

TDWI RESEARCH

TDWI BEST PRACTICES REPORT

THIRD QUARTER 2011

SELF-SERVICE BUSINESS INTELLIGENCE

Empowering Users to Generate Insights

By Claudia Imhoff and Colin White

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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. TDWI is dedicated to educating business and information technology professionals about the best practices, strategies, techniques, and tools required to successfully design, build, maintain, and enhance business intelligence and data warehousing solutions. TDWI also fosters the advancement of business intelligence and data warehousing research and contributes to knowledge transfer and the professional development of its Members. TDWI offers a worldwide Membership program, five major educational conferences, topical educational seminars, role-based training, onsite courses, certification, solution provider partnerships, an awards program for best practices, live Webinars, resourceful publications, an in-depth research program, and a comprehensive Web site: tdwi.org.

About the TDWI Best Practices Reports Series

This series is designed to educate technical and business professionals about new business intelligence technologies, concepts, or approaches that address a significant problem or issue. Research for the reports is conducted via interviews with industry experts and leading-edge user companies and is supplemented by surveys of business intelligence professionals.

To support the program, TDWI seeks vendors that collectively wish to evangelize a new approach to solving business intelligence problems or an emerging technology discipline. By banding together, sponsors can validate a new market niche and educate organizations about alternative solutions to critical business intelligence issues. Please contact TDWI to suggest a topic that meets these requirements.

Acknowledgments

The authors would like to thank the many people who contributed to this report. First, we appreciate the people who responded to our survey. Second, our report sponsors, who diligently reviewed outlines, survey questions, and report drafts. Finally, we would like to recognize TDWI's production team—Jennifer Agee, Michael Boyda, and Denelle Hanlon—for their hard work and support, as well as Philip Russom, TDWI Research Director, for his input and guidance.

Sponsors

Birst, IBM, Infobright, Neutrino Concepts, PivotLink, Quest Software, SAP, SAS, and Tableau Software sponsored the research for this report.

Research Methodology and Demographics

Report Scope. This report is designed for business and technical executives who are responsible for planning and implementing business intelligence (BI) environments. The report is essentially a catalog of the many new technologies and techniques that have arisen for self-service BI in recent years. Its goal is to help data warehouse professionals and their business sponsors understand what's now available, as well as the business and technology use cases for which the new options are best suited.

Research Methodology. Most of the market statistics presented in this report are based on a research survey. In March 2011, TDWI sent an invitation via e-mail to the data management professionals in its database, asking them to complete an Internet-based survey. The invitation was also distributed via Web sites, newsletters, and conferences from TDWI and other firms. The survey drew complete responses from 625 survey respondents. From these, we excluded respondents who identified themselves as academics or vendor employees, leaving the responses of 587 respondents as the core data sample for this report.

Survey Demographics. The majority of survey respondents are corporate IT professionals (58%), with the remainder consisting of consultants (23%) or business sponsors/users (19%). We asked consultants to fill out the survey with a recent client in mind.

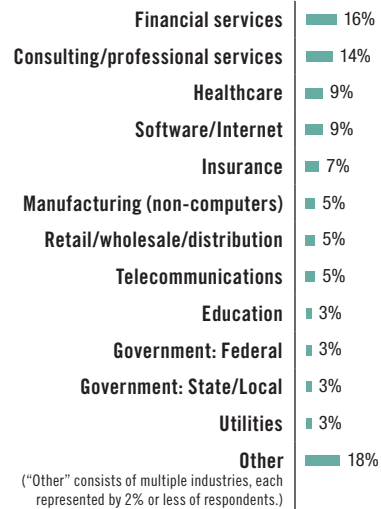
Financial services (16%) and consulting (14%) industries dominate the respondent population, followed by healthcare (9%), software (9%), insurance (7%), manufacturing (5%), retail/wholesale/distribution (5%), telecommunications (5%), and miscellaneous other industries. Most survey respondents reside in the United States (53%) or Europe (20%). Most respondents are from a fairly even distribution for all sizes of companies and other organizations.

Other Research Methods. In addition to the survey, the authors conducted numerous telephone interviews with sponsoring vendors and some of their customers. The authors also received product briefings from vendors that offer products and services related to the best practices under discussion.

