Chapter 1

Understanding Business Intelligence

In This Chapter

- Getting comfortable with the basics
- Understanding the business intelligence value proposition
- Seeing where BI came from and where it's going
- Previewing what works (and what doesn't)

From the CEO down to the lowest levels of any organization, every minute of the day someone is making a decision that has an impact on the company's performance. Sometimes a decision is at a very high strategic level that affects the fate of the entire organization, and other times a decision might be narrowly defined and tactical, affecting a single person or department for a very short window of time. When taken together, these decisions make up a significant portion of the "day in the life" at any given organization, be it a company, governmental agency, or nonprofit organization.

In spite of the dramatic advances in technology and tools that aid in the decision-making process, however, far too many people still make decisions the old-fashioned way: by blending a gumbo of tidbits of current information, best recollections of the past, advice from others, and a whole lot of "gut instinct," and then assessing which path is likely to give the best possible outcome for the decision at hand.

Decisions drive organizations. Making a good decision at a critical moment may lead to a more efficient operation, a more profitable enterprise, or perhaps a more satisfied customer. So it only makes sense that the companies that make better decisions are more successful in the long run.

That's where business intelligence comes in.

Business intelligence is defined in various ways (our chosen definition is in the next section). For the moment, though, think of BI as using data about yesterday and today to make better decisions about tomorrow. Whether it's selecting the right criteria to judge success, locating and transforming the

appropriate data to draw conclusions, or arranging information in a manner that best shines a light on the way forward, business intelligence makes companies *smarter*. It allows managers to see things more clearly, and permits them a glimpse of how things will likely be in the future.

Limited Resources, Limitless Decisions

All organizations, whether business, government, charitable, or otherwise, have limited resources for performing their missions. Companies are forced to make do with what they have — all the time. You can't put a Nobel laureate in every position, and you can't pour unlimited dollars into an endless quest to make all your factories and offices more efficient.

The most precious resource is *time.* The marketplace is in constant motion, and companies must not only move correctly, they must move quickly. Otherwise competitors will fill any available vacuum in the market, resources will get used up, and your organization will inexorably wither away.

Business intelligence's entire *raison d'être* (that's French for "shade of lipstick" — just kidding) is as an ally at those inflection points throughout the life of a business where a decision is required. Business intelligence is a flexible resource that can work at various organizational levels and various times — these, for example:

- A sales manager is deliberating over which prospects the account executives should focus on in the final-quarter profitability push
- An automotive firm's research-and-development team is deciding which features to include in next year's sedan

The Name Game

Business intelligence is commonly known simply as BI. That's pronounced "Bee Eye," not "Buy." We'll go back and forth in this book between the full phrase and the abbreviated name. And if you're wondering why there aren't any periods in the acronym (as in, "B.I.") it's because of a custom in the technology world: Once a concept has gained widespread acceptance and becomes known by its initials alone, the punctuation disappears.

Extracting periods from techno-acronyms (CPU, GB, ICBM, whatever) is the mission of the International Punctuation Review Board, a group of Internet billionaires, former ambassadors, and high school football coaches who meet in Geneva every four years to review which new buzzwords qualify for punctuation-free status. (Just kidding. Everything about acronyms in the *previous* paragraph is true but the Board doesn't really exist. Yet.)

- The fraud department is deciding on changes to customer loyalty programs that will root out fraud without sacrificing customer satisfaction

The decisions can be strategic or tactical, grand or humble. But they represent two roads diverging in a yellow wood: Considered in the aggregate, the roads taken and those not taken represent the separation between successful and unsuccessful companies. Better decisions, with the help of business intelligence, can make all the difference.

Business Intelligence Defined: No CIA Experience Required

So what the heck *is* business intelligence, anyway? In essence, BI is any activity, tool, or process used to obtain the best information to support the process of making decisions.

Right now you're scratching your head and wondering, "Does he really mean *anything*?" And the answer is a qualified yes. Whether you're calling the Psychic Hotline, using an army of consultants, or have banks of computers churning your data; if it helps you get a better handle on your company's current situation, and provides insight into what to do in the future, it's BI.

But by popular demand (and so I don't have to write a chapter called "Using a Magic 8-Ball for Improved Portfolio Risk Management") we'll narrow the definition just a tad. For our purposes, BI revolves around putting computing power (highly specialized software in concert with other more common technology assets) to work, to help make the best choices for your organization. Okay, there's a little more to it than that. But before digging into specifics, it is (as the Magic 8-ball would say) decidedly so that you should understand some context about how BI is defined, and who's defining it.

The more you learn about BI, the more likely you are to encounter a wide swath of definitions for the term. Sometimes it seems as if nearly every new article on BI characterizes it in a new way. BI invariably gets unceremoniously tagged with an array of newfangled labels and connected with a whole catalog of different technologies that can leave your head spinning as you try to peg which elements are included in the definition and which ones aren't.

And it's no mystery why there is no single definition for business intelligence. Vendors and consultants define the phrase in a way that conveniently skews toward their particular specialty. Academics, authors, and consultants also have their own pet definitions of BI; one may barely resemble the next.

Don't get knocked off course. Regardless of who's saying it, when you put BI on a stove, turn the heat up, and boil it down to its constituent elements, you'll always find the same thing left in the pot: technology and tools to support decision-making.

For the purposes of this book, and for your needs beyond this book, you'll only need to know this one single definition (drum roll, please):

Business intelligence is essentially timely, accurate, high-value, and actionable business insights, and the work processes and technologies used to obtain them.

If you look up *actionable* in the dictionary, you see it actually means any deed that might cause you to get *sued;* here *action* refers to *legal* action. But feel free to use this specialized meaning of "actionable" with BI-savvy pros such as techies and finance folks. Just don't use it when you're talking to an attorney (unless, of course, you're a partner in the same law firm).

Contrary to what you may have been led to believe, there are no stone tablets with a single list of processes, protocols or hardware/software combinations that define BI once and for all. In technology, those things are always evolving. And they are often different from company to company, and different depending on the situation. Today's common definitions of the essential BI components are markedly different from the definitions bandied about in the 1990s. What remains constant, though, is that BI's purpose has always been to produce *timely*, *accurate*, *high-value*, and *actionable information*.

Pouring out the alphabet soup

If you think BI's definition sounds a little familiar, it's not just a case of *déjà vu* (that's French for "I've had this head cold before"). The concept of BI is not necessarily new; companies have been trying for years to press their systems into service to produce better strategic insights. You might have come across some of these acronyms in your past.

- **DSS**: Once upon a time, a company was in need of systems that would support the decision-making process. The IT crew got together and came up with Decision Support Systems. Pretty clever, eh? DSSs gained popularity by helping managers apply computing power and historical data to structured problems, such as production scheduling and other types of recurring planning decisions.
- **EIS:** The corner-office gang took notice of the success of DSS and decided that just like executive bathrooms, they deserved their own decision-management tools, and Executive Information Systems (EIS) technology was born.

- **MIS, MDS, AIS, and so on:** Plenty of other BI predecessors came and went — Management Information Systems, Management Decision Systems, Analysis Information Systems, and so on, and each one laid claim to some new style of supporting companies' decision-making processes.

Business intelligence has a big family tree. All of these technologies contributed to today's incarnation of BI, some more than others. And some of the disciplines and movements that warranted their own acronyms still exist today — in some cases calling themselves "next-generation BI" or, at the very least, "extenders" of BI.

There are several forces driving the multiple incarnations of what is basically the same idea. First, there is a motivation among vendors and IT consultants to mint a phrase that catches on in the technology world. Doing so helps set them apart from the competition (as if they've invented a better mousetrap).

Perhaps more important — and more cynical — is the tendency within the technology world to sheepishly leave behind heavily hyped initiatives that don't quite live up to the buzz in their initial go-around. For example, earlier generations of DSS and EIS often suffered from the same shortcomings that affected all types of technology implementations in that era. The unknowns of cutting-edge technology, the unpredictability of organizational politics, and other deficiencies sabotaged early implementations. The ideas were sound, but the failures gave the specific concept being adopted a bad reputation.

But the underlying concepts would always survive. After all, who could argue with the value of using high-power computing to support decisions? What executive wouldn't want to put IT resources to work delivering valuable information to the office every day? And so, as memories of past failures faded, new ways of thinking evolved — and more advanced technologies came along — those same vendors and consultants would leave behind the now-tainted label, coin a new term, and begin selling the "new and improved" solution.

A better definition is in sight

It might be useful to take a quick second look at the term *insight*. Insights are the ultimate destination for the many roads that all those authors, consultants, vendors, and various other nerds will send you down when you embark on a BI project. "Insight" does a good job of encompassing the deliverables that flow forth from a good BI project. Imagine those as the glowing light bulbs that appear over your head about some aspect of your business. Insights are a new way to look at things, a moment of clarity, a way forward. When BI delivers a business insight, you've divined some fact or hypothesis about some aspect of your organization that was previously hidden or unknowable.

Insights is actually a more intelligent word than . . . well . . . *intelligence.* After all, "intelligence" can mean so many different things, depending on the context. So the next time you think about BI and an instant of confusion obscures its definition from you, it helps to mentally substitute the word *insights* for *intelligence* and just attach BI to the phrase *business insights*.

But the good news is, with the kind of BI we're describing here, you don't *have* to play James Bond to improve your market position. With the real business intelligence, there are no double agents, no foreign sports cars, and the word "detonator" will never be relevant (unless your project goes *very* poorly.) BI is kind of like spying — but only if spying on *yourself* counts.

If your BI project goes well, you can ask your boss to start calling you "Q".

BI's Big Four

So what do we mean when we talk about insights that are accurate, valuable, timely, and (benignly) actionable? As you dig into BI's main characteristics, you'll see why each is so important to the process. In fact, if the knowledge gained from BI fails to meet any of the four criteria, the process has failed.

Accurate answers

When decisions are taken in your organization they are inevitably informed with conclusions drawn by a range of experts using important pieces of information about the enterprise's current state. For BI to be of any value in the decision making process, it must correctly reflect the objective reality of the organization, and adhere to rigid standards of correctness. As such, the first hallmark of insights produced from BI processes is their accuracy.

As with any technology-related tool or process, the GIGO rule is in full effect with BI — that's Garbage In, Garbage Out. GIGO says that if the BI insights are not accurate, the decisions made are less likely to be the correct ones for your enterprise. Imagine a sample BI report that shows one of the company's sales territories lagging woefully behind the others. When folded into the decision-making process, that piece of knowledge might well lead executives to adjust the sales process (or perhaps the personnel). But if the picture is wrong — say the offices and departments were incorrectly aligned to the various territories, so sales dollars weren't correctly allocated — then the conclusions (and the resulting actions taken) not only fail to help the company, they might actually make things worse.

Getting it right is important from a political perspective as well. For BI to have an impact, company *stakeholders* (those key employees whose business domains affect, and are affected by, BI) must trust it. Nothing's more frustrating in the world of business intelligence than a development team toiling for months to produce a report that an executive looks at and, within 30 seconds, dismisses it by saying, "Those numbers aren't correct."

But such things are common. After all, BI insights are often surprising, counterintuitive, and even sometimes *threatening* to groups within an organization. The sales manager who is shown numbers that indicate her team is lagging behind will be motivated to find ways to challenge the validity of the report. Any errors, no matter how small, will call into question the veracity of the conclusions drawn from the data.

BI must represent the absolute closest thing to the truth that's possible, not only to produce results, but to protect its reputation among the skeptics! Without accuracy, insights that are the product of BI are worse than worthless. They can be harmful to the company. And once that happens, nobody will ever trust BI again.

Valuable insights

Not all insights are created equal. Imagine, for example, that after a multimillion-dollar BI-driven probe of sales-history data, a grocery store chain finds that customers who bought peanut butter were also likely to buy jelly.

Duh.

BI insights like this are certainly accurate, but they are of limited value to the decision makers (who probably know that most supermarkets place those two items close together already). Part of what distinguishes BI is that its goal is not only to produce correct information, but to produce information that has *a material impact* on the organization — either in the form of significantly reduced costs, improved operations, enhanced sales, or some other positive factor. Further, high-value insights usually aren't easily deduced — even if data-driven analysis weren't readily available.

Every company has smart people working for it who can connect the obvious dots. BI insights aren't always obvious, but their impact can be huge.

On-time information

Have you ever had a heated discussion with someone and thought of the perfect retort to their witless argument exactly five minutes after you walk away from them?

The French call this phenomenon *"esprit d'escalier* —"(the spirit of the staircase). You never think of your best comeback until you've left a person's apartment or office and are walking down the stairs in defeat.

The lesson is simple: What makes people effective in a debate is that they can not only deliver sound information, they can do it at the precise time it's needed. Without timeliness, great verbal pugilists like Oscar Wilde or Cicero would have gone down in history as nothing more than good (but obscure) writers full of *esprit d'escalier.*

In business, information delays can make just as big a difference — and they can come in many forms:

- Sometimes it's a technology problem where the hardware or software can't compute fast enough to deliver information to users.
- Sometimes the problems relate strictly to workflow and logistics; the data isn't fed into the systems often enough.
- Logistics problems can pop up from time to time — for instance, what if a report has to be translated into a different language?

Every step in the process takes time, whether it involves microchips or humans. In the aggregate, those time intervals must be small enough to make the output of a BI process still relevant, useful, and valuable to a decision maker.

Timeliness is as important a quality in your business insight as any other. The best decision support processes involve up to the minute information and analysis made available to decision makers in plenty of time to consider all the courses of action. Stock traders at hedge funds use massive spreadsheets full of constantly updated data. The data streams in and is manipulated in a series of processes that makes it usable to the trader. He or she buys and sells stocks and bonds using the results of those calculations, making money for the firm and its clients. If the trader's applications were slower in producing translated data, they would miss opportunities to execute the most profitable trades and their portfolios would start to look like ones the rest of us have.

Actionable conclusions

Accurate is one thing, actionable is another. Imagine if the conclusions reached at the end of the BI cycle were that the company would be better off if a competitor would go out of business, or if one of its factories were 10 years old instead of 30 years old.

Those ideas might be accurate — and it's no stretch to believe that if either scenario came to pass, it would be valuable to the company. But what, exactly, are the bosses supposed to do about them? You can't wish a competing company out of business. You can't snap your fingers and de-age a factory. These are exaggerated examples but one of the biggest weaknesses of decision support tools is that they build conclusions that are not *actionable*. To be actionable, there has to be a feasible course that takes advantage of the situation. It has to be possible to move from conclusion to action.

Ideally, the BI team at your company would produce a report that would guide future actions. The executives would conclude that a price should be lowered, or perhaps that two items should be sold as a package. These are simple actions that can be taken — supported by BI — to improve the position of the company. In BI-speak, that means insights must be *actionable*.

The BI Value Proposition

BI links information with action inside an organization. But because of the confusion over defining BI, it's not always clear where the value of a BI solution lies. What exactly do businesses *get* from a BI implementation? If you're thinking about BI, you're naturally wondering "What's in it for me?"

The answer is that when companies utilize BI, they don't just have a swell new toy for the IT team to deploy, or a snazzy new report or data store. Sure, it can be all of those things, but more than anything, the BI value comes from promoting good decision-making habits.

Encompassing BI is a rational approach to a continuous improvement loop:

1. Gathering data
2. Making decisions and taking action based on that data
3. Measuring the results according to predetermined *metrics* (a fancy word for measurements) for success
4. Feeding the lessons from one decision into the next

By using a continuous cycle of evidence-based actions, organizations adopt a rational approach to their decision-making process — and BI can support that cycle. Figure 1-1 shows how this continuous loop can work. Through business intelligence concepts and tools, companies glean meaningful insights from their operational data. If the insights fit the four criteria of BI (remember: *timely, accurate, high-value,* and *actionable*) the company can apply them to its regular decision-making process. Those decisions, now informed with BI insights, lead to actions — and, if all goes well, improved operational results. (Don't lose sight of the fact that improved results are what this is all about). And so the cycle begins anew; the first round of results becomes part of the historical data record, and the related BI insights are refined even further.

The process of using data to make better decisions can involve just about any piece of an organization. If there are lessons to be learned from operational data, be it customer behavior, financial information, or another category, BI can play a part. By using BI practices to transform raw data into meaningful conclusions, a team makes better decisions. The actions taken as a result of those decisions produce a new round of results — which can be fed back into the system as new empirical evidence to draw the next round of conclusions.

BI can improve any decision by supplying it with (everybody, now!) *timely, accurate, valuable,* and *actionable* insights.

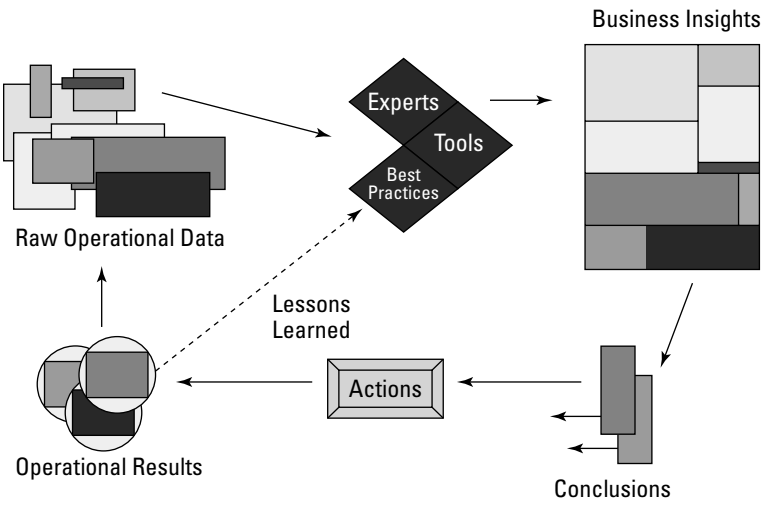

Figure 1-1: New data and results constantly feed the decision-results cycle.

A Brief History of BI

Business intelligence is an approach to solving business problems. It's a framework for managing tactical and strategic operations performance. BI is only possible because of advances in a number of adjunct technologies, such as computing power, data storage, computational analytics, reporting, and even networking technologies. But its origins are definitely more humble. In this section we'll take a look at how BI evolved to where it is today.

Data collection from stone tablets to databases

From the beginning of history, organizations have always had a need to collect and store data. Several thousand years ago, there were armies and imperial bureaucracies, working out ways to collect taxes, feed people, wage wars, and so on.

The first recorded use of written language *was* data storage: Sumerian stone tablets that tracked shipments of wheat through the local granary.

Data storage started as a notion of faith, an act of foresight and planning by the world's earliest worry-warts and packrats. (It might not have seemed important to remember the names and hometowns of the soldiers in the Praetorian Guard of the Roman Empire, but somebody realized they'd get a lot better turnout at the 20-year reunion if they made an effort to collect and keep that information. That toga-wearing bureaucrat would have loved BI.)

Available research on BI

You can look up all kinds of research and white papers on the Internet to check out the impact of BI on business. But don't just skim through the study looking for the return-on-investment (ROI) number without understanding the context. Numerous important peer-reviewed studies show that BI projects have a positive ROI, provided they are done correctly, and with the proper goal in mind. When BI produces timely, accurate, high-value, actionable conclusions, and those conclusions are applied correctly, the ROI will be positive. But lots of things can go wrong along the way. For every BI success story, there are horror stories, just as you find with any other technology. So how do you do it *right?* How can you maximize ROI? Read on . . . .

Record-keeping really came into its own as better forms of paper were invented. It allowed for more information to be stored and accessed in a smaller space.

Reading a book written on stone tablets is a real pain in the neck.

From silicon in *stone* to silicon in *microchips,* that challenge continues to this day: storing more and more information in smaller and smaller space. The modern organization makes use of computer power for its data storage.

The growth of computing power and data storage

The first computers were tabulating machines, designed and built to perform one-off calculations. But scientists and inventors developed information-storage capability almost neck and neck with the growth of computing power. After the 1940s, both technologies exploded.

Mass storage began to take form when the properties of magnetic tape were used to store analog patterns of information. That turned to disk drives, a decades-old technology that is still in use today in a form that would be recognizable to its inventors, but on a scale that would blow their minds.

To manage the growing mountains of stored data, programmers developed Database Management Systems (DBMSs) of growing power and complexity. Relational database technology came about as a response to the increasing information-storage demands. This was a revolutionary way to maintain data that dramatically sped up transaction time by splitting data elements into their component pieces and storing those pieces separately.

Transactional systems

As computing systems became more powerful and ubiquitous, businesses began taking advantage of them to manage their daily transactions.

Point-of-sale (POS) systems are the classic example of a transactional system. A POS system has one main purpose: to allow sales reps to quickly enter sales transactions, collect payment, and issue a receipt to the customer for that purchase. Handily enough, if the POS is some kind of computer (rather than just a cash register that goes *cha-ching*) it can be connected with accounting systems that gather and organize sales information for later use.

Companies normally have many transactional systems, each one a source of its own unique kind of data, each one designed to perform one primary business role. Transactional systems help with the day-to-day operations of the company — for example, a system that tracks shipments between warehouses or handles customer billing.

The emergence of decision support

With so many disparate transactional systems, a company stores an enormous amount of data. It didn't take long before CEOs wanted to take a peek. After all, if they could see summaries of all that stored transactional data, they could gain insight on certain aspects of their business (say, how often shipments move between Warehouse A and Warehouse B, or what day of the week their customers are more likely to buy dessert). Examining transactional records in the aggregate seemed to offer a wellspring of good business insights. But no sooner did companies try it than a horde of problems sprang up — for example, these:

- The systems were often separated, not only physically, but perhaps also by separate storage protocols, naming conventions, or even political barriers within a company. That meant the analysis had to take place individually for each set of transactional records.
- Transactional systems such as the point-of-sale database were designed for speeding transactions along — not for doing research. Digging through the data to learn which products appealed enough to certain demographics to purchase at certain times of the year (or to unearth other such business insights) was undeniably useful, but a transactional system by itself was the wrong tool for that job. More powerful information systems were necessary to get the most out of the data.

In the late 1980s, companies began to recognize the potential value that the data represented. In response, they became motivated to build systems to extract the knowledge buried in their files. And so BI was born.

Business intelligence came to encompass the wide range of technologies, protocols, and practices that is required to produce valuable business insights. What BI actually means to one company may be different from what it means to another because every company represents a different situation, with different installed technology, and different needs. That's why business intelligence doesn't fit into a perfect definition you may have read on a vendor's website. BI means timely, accurate, high-value, and actionable insights . . . and whatever it takes to produce those insights.

BI in the by-and-by

As computing gets more powerful and software more useful, it seems BI — whether operating under its current name, or dressed up yet again as a "new" undertaking — will continue to increase in importance to large organizations. But look for it to take root in ever-smaller enterprises as well, as small businesses realize they can finally take advantage of the advancing technology.

The BI concept is a flexible organism that will undoubtedly grow and evolve in response to whatever direction the advancing technology may take it. Some near-term trends seem apparent:

- **Origins in various business units:** BI started as IT pet projects. After all, who else knew what was possible? But as executives and decision makers get used to thinking in terms of business intelligence, more (and bigger) BI initiatives will be driven by departments other than IT.
- **Analytics delivered to the desktop:** Vendors have created powerful add-ins to go with already-flexible and potent desktop tools (such as Microsoft Excel). Starting with MS Office 2003, continuing with Office 2007, advanced analytical tools will be available to just about everyone in the company who has a computer.
- **Following the data:** BI has traditionally been associated with data-warehousing technology (which we discuss in depth in the coming chapters). But future BI technology will be able, with increasing efficiency, to reach out into the source systems, grab data, and transform what it finds into what it needs to perform its analysis.

BI's Split Personality: Business and Technology

BI is built on the massive computing power available to today's enterprises. But it isn't just about bits and bytes. Business intelligence requires a company culture dedicated to the principles and practices that make high-quality, usable insights possible. Simply installing software and flipping a switch won't get a company to the promised land.

The commitment to BI has to come from both the business *and* technology sides of a business:

- Business managers must engender a rational, measurement-based approach to setting strategy and running operations.
- IT must be prepared to support the BI culture to the extent that business managers are prepared to push it into all levels of the company.

BI: The people perspective

Business intelligence is about giving people new tools and perspectives; it's designed to let decision makers ponder what-if questions. That only works if those decision makers are not only able to use the BI tools but are also prepared to ask the right questions.

That's where BI truly straddles the world between business and technology — it's both an art and a science. There is no set formula for determining the "right" reports and analytics for a particular company. No book explains every single possibility to consider in your analysis cycle.

What's required is putting the right kind of people in positions where BI is to play a role. Or the BI attitude must be spread by the company's leadership. BI is about a commitment to a rational approach to making decisions — and that approach must be supported at all levels of the organization, by IT executives and business executives.

So, Are You BI Curious?

Would your organization benefit from a business intelligence solution? There is no automatic answer to that question, but nearly every company can see improvement from adding some rigor to the decision-making processes. The following list of questions you might ask about your organization could indicate whether a BI approach makes sense:

- Can you view sales data in more than one view simultaneously? For example, if you wanted to see quarterly sales data by sales manager, product line, and customer type, how long would it take to produce the report?
- Is there data locked in transactional systems about your customers that you'd like to see but can't because the system just isn't designed to view the data the way you want?
- When your company makes strategic decisions, are you relying on hard data before you proceed or is it coin-toss time? Do you base your actions around evidence of the past and verifiable conclusions about the future? Do you consider statistical correlations between causes and effects? Or is it a seat-of-the-pants maneuver?
- You know what items your customers buy the most, but do you know what items your customers buy in *pairs*?
- Do you know what your company does best? How do you know it? Is it a gut feeling or do you have metrics to back up your conclusions?