regulations, but these were surmountable if people would just embrace the idea and focus on how to make it work.

The first showdown came in September when Lisa's boss, Charlie Anderson, blocked a proposal to distribute a line of handmade Peruvian dolls throughout Canada. In the heat of the moment at a staff meeting, Lisa had lost her temper and accused Charlie of being afraid to take risks. Her exact words were, "You're a wimp, Charlie. Face it." The room became dead silent. A colleague finally joked, "Lisa, no real wimp would disagree with you."

She mumbled an apology, but Lisa knew that she had crossed a forbidden line. Roger Harui, Fabrikam's CEO, had also been at the meeting. He hadn't said a word.

The morning after the "wimp" meeting, as it was being called around the office, Lisa got a call from Roger asking her to join him for lunch. "Uh oh," thought Lisa. "This is the ax." As it turned out, that wasn't the case. Instead, Roger's agenda was to encourage Lisa to pursue the idea of expanding into other provinces. But the talk did include a reprimand.

"Lisa, your thinking is too insular," he started. "Your mental model of this—your understanding of how Fabrikam works and how this will affect us—is too oriented to your own job. With such a narrow focus, you'll never get the support from others that is needed for such a move as expanding into new geographies. Go back to the drawing board. Do a better, broader job. Find something really out of the box to wake us up. Give us some very good reasons for doing this thing."

Better a boot than an ax. Lisa then started digging into the corporate databases, nagging the information systems (IS) people for downloads and new reports, rejuvenating an abandoned compilation of store shelf utilization and margin statistics, and personally dumping data into spreadsheets and analyzing them.

The next presentation went better—a lot better. She started with the "core competency" pitch that everyone knew. "At Fabrikam, we understand the specialty gift market better than anyone else, and we know the real details of how to build a channel. That's a good foundation to start from. But, you know what? I don't think we really know how good we are at it."

Lisa starting walking the staff through a series of presentation slides, with some surprising insights. Finally, she came to the *coup de grace* slide (Figure P-1).

"To sum it up, our customers have some very, very good reasons to love Fabrikam. While we take only 26 percent of their shelf space, our products generate 41 percent of their sales and a whopping 51 percent of gross profits. These are statistics we can win with—it's called tooting the horn—that leads to the most difficult part of expanding—convincing new stores to sign up."

Chairs shuffled. Whispers. You could sense both excitement and skepticism. Then the questions started, and for the next hour Lisa defended her analysis and the numbers—the survey data, the underlying database structures, the allocation methods she used, and the sales projections. The IS director was the most challenging. He knew that Lisa had been working on something with all that data, and finally here it was. Nobody at Fabrikam

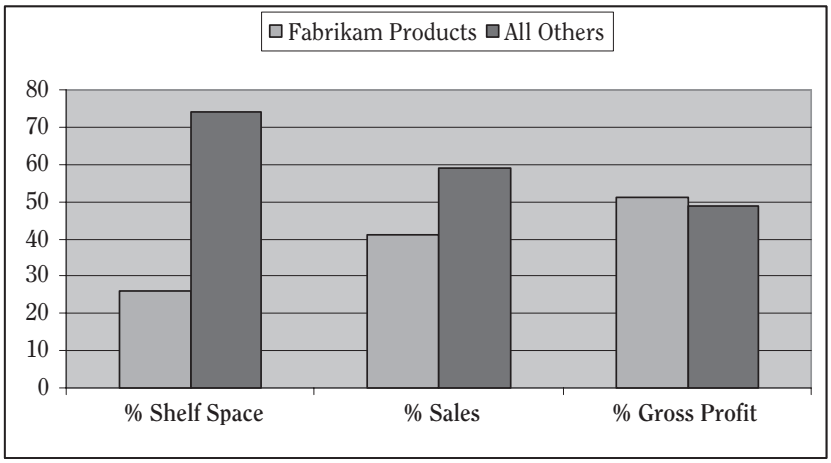

Figure P-1. *Fabrikam products vs. other products*

had done anything like this before. Usually financial analysts, not managers, crunched the numbers.

Roger leaned back, watched the action, and smiled. "No wimps here," he thought.

* * *

Lisa looked up from her laptop and poked at what was left of her scrambled eggs. Such a great presentation that was, and such a great response from Roger and everyone else. There was a whirlwind of real activity and commitment—new financial plans and forecasts, the hiring of two new regional directors, and opening new warehouse space in Vancouver. And, of course, the kickoff product line—the Peruvian dolls that Charlie had nixed at the wimp meeting.

Everything for the expansion had been executed according to plan, including spending a lot of up-front money for prospective new stores. Ninety new stores were signed up within three months. Then came the sales reports. "From hero to loser in three months," Lisa thought. The Peruvian dolls, their flagship product with the new distribution channel and a major campaign for the established stores, was selling at 19 percent of plan.

There were some explanations, such as weather, timing, and too steep a ramp, but most sounded like excuses. Finally, Lisa and her staff hit the road to find out what was really happening in the stores. They visited scores of

new and old outlets. A few had not set up the point-of-purchase displays properly. At one store, the entire product shipment was still in the storage room. Lisa talked for hours with dozens of store owners, but she couldn't nail down anything concrete to explain the huge variance from the projections.

In the next weeks, sales crept up but very slowly. With great anxiety Lisa reviewed the results for the week that included a long vacation weekend at the end of May. Thirty-four percent of plan—maybe it was the weather. First two weeks of June—41 percent of plan; marginally better but still bad. Third week of June—25 percent of plan. The sky was falling, and the phone was ringing. There were now five calls from expansion stores wanting to ship back the dolls. Finally, Lisa was forced to look into the mirror. She had to accept what the data was telling her. Her Peruvian dolls were a dud.

Lisa glanced at the check, left a $10 bill, and headed for the restaurant exit. As she climbed into her truck, Lisa smiled broadly. She had rechecked the data at the restaurant, and it was clear. Whatever the answer, for better or worse, the mystery of the Peruvian dolls should be answered at the gift shop on Lovesick Lake.

* * *

In the parking lot of the shop, Lisa picked up a boxed doll that sat on the seat beside her. She studied the glossy beige color and the clear plastic front of the packaging she had designed. She examined the labeling in English and French. The packaging had been intentional. The neutral box color let the high-contrast colors of the doll costumes stand out. The high quality of the box added to the perceived value of the product.

Lisa removed the doll from the box and examined it. The craftsmanship was superb. The facial features were clearly painted. The hair was neatly braided and tied with ribbons. The care with which the costume had been sewn was evident. There was no better product on the market in the same price range. Was this really a dud or what?

Lisa stepped into the shop. A woman with shoulder-length salt and pepper hair, presumably Linda Mitchell, stood behind the sales counter and greeted Lisa warmly. Lisa nodded and smiled but said nothing. She turned to the interior and stood for a moment absorbing the scene. It took every bit of self-control to prevent her from racing through the shop searching for the dolls.

She wandered deeper into the displays, rapidly scanning the shelves at the five-foot level—the correct height for showing off the dolls. She expected to see a display of 48 dolls, 12 wide and 4 deep, with each doll standing neatly within its box staring out at the world. She did not expect to look down to table level and see a most delightful dollhouse. It was made of several shades of wood, all appearing to be unpainted but of such distinctive textures that the overall impression was remarkably lifelike.

She crouched down to study the dollhouse more closely—its superb craftsmanship and the detailing of the covered front porch that hosted a swing where one of the Peruvian dolls was placed. More dolls inhabited other rooms of the storybook house. Each was completely congruous, the fine details of their appearance matching that of the setting. One stood beside the fireplace somewhat askew. Without hesitation, she adjusted its position.

It was immediately clear to Lisa where she had erred. Her market testing had placed the actual doll into the hands of test customers. They had been able to examine the fine details at close range and feel the quality of the construction. The packaging, of which she was so proud, was preventing this in her specified displays. The dollhouse display showed the dolls in a far superior setting—really showing them off.

She read the small laminated placard that stood beside the dollhouse: "Unique handcrafted dollhouses available by special order. We ship anywhere. Lovesick Lake Dollhouse Company." The price was $299. Her mind raced through scenarios. Then she was startled by the owner who was standing beside her.

"May I help you?" asked Linda.

"You already have." Lisa's face beamed a great smile. "Let me introduce myself. I'm Lisa Jacobson. You must be Linda Mitchell."

* * *

The telephone rang, but Lisa didn't look up from her dinner of Chinese takeout. It was the fax line. Just as expected.

It had been a whirlwind of activity since her visit to Peterville—conferencing with her staff, rewriting the display recommendations, meeting with the dollhouse maker, driving hundreds of miles setting up displays, pitching store owners on the new approach. It came together quickly and cleanly.

The dollhouse maker was Linda Mitchell's brother, Harvey. His only channels were his sister's shop and word of mouth. When Lisa bought his inventory of five houses and ordered a hundred more, Harvey quit his job as a carpenter and started to work. The fax on Lisa's line was from Harvey, a signed distribution agreement between Fabrikam and the Lovesick Lake Dollhouse Company.

The best news was the impact on sales. It was like magic—every store where they placed a dollhouse showed an immediate improvement in doll sales. Even the stores where they just got them out of the box showed improvement. Overall sales of the Peruvian dolls were now 12 percent ahead of plan. Dollhouse sales were also supplementing the bottom line very nicely. "Thank-you very much," thought Lisa.

She thought back to her meeting with Charlie and Roger two weeks earlier. "You were two Peruvian doll cancellations away from getting canned," teased Charlie as he smiled broadly. "It would have been half a million down the toilet."

"I know, it was just that..." said Lisa.

"Lisa," Roger interrupted. "We want to know how you figured out about the dollhouses. You'd been plugging around in all that data, but there was nothing in the database about the dollhouses." Roger and Charlie looked at her with question marks on their faces.

"OK, guys," said Lisa. "A couple of nights before I went to Peterville, I was struck by a lightning bolt. I was asking the wrong question."

"And the wrong question was?" asked Charlie.

"I was asking what's going wrong?" answered Lisa. "I was looking at the problem upside down. Instead of focusing on what was wrong at many outlets, I needed to find some examples of what was going right at one or a few outlets, if there were any."

Lisa explained how she had studied all the standard sales reports, which included summaries by province, region, and district, plus listings of the top 10 and bottom 10 districts. There was no reporting by individual stores, however. The IS department used to print out these reports, but they were cancelled a year ago. As the company grew and the number of stores multiplied, nobody seemed interested in store-level data, except the field representatives who got special store reports for their districts.

Out of frustration, Lisa asked IS for a copy of the entire sales database with every sales transaction down to the store level for the previous 12 months, which she loaded in a multidimensional database on her laptop. She spent hours massaging the data, looking at variances and peculiarities. But nothing clear-cut jumped out until...

"Finally, I stumbled onto the right question, which was, 'Is anybody doing anything right?'"

Lisa continued: "By analyzing which stores were doing good as well as bad, I found there was only one store that had performed as expected more than two of the five weeks. That one store had performed as expected in all five weeks. It was obvious to me that they knew something about selling dolls that I did not. Here, I'll show you."

Lisa stopped, thought a second, and then flipped open her laptop. She double-clicked an icon and selected a saved view. There it was at the top of the list—the gift shop on Lovesick Lake (Table P-1), the only store that was above plan for all five weeks.

Table P-1. Peruvian doll sales by store

		Sales Week					
Store Number	**Store Name**	**1**	**2**	**3**	**4**	**5**	**YTD**
9841	Lovesick Lake Gift Shop	103	103	135	116	128	119
3722	Wingtip Gift & Toys	76	84	104	89	111	93
1655	Tailspin Gift & Toys	66	93	80	88	91	84
7269	Contoso, Ltd.	84	35	104	74	95	84
5460	Tkachuk Gifts	74	84	80	74	82	79

Key:

Above Plan ■

At Plan □

Below Plan ■

CHAPTER 1

Understanding Business Intelligence

The story of Lisa in the Prologue, while fictitious, is actually quite relevant to the real challenges that business decision makers face everyday. From Main Street to Wall Street, the pace of business decisions continues to increase. Those companies that can create competitive advantage and craft superior business strategies in this fast-paced market will leave slow and outsmarted companies in the dust. Even though we live in the Information Age, where ever-increasing masses of data are at our disposal, we often struggle to understand what the data means. While advancements in the power of available technologies are never ending, we need to recognize that technology alone cannot solve a business problem. To drive the business forward, companies need people at the helm who can make effective decisions. Business intelligence is the key to bringing together information, people, and technology to successfully manage a company or organization. Perhaps by explaining what business intelligence has to offer a company, we can help you impact your business just as Lisa did.

Describing Business Intelligence

The term **business intelligence**, also known as **BI**, is relatively new. The term is used by different pundits and software vendors to characterize a broad range of technologies, software platforms, specific applications, and processes. Since business intelligence is a multifaceted concept, we will examine it from three different perspectives:

- Making better decisions faster
- Converting data into information
- Using a rational approach to management

Making Better Decisions Faster

The primary goal of business intelligence is to help people make decisions that improve a company's performance and promote its competitive advantage in the marketplace. In short, business intelligence empowers organizations to make *better* decisions *faster*.

In the best of all worlds, managers, from the lowest lead supervisor to the CEO, make decisions by considering their experiences, their understanding of the business, their business plan, and information. Often the experiences, understandings, and strategies that go into decision making are pretty static; that is, they change very slowly. The information, however, is always new, which means it is often changing rapidly and in a big way. It is often difficult to get a handle on these changes and understand their significance. Making *better decisions* means improving any or all parts of the process; this also results in fewer poor decisions and more superior ones. Better decisions result in better achievement of corporate objectives, such as improving shareholder value.

Business intelligence aids better decision making by analyzing whether actions are, in fact, resulting in progress toward company objectives. Deciding what is a better decision for an organization is best accomplished with a clearly stated set of objectives and a plan for achieving them. This relationship between a company's overall plan and business intelligence is not a one-way street, with business intelligence simply receiving the plan and using it as the scale for measuring the quality of decisions. Business intelligence has a major role in creating those strategies and plans. It is about making better decisions faster, and the most strategic decisions are the ones where business intelligence is the most indispensable.

What good is a well-thought-out action plan if it is simply too late to achieve competitive advantage? Most industries are highly competitive, and business opportunities are extremely time sensitive. Businesses that spot opportunities but decide too slowly how to take advantage of these opportunities will lose out to their quicker rivals. There is a need to make not only better decisions but also better decisions *faster*.

The need for speed also applies to gaining feedback within an organization. If rapid access and turnaround of information are not available, decisions are made either without information or with stale information. The negative consequences of no information or old information can be huge, such as losing a key customer or continuing to produce a product that con-

sumers no longer prefer. While having perfect information to support every decision is an unobtainable goal, there is no doubt that making consistently better decisions sooner will provide a competitive advantage.

Converting Data into Information

To make better decisions faster, business executives and managers need relevant and useful facts at their fingertips. But there is often a large gap between the information that decision makers require and the mountains of data that businesses collect every day. We call this the **analysis gap**.

To bridge this analysis gap, organizations make significant investments in the development of BI systems to convert *raw data* into useful *information.* The most effective BI systems access huge volumes of data (measured in gigabytes and even terabytes) and deliver relevant subsets instantly to decision makers in a form to which these people can easily relate. Some call this "analysis at the speed of thought"—being able to get an answer to a question almost as quickly as the question is formulated. This makes possible a quantum leap in the quality of analysis that can be performed, which leads to a much better understanding of the business. In Chapter 2, "Bridging the Analysis Gap," we explain how BI systems support "analysis at the speed of thought."

Some people consider technology's contribution to delivering useful information as a baseline definition of business intelligence—the systems, applications, processes, and procedures that collect and convert large volumes of data into useful information for managing and controlling business activities within departments, divisions, and business units. We think this is too narrow a view.

While technology is a significant part of this process, often the hardest aspect of business intelligence is being able to define what information is useful and relevant to a decision. BI solutions at the enterprise level are charged with collecting and reporting a company's most important metrics, sometimes called **key performance indicators** (**KPIs**). KPIs guide businesses in making decisions that affect particular business units as well as the company at large. We explain more about KPIs in the section on measurement later in this chapter. In addition to KPIs, now more than ever, the vision of business intelligence has expanded beyond the internal measures that have traditionally characterized management reporting. With advancements in e-commerce, **business-to-business** (**B2B**), and

business-to-consumer (**B2C**) transaction systems, business intelligence is increasingly about delivering actionable information to people outside the organization—often as a revenue source.

Throughout this book, including the case studies in Part II and the practical advice in Part III, we provide details to help you understand the importance and specific techniques for converting raw data into useful decision-making information.

Using a Rational Approach to Management

Business intelligence can be described as an approach to management, an organizational state of mind, a management philosophy—in short, the *BI attitude*. People and organizations adopt the BI attitude because of a belief that a fact-based, rational approach to making decisions, to the extent this is possible, is basically a good thing.

The BI attitude is characterized as follows:

- Seeking objective measurable quantitative facts (data) about the business
- Using organized methods and technologies to analyze the facts
- Inventing and sharing models that explain the cause and effect relationships between operational actions and the effects these have on reaching the goals of the business
- Experimenting with alternate approaches and monitoring feedback on results
- Understanding that people are not always rational
- Running the business (making decisions and taking actions) based on all of these characteristics

Rationality and Science

How business intelligence applies rationality to the management of a business is reminiscent of the way science uses rationality to study the natural universe. Many aspects of science, such as collecting data, forming and testing theories, and experimenting, have parallels

Rationality and Science *(continued)*

in the most rigorous BI applications. While science seeks to study isolated phenomena in meticulously controlled experimental settings, business intelligence deals with the behavior of customers, suppliers, competitors, employees, and others actors in the rough-and-tumble day-to-day conduct of business. Pure science seeks understanding for its own sake without a deadline; business intelligence seeks understanding for the purpose of taking action to meet organizational objectives.

The BI attitude of fact-based and analysis-based decision making is influencing corporate cultures everywhere, principally because we are living in a world that is becoming increasingly rich in information; the technology is available, it is getting cheaper and easier, and it is working.

Experience, gut feelings, and lightning bolts of intuition—all of these will continue as an important basis for making decisions, but more and more they are being supported by the foundation of information that business intelligence delivers. In fact, gut feelings and lightning bolts work better because they are inspired by the hard facts of business intelligence. Armed with the facts, you have excellent backup when you need to sell and promote your ideas.

Defining the BI Cycle

It is important to understand that business intelligence is even more than an attitude or an enabling technology; in fact, it is a performance management framework, an ongoing cycle by which companies set their goals, analyze their progress, gain insight, take action, measure their success, and start all over again.

Business intelligence helps managers make better decisions faster at both strategic and operating levels. Data from many sources are typically analyzed. Analysis leads to insights—many small ones, and hopefully a few big ones. These insights suggest ways to improve the business; when acted on, these insights can then be measured to see what is working. These measurements also provide more data for analysis, and the cycle starts anew. We call this progression—analysis to insight to action to measurement—the **BI cycle** (Figure 1-1).

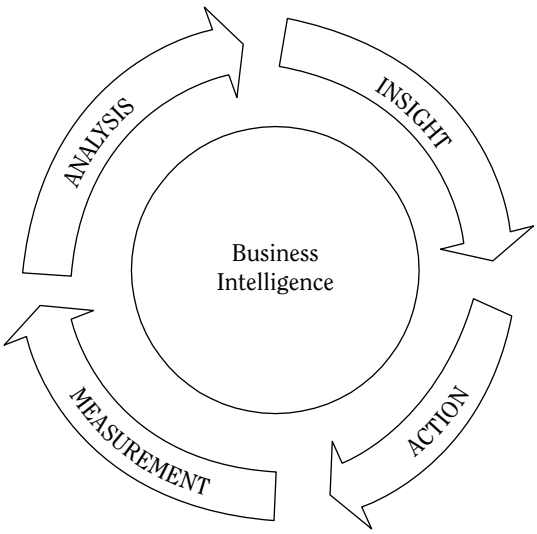

Figure 1-1. *The BI cycle*

Analysis

When we undertake analyzing our business, how do we determine what data to collect and what analysis to perform? We do this by consciously selecting and subconsciously filtering what we think is important. This filtering is based on our basic understandings and assumptions of how our business operates, including, for example, what is important to our customers, suppliers, and employees; what factors affect product cost and quality; and what happens if we raise the selling price. This collection of everything that we think we know about how something works (in this case our business) is referred to as a **mental model**. This labeling of our understanding applies not only to people but also to organizations. Some people refer to the company's mental model as "tribal wisdom."

Vision and the Mental Model

Why are the most wildly successful companies of each generation not the ones started with the most history, money, and market share but rather those led by leaders with a vision? Is the success due to the leader or the vision? What is vision?

Vision and the Mental Model *(continued)*

The leader has a mental model of how the world is and how the world is changing. The leader imagines a new kind of organization that is suited to take competitive advantage of these trends, and he or she sets about to create it. While a mental model explains the way the world is, a vision explains a world that may be. The leader must get many others to share the vision in order to implement a strategy to make it happen. Hugely successful organizations, the ones that establish new business paradigms, are the embodiment of radically new mental models. Business intelligence contributes significantly to this process through the BI cycle.

Mental models are essential for managers to make the many decisions that they must make at an ever-increasing pace. They are the basis on which we informally decide what we think is a good idea. Our mental models, however, can also hurt us because they can block us from seeing what might be obvious to others.

Remember Lisa? At first all she saw was the problem; it never occurred to her that she could learn something from the stores that were being successful. She assumed all stores were following her program. And the sales reporting system—a product of her company's mental model—further screened her view by delivering only fixed-format reports and assuming that reporting at the individual store level was not important for product analysis.

Having BI systems that support freestyle analysis can help you break through the limits of your current mental models and even conceptualize new ones. The abilities to drill down through layers of data, pivot rows and columns, calculate specialized metrics on the fly, and sort in any direction on any variable—all at the speed of thought—enable users to ask the questions and do the analysis in any form they choose, go down wrong paths without embarrassment or material loss of time, and work without a highly prestructured process until a clue is discovered, which then leads to a question, which then leads to an insight. Excellent analysis helps us understand our business better by allowing us to challenge conventional patterns of thinking and assumptions about what the right analysis is. Lisa didn't get an immediate answer about why the dolls were not selling, but when she started asking different questions in a more open format, a new world of possibilities opened up.

Step one of the BI cycle is to ask and answer many questions rapidly, both the conventional and the unconventional. That is what real analysis is—the freedom to be curious and ask lots of really stupid questions until you ask a brilliant one.

Insight

Insights come in different sizes. There are operational insights, such as discovering the cause of price variances in a specialized commodity purchase. There are strategic insights. For example, the best way to gain cell phone subscribers is to give away the phone and charge only for the service. On occasion, insights have created entire industries. The visionaries of computing realized that computer chips and components were becoming so small, powerful, and inexpensive that eventually everyone could own a computer; hence the personal computer was developed.

Insight is the product of broad, free-ranging analysis born of questions that only we human beings can ask—the discovery of patterns that only humans can recognize as useful. Lisa experienced several critical insights into Fabrikam's business operations because of her analysis of the data, including the realization that the gift shop on Lovesick Lake held the answer for her.

Convincing others that you have a better understanding of something is not often easy. Remember Lisa's struggle to convince her company of her great idea to expand? Her troubles were minor when compared to some historical examples of what people have gone through to shift the mental model of a large number of people. Consider the following.

Until the sixteenth century, conventional wisdom held that the earth was the center of the universe, and everything else—the sun, the moon, planets, and stars—revolved around it. This was the Ptolemaic view from which scientists developed sophisticated mathematical formulas that actually predicted celestial events such as eclipses. Then a different generation of thinkers and mathematicians had a revolutionary insight: the earth and planets revolve around the sun. This heliocentric idea was heresy, of course; it challenged political and religious foundations as well as conventional science. It was many years before it became the norm. In short, an insight per se is not always accepted just because it is brilliant or even correct.

What does this mean for business intelligence? If an individual has an important insight, it generally has to be shared by others to be useful. Just like the heliocentric model, challenges to conventional wisdom (the predominant mental model of the organization) are often unwelcome and likely to meet resistance. Well-organized business intelligence leads us to the insights, but it also provides

us with the clear data, patterns, logic, reporting, graphics, calculation algorithms, and other analysis and presentation tools to help us sell the insight. Propagating insight is as much about helping people see the world in a new way and understand the benefits of this as it is about the underlying data and logic.

Action

The connection to action in the BI cycle is through the decision-making process. Action follows the better and faster decisions that business intelligence facilitates. Well-grounded and better-grounded decisions (decisions backed up by good analysis and insights) give strength and courage to the action taker. Instead of tentative decisions that often result in hedged action plans and underfunded projects, action backed by strong analysis and business intelligence is typically clearer in its purposes and details and gathers stronger organizational support for its implementation. For example, Lisa's decision to act quickly and use the dollhouse displays in other stores was not guesswork; it was a well-reasoned decision based on the analysis of data.

Finally, good business intelligence that is delivered quickly improves the cycle time for action. There is an imperative today in organizations to react more quickly, try new approaches, experiment more, and prototype faster and more frequently. BI-based decision making with faster turnaround and tighter feedback loops provides more opportunity for such action-oriented experiments and testing.

Measurement

With improved information gathering and more frequent and sometimes concurrent reporting that business intelligence brings to the table, there is greater opportunity in the organization to measure results against quantitative standards, thus leading to another cycle of analysis, insight, and corrective action.

This may sound like the old "planning and control" cycle that bean counters have made the foundation of financial management for decades. With business intelligence, however, there is a huge difference: it is not just financial management and spending controls; it is everything. Business intelligence allows the setting of standards and benchmarks for monitoring performance and providing feedback in every functional area of the business, using metrics that extend well beyond traditional financial measures.

We measure what we think is important. The BI term for the most important measures is *key performance indicators.* BI systems are specifically designed to assimilate large amounts of complex data from disparate sources

and then combine the data using complicated algorithms for allocating, aggregating, and otherwise massaging the data. The result is consistent reporting on the metrics, ratios, and activity drivers—that is, the true KPIs—that managers need to understand, analyze, and take action against on a frequent basis. In a truly comprehensive BI system, no functional area of the business is untouched by its own KPIs, nor should it be. We want managers to manage what is truly manageable, and that is usually KPIs, not dollars. This is strongly facilitated by the measurement systems explicit in most BI systems.

A KPI Sampler

Here are a few examples of commonly used KPIs.

Functional Area	Typical Key Performance Indicators	
Operations	Capacity utilization	Inventory turns
	Units produced	Adherence to production plan
	# of SKUs	
	% defective	# rejects
	Direct to indirect heads	Operations headcount
	Average wait time	% orders scheduled to requested
	Yield	
	Inventory carrying cost	Returns
	Vendor performance to schedule	Inventory accuracy # vendors
Sales/marketing/ customer support	Unit sales	Amount sales
	Average selling price	# customers
	Amount value per customer	# products per customer
	Book-to-bill ratio	Items per order
	Sales per salesperson	Sales per employee
	# customer inquiries	
Finance	Variance vs. budget	Variance vs. forecast
	% variance	% margin
	% profit	% of sales
	Days sales outstanding	Current ratio
	Quick ratio	Asset turns
	Debt-to-equity ratio	

Enabling Business Intelligence

We have described business intelligence from several perspectives and explained the BI cycle. We are now going to explain how business intelligence can be enabled. The principal enablers are technology, people, and corporate culture.

Technology

Even the smallest company, with BI software, can do sophisticated analyses today that were unavailable to the largest organizations a generation ago. The largest companies today can create enterprise-wide BI systems that compute and monitor metrics on virtually every variable important for managing the company. How is this possible? The answer is technology—the most significant enabler of business intelligence. Let's look at the technology trends that have made modern business intelligence possible.

Processing Power

Today's desktop computers deliver more raw power than was available on supercomputers just a decade ago. The computing power of a microprocessor has reliably doubled every 18 months (Moore's law), while prices have generally held constant. The impact on business intelligence is twofold: (1) BI analysis techniques that require millions of calculations can now be done quickly on low-cost servers and distributed to client desktops at a low cost. (2) Greater processing power has revolutionized the visualization technology available—graphical views of data displayed on colorful monitors, projected on a wall for teams to share, printed, and even enhanced with real-time animation.

Data Volumes

Data storage has seen an exponential increase in capacities over the last decade, while prices have held constant or even fallen. An unprecedented amount of transaction detail is now captured, massaged, and made available for BI analysis. An analyst can load an entire copy of a business unit's sales database onto a laptop computer. The rule of thumb is the greater the quantity of data, the more certain the analysis and conclusions. As long as the BI software can load and crunch the numbers with fast turnaround, the cost of storing vast amounts of data has become insignificant compared to the benefits of better analysis.

Network Technologies

The growth of the Internet, the widespread adoption of Web browsers, and the development of user-friendly interface software have enabled organizations to connect virtually every employee to BI information databases. Business intelligence is no longer the domain of a few select department analysts who crunch numbers on their spreadsheets. Because of network technologies, it can be available to every manager and employee who needs to know what is happening in his or her own part of the business. As Bernard Liautaud[1] explains it, we are entering an era of Information Democracy.

Standards

Gone are the days when computer hardware and software had to be purchased from a single vendor. Novice users can purchase software from numerous companies, plug it into their computers, and have a high degree of confidence that the software will work. Standards enable this interoperability. BI interoperability is becoming increasingly possible primarily because of data access standards for relational and multidimensional databases that support BI systems.

BI Software

The BI software industry barely existed 10 years ago. Now several large software companies offer full suites of BI products, including tools for **extracting, transforming, and loading data** (**ETL**); large-scale systems for the storage and aggregation of data; and front-end interfaces for user access—all at a fraction of the cost of the legacy, mainframe-based decision support systems that first appeared in the 1980s. The impact that the use of these tools can have on an organization's efficiency and effectiveness is enormous. In Chapter 3, "Defining BI Technologies," we describe these tools and technologies in more detail.

1. Author of *E-Business Intelligence: Turning Information into Knowledge into Profit* (New York: McGraw-Hill, 2000).

People

Understanding the role of people in the BI cycle allows organizations to systematically create insight and turn these insights into actions. One way in which organizations can improve their decision making is to have the right people making the decisions. This usually means a manager who is in the field and close to the customer rather than an analyst rich in data but poor in experience. In recent years "business intelligence for the masses" has been an important trend, and many organizations have made great strides in providing sophisticated yet simple analytical tools and information to a much larger user population than previously possible.

Some BI technology companies claim that their software turns data into knowledge. In our view this is marketing hype because it discounts the essential role of people. Knowledge is something people create. People are the ones who persuade others to see the world in a new way.

Today's BI technologies can analyze vast quantities of data. Inexpensive desktop computers can process more data faster than the supercomputers of a decade ago. The ability to process vast amounts of data is definitely a benefit, but suggesting that more data is the primary driver to improving business intelligence is similar to suggesting that if Sir Isaac Newton had observed more apples falling, he would have certainly developed his laws of gravity sooner. Modern managers do not suffer from a lack of data, and the technologies and techniques described later in this book provide the means to analyze that data efficiently. But no amount of raw data will substitute for experimentation and pondering. Information systems may report what is going on, but gaining insight into why this is happening requires intuiting the motivation of people and organizations. This requires people.

People are an essential element of business intelligence. But as we have observed, people can also obstruct the benefits of such intelligence because people resist changing their understandings; they like what has served them well—things with which they are comfortable. The resistance to change and the opposite of this, the eagerness to change, are often tightly woven with emotion. We saw an example of this in Lisa's story. Recall that it takes her several weeks before the data finally convinces her that the dolls are a flop. But then it takes her only a few hours to develop the conviction that she knows how to turn the situation around.

Given a set of facts, there are an infinite number of rational explanations, which are limited only by human imagination. It is not surprising

then that business people, who have many motivations, will often disagree about what the data means.

Resistance to change is a problem because getting people to shift their mind-set is how organizations learn. Having models and strategies that are widely shared throughout an organization is essential for the independent decisions of numerous managers to move the organization forward, rather than working at cross purposes. Understanding our own stubbornness is useful in helping us devise strategies to persuade others. Certainly providing facts that cannot be explained by the conventional mental model, providing time for this to be grasped by all, suggesting alternative models that are consistent with the facts, and avoiding emotionally charged disputes over who is right or wrong are advisable tactics for the successful adjustment of mental models.

Let's conclude this discussion of people with an observation that may be personally relevant. BI systems serve business managers in much the way that navigation instrumentation serves a pilot; they both provide feedback information. The degree to which this instrumentation is essential depends on the size and complexity of the enterprise and the role of the manager. While a small business owner might be able to manage by dead reckoning, the head of a huge enterprise would be hopelessly overwhelmed if he or she attempted to manage without the aid of BI technologies. This observation implies that your organization's ability to grow and your success in more senior roles depend, at least in part, on having satisfactory BI technologies and a mastery of business intelligence.

Culture

A key responsibility of executives is to shape and manage corporate culture. The extent to which the BI attitude flourishes in an organization depends in large part on the organization's culture. Perhaps the most important step that an organization can take to encourage the BI attitude is the decision to measure the performance of the organization against a set of KPIs. The implied actions of publishing what the organization thinks are the most important indicators, measuring these indicators, and analyzing the results to guide improvement are nothing more than using the BI cycle.

Business intelligence can be the source of many improvements to an organization, from minor improvements in efficiency to innovative new

strategies. The cultures that are most successful in enabling business intelligence are those that systematically succeed at the following:

- Providing easy and wide access to information
- Motivating wide-scale analysis and decision making
- Motivating the sharing of findings with broader audiences
- Insisting on fact-based rational support for plans
- Encouraging experimentation and tolerating "good try" failures

Finally, adopting a BI attitude is not simply something you write into a business plan, talk up at company meetings, and then expect to happen. A BI attitude has to be backed by actions. Executives cannot rationally expect better and faster decisions unless they invest in the enablers of technology and people.

Summary

Business intelligence is best understood from several perspectives: making better decisions faster, converting data into information, and using a rational approach to management. The analysis of business information leads to insights—many small ones, and hopefully a few big ones. These insights suggest ways to improve the business; when acted on, these insights are then measured to see what is working. These measurements provide more data for analysis, starting the cycle anew. We call this progression—analysis to insight to action to measurement—the BI cycle.

The enablers of the BI cycle are technology, people, and organizational culture. To achieve and maintain excellent business intelligence, these enablers require investment. Superior business intelligence is a competitive advantage that can have a huge impact on the success of an organization.