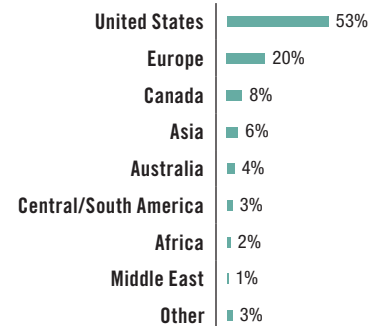
Position



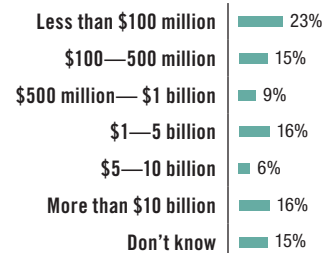
Industry



Geography



Company Size by Revenue



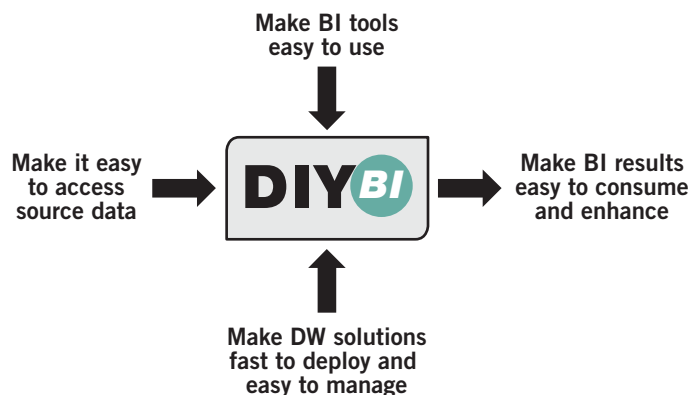
Based on 587 survey respondents.

Executive Summary

In today's economic environment, organizations must use business intelligence (BI) to make smarter, faster decisions. The business case for BI is well established. Access to BI is what gives companies their competitive edge and allows them to discover new business opportunities. Yet, in too many organizations, decisions are still not based on business intelligence because of the inability to keep up with demand for information and analytics. IT has been stripped down to the barest numbers, even while information workers are demanding more control and faster access to BI and business data.

To satisfy this demand and accelerate time to value, one approach involves setting up an environment in which the information workers can create and access specific sets of BI reports, queries, and analytics themselves—with minimal IT intervention—in a self-service BI (SS BI) environment. Information workers become more self-sufficient by having an environment that is easy to use and supplies information that is easy to consume. It is these two themes—ease of use and information consumability—that play crucial roles in a fully functioning SS BI environment.

Self-service BI is defined as the facilities within the BI environment that enable BI users to become more self-reliant and less dependent on the IT organization. These facilities focus on four main *objectives*: easy access to source data for reporting and analysis, easy-to-use BI tools and improved support for data analysis, fast-to-deploy and easy-to-manage data warehouse options such as appliances and cloud computing, and simpler and customizable end-user interfaces.



This report describes the technological underpinnings of these four objectives in great detail while recognizing that there are two opposing forces at work—the need for IT to control the creation and distribution of BI assets and the demand from information workers to have freedom and flexibility without requiring IT help. Companies seeking to implement self-service BI must reach a middle ground in which information workers have free access to data, analytics, and BI components while IT has oversight into the SS BI environment to observe its utilization. This gives the information workers the independence and self-determination they need to answer questions and make decisions while giving IT the ability to monitor the SS BI environment and apply governance and security measures where necessary. For guidance, this report provides practical recommendations to ensure a successful SS BI environment.

Introduction to Self-Service Business Intelligence

DEFINITION OF SELF-SERVICE BI

The facilities within the BI environment that enable BI users to become more self-reliant and less dependent on the IT organization. These facilities focus on four main objectives: easier access to source data for reporting and analysis, easier and improved support for data analysis features, faster deployment options such as appliances and cloud computing, and simpler, customizable, and collaborative end-user interfaces.

In today's economic environment, organizations must use business intelligence (BI) to make smarter, faster decisions. Business users must have better access to critical information at the right time and in the right format for comprehension. The business case for BI is well established; it gives companies their competitive edge and allows them to discover new business opportunities. Corporations and their employees need to be innovative and creative if they are to compete effectively. "Those with the imagination ... to invent smarter ways to do old jobs, energy-saving ways to provide new services, new ways to attract old customers, or new ways to combine existing technologies will thrive."¹ But in many organizations, countless decisions are still not based on business intelligence and analytics. Why? Certainly not from a lack of demand. Because of the changes in our economies, IT departments have been stripped down to the barest numbers, even as business users are demanding more control and faster access to BI and business data. From our survey of 587 technical and business professionals, we found that an overwhelming 78% of respondents stated that they needed a faster time to value from BI solutions.

To satisfy this demand and improve time to value, companies are looking for alternative approaches to BI. One approach is to set up an environment in which the information workers can create and access specific sets of BI reports, queries, and analytics themselves—without IT intervention. The purpose of this environment is to extend the reach and scope of BI applications to address a wider range of business needs and problems. At the same time, this extension must support the information workers' need for a personalized and collaborative decision-making environment. Information workers must become more self-sufficient by having a BI environment that is more usable and more consumable. It is these two themes—usability and consumability—that play crucial roles in a fully functioning self-service business intelligence (SS BI) environment.

Self-Service Business Intelligence and Its Objectives

This section provides a brief overview and description of four key objectives of self-service BI (see Figure 1). The technologies supporting them will be covered in detail later.

¹ Tom Friedman, *New York Times*, October 2009.
<http://www.nytimes.com/2009/10/21/opinion/21friedman.html?ref=thomasfriedman>

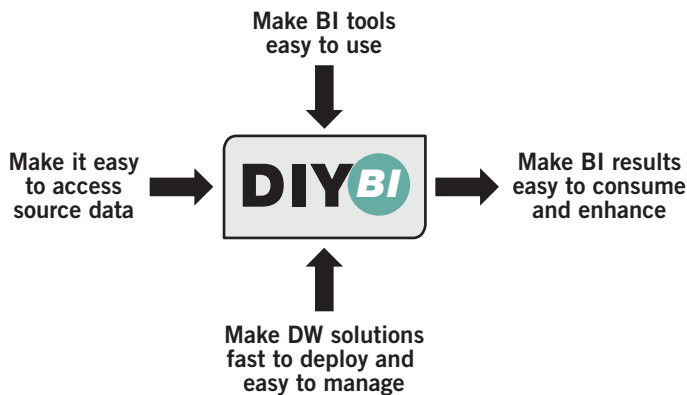


Figure 1. The four objectives of do-it-yourself or self-service BI. (Courtesy of BI Research and Intelligent Solutions, Inc.)

Without business context, self-service BI is unlikely to succeed.

Make BI Results Easy to Consume and Enhance

This objective is probably the most important from the business community's perspective. Users must be able to grasp what the information presented to them means. A fire hose of information makes it difficult to determine where things are going off-kilter, where exceptions occur, or even get a handle on critical situations. SS BI must be an environment in which it is easy to discover, access, and share information, reports, and analytics. Information workers want to be able to personalize their dashboards or have automated BI capabilities so that the information becomes actionable for their particular situations. It must also be in an easy-to-use format and delivered to a device and user interface of their choosing.

From a technical perspective, BI that is easy to consume and enhance requires clear business definitions that are easily accessible as well as data lineage that is tracked and documented. The organization improves its decision making by tracking interactions and decisions to discover, capture, and disseminate best practices. In addition, the information must be presented in a way that is easy for users to understand: data visualization and presentation are paramount for comprehension.

Finally, information workers increase knowledge content through interactions such as entering feedback on analytic results, models, and other BI results; adding business context on situations; and identifying related information such as external links, meteorological data, and other data that affects business activities. This allows the information workers to improve an organization's body of knowledge content. It also enables them to be more self-sufficient and make faster decisions. This feature helps BI implementers create environments that are appealing to business users and promotes the adoption of self-service.

Make BI Tools Easy to Use

Easy-to-use BI creation tools are crucial to self-service BI.

Not only do BI results need to be easy to consume and enhance, but the tools generating the results must also be easy to use. BI solution providers have focused on making these technologies easy to use for years and, for the most part, vendors have succeeded in making them straightforward and simple. This is a significant factor in the success of any SS BI environment. It may help even novice information workers select their own reports and create simple analyses. It will certainly allow technologically savvy users to get what they need when they need it.

Although reporting and simple analytics interfaces have achieved a high level of ease of use, we still need to make the more complicated analytics easy to use, create, and publish. Sophisticated analytics are often too intricate, complex, or difficult to construct for many information workers. Support for such sophisticated analyses, as well as making results easy to publish in the required format, greatly improves the productivity of a company's information workers.

Make Data Warehouse Solutions Fast to Deploy and Easy to Manage

Self-service business intelligence may mean looking at alternative deployment mechanisms to reduce costs, improve time to value, and support increasingly extreme data processing. Agile methodology, software-as-a-service (SaaS), and cloud offerings, as well as analytic DBMSs, all contribute to these goals. Key components of this objective include ensuring that the SS BI environment provides good performance and scalability for simple to complex analytical workloads and high data volumes. In addition, SS BI must support easy administration and enhancement of the environment in a timely manner.

Opening BI to access by the business community also enables applications to be built that may not have been possible with earlier architectures and technologies. Business units can deploy their own applications, tailored to their specific requirements, and on their own timetable. User satisfaction increases dramatically when this level of creation and management of reports and analytics is available to the business community.

Make Data Sources Easy to Access

In our interviews, we heard a number of times that if you couldn't access the data, then nothing else mattered—whether it was traditional, IT-created BI components or SS BI. However, there is one significant difference with SS BI—not all the data accessed needs to be stored in a data warehouse. Data external to the data warehouse such as operational and external but relevant data (e.g., weather information, geographic, demographic, or psychographic data) may need to be made available for access by the business community without IT assistance.

Self-service business intelligence may also require that all types of data be made accessible by the BI implementation team—not just traditional, structured data. This includes unstructured data such as comments or e-mails and even social media sources. The ability of the information workers to understand the full picture (which includes the context in addition to the content) is becoming mandatory. It may not be possible or even necessary to bring this contextual data into the data warehouse before it can be utilized by SS BI. If some of this data resides outside the warehouse, it means the BI environment must have some means or mechanism to federate data—bringing it together virtually from different sources for analysis and access.

The BI implementation team's job is to create the infrastructure that permits the free flow of data from all these sources. They can then monitor access and utilization of the data, ensure the environment's optimal performance, implement appropriate security and privacy procedures, and provide support to the business community where needed in the construction or publication of BI reports, analytics, and so on.

If source data is not easy to access, self-service BI won't happen.

USER STORIES

EASY-TO-USE TECHNOLOGY IS A CRITICAL SUCCESS FACTOR FOR SELF-SERVICE BUSINESS INTELLIGENCE

Mike Beatrice is a marketing analytics manager who works in the credit card services area for one of the U.S.'s top five commercial banks. His responsibilities include extracting data from both operational and data warehouse databases, integrating and cleaning it up, and making it accessible for his users, who are the marketing personnel for his company. He wants to get the bank's marketers more involved with self-service BI, and that requires easy-to-use tools. Many of his business users are not very technologically savvy, so he offers them an intuitive, non-technical front end: "If it is not easy to use, people will walk away and there will be no adoption," he says. Mike's group creates analytics to answer business questions but also supplies data for Excel applications for analysis. For the more technical users, his environment supports their ability to create advanced analytics. When asked why he developed the self-service capabilities, Mike responded, "Business changes so fast that self-service enables you to respond nimbly for fairly low cost."

EASY-TO-ACCESS DATA IS MANDATORY FOR SELF-SERVICE BI

Education improves lives by accelerating careers, increasing employees' earning power, and improving the overall quality of their lives. Bridgepoint Education provides cost-effective solutions to this ever-expanding need for higher education. According to Ben Sullins, principal BI engineer at Bridgepoint Education, self-service BI helps the business users develop and monitor the company's educational offerings. It means giving business users access to data without making it a formal IT project or even needing IT's help. He states, "SS BI allows business users to do their own requirements gathering and prototyping. If one of their products becomes popular, then IT can take it over and move it into production." His goal is to quickly provide business users with an intuitive interface into as many sources of data as possible. He provides the infrastructure for this so the users don't need to understand the underlying data structures. His advice is to partner with the business users and develop direct engagement with them so they feel a sense of ownership. This good relationship allows him to push back when necessary, occasionally say no to some data access, and still have the users trust him and his reasons for refusing access.

ABILITY TO EASILY CREATE AND CONSUME ANALYTICS MAKES FOR SUCCESSFUL SELF-SERVICE BI

According to the LiveRail Web site, more than 150 million people will watch videos online this year in the U.S. alone. How can advertisers take advantage of this burgeoning audience without forcing them to watch irrelevant, intrusive advertisements? LiveRail believes the solution lies in creating new, video-specific approaches and technology platforms that manage, deliver, optimize, and track video advertising. But to do this, they need to provide their customers with analytical capabilities that are simple to use yet give these information workers the ability to perform any type of action—sorts, aggregations, twisting and turning the data—in other words, the freedom to do whatever they want with their data. Andrei Dunca, LiveRail's chief technology officer, says that "customer satisfaction in the form of having control over their own data is the biggest benefit" of their SS BI environment. LiveRail's customers have customers as well, and the ability to produce reports and analytics for those customers faster is a great competitive advantage. LiveRail also provides training and education for their customers to demonstrate the different ways to use the data and the meaning and usage of various metrics. LiveRail provides significant flexibility in what their customers can do with the SS BI environment, along with tremendous performance for simple to complex reporting and analytics. They also supply templates from which their customers can begin creating more specialized and customized BI components.

The Evolving State of Self-Service Business Intelligence

Drivers for Self-Service BI

Why should BI developers strive for a self-service environment for their users? We asked our survey respondents this question. Here are just a few of the reasons they gave for implementing this environment (see Figure 2).

Self-service BI is driven primarily by business change, IT's backlog, and the need to be an analytics-driven organization.

- **Constantly changing business needs (65% of respondents).** The inability to match the speed at which the business changes is a major impetus for SS BI. With minimal effort, BI implementers can create an environment where the business community can select the BI components they need to assess the current business situation and then make the proper decisions. The implementers set up the infrastructure much like a buffet table where the information workers can then “choose” from the full set of offerings and create their own combinations of analyses, reports, and data sets, based on their individual needs.
- **IT's inability to satisfy new requests in a timely manner (57% of respondents).** This backlog means new reports or queries may take months to deliver. If IT can't satisfy users fast enough, the users will go around IT and create chaotic but quick BI solutions. The cost and impossible maintenance of these suboptimal environments far outweighs the cost of a proper SS BI environment. In addition, the increasingly disparate sources of data and content mean that IT must open up BI so that business users can incorporate the myriad of data and content into their BI decision-making components. Technologically savvy business users can then create their own analyses, eliminating the alternative of inconsistent and inaccurate information.
- **The need to be a more analytics-driven organization (54% of respondents).** Due to the lingering slow economy, businesses cannot afford any missteps. Business users need more information faster than ever; they must become more competitive and respond faster to shifting business scenarios. They must rely more on their analytical prowess than on their gut or intuition.
- **Slow or untimely access to information (47% of respondents).** Some business users want to create their own reports rather than waiting for IT. Some want complete and unfettered access to data completely *without* IT interference. Many ask—or demand—that they be given access to any and all data as soon as it becomes available. They know they must make better decisions to keep their jobs, and they see BI as a significant component to that improved decision-making process. Timely access to crucial data means success!
- **Business user dissatisfaction with IT-delivered BI capabilities.** If the delivery of BI capabilities from IT takes a significant amount of time, it can result in BI capabilities that are no longer relevant. The resulting dissatisfaction only adds to the frustration from both IT and the business community. When various BI components are made available to the business community, the information workers can pick and choose appropriate components, modify them to meet their immediate needs, and create new and more relevant reports or analytics from existing offerings.

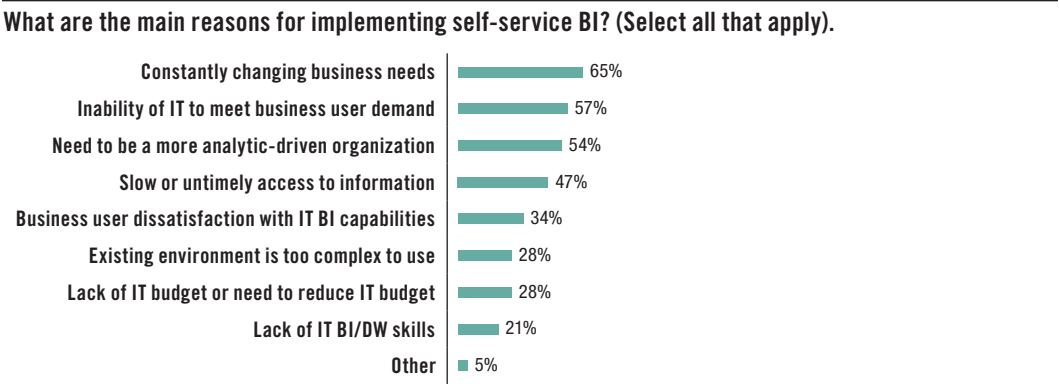


Figure 2. Based on 1,999 survey responses from 587 respondents.

Demographics of Self-Service BI

Self-service BI applies uniformly across front-, middle-, and back-office tasks.

We asked a number of survey questions about the state of adoption of SS BI within respondents’ organizations. We were surprised that over one-third (36%) of respondents had implemented some self-service capabilities and 26% were currently implementing them. Rounding out the percentages were 14% who planned to implement SS BI within 6 months and 15% within the next 12 months.

When asked where in the organization SS BI would be used, we found that 65% said SS BI is used in the middle office (finance, accounting, human relations), 62% are using it in the front office (sales, marketing, service, and support), 54% use SS BI for the back office (operations, supply chain, inventory, and so on), and only 22% are using it for research and development.

Of the 587 respondents, 67% said that zero to 25% of their business user population actually used SS BI, 21% said between 26% and 50% used it, and only a few said that more than 50% of their user population had adopted SS BI. When asked about future usage, 28% of respondents said they expected up to 25% of their user population to be using SS BI within the next 12 months, 38% thought 26% to 50% would be using it, and a surprising 26% said they thought 51% to 75% of their users would begin using SS BI.

Above all, users want easy data access and short delivery time from self-service BI.

We also asked what features make self-service BI attractive to business users. It was no surprise that the vast majority of respondents answered that easy access (83%) and faster time to value (78%) were the significant winners. These were followed by no or little training required (53%) and customizable and reusable BI components (49%). See Figure 3 for the full results.

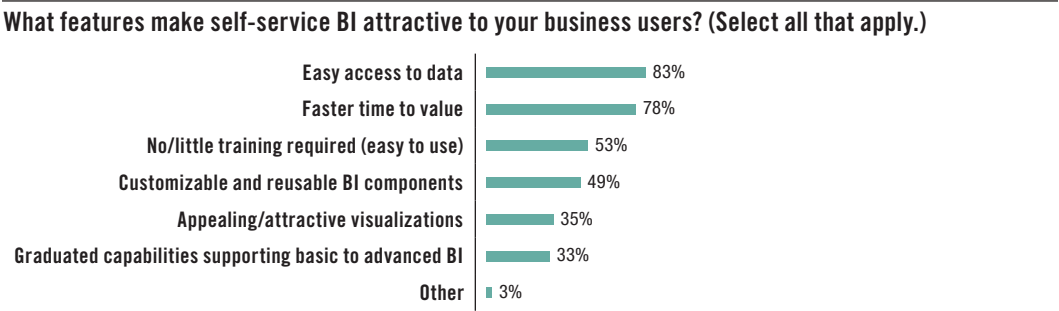


Figure 3. Based on 1,960 responses from 587 respondents.

Benefits to IT of Self-Service BI

In our research, we noted that IT garnered a number of key benefits from the deployment of SS BI as well.

- **IT can often step aside as the intermediary.** Self-service capabilities give users what they have wanted for years—more hands-on control over the information they access and use. This directly leads to better satisfaction with BI and IT in general.
- **IT can focus on more value-added activities.** Rather than constantly being pulled off projects to create a new report or analytic, IT can focus on more value-added activities. For example, they can concentrate on developing new applications, expanding data in the data warehouse from existing and new sources, improving data quality processing, and incorporating new technologies to improve performance.
- **IT becomes a partner to business users rather than a roadblock.** Business users move into a role that is more responsible for BI capabilities. IT moves into a role that better supports business needs. Both sides become respected partners in the organization.

Information Worker Requirements

To create a sustainable and appropriate self-service BI environment, the implementers must thoroughly understand the information workers who will be using the environment. They must understand their motivations, mode of working (e.g., mobile, geographically dispersed, virtual) and, of course, their technological skill sets. In our research over the past year, we have studied these workers as well as the groups responsible for constructing much of the BI infrastructure. We have determined that there are three categories of information workers and one developer category.

Self-service BI must be tailored to match the needs and skills of information workers.

Types of Information Workers

The business community can be divided into three sets of information worker roles:

1. **Information producer.** Information producers are also known as power business users. These users are capable of building BI templates and dashboards, customizing BI components, and publishing BI-related information for use by information consumers. These workers have a great interest in the self-service environment and want to participate in self-service BI governance committees. Their job is to improve business operations and make tactical and strategic decisions. To do this, they explore, analyze, and produce actionable BI analytics for decision making. Information producers can be business analysts, senior managers, or middle managers. Unfortunately, they are often frustrated by the IT-developed BI environment and may create their own solutions (for example, using spreadsheets). They find the IT environment does not encourage user self-sufficiency or that it does not aid in helping users improve the value of existing solutions.
2. **Information consumer.** These are task-oriented business users who gather information to increase personal knowledge and make decisions. The information may be delivered by operational applications (e.g., availability of services or products), analytical applications (e.g., reports or dashboards), or collaborative applications (e.g., e-mail, information portal). These information workers support day-to-day business operations and generally do not have the time, experience, and/or inclination to produce, analyze, or synthesize information for decision making. They

want to be able to easily consume BI analytics and make operational decisions based on the information presented to them. Examples of information consumers include the general public, customers, suppliers, call center staff, store managers, hospital staff, and salespeople. These workers are unfortunately poorly supported today because corporate, IT-delivered BI analytics may be too complex for them, are not put into a business context, or can't be made actionable within their workflows.

- 3. Information collaborator.** Collaborators are the newest members of the information worker community. These people improve the knowledge content and expertise of an organization as well as other information workers (especially information consumers). Their knowledge is typically added using collaborative applications and usually involves some form of collaborative and social computing technologies to access and enhance BI analytics with related business knowledge. Examples of collaborative content include feedback and commentary, ratings, tags, sources of related information and expertise, and links or contact information for expert communities. Information collaborators tend to be motivated information workers, subject matter experts, or researchers who consume business analytics created by information providers.

An interesting note about these three types of information workers is that they may not stay within these roles. For example, it is not unusual for a consumer to become a collaborator on occasion. A producer may become a consumer or collaborator at some point during the day. Any self-service environment must allow these information workers to change roles and characteristics with ease.

The BI/Data Warehouse Builder

The final resource in any SS BI environment is that of the BI developer. We call this role the BI/DW builder. The builder is traditionally responsible for constructing a data warehouse and/or BI solutions. Due to budget, resource, or priority issues, these personnel may be seen as the bottleneck in deploying BI. In an SS BI environment, the BI/DW builder is responsible for providing access to source data (ideally via common business views), developing customizable BI components (see below) for use by other information workers, participating in the SS BI governance committee, and monitoring the use of SS BI solutions by other information workers. The BI/DW builder usually comes from central IT or the line-of-business IT group. They may also potentially come from the information producer community.

BUSINESS INTELLIGENCE COMPONENTS

This report uses the term *BI component* to describe a unit of BI processing that is predefined and packaged for use by less experienced BI users. In addition to ease of use, a BI component also speeds BI deployment because each component can usually be customized to suit a specific business problem and personalized to match the requirements of an individual user. Examples of BI components include:

- **Report templates** that can be tailored to change report contents and layout
- **Parameterized reports** that can be tailored to change the data content of the report contents, but not its layout
- **Stored analyses** for reuse by other users
- **Dashboard analytics** that can be customized and manipulated by users
- **Web widgets** (sometimes called Web gadgets or Web parts)—small applications that can be installed and executed within a Web page by a user

- **Mash-ups** that blend and analyze data from multiple sources and present the results using a Web widget; a mash-up usually blends data that was not originally designed to be integrated
- **Stored analytic models** that are typically used at runtime to produce predictive analytics
- