THIRD QUARTER 2008
TDWI BEST PRACTICES REPORT

PERVASIVE BUSINESS INTELLIGENCE

Techniques and Technologies to Deploy BI on an Enterprise Scale

By Wayne W. Eckerson

www.tdwi.org

tdwi
THE DATA WAREHOUSING INSTITUTE

Research Sponsors

Business Objects, an SAP company

Corda Technologies

InetSoft Technology Corp.

LogiXML

Microsoft

MicroStrategy

SAS

Strategy Companion

PERVASIVE BUSINESS INTELLIGENCE

By Wayne W. Eckerson

Techniques and Technologies to Deploy BI on an Enterprise Scale

Table of Contents

Research Methodology 3

Executive Summary 4

Introduction 5

BI Tool Adoption and Usage Rates 6

Role-Based Adoption 6

Adoption Obstacles 7

Impediments to Usage 8

Systems Theory and Business Intelligence 11

The BI Tipping Point 11

"Limits to Growth" Archetype 12

Leverage Points 14

Usability 17

Design 17

Support 23

Architecture 25

Change Management 27

Project Management 29

Recommendations 31

About the Author

WAYNE ECKERSON is the director of TDWI Research at The Data Warehousing Institute. Eckerson is an industry analyst, consultant, and educator who has served the DW and BI community since 1995. Among his numerous published works, Eckerson is author of the bestselling book *Performance Dashboards: Measuring, Monitoring, and Managing Your Business*. He is also the author of TDWI's BI Maturity Model and Assessment Service, which enables organizations to benchmark their BI programs against industry norms. Eckerson speaks frequently at industry events and works closely with BI teams to optimize the agility and value of their BI initiatives. He can be reached at weckerson@tdwi.org.

About TDWI

TDWI, a division of 1105 Media, Inc., is the premier provider of in-depth, high-quality education and research in the business intelligence and data warehousing industry. Starting in 1995 with a single conference, TDWI is now a comprehensive resource for industry information and professional development opportunities. TDWI sponsors and promotes quarterly World Conferences, regional seminars, onsite courses, a worldwide Membership program, business intelligence certification, resourceful publications, industry news, an in-depth research program, and a comprehensive Web site: www.tdwi.org.

About TDWI Research

TDWI Research provides research and advice for BI professionals worldwide. TDWI Research focuses exclusively on BI/DW issues and teams up with industry practitioners to deliver both broad and deep understanding of the business and technical issues surrounding the deployment of business intelligence and data warehousing solutions. TDWI Research offers reports, commentary, and inquiry services via a worldwide Membership program and provides custom research, benchmarking, and strategic planning services to user and vendor organizations.

Acknowledgments

TDWI would like to thank many people who contributed to this report. First, we appreciate the many users who responded to our survey, as well as those who responded to our requests for phone interviews. We would also like to recognize TDWI's account and production team: Jennifer Agee, Bill Grimmer, Denelle Hanlon, and Deirdre Hoffman.

Sponsors

The research for this report was sponsored by Business Objects, an SAP company; Corda Technologies; InetSoft Technology Corp.; LogiXML; Microsoft; MicroStrategy; SAS; and Strategy Companion.

©2008 by TDWI (The Data Warehousing Institute™), a division of 1105 Media, Inc. All rights reserved. Reproductions in whole or part prohibited except by written permission. E-mail requests or feedback to info@tdwi.org. Product and company names mentioned herein may be trademarks and/or registered trademarks of their respective companies.

Research Methodology

Focus. This report is designed for business and technical managers who oversee a business intelligence environment and wish to learn the best practices and pitfalls for deploying reporting and analysis tools on an enterprise basis. The report examines how to increase adoption of BI tool licenses and how to increase usage once those licenses are deployed.

Methodology. The research for this report is based on in-depth interviews with more than 20 BI practitioners and solutions providers as well as a 10-question survey that TDWI conducted in February 2008. TDWI issued the survey to attendees at its February conference and via e-mail to its database of data warehousing and BI professionals during the same month. More than 700 people responded to the survey, although not all respondents answered every question.

In prior reports, we conducted surveys with 50+ questions. We decided to shrink the size of the survey to see if it would increase response rates, which it did. The shorter survey also enabled us to distribute the survey at our TDWI World Conference (via a printed form) as well as via the Web, which has been our traditional channel.

One consequence of shrinking the size of the survey is that we eliminated most (but not all) of the demographic questions that we've included in every survey for the past six years. Given that these results rarely fluctuate and that we have a good profile of our conference audience, we felt safe in eliminating these questions without jeopardizing the quality or integrity of the results.

Respondent Profile. Given the above, based on past surveys and a profile of our conference attendees, we feel confident in saying that a majority of survey respondents are corporate IT professionals who work at large organizations predominantly in the United States. Almost two-thirds are either BI program managers, project managers, or architects. Respondents come from a range of industries with the top two being financial services and consultancies. (See previous report demographics for a general breakdown.)

We did ask survey respondents about the scope of the BI teams for which they work. A majority serve an enterprise BI team (62%), while the remainder work on departmental or business unit teams. (See Figure 1.)

We also asked about organizations' BI maturity. A slight majority (51%) are in the "Teenager" phase, where their BI program is under way and they are making progress. The remaining respondents are evenly split between organizations that are "just starting out" and those are "almost fully deployed or mature." (See Figure 2.)

Which best describes the group that your team supports?

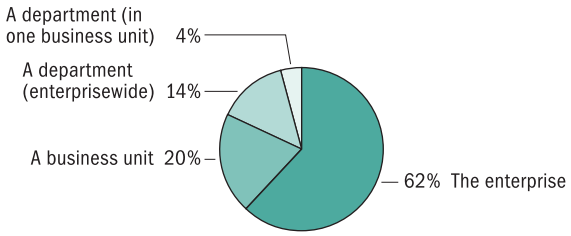

Figure 1. Based on 704 respondents.

Which best describes the stage of your BI implementation?

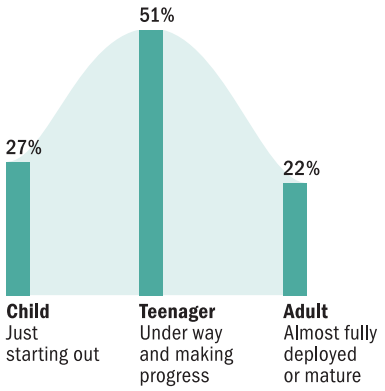

Figure 2. Based on 704 respondents.

Executive Summary

The key to making BI pervasive is getting users to adopt and use the BI tools that an organization purchases for them. This seemingly straightforward statement is actually very complex given all the variables that go into making a BI tool easy to use. This is why the penetration of active BI users in organizations is only 24%.

Certainly technology plays a big role in increasing adoption and usage and making BI pervasive: new visualization techniques, search-enabled BI, in-memory analysis, Office integration, dashboards, high-performance systems, and integrated BI platforms all factor into the equation. But, interestingly, the users whom we interviewed for this report and who responded to our survey focused largely on the "soft" issues involved in making BI pervasive: sponsorship, marketing, training, support, monitoring, and prototyping. Users also mentioned the importance of good design, architecture, and project management and scoping skills.

Key Results. The biggest impediments to BI adoption (i.e., obtaining licenses for all users) are the time and complexity to deploy BI tools followed by the cost of BI licenses, according to our survey. Recognizing these challenges, BI vendors are making strides to reduce the complexity and costs of BI tools.

Once BI tools are in-house, the biggest impediments to greater usage are poor data quality, overly complex tools, slow query response times, lack of executive backing, and the existence of other tools, according to respondents. To accelerate usage, they recommended integrating BI with Microsoft Office, implementing dashboards, embedding BI into a business process, and delivering highly interactive and self-service BI.

Systems Theory. Our telephone interviews with BI practitioners revealed that BI initiatives have either positive or negative momentum. Many BI teams seem stuck in a negative feedback loop where, despite Herculean efforts, BI teams find it difficult to gain traction and widespread user adoption. Conversely, some organizations have the opposite problem: they are cursed with success and can't seem to keep up with user demand.

This dynamic suggests that systems theory might be the key to unlocking the secrets of pervasive BI. Applying the limits of growth archetype, we discovered that BI initiatives have both positive- and negative-reinforcing loops and two key points of leverage: usability and project management. BI managers can exploit these leverage points to extricate themselves from a negative feedback loop.

But delivering an easy-to-use solution is no easy task. BI teams must address design, architecture, support, and change management issues, each of which comprise multiple factors that ultimately affect whether BI becomes a pervasive resource within an organization. Managing projects is more straightforward but still requires finesse to manage project scope, build a team, and establish standards and goals.

By understanding system dynamics driving BI initiatives and the variables that affect leverage points of usability and project management, BI teams can focus their efforts to ensure widespread deployment of BI solutions.

Introduction

Penetration of BI Tools. The origins of this report date to research TDWI conducted in 2005 that revealed that only 18% of potential BI users were actively using the tools (i.e., at least once a week). Given that organizations spend millions of dollars on data warehousing and BI deployments, we felt obligated to revisit this issue and see whether organizations have made any progress toward achieving greater adoption of BI tools and making good on their BI investments.

Our approach was straightforward. We first asked BI professionals to explain the current state of BI tool adoption and usage in their organizations. We then asked them to describe their challenges and strategies for increasing adoption and usage. We asked these questions in a short survey and in extensive interviews with more than 20 BI practitioners.

Definitions. The BI *adoption* rate refers to the degree to which an organization has purchased BI tools for its employees. The BI *usage* rate refers to the degree to which users are using the BI tools. The combination of adoption and usage provides an accurate gauge of the health of an organization's BI environment.

A good portion of this report focuses on the different information needs of power users and casual users. *Power* users are generally business analysts who spend a great deal of time accessing and analyzing information and create a majority of the ad hoc reports within an organization; they are savvy with software tools and familiar with the applications and databases used to populate reports. *Casual* users, on the other hand, are generally executives, managers, and staff workers who primarily consume reports created by others and are not interested in learning the details of how BI tools or databases work. In general, power users represent 20% of the BI users in an organization, while casual users comprise 80% of the population.

Report Outline. The first half of this report will examine data from the survey that TDWI conducted. The second half will use systems theory to explain the dynamics of BI deployments that either accelerate or decrease usage and examine the key leverage points that organizations can use to reverse a downward cycle of usage.

BI Tool Adoption and Usage Rates

BI tool usage rates have increased from 18% to 24% since 2005.

Our data shows that BI tool usage rates have increased slightly since 2005, from 18% to 24%. This is progress, but there is still work to do. Our interviews reveal that BI teams still face many hurdles in increasing adoption and usage.

Role-Based Adoption

Undue Influence. Not surprisingly, power users (or business analysts) lead all types of users in both adoption and usage rates (see Figures 3 and 4). This is not surprising, given the nature of their work, which is numerically intensive. These power users also exert significant influence over the selection of tools that an organization purchases and steer requirements toward meeting their needs. Unfortunately, the tools they select usually prove too difficult for other types of users, who are not as technically or data savvy as themselves.

What percentage of the following users have been assigned a license to a BI tool?

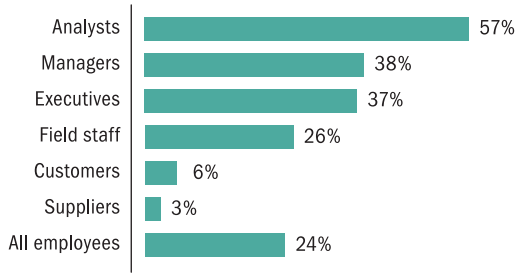

Figure 3. Based on 704 respondents.

What percentage of BI users with a license are "active users"—using the tool at least once a week?

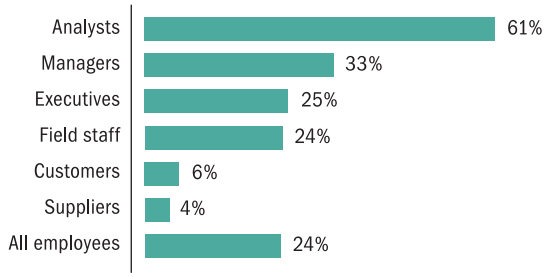

Figure 4. Based on 704 respondents.

Trickle-Down Effect. Managers and executives have the next highest adoption rates, with 38% and 37% respectively having BI tool licenses. Interestingly, while a third of these managers are considered "active" users, only a quarter of executives are. This jibes with our experience that executives are a challenging audience to support. Many are extremely busy and don't have much time to sit through training sessions, and most want only a top-level view of performance and rely on business analysts to dive into the details. In some cases, the executives are "old-school" managers who rose through the ranks without use of computers or fancy reports and make a majority of decisions based on personal judgment honed through the years.

Nevertheless, executives are the most critical people to get on board with a BI program because of the powerful trickle-down effect. One survey respondent described this effect, writing: "Our executives use all the tools, cubes, etc., so the subordinates feel they must, too." This is not a case of blind imitation but rather the need of employees to view the same information as their bosses so they aren't blindsided.

It is critical to get top executives to use BI because of the trickle-down effect.

Quick Glance. Field staff are the next biggest consumers of BI tool licenses, with usage at roughly 25%. Store managers, salespeople, field technicians, customer service representatives, and so on comprise field staff. As the face of the organization to the customer, they have little time to view or analyze information. So BI output must be simple, delivered quickly, and highly tailored to the process they manage. Organizations that have successfully deployed BI tools to field staff either embed reports and analytics into other applications, or deliver dashboards or simple static reports that require only a quick glance to absorb the relevant information.

"We give our store managers very simple dashboard reports that they can print out, put in their pocket, and take with them. We want them out in the store working with customers and employees, not sitting behind a computer," says a BI manager from a large retail chain.

External BI. The use of BI by external customers and suppliers is in the single digits, which shows that most organizations have yet to leverage BI as a way to establish a tighter relationship with customers and suppliers. Despite these low numbers, there are a few organizations that use BI on a massive scale to reach out to customers and suppliers. I've seen instances where organizations deliver reports to tens of thousands of customers or suppliers, either as part of an existing contract or relationship or as an added fee-based service.

Adoption Obstacles

Time and Complexity. The most significant obstacle to adopting BI tools is the "time and complexity to deploy" them, according to survey respondents. (See Figure 5.) Most BI solutions work well when deployed on a departmental basis, but the complexity and cost increases when the solutions are deployed enterprisewide.

The most significant obstacle is the time and complexity to deploy BI tools.

BI tools, at least in their current incarnation, are not out-of-the-box products; they embed sophisticated query, reporting, and analytic engines and must integrate with security and other corporate systems. This point was underscored by an official at one BI vendor who wished to remain anonymous: "We've asked our customers: 'If we gave you free licenses, would you distribute them?' and the answer has usually been, 'No, it would take too long to set up and manage security and access rights.'"

Sometimes integrating BI tools with third-party Web application servers and database systems can create unexpected headaches. One BI manager said that her BI tool vendor had little experience integrating its solution with IBM DB2 and WebSphere. This created performance problems with the BI solution and delayed its deployment, both of which have seriously affected the uptake and usage of the BI tool. "We still struggle with user adoption issues two years later," she said.

Seeing these difficulties, many new and established BI companies are working hard to deliver highly architected solutions that plug seamlessly into Web services and other standards-based architectures and don't require a lot of up-front configuration.

To what degree do the following impede wider adoption of BI tool licenses?

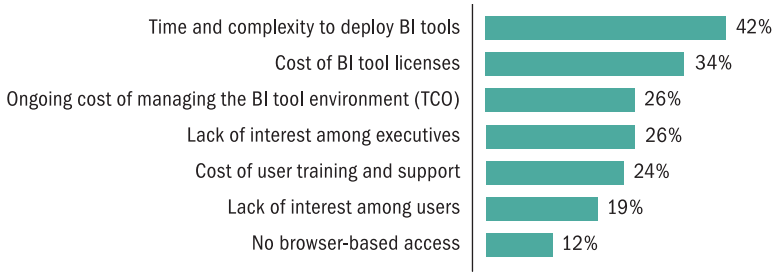

Figure 5. *Based on 685 respondents who rated the impediment as "high." Other answers were moderate and low.*

Cost proved to be a factor in three of the top five impediments.

Total Cost of Ownership. In fact, cost proved to be a factor in three of the top five impediments to disseminating BI tool licenses. Top among them are: "cost of BI tool licenses" (34%); "ongoing cost of managing the BI tool environment (TCO) (26%); and "cost of user training and support" (24%). The indirect costs to implement BI tools can sometimes dwarf the licensing costs. The totality of costs puts pressure on some corporate BI teams to justify their investments in BI tools, especially as newer, less expensive products come to market.

"We are continually being challenged to deliver faster, better, cheaper BI," says a BI director at a large retail operation. "Third-party vendors are encroaching on the work we deliver to our business units… They supposedly deliver richer functionality and simpler reports for lower monthly fees. Yet, at the same time, we are looking at exponentially higher costs to upgrade to a new BI server."

Because of costs, some organizations don't initially purchase as many licenses as they may need. This can choke the lifeblood out of a new BI project. "We didn't purchase as many licenses as we needed because the cost was prohibitive and management wanted us to prove the value first," says Ryan Bennett, director of information management at Sports Authority.

Many BI tools were initially designed to serve the needs of power users, not casual users.

Evolution of Capabilities. Part of the problem is that BI tools were historically designed to serve the needs of power users, not executives, managers, and field staff. As a result, the casual users—who typically represent 80% of employees in an organization—found the first generation of BI tools hard to use, which increased training and support costs, adding significantly to the expense of a BI solution.

Most BI vendors have made significant strides in simplifying their toolsets to better address the needs of casual users, who generally want to monitor KPIs and navigate through the data to identify the root cause of problems. Many, including sponsors of this report, have added a variety of capabilities to make their products more attractive to casual users: end user reporting modules; thin client authoring; dashboards and scorecards; AJAX- and Flash-powered graphical interfaces; keyword search; advanced visualization; and software-as-a-service offerings.

Impediments to Usage

Once an organization deploys BI licenses to users, the next challenge is getting them to use the tools. Survey respondents cited numerous impediments to usage, none of which stood out from the rest. Rather, BI teams looking to accelerate usage of BI tools face a plethora of challenges. See Figure 6.

Rate the impediments to usage of BI tools among licensed users.

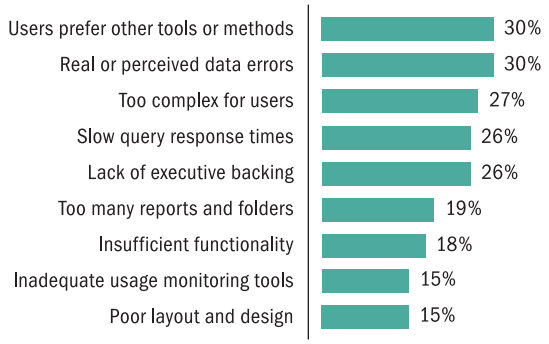

Figure 6. *Based on 675 respondents who rated the impediment as "high."*

The survey showed that 30% of respondents cited users' preference for "other tools or methods" as a significant impediment. Sometimes the only way to get users to use a new BI tool is to turn off legacy reporting environments. As one respondent wrote, "The only way to move users within our company to new BI tools is to eliminate their ability to rely on the crutches they currently use."

BI Tripwires. The primary tripwires that undermine BI usage are data quality, query performance, and complexity. We addressed complexity in the previous section. Data quality is as much a change management issue as a technical one, because users often reject new reports that present data in a different format with different metrics or results—even though the data is accurate. In an ironic twist, one BI manager said they knowingly published erroneous data to ensure the adoption of a new tool.

"When we developed a dashboard based on an existing 120-page operational report, we found minor errors in the way the data was being calculated," says a BI director at a major transportation company. "We decided not to address those errors prior to launching the dashboard so users wouldn't focus on data discrepancies and question the quality of our solution. Once the system was approved, we resolved the data issues over time."

Another tripwire is performance, which is in the eye of the beholder. Increasingly, users have little tolerance for long-running queries. Expectations among casual users accustomed to the speed and flexibility of consumer-based Web applications are tough to satisfy. "People won't use a tool that doesn't perform. Users expect to run a query and get results back within seconds. I call this the Google effect," says Laura Madsen, a BI director at a midsize pharmacy benefit management company.

"Users expect to run a query and get results back within seconds. I call this the Google effect."

Technology Levers. On the flip side, it appears that BI teams have quite a few levers to increase usage among BI tool users. (See Figure 7.) Chief among these is integrating the BI environment with Microsoft Office (54%). Since many users need to work in Excel to develop complex business plans and models and use PowerPoint to display results to managers and teams, it only makes sense to bring these toolsets more closely into the BI orbit. Many BI vendors have done just that in recent years, making these tools full-fledged clients to their BI applications.

Rate the following things that accelerate usage of BI tools.

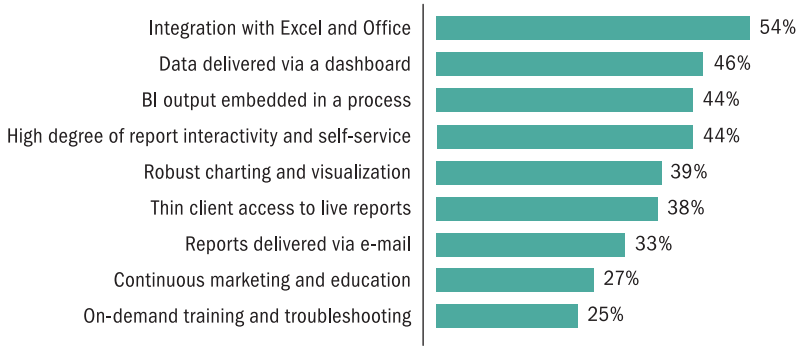

Figure 7. *Based on 678 respondents who rated the impediment as "high."*

Forty-six percent of respondents said that delivering data through a dashboard has accelerated BI usage. Performance dashboards provide a highly interactive and intuitive interface that resonates with casual users and requires little or no training to use. When designed properly, a performance dashboard can replace a multitude of "legacy" reporting systems. We'll discuss how to design the ideal dashboard framework later in this report.

Many users said that the best way to increase BI usage is to embed it into business processes.

Many users also said that the best way to increase BI usage is to embed it into existing processes, an option favored by 44% of survey respondents. For instance, HSBC uses business intelligence and analytical tools to review credit card transactions and changes in customer behavior, enabling real-time decisions about whether to proceed with a transaction or seek customer clarification regarding its authenticity.

Another example: one large bank uses a BI tool to build an Excel-based price management application that blends analytics, e-mail, and forms to optimize revenue. The application notifies the officers when price rates they negotiated with clients are about to expire and calculates the revenue implications if they fail to take action. Once a decision is made, the application automatically creates a form letter to reset pricing and notify customers of the changes. "The application has generated $30 million in one year," says the bank's BI director. "The best thing about it is that the users don't even know they're using a BI tool."

Systems Theory and Business Intelligence

The BI Tipping Point

Behind the Eight Ball. Does this scenario sound familiar?

> You've deployed BI tools, and usage spikes—but then gradually declines. Some users are generating lots of reports, in fact way too many. Other users still request custom reports, and your backlog has grown bigger instead of smaller. People who have tried the BI tool say the "data isn't right" and performance is poor. You then spend the next six months reconciling your reports to legacy systems to verify that the data in your reports is accurate—which you already knew, but you can't seem to convince certain vocal and influential users. You also discover that several analytics experts are bogging down BI performance by issuing massive queries against the data warehouse so they can populate their local data sets.
>
> Although you and your team are working harder than ever, upper management is beginning to question the value of BI. They've invested considerable money and hear only negative feedback, and they have yet to see significant payback. BI has become a dirty word within the organization, and it's likely that your funding will get reduced or eliminated next year. Your reputation is on the line, and there's not much you can do to salvage it.

Unfortunately, too many BI teams are stuck in this scenario or some version of it. They are caught in a negative feedback cycle that seems impossible to change. There seems to be no magic formula that can cure this malady.

The Lucky Few. What makes this situation intolerable is that a few lucky teams seem to experience the opposite phenomenon. Instead of witnessing decelerating usage, they can't keep up with demand for new BI applications, data, and BI licenses. Rather than circumventing the BI offerings, business users pitch ideas to the BI team for how to leverage the BI platform to drive new value to the organization. Not surprisingly, these BI teams boast strong partnerships with sponsors and users who are actively involved in setting priorities and direction for the BI portfolio via BI steering committees or a BI center of excellence. In addition, executives recognize BI as a strategic asset that delivers huge ROI and almost immediate payback from their investments. They give BI priority in the IT budget and want to expand the team to keep up with demand.

Hopefully, you are among the fortunate few whose teams are immersed in the exuberant whirlwind of a positive feedback cycle. It's clear that you've passed a magical tipping point where every effort amplifies user satisfaction and business value. It seems like there is nothing you can't accomplish.

There is a magical tipping point where every effort amplifies user satisfaction and business value.

Have and Have Not. Obviously, there is a huge disparity between these two scenarios. The BI "haves" are caught in a positive reinforcing cycle, while the BI "have nots" are stuck in a negative reinforcing cycle. What's true in life is also true in BI: the rich get richer, and the poor get poorer.

"On one end of the spectrum are IT shops that are order takers, reacting to user requests and creating a backlog that gives rise to spreadmarts. On the other end, BI is proactive and driven by the business. Here, designated 'super users' in each department create reports for themselves and their colleagues using self-service BI tools with support from the BI team. Since they reside in the business, they can anticipate requests before they happen and deliver better reports faster," says M.C. Sankar, senior vice president of Wachovia Securities.

Breaking the Cycle. Sankar has a formula for BI shops that want to cross the tipping point and change roles from reactive order takers to proactive providers of information and insights: 1) get strong executive sponsorship; 2) educate managers and users about the importance of fact-based decision making and the dangers of spreadmarts; and 3) establish a partnership with power users in each department and meet with them weekly to prioritize BI initiatives.

"At this point, they stop complaining that IT isn't delivering because they are part of the solution. They also see how individual requests can be consolidated to serve multiple needs, improving efficiency," says Sankar. This group also selects tools, develops a semantic layer, trains their business counterparts to use them, and recommends enhancements to improve the user experience, such as upgrading the platform to optimize performance.

"As soon as backward demands are satisfied, then people start looking forward. BI gets embedded in the way people make critical decisions, and that's when you have a huge uptick in usage," says Sankar.

"As soon as backward demands are satisfied, people start looking forward. BI gets embedded in the way people make critical decisions, and that's when you have a huge uptick in usage."

BI Counseling. The key to breaking a negative feedback cycle is to understand the dynamics driving it, find the leverage points, and take action. We can use systems theory to understand what we're facing, but it takes a lot of willpower, perseverance, and discipline to take action that changes system dynamics. The challenge is similar to what an alcoholic faces in trying to break an addiction or a married couple faces in trying to repair a soured relationship.

This report will serve as professional BI counseling to help you recognize the system dynamics that might be undermining your ability to meet user needs. It will also help identify leverage points that you can use to help ensure your BI solution is widely adopted and used.

"Limits to Growth" Archetype

Systems theory depicts various types of feedback loops that show how actions can reinforce or balance each other.

Feedback Loops. In his groundbreaking book, *The Fifth Discipline*, Peter Senge says that systems theory "is a discipline for seeing wholes ... a framework for seeing interrerlationships rather than things." Systems theory depicts various types of feedback loops that show how actions can reinforce or balance each other. Reinforcing loops accelerate quickly—either for good or bad—and often catch people by surprise. Change often happens slowly at first, and rapidly at the end. For example, according to systems theory, we can expect the effects of global warming—which are mutually reinforcing—to accelerate rapidly and more quickly than most people anticipate.

Archetypes. Some types of feedback loops work in concert to form "patterns of structure" that occur repeatedly. Senge calls these "systems archetypes." One of the most common systems archetypes is called "limits to growth." By applying this archetype to BI, we can understand why some BI teams face an uphill battle to increase adoption and usage, while others grow at a rapid clip. It can also help identify leverage points that enable struggling teams to reverse the dynamic and start growing, or that cause fast-growing teams to hit a wall and go into decline.

BI Systems Dynamic

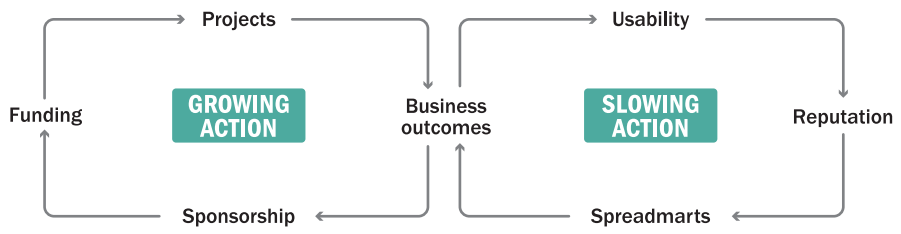

Figure 8. When applied to BI, the limits to growth archetype depicts two adjacent feedback loops: one that slows growth and another that accelerates growth.

BI Dynamics. Figure 8 shows a "limits to growth" archetype applied to BI. It consists of two adjacent feedback loops: one that inhibits growth (i.e., a negative reinforcing cycle) and another that accelerates it (i.e., a positive reinforcing cycle). Both hinge on a single condition called "business outcomes," which represents the value that the BI solution offers the organization. (See Figure 9 for a concept map of business outcomes.)

Concept Map of Business Outcomes

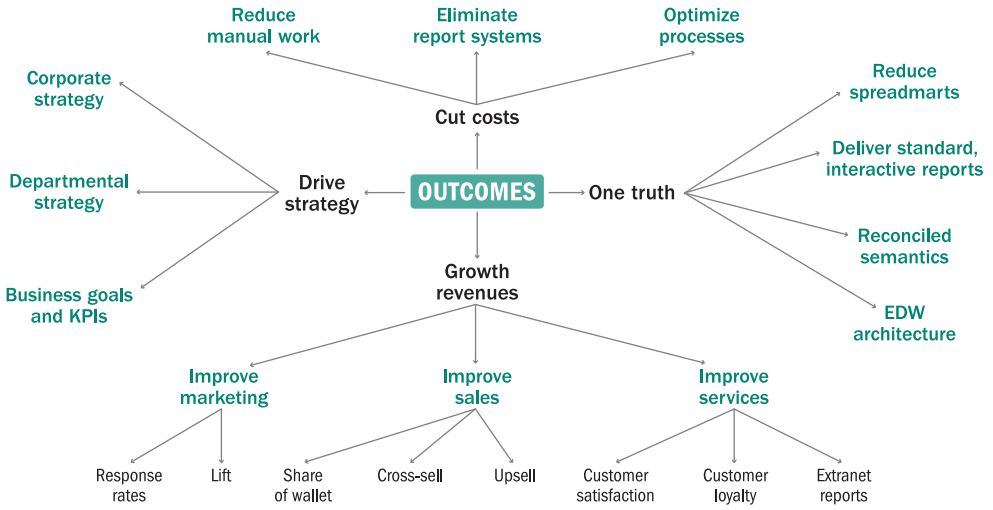

Figure 9. Business outcomes tie together positive and negative reinforcing cycles within a BI environment. BI teams in the negative loop see outcomes decline, while those in the positive loop see outcomes improve.

Negative Cycle. The right-hand cycle shows how a lack of usability in a BI solution gives the BI team a bad reputation, which causes users to create spreadmarts—renegade BI systems or data shadow systems built outside of IT—rather than use the corporate-provided BI tools. This causes executives to question the value of their BI investment and reduce funding, which further limits a BI team's ability to deliver a usable solution. The cycle repeats until the organization either cancels the BI program or the BI team finds a way out of the negative loop.

Some BI teams break this cycle by finding time within an ever-growing backlog to deliver a "quick-hit" application or dashboard that is easy to use and highly performant. Word spreads quickly, and soon

Some BI teams break the cycle by delivering a quick-hit application that is easy to use and gets readily adopted.

other groups want a similar application. They petition senior executives to fund an expansion of the BI application and perhaps other new BI initiatives. With an infusion of support and funding, the BI team ramps up its existing data infrastructure, accelerating deployment times and usability. As its reputation builds, the BI team frees itself from the negative reinforcing loop.

Positive Cycle. The left-hand cycle depicts how business sponsors fund new BI projects that lead to positive business outcomes. Once a BI project demonstrates that it can reduce costs, increase revenue, or advance business strategy, executives are likely to boost funding to undertake new projects, which add more business value. This positive reinforcing cycle accelerates until it reaches the natural limits of its growth and begins to reverse course. (Hence the archetype name, "limits of growth.")

In BI, this reversal happens when the BI team grows too big to work efficiently and its architecture and standards become too ponderous to respond rapidly to user requests. As a result, user satisfaction declines and the growth of the BI initiative slows. Unless the BI team moves quickly to improve responsiveness, the BI initiative will switch from the positive to negative feedback cycle and begin to contract rapidly. External events can also derail a fast-growing BI initiative, such as an across-the-board budget cut or a new strategic initiative that reallocates BI resources to other projects.

Given the fluidity of feedback cycles, BI teams need to monitor the momentum of their BI initiatives to ensure they are on the right track.

Given the fluidity of these feedback cycles, BI teams need to continually monitor the momentum of their BI initiatives to ensure they are on the right track. "We've crossed the threshold where the business is now excited by what we have to offer," says a BI director at a large financial services firm that recently deployed dashboards and a data warehousing appliance to augment an enterprise data warehouse that took years to build. "But we are cautious, because we know that it can tip back the other way very quickly."

Leverage Points

According to Senge, most people react to limits-to-growth situations by trying to push too hard. "Unfortunately, the more vigorously you push the familiar levers, the more strongly the balancing process resists, and the more futile your efforts become." Senge recommends finding the leverage points within the systems, which often "require actions you may not have considered, choices you never noticed, or difficult changes in rewards and norms." In other words, sometimes we have to challenge our innate assumptions about what works—and try doing the opposite.

Backsliding. For example, many BI teams find themselves at a crossroads after they consolidate shared data elements into an enterprise data warehouse and centralize development within an enterprise BI team. Although they deliver high-quality solutions and ensure a single version of truth, the centralized team now struggles to keep up with user demand and becomes a bottleneck to growth. Most BI teams in this situation buckle down, work harder, and plead for more funding and resources to grow the team, expand the hardware platform, and increase database performance. While all these things might be necessary, they are usually not enough to counter the system dynamics that the team has created through its own success.

The primary option is counterintuitive. Instead of continuing to expand central operations, the team must forfeit hard-won control and distribute ownership back to the business units. This is a scary proposition for most BI teams, because business units can easily undermine information consistency by creating non-standard data marts, cubes, reports, and so on. But if the central BI team doesn't distribute work to business units, users will become so dissatisfied with the pace of development that they will build their own systems (i.e., spreadmarts) anyway, derailing the BI initiative and moving it into a negative feedback loop.

In this situation, enlightened BI executives recognize that they need to give back some control to continue growing. "We will soon hit the wall, and it's clear that we need to decentralize our operations if we want to achieve the kind of growth and capabilities the business desires long-term," said a BI director at a major manufacturing firm.

Enlightened BI executives recognize that they need to give back some control to continue growing.

In a decentralized environment, BI managers maintain "control" by defining standards for development rather than performing the development themselves. They define standards for project management, ETL processes, data quality, and other architectural elements. They educate remote developers about these standards and review their work to ensure that they are adhering to the standards. In this way, BI teams maintain a reinforcing cycle of growth.

Components of Leverage. In the world of BI, each element within the dual feedback loops is a point of leverage that BI teams can use to alter the cycle of growth or decline: usability, reputation, spreadmarts, sponsorship, funding, and projects (see Figure 8).

For example, there are numerous techniques to eliminate spreadmarts, such as my five Cs: communicate, coerce, convert, coexist, and co-opt. There are also dos and don'ts for acquiring sponsorship for an initial project or ongoing program.

"BI projects succeed from the top down with strong executive sponsorship; I've never seen it successful from the bottom up," says Mike Ferrante, manager of data services at Habitat for Humanity International. (See Figure 10 for a concept map of sponsorship.)

Sponsorship Concept Map

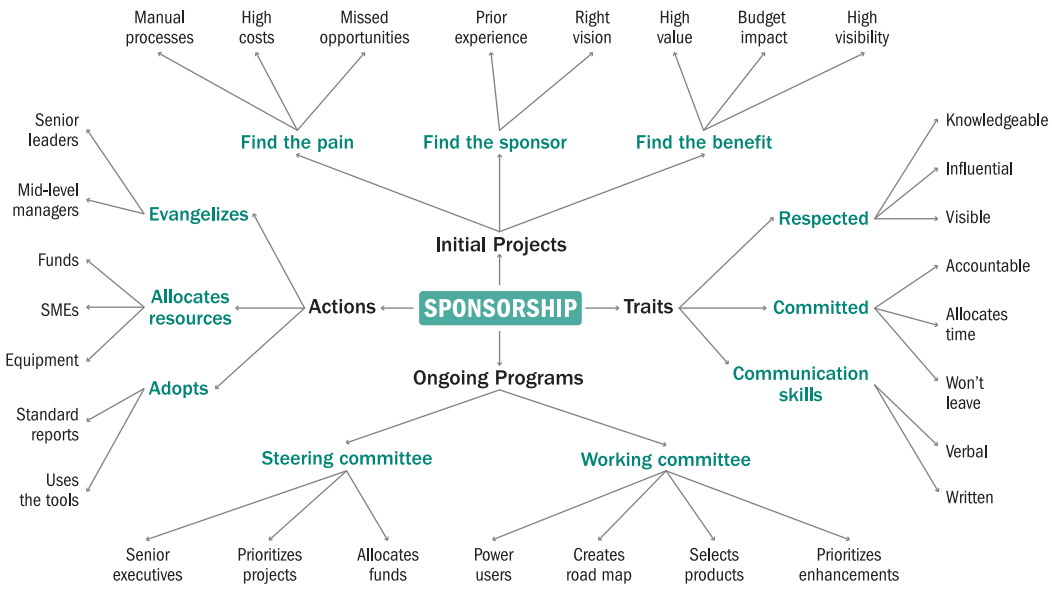

Figure 10. Obtaining and maintaining sponsorship is a key leverage point for creating successful BI solutions.

The two most powerful leverage points for changing the nature of system dynamics within a BI environment are usability and project management.

Usage and Projects. While sponsorship and spreadmarts are important elements, the two most powerful leverage points for changing the nature of system dynamics within a BI environment are usability (see Figure 11) and project management. These are areas in which BI professionals can exert the most control over the shape of the BI environment and its eventual outcome. By focusing efforts here, BI managers can obtain the necessary leverage to change system dynamics and move their initiatives in a positive direction.

However, each leverage point is complex in its own right, consisting of multiple components and subcomponents, each of which can affect the usability of the system or the effectiveness of a project overall. Typically, BI teams need to address all the components within a leverage point to ensure a successful outcome. This is the equivalent of juggling multiple balls at once without dropping any.

The rest of this report will examine in detail these two leverage points—usability and projects—relying on interviews with BI practitioners to illustrate best practices and pitfalls to increase BI adoption and usage. The issues raised synthesize the best practices for increasing adoption and usage articulated by users we interviewed for this report and who responded to an open-ended question in our survey.

Usability

Figure 11 is a concept map for usability. The main components are design, support, architecture, and change management. Each contains three or more subcomponents, and each of these consists of multiple implementation practices. The way BI teams manage each of these components determines the degree of leverage they can exert to change the dynamics of a BI initiative.

Usability Concept Map

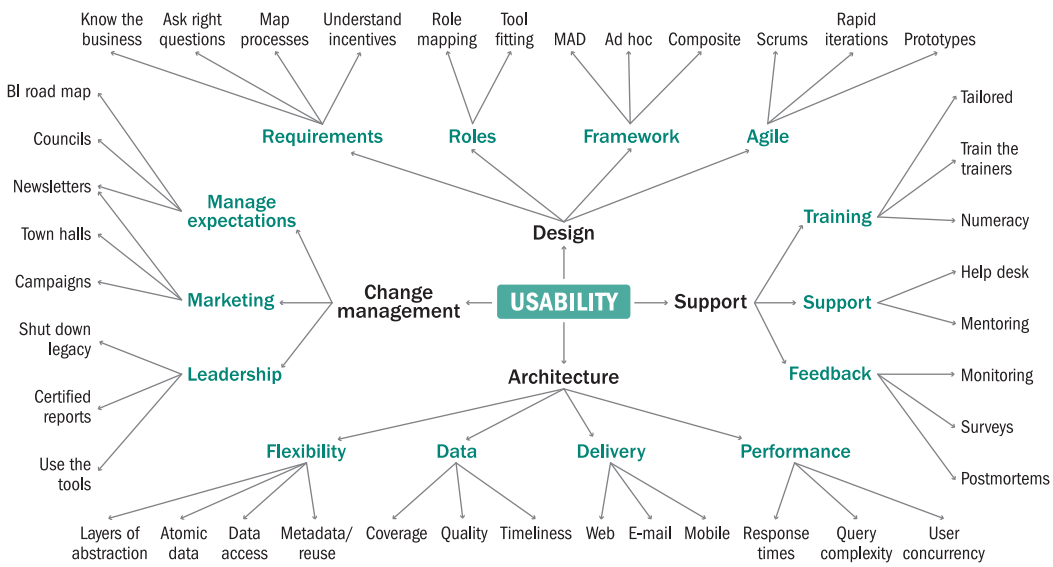

Figure 11. Many factors affect usability.

Design

While all components are critical to the usability of a BI solution, design is perhaps the most important to ensuring optimal BI usage. Design is the art of matching technical solutions with user requirements. It's an art because users rarely know what they want in a report in advance. This makes the process of gathering requirements rather quixotic. Asking users, "What data do you want?" invariably produces the answer, "Everything!" A better question to ask, according to BI practitioners, is: "What are you trying to accomplish?" To gather sufficient detail, one BI director asks users to step him through a "day in the life" of their job, including their pain points, how they are being measured, and generally what they care about. This helps separate the real requirements from the "nice-to-have" ones.

Design is the art of matching technical solutions with user requirements. It's an art because users rarely know what they want in advance.

"Users typically say, 'Just give me all the data,'" says Alex Crabtree, senior manager of BI solutions at NetJets. "But we've learned to ask what they plan to do with the data. If they say, 'It would be nice to know,' we now see that as a low priority. We want to give them information that is going to drive behavior. We don't want to build metrics that don't impact the company!"

Process. Some BI managers have users describe the process or processes they are responsible for managing. A process map, for example, can help to identify information gaps that a BI solution might address. But shy away from using formal process mapping methodology, which might turn off

users, says Ryan Uda, senior IT manager, enterprise BI, at Cisco Systems. "They might think you are trying to reengineer their process, which makes them nervous."

Business Knowledge. Many BI managers said the key to gathering effective requirements is to have an insatiable curiosity about the business, how it works, and the roles people play in making things happen. Obviously, it's better if the BI team has this knowledge up front. They'll ask better questions and more quickly identify patterns and commonalities among users and groups. Essentially, the team will anticipate what business users need and want before they know themselves.

Some of the best BI solutions are built by veteran teams of BI professionals with 10 or more years of experience at their companies.

Some of the best BI solutions are built by veteran teams of BI professionals, each of whom has 10 or more years of experience in their industry and company. Their knowledge of the business helps them anticipate business requirements and bake these into their architecture in advance of any requests. "We knew the business would eventually want a real-time data warehouse, so we architected it that way from the start," says Alicia Acebo, former data warehousing manager at Continental Airlines and now an independent consultant.

BI Account Managers. To inculcate this knowledge rapidly, many BI teams hire people from the business with a degree of technical savvy and appoint them to serve as "account managers" for a business unit. These people spend most of their time in the business unit, talking with users and sitting on strategic advisory councils. Given their influence, they can help evangelize technical solutions to business problems while bringing back requirements for new development to the BI teams.

These types of BI account managers are much more effective than traditional business requirements analysts because they operate at a higher level in the organization and are more knowledgeable about the business and more respected by the business users. In contrast, traditional business requirements analysts are generally junior people who spend most of their time in the IT department. They are sent out periodically to interview business users and translate their needs into IT specifications. Usually, much is lost in translation.

Many users said they use prototypes and agile development methods to align development with user requirements.

Prototyping. Many users said they use prototypes and agile development methods to align development with user requirements as a way to increase usage. Jeff Gill, senior director of network surveillance at Comcast, said he built a dashboard for network support engineers using rapid development techniques. "Over the course of three months, I sat with the network support engineers in the morning to find out how they handled different situations. In the afternoon I built queries, arranged KPIs, and gathered data to build the dashboard, and I would show them the results the next morning. Since I never actually conducted a formal interview or documented their specifications, they didn't immediately realize that I was developing a software solution for them."

Becky Briggs, senior manager of strategic infrastructure at Airline Reporting Corporation (ARC), said her BI team converted from waterfall to agile and scrum development techniques, where the emphasis is on short iterations and daily, 15- to 30-minute stand-up meetings with users to get their feedback, understand their priorities, and evaluate risk. Furthermore, ARC "cohabited product managers and developers within the sales department" to facilitate interaction between developers and business users, she said.

User Mapping. Another key part of design is to understand user roles and the type of information access and BI tools each role requires. Organizations that purchase a single tool for all users soon discover they have lots of BI shelfware and abysmally low usage. To avoid this problem, many BI teams perform a user inventory that helps them classify users by information requirements. Figure 12 illustrates one such inventory.

Mapping Users to BI Tools

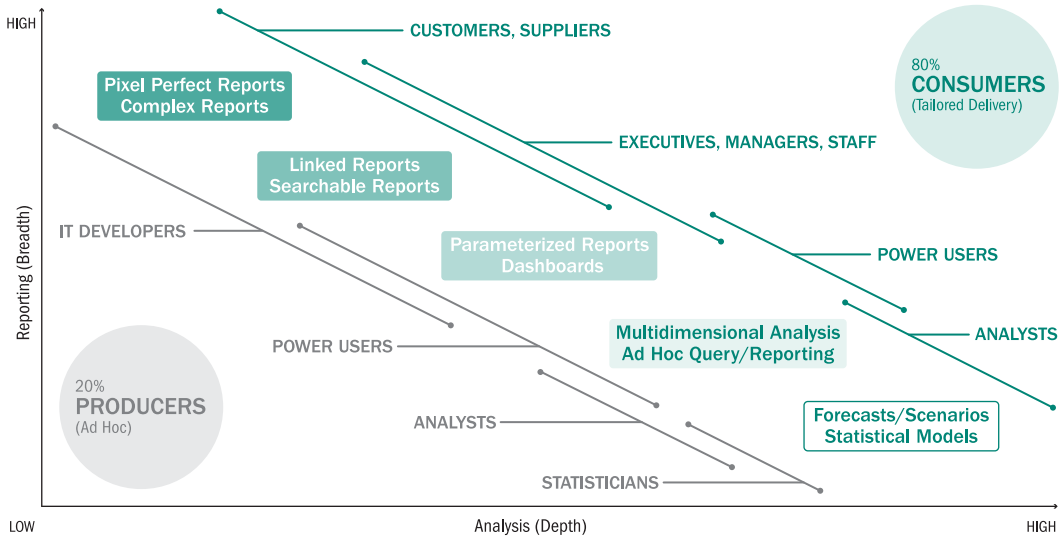

Figure 12. A sample inventory of user types and the functionality they require.

At the highest level, users divide into two camps: 1) information producers (or power users) who develop reports and business views, and 2) information consumers (or casual users) who "consume" those reports and views. Typically, consumers represent 80% of potential BI users in an organization, while producers constitute 20%. The information needs of these two groups are starkly different. Consumers need tools that are intuitive to use, require little training, and parse out information as needed so they aren't overwhelmed with detail. Producers, on the other hand, need true, ad hoc access to query objects (e.g., metadata), data warehouse tables, and source data (both internal and external) to generate new views of information that don't already exist. Giving casual users tools that are geared toward power users is a recipe for disaster—yet, many organizations today still fall into this trap.

The MAD framework addresses 60% to 80% of the information needs of casual users.

Going MAD. To improve BI usage among casual users, some BI teams are implementing what I call a MAD framework (see Figure 13). MAD stands for monitor, analyze, and drill to detail. Each function is associated with a different layer of information and sets of key performance indicators (KPIs). The amount of data and number of KPIs expand exponentially at each level, as indicated by the pyramid shape of the framework. BI applications based on the MAD framework address 60% to 80% of the questions asked by casual users (80% of the population).

A MAD framework creates an interactive sandbox that parcels out information and insights to users in layers, optimizing usability and usage. The monitoring layer consists of graphical KPIs that enable business users to assess the status and trend of KPIs with a glance. If a KPI stoplight is yellow or red, users can drill down to the analysis layer to explore the issue from multiple perspectives or dimensions using filters. Once they discover the root cause of the problem, they can drill to atomic-level data in the data warehouse or source system to identify the customers or products affected by the problem and take action.

MAD Framework

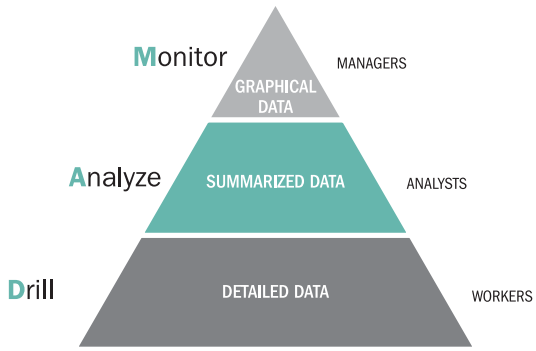

Figure 13. Each function is associated with a different layer of information and sets of key performance indicators (KPIs).

Users can start anywhere in the framework. Managers and executives typically start at the monitoring layer and drill down as needed; analysts start at the middle layer and drill up or down; and field staff start at the detailed data layer using operational reports. KPIs cascade from the top level to the bottom, and data aggregates from the bottom to the top. This gives executives a clear line of sight throughout the entire organization—both across departments and up and down hierarchies—when evaluating performance. Security features determine which users can see what data at each level of the framework.

The monitoring layer is usually supported by a portal or dashboard interface, the analysis layer by an OLAP tool, and the drill-to-detail layer by dynamically generated queries into a data warehouse or source application. However, there are multiple techniques for building these layered information delivery systems. Many BI vendors are creating full-fledged MAD solutions with seamless interfaces between the three layers.

By parsing out functionality and data in a layered fashion, the MAD framework meets the information needs of casual users in an optimal way.

By parsing out functionality and data in a layered fashion, the MAD framework meets the information needs of casual users in an optimal way. Users start at the layer they want and drill up or down depending on their preferences. Unfortunately, most organizations flip the pyramid upside down and only provide users access to detailed data via reports. This is not MAD; it's insane! "BI teams that have spent a lot of money on data warehousing just to generate reports are raising eyebrows," says a director of applications development at a benefits insurance company.

Cisco Systems. Cisco Systems has built 80 dashboards using the MAD framework, supporting almost 20,000 users in marketing and sales and 8,000 people in human resources. The company is now implementing the framework in its finance department. Its top layer has 10 "actionable" KPIs, each of which breaks down into 10 or so "contributing KPIs" at the middle layer, each of which divides into 10 additional "detail" metrics at the bottom level. Cisco's dashboards typically represent data using 30 dimensions, enabling users to slice and dice data any way they want. A single dashboard often replaces more than 100 "legacy" reports, according to Dongyan Wang, who led the BI effort at Cisco Systems and is now senior director of enterprise BI at Network Appliances.

One benefit of the MAD framework is that it helps simplify user requirements, says Wang. "Human resources once gave us a 130-page specification for a report that would let them slice and dice data in an infinite number of ways. We fit their requirements into our BI framework and responded with a three-page document that defined three dashboards. It was hard for them to grasp the framework at first, because it makes them think top-down using KPIs instead of bottom-up using reports."

Self-Service Gone Wrong. MAD also helps counterbalance the overexuberance that naturally accompanies self-service BI. While self-service BI is critical for power users, it is overkill for casual users. Many companies carry self-service BI too far, and the result is report chaos, which ultimately causes usage to drop among casual users. One large energy company embraced self-service BI tools several years ago and recently found it had 26,000 reports stored on its servers in one department alone. The reports were generated by 450 users in a department of 3,500, most of whom found the tools and maze of reports too overwhelming to use. The company is now pulling back from self-service, implementing 300 "standardized reports" that encompass the majority of metrics and dimensions in the 26,000 reports, and reserving self-service BI for ad hoc requirements outside standard information views. The best way to implement "standardized reports" is via a MAD framework that provides users all the detail they need, but only when they need it.

Winn-Dixie Stores has also felt the pain of self-service BI gone awry. "We gave our associates self-service BI and let them run with it and now we have more than doubled the number of reports over the past year," said Matthew Laney, data warehouse and business intelligence manager at Winn-Dixie Stores. "We are currently establishing an audit process for certifying those reports. The certified reports will be labeled so management will know it's a quality-assured product."

"Last year we had 1,400 reports on our servers; today we have 4,000. Holy smoke, what happened?"

Mapping Roles. The MAD framework also provides a better way to map users to tools compared to traditional inventories. That's because most users are not uni-dimensional: they play multiple roles, and each role has different information requirements. The variety of roles users play often makes it hard for BI managers to regulate access to information without interfering with the way users do their jobs. In some cases, the BI team may institute overly restrictive policies that prevent users from accessing information they need; in other cases, they may provide overly open access, exposing sensitive information to the wrong people or overwhelming users with detail that makes the system virtually unusable.

Most users play multiple roles, and each role has different information requirements.

For example, in some roles, casual users may only need to monitor KPIs, while in others, they may need to analyze and even drill to detail. Power users may also require MAD capabilities to perform certain roles, such as a human resource analyst who wants to track the financial performance of the organization as a whole. Rather than needing detailed financial breakdowns, she is only interested in a summary view. Figure 14 shows how to map user roles to information functions within an extended MAD framework.

Mapping Roles to an Extended MAD Framework

Roles	Monitor	Analyze	Drill
Set strategy (Executive)	●		
Manage process (Manager)	●	●	
Plan/Model (Strategy analyst)	○	●	●
Optimize process (Functional analyst)	○	●	●
Executive process (Field staff)	●		●

● Heavy use
○ Moderate use

Figure 14. It's important to think about the roles users play in the course of their daily work rather than the type of user they are (e.g., executive, manager, analyst), since most users play multiple roles. By identifying roles they play within a MAD framework, you can determine the various types of access they require.

Ad Hoc for Casual Users. Occasionally, casual users need to work outside the MAD framework to answer the 20% to 40% of questions not addressed there. The primary driver for such ad hoc usage is the need to create plans or forecasts, which usually require data not found in their MAD-based dashboards or reports.

For example, a manager may want to create a plan that models performance using different assumptions and risk scenarios. To create this plan, she will need ad hoc access to detailed data in the warehouse or source applications and the ability to dump the results into an Excel spreadsheet or some other modeling tool.

"Today, we look at financials historically. We can slice and dice data in a cube until the cows come home, but the views are historic. What we really need is a tool to model the financial impact of potential decisions so we can look at best- and worst-case scenarios; otherwise, we are operating in the dark," says a director of enterprise management reporting at a large healthcare organization.

An ad hoc BI tool for casual users was a contradiction in terms, until recently.

Ad hoc BI provides unfettered and unplanned access to data resources, which is typically more than most casual users need or are able to use effectively. Thus, an ad hoc tool for casual users has been a contradiction in terms until recently. However, new search-enabled BI and visualization technologies promise to make simplified ad hoc access a reality. In addition, most BI tools now offer tight integration with Microsoft Office products, making it easy for users to blend ad hoc data access with planning tasks. And many BI vendors now sell robust planning tools as adjuncts to their BI platforms, providing graceful sharing of data and tasks between the two environments.

More Power for Power Users. It's also important to meet the needs of power users, who typically require more powerful analytical tools than those available within a MAD framework. They need to develop complex what-if models (usually on behalf of an executive or manager), create detailed forecasts, use advanced visualization and in-memory OLAP tools to identify anomalies, and use analytic workbenches to ferret out unforeseen patterns and relationships in large volumes of data for predictive purposes.

It's a mistake to provide tools that are too complex for casual users and not powerful enough for power users.

But even the most die-hard power users will require MAD-like capabilities 20% of the time. Thus, it's important that organizations provide both casual and power users the right tools for the task at hand. The mistake most BI teams make is providing tools that are too complex for casual users and not powerful enough for power users. Figure 15 sorts out the MAD and ad hoc requirements of casual and power users.

MAD and Ad Hoc Requirements of Casual and Power Users

	80% of the Time		20% of the Time	
	TASK	TOOL	TASK	TOOL
Casual Users	Monitor	MAD dashboard	Find reports	Keyword search
	Analyze		Create queries	Keyword search
	Drill through		Plan	Keyword search
Power Users	Author	Query/report tool	Find reports	Keyword search
	Plan	Excel via BI	Monitor	MAD dashboard
	Analyze	In-memory OLAP	Analyze	
	Predict	Data mining	Drill through	

Tailored Delivery
Ad Hoc

Figure 15. Ad hoc requirements involve providing unfettered and unplanned access to data resources. Ad hoc tools for casual users must be easy to use. These include keyword search with natural language processing (NLP) capabilities or the ability to export to Excel or other modeling tools for planning purposes.

Support

Tailored Training. Most survey respondents and interviewees mentioned training, support, and monitoring as keys to ensuring high levels of BI usage. In terms of training, most mentioned the importance of delivering "tailored" training; that is, training not just in the use of the tool, but also in how to use the tool in the context of the data relevant to each group of BI users. That means using finance data to train finance users and HR data to train HR users. Once deployed, the training continues. "We now bring four to five people in a room from a single department and ask them to tell us what problems they are having. We also review problems that we've noticed. For example, we might show them how to make a 45-minute query run in 45 seconds," says Laney at Winn-Dixie Stores.

Super Users. Many organizations use a "train the trainers" approach in which the IT department trains a handful of power users in each department to write reports on behalf of their colleagues. These "super users" provide first-level support to their colleagues, and in turn, IT provides the first level of support to the super users. "We are now selecting representatives from each user group to be the 'go-to' person to get more detailed training so they can build their own reports," says Bennett of the Sports Authority.

Numeracy. One of the thornier problems in BI training is teaching users how to interpret data and overcome gaps in formal education. For instance, most users misinterpret the meaning of ratios and may take incorrect actions when the value of a ratio changes, according to Charles Caldwell, practice lead for analytics at Management Concepts, Inc. For example, managers might interpret the cause of an increasing employee turnover ratio as an increase in the number of people leaving the company (numerator), when in actuality, the cause is a decreasing base of employees (denominator). Other

Most users misinterpret the meaning of ratios and may take incorrect actions as a result.

common traps include confusing causality with correlation, choosing the wrong visualization to answer a given question, and lack of skills for validating calculations.

Business Assumptions. Beyond numeracy, many business users may not understand the dynamics driving their business and can apply false assumptions to the data. For instance, executives in an online retail business may view a revenue report of their top customers by location. The data may reinforce their assumption that their brick-and-mortar competitors get the lion's share of business from customers within two square miles of their stores. This assumption ultimately drives some expensive decisions, such as which customers the retailer targets and through which channels. Yet, a more detailed analysis might reveal that the geographic proximity has no bearing on customer loyalty or share of wallet, which was true in the case of one online retailer I interviewed.

As an analytics trainer, Caldwell also believes that change management plays a significant role in whether users are able to apply BI tools effectively. "I can teach people to use linear regression, but will they recognize the right problems to which they can apply this technique once they leave the classroom? Many times, they are not incentivized to use new techniques and never apply them. Most need a mentor to apply the tools and interpret results correctly."

"We did one-on-one sessions for 50 people in our corporate office."

Mentoring. While a six-month apprenticeship for analytic modelers is not uncommon, such a practice becomes unwieldy when trying to roll out general BI tools to an entire workforce. Nevertheless, many organizations devote a considerable amount of time to one-on-one training, especially for executives, to ensure uptake. "We did one-on-one meetings for approximately 50 people in our corporate office," says Laney, whose team also met with small groups of users in each department to provide training and answer questions. For managers in its 520 retail locations, the team pushes dashboards that are intuitive to use and come with a one- to two-page instructional document.

Support. Most organizations also see the importance of providing a responsive support system to users once they go live with the BI tools. This involves devoting full-time people to a BI help desk or at least training existing support staff to handle BI support calls. Typically, there is a transition period just after rollout when the development team and help desk share support calls. This enables the help desk to get up to speed on issues and resolutions and enables the development team to provide immediate fixes to version 1.0 bugs and see first-hand the consequences of their design.

"If usage dips below expected levels, we immediately talk to users to find out what might be impeding their use of the tool."

Monitoring. Most BI teams also carefully monitor usage as a way to understand usage patterns. "We know the usage patterns after a new release," says Jim Rappe, manager of data warehousing at Navistar International. "If usage dips below expected levels, we immediately call a meeting with the affected department to find out what issues might be impeding their use of the tool."

To perform this kind of monitoring, users need administrative tools that let them monitor a range of activities. According to our survey, a majority of organizations can track the number of users using a BI tool (77%) and number of queries/reports run (64%), but less than half can assess the types of queries/reports run (49%), types of users issuing the queries (48%), tables (39%), or aggregates (30%) queried (see Figure 16). The last two are critical for improving query performance—a key factor in improving usage.

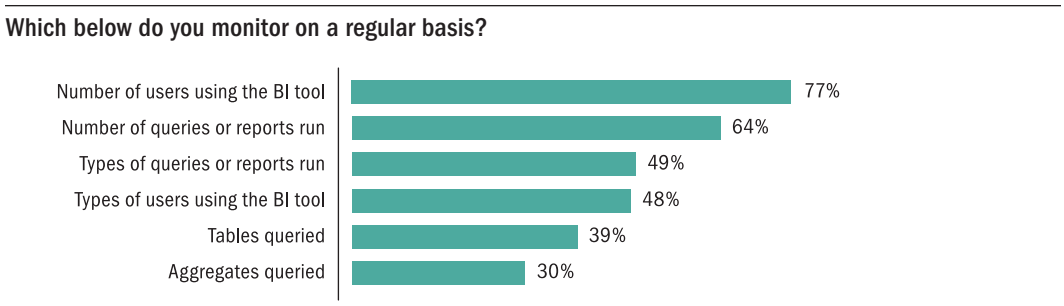

Figure 16. BI teams monitor a range of activites in order to understand usage patterns.

Surveys. Most successful BI teams gauge user satisfaction and complaints through an annual survey and postmortem reviews. Surveys need to be kept short to ensure a high response rate, and should ask the same questions each year to provide a good benchmark for improvement. Postmortems are important, especially when usage falters. "Three months after we rolled out our dashboard, it was mostly dead in terms of activity, and we have no idea why! We are now doing a postmortem around it," says one BI manager at an Internet service provider.

Architecture

Some BI teams find that they've marched ahead to deliver solutions without first developing the proper architecture and business rules to support growth. "We've been using data warehousing and forms of BI for several years, but we never laid a strong foundation. Now we want to jump to dashboarding, but we are struggling," says a BI manager who works in the IT department for a local government.

This is a significant problem for small and midsize businesses that may not have the financial resources or expertise to make good on their visions for BI. "If you don't have a game plan from day one and understand your limitations based on resources, then there is a serious risk that BI will fall off the table. Some people now question whether our investment in BI is worth it," says the BI manager.

Flexibility. The architecture supporting a BI solution is as important as a BI tool for ensuring proper uptake and usage. Fundamentally, data must be structured or delivered in a dimensional format that aligns with the way users think about the business. "The amount of BI usage isn't nearly as high as we would like it. Some people say the data doesn't look good enough," says a director of applications development. Part of the problem is that the company built data marts that were so specialized that they cannot be tweaked to give users the exact view they want. "Dimensionality is important; users want to drill up and down hierarchies to explore why something has changed from last month."

Besides dimensional structures, BI teams need to design the architecture to support layers of abstraction so that a change in one part of the system doesn't ripple through the entire stack. So when an organization restructures, merges with another, changes strategy, or must deal with new competitors or regulators, the BI architecture adapts gracefully without requiring months of rework. To accomplish this, designers create data models that use surrogate keys, lookup tables, and conformed dimensions and leverage metadata within ETL and BI tools to loosely couple source systems, data models, and end-user reports. Besides improving adaptability, metadata-driven approaches to ETL and BI development encourage reuse, improving responsiveness and time to market.

Data Coverage. In addition, data warehouses that rest on detailed atomic data are more flexible than those that rely on summarized data that cannot be repurposed to service new views. A data

warehouse should also contain most or all of the data that users need to support major applications. It is a challenge to create a data warehouse that provides a comprehensive source of information, because adding new subject areas takes a minimum of three months—too long for most users to wait.

"User adoption has gone through the roof and we no longer worry about new data marts popping up."

This was a vexing problem at eBay, which has a large number of analysts who need to create custom data sets to build predictive models. "We realized several years ago that for every data mart that we consolidated into our data warehouse, our analysts spawned a new one. Their desire to add new data in new formats to our data warehouse was a significant issue," says Oliver Ratzesberger, director of information management architecture and operations at eBay. Working with its database vendor, Teradata, eBay created a new data structure called a prototyping environment (PET) that enables users to create virtual data marts within a partition of the Teradata database. Users can add their own data to the PET data marts and combine it with data from the enterprise data warehouse. "User adoption has gone through the roof and we no longer worry about new data marts popping up," says Ratzesberger.

In addition, BI teams might consider adding federation capabilities that let users query data contained in multiple systems as if the data were located in one system. Many BI tools now support such federation capabilities.

Data Quality and Timeliness. The real or perceived quality of data is a huge factor that determines whether the business uses a BI solution. If users don't trust the data in a BI tool because it contains real or perceived inaccuracies, they won't use it. Conversely, if they can't access the data in a timely manner, it's of little value to them and they won't use the tools.

Many survey respondents underscored the need for BI environments to deliver just-in-time or "right-time" data so users can monitor what's happening at the moment instead of sometime in the past. "Being an ad-based Web company, I feel strongly that analytics need to be delivered in real time. Operational analytics is taking a front seat because it has a direct impact on revenue," says Joshua Eldridge, senior technical manager of corporate technology at AOL.

Gill from Comcast says his operational dashboard has enabled the company to respond quickly to outages and avoid doing things that would alienate users of the network. "At one point we realized that our scheduled maintenance was regularly occurring during hours of peak operation. By utilizing operational dashboards to capture the utilization of the service, we were able to quickly adjust the maintenance schedule to accommodate for off-peak periods of customer activity."

Data Delivery. The typical BI mantra is "Deliver the right data to the right user at the right time." We might add "through the right channel." Many users waste valuable time hunting for BI reports in a complex folder structure on the BI server. They also get overwhelmed with regularly scheduled reports, many of which they don't need to view unless something is out of whack.

"We have simplified access to information by creating a custom portal page for almost every user with links to the reports they really care about and a few interactive charts that they can click on to get more details. People like that. We're even adding RSS feeds to live news," says Steve Veilleux, business intelligence analyst at Groupe Canam, Inc.

"Most of our users are senior managers who don't have time to log into the BI system and find reports, so we push reports to them via e-mail."

Increasingly, organizations find it's necessary to deliver information and insights to users via e-mail and mobile devices, bringing data to the users instead of forcing users to come to the data. "Most of our users are senior managers, and they don't have time to log into the BI system and find their reports. So we push information to them via e-mail. Today we e-mail 75 reports to 65 people, and they are okay with static PDF reports since they have all the data they need on those reports to make a decision," says Canam's Veilleux.

Performance. Performance is a huge factor in usability. Casual users expect query performance akin to the response time of a Web search; that is, within seconds. On the other hand, power users who submit ad hoc queries against large volumes of data are more tolerant of slower response times because they've been schooled to understand the complexities of their query. Yet, a poorly performing system can tax their patience as well. "Improving performance is a constant issue," says Bennett of Sports Authority, which is examining various appliances to enhance the performance of its BI environment.

The easy thing to do when confronted with poor performance is to throw more hardware and indexes at the database. Indeed, many companies today are deploying data warehousing or analytics appliances to improve query performance, or implementing dedicated caching engines to store more data in memory for fast processing. But there may be less expensive ways to improve performance, such as training power users to monitor system performance and schedule their queries accordingly. "We've developed an in-house portal to our BI infrastructure, which informs our users what's going on in the environment and helps analysts self-manage the workload they apply to the system," says Ratzesberger at eBay.

Other performance-optimizing techniques include creating aggregates based on query patterns, caching commonly requested reports before users arrive to work, restricting long-running, complex queries to off-hours, and performing complex calculations in an ETL tool or data mart instead of a report. It's also imperative that BI teams think about data and user scalability when they design their initial system. That way they can gracefully expand capacity as demand rises without having to do a major rebuild midstream.

Change Management

The hard part about BI is not managing the technology; it's managing change. BI forces people to change the way they absorb information and make decisions, something most don't want to do, even if their current approach is suboptimal. Basically, most people don't want to change their habits, especially if they've been successful to date doing things in a particular way with specific types of tools. As one BI manager wrote, "If you are in the change business, you are going to have a lot of bad days."

Marketing. Consequently, most survey respondents emphasized the importance of marketing the BI solution as if it were a new product. "It's all about marketing. We have a 25-page marketing plan that encompasses everything from training, support, documentation, mentoring, newsletters, and so on," says Crabtree from NetJets.

"It's all about marketing."

Most BI teams produce newsletters, run seminars, conduct town hall meetings, and maintain Web sites to keep BI users abreast of new developments and changes. Many produce regular "Did You Know?" or "FAQ" articles that try to pique users' interests by showing them the types of insights and information available in the data warehouse or via BI tools. The best BI marketing campaigns define the target markets (i.e., BI user constituencies) and devise plans to communicate to each group with appropriate messages through the right channels at the optimal times. These marketing-savvy BI teams also create a logo and tagline for the BI program and launch the initiative with a campaign of posters, t-shirts, stickers, memos, and other communications devices designed to raise awareness.

Interestingly, technical writers play a key role in raising awareness and ensuring user adoption of BI tools. "At a previous company, they cut my technical writer and that had a huge impact on usage. We couldn't get our newsletters out on time, which frustrated users. We had developers write technical guides, but the users couldn't understand them. Prior to this we had good usage, but then we started getting negative comments and usage declined," says Crabtree.

Raising awareness without managing expectations is a recipe for disaster.

Manage Expectations. At the same time, it's imperative for BI teams to manage expectations. Raising awareness without managing expectations is a recipe for disaster. "People are more patient if they know when something is happening. Managing expectations is key," says Crabtree. One way to help users understand the timeline for BI deliverables is to publish a BI road map that shows what applications will be delivered when. It's best if a council of power users representing different departments sets the priorities defined in the road map, which cements the loyalties of this difficult-to-please group.

Some users will adopt the new BI environment immediately and ask why it took so long to deliver it. Others who are good corporate citizens will walk across the bridge in due time. And a minority will never adopt the new tools unless forced. "Some users are open to new things; others are not. We show them other ways of looking at data, but we are taking this one step at a time," says Sports Authority's Bennett.

When migrating users from one environment to another, it's imperative to make the new environment look as similar to the old one as possible in order to provide some level of comfort to users accustomed to the old ways of doing things. For example, if users are used to viewing a paper-based report, make sure the new BI solution can reproduce that report exactly. Once they are accustomed to the new environment, you can gradually expose users to more efficient ways of accessing and analyzing information. However, some users won't change unless you shut down the old system.

Watermarks. A bona fide way to ensure adoption is to make sure top executives use the BI tool. This will force their underlings to use the tool, too, or face surprises when the boss asks them questions about a report they've never seen. Executives can also fuel adoption by requiring that only certified reports be used in regularly held meetings. Some companies go so far as to imprint these standard reports with watermarks or codes so it's clear which information is valid and which is not suitable for making decisions.

Summary. Given all the facets involved, it's easy to see why many BI teams fail to deliver easy-to-use BI solutions—and then wonder why no one is using them. This is why usability is in the negative feedback loop of the "limits to growth" systems archetype. It's too easy to deliver hard-to-use BI solutions. Yet, if a BI team can manage to deliver a small application that meets all the usability requirements—a quick hit—they can change the system dynamics. Creating a quick hit also requires strong good project management skills, as we will see when we examine our next major leverage point.

Project Management

The other major leverage point that BI teams can manipulate to ensure high rates of usage and adoption is project management. Here, the dimensions are equally as broad as those for usability, but perhaps better understood, since project management is a universal discipline. Nevertheless, BI introduces several new facets to project management and deserves some discussion.

The four key elements of project management are scope, team, goals, and standards. (See Figure 17.)

Project Concept Map

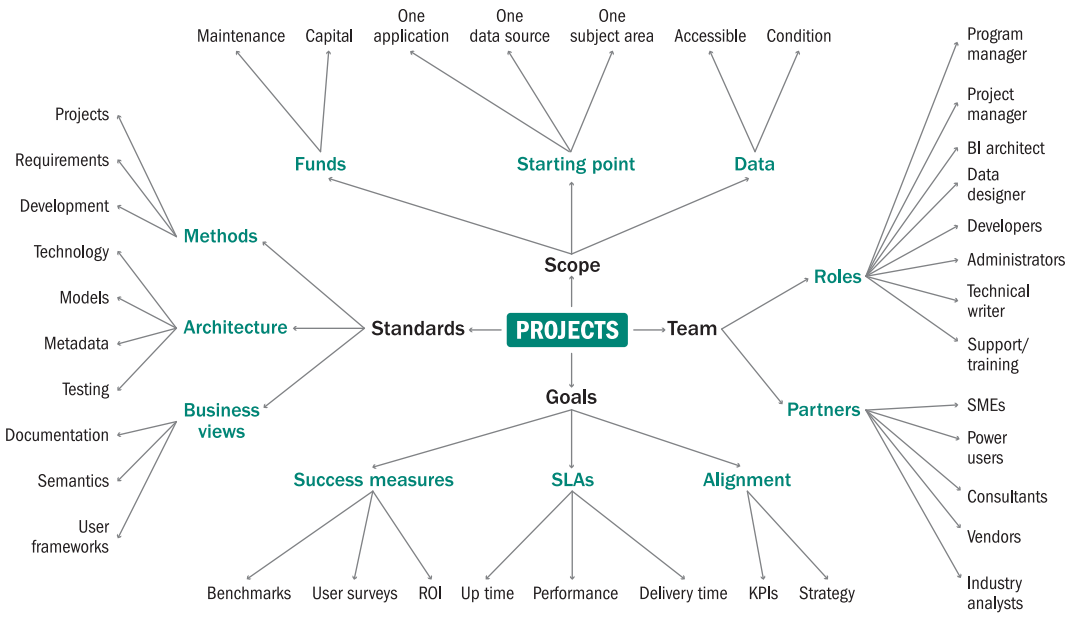

Figure 17. The four key elements of project management are scope, team, goals, and standards.

Scope. The key to the success of any BI project is scope. Generally speaking, the narrower the scope, the better your chance for success. Most successful BI initiatives start small and grow quickly through multiple, rapid iterations, each of which provides a checkpoint to ensure that they are meeting the needs of business users. We've already discussed agile development concepts that call for rapid iterations and weekly or monthly deliverables. But the hardest part is finding a way to focus the project so you can succeed in delivering value in these short time frames.

Many organizations scope an initial project by selecting an application that can be partly or fully built using data from one source system or application—usually one that is well known, runs on a relational database, and supports a well-documented, recently deployed, packaged application. It's wise to scope projects based on data sources, because source system data is usually the most unreliable variable in any BI project. Working with a new data source is like renovating a house: you never know exactly what you'll find when you open up the walls. Source data often contain errors and anomalies that aren't readily evident when reading the property descriptions of data fields or reviewing samples from various tables in the databases.

Many organizations scope an initial project by selecting an application that can be built using data from one source system.

Many short-handed BI teams mentioned the importance of scaling a project to the available resources. Executives or managers may have a vision for a new dashboard to monitor operations, but they don't have the political or financial appetite to fund the vision. Or the executives and the BI

team may not have a clear appreciation for the infrastructure and maintenance required to build and sustain an effective, long-term solution.

Teams. Most project managers understand the importance of putting together a good team that can fill all the roles needed to deliver an effective solution. But the dearth of skilled BI professionals is currently putting pressure on organizations to hire outside consultants, partner closely with vendors, or bootstrap the system.

Most BI managers underscore the importance of partnering with power users to ensure they buy into the system. "We identified power users and made sure they were happy," says NetJets' Crabtree. "If they are happy, they spread the word. But if you neglect them, they are the first to criticize."

Goals. A key to project management is to set goals that are aligned with strategic and departmental goals and KPIs. It's also important to define a baseline of performance so you can gauge your progress. This also lets you benchmark your success in a quantitative way so you have a better chance of convincing executives to fund your next project or program extension. Finally, it's critical that you work with users as part of the requirements phase to determine service-level agreements (SLAs) and write those into the project plan. Sample SLAs include up time, response time, and delivery time.

Standards. Setting standards for BI projects is critical to ensure efficient and effective development. It also lays the groundwork for enabling BI teams to distribute development once they reach a point at which their own size begins to slow their ability to respond quickly to user requests.

BI teams need to adapt standards defined by the PMO to accommodate the nuances of BI projects.

BI teams need to adapt standards defined by the project management office to accommodate the nuances of BI project management and development techniques (e.g., agile versus waterfall methods). They also need to establish development standards for developing ETL code, data models, dimensional models, and BI reports, along with specifications for writing error codes, table and field names, logging procedures, backup and recovery, disaster recovery, testing, documentation, and production rollouts.

Perhaps the hardest job of all is standardizing business views, specifically the definitions and rules for shared data elements and metrics. For instance, many companies struggle to define the meaning of the term "customer" or the metric "net profit." Crabtree says his team used a tool that facilitates communications with the business and helps them reconcile semantics. With it, business and IT can visually define and model the data in business terms and then automatically generate BI blueprints (or metadata) with leading BI tools. "We no longer just read requirements back to them; we interactively design the models in real time."

Summary. With adequate project management skills, BI teams can deliver positive outcomes that generate additional sponsorship and funding that maintain momentum for a successful BI solution and avoid hitting the wall once the BI team and architecture gets too big. Good project management skills are also needed to deliver quick-hit applications that attract business user attention and can help a BI team break the stranglehold of a negative feedback loop.

Recommendations

The key to making BI pervasive is getting users to adopt and use the BI tools that an organization purchases for them. This seemingly straightforward equation is actually very complex when you start to analyze all the variables that go into making a BI tool easy to use. It's why the penetration of active BI users in organizations is only 24%.

To increase the adoption of BI tools:

- Consider all the costs and the best way to address them. Although the cost of BI tool licenses is not insignificant, the real costs are the time and complexity to configure the tools and integrate them into an existing architecture (security, Web servers, databases, etc.). These costs increase exponentially in an enterprise deployment. Therefore, one way to make the cost of BI tools more affordable is to deploy them departmentally, gain buy-in, and expand incrementally.
- Conduct an inventory of users to ensure that you purchase only the licenses you need. For example, many casual users may only need static reports pushed to them each night via e-mail or a Web folder. Replacing full-client licenses with less expensive "recipient" licenses will reduce overall license and maintenance costs and make it more affordable for your company to purchase licenses for all who need them.
- Create a working committee of power users from each department and have them create a road map for BI with IT's assistance. Getting the power users on board will create a cost-efficient program that prioritizes the delivery of BI functionality in an optimal way, leaving more time and money to purchase and deploy the right BI tools for each category of user.

To increase BI tool usage:

- Among power users, purchase BI tools with strong Excel integration and deep analytics and visualization capabilities. Tools that offer tight integration with planning tools also are a boon to power users who seek to model business scenarios.
- Among casual users, focus on usability. This means delivering a clean interface where extraneous functions are hidden. Offering Web 2.0 capabilities via Flash and AJAX also helps, since many (but not all) executives and managers are captivated by interactive graphics. Also, adopt the MAD framework when building dashboards and parameterized reports so that you parcel information to users on a just-in-time basis, giving them only the information they need, when they need it.
- In all cases, deliver fast performance and high-quality data. Nothing will torpedo BI usage among casual users more quickly than data defects and slow response times. To ensure good performance, implement a robust BI platform and a sound BI architecture that lets you scale users and queries rapidly once you cross the BI tipping point.
- Most importantly, develop a marketing plan that is tailored to every group in your organization and that leverages a variety of media and channels (e-mail, Web, meetings, events, posters, training, help desk, etc.) to communicate the value of BI to individuals and teams in an optimal fashion. Use end-user training and help desks to monitor usage and ascertain requirements.

Business Objects, an SAP company
As an independent business unit within SAP, Business Objects transforms the way the world works by connecting people, information and businesses. Together with one of the industry's strongest and most diverse partner networks, the company delivers business performance optimization to customers worldwide across all major industries, including financial services, retail, consumer-packaged goods, healthcare and public sector. With open, heterogeneous applications in the areas of governance, risk and compliance; enterprise performance management; and business intelligence; and through global consulting and education services, Business Objects enables organizations of all sizes around the globe to close the loop between business strategy and execution.
www.businessobjects.com

Corda Technologies
Corda delivers anywhere, anytime visual access to your data enabling timely, accurate and more informed decisions. Corda's innovative performance dashboard and data visualization solutions work with virtually any data source, on any platform and with any Web-enabled device including BlackBerry and Treo. Corda's dashboards make finding the right information easy and intuitive. Data is easily navigated, can highlight exceptions and be presented in ways that best suit specific processes and metrics. Infinite drill-down capabilities allow decision-makers to quickly spot trends and still see the root causes. Dashboard deployment is fast, flexible, and re-usable with limitless customization.
www.corda.com

InetSoft Technology Corp.
InetSoft offers an Operational BI platform that features visualization-driven: reporting, dashboards, and analytics. It is backed by Data Block technology that provides user-defined data mashup and transformation, and performance benefits like streaming, caching, and materialized view pre-aggregation. Our products are easy, agile, and robust: easy to implement initially, and easy for users to learn; agile to adjust to changing business requirements quickly; and robust in terms of feature-set and scalability. Your budget benefits from fast implementations and flexible licensing while your users receive greater self-service, exploration, and collaboration. InetSoft's innovative products have won awards from developers every year since 1999.
www.inetsoft.com

LogiXML
Established in 2000, LogiXML is the leader in Web-based business intelligence (BI) software. It provides reporting, analysis and data integration solutions to private and public enterprises worldwide. LogiXML's philosophy is to offer a complete BI platform that is feature-rich, fully Web-based, easy to implement, use and update, and aggressively priced. The company believes that BI should help all levels of personnel make their daily jobs better and more efficient. LogiXML is based in McLean, VA, and is privately held. In 2007, it received $5M in funding from the Updata venture capital firm, and currently employs 60 workers.
www.logixml.com

Microsoft
Founded in 1975, Microsoft (Nasdaq "MSFT") is the worldwide leader in software, services and solutions that help people and businesses realize their full potential. Microsoft® Business Intelligence offers a complete suite of products supporting all facets of decision making. Through tight integration with the powerful, proven, and scalable Microsoft® SQL Server™ 2005 platform, Microsoft® Office SharePoint® Server 2007, Office Excel 2007, and Microsoft Office PerformancePoint Server 2007 provide compelling business intelligence (BI) capabilities that deliver the right information, at the right time, in the right format.
www.microsoft.com

MicroStrategy
MicroStrategy is the leading independent provider of open systems business intelligence software. Founded in 1989, MicroStrategy provides integrated reporting, analysis, and monitoring software that helps leading organizations worldwide make better business decisions every day. Companies choose MicroStrategy for its advanced technical capabilities, sophisticated analytics, and superior data and user scalability. With more than 15 years of industry experience, thousands of customer successes, and a reputation for innovation and leadership, MicroStrategy is the clear choice for your business intelligence investment.
www.microstrategy.com

SAS
SAS is the leader in business intelligence and analytical software and services. Customers at 44,000 sites use SAS software to improve performance through insight from data, resulting in faster, more accurate business decisions; more profitable relationships with customers and suppliers; compliance with governmental regulations; research breakthroughs; and better products and processes. Only SAS offers leading data integration, storage, analytics and business intelligence applications within a comprehensive enterprise intelligence platform. Since 1976, SAS has been giving customers around the world THE POWER TO KNOW®.
www.sas.com

Strategy Companion
Strategy Companion Corporation is a leading provider of business intelligence solutions focused solely on the Microsoft SQL Server platform. Analyzer™ provides an intuitive and powerful front end for the latest SQL Server Business Intelligence (BI) capabilities. BI Analytics for Dynamics CRM™ brings Analyzer's leading-edge analytics to the Microsoft Dynamics™ CRM platform. Global Fortune 500 companies and other large and mid-sized businesses are enhancing their competitiveness and revenue streams by leveraging Analyzer's proven, mission-critical enterprise BI capabilities. Founded in 2001, Strategy Companion is headquartered in El Segundo, California, with offices in Atlanta, GA; London, UK; India; China; and Taiwan.
www.StrategyCompanion.com

TDWI RESEARCH

TDWI Research provides research and advice for BI professionals worldwide. TDWI Research focuses exclusively on BI/DW issues and teams up with industry practitioners to deliver both broad and deep understanding of the business and technical issues surrounding the deployment of business intelligence and data warehousing solutions. TDWI Research offers reports, commentary, and inquiry services via a worldwide Membership program and provides custom research, benchmarking, and strategic planning services to user and vendor organizations.

tdwi
THE DATA WAREHOUSING INSTITUTE

1201 Monster Road SW
Suite 250
Renton, WA 98057

T 425.277.9126
F 425.687.2842
E info@tdwi.org

www.tdwi.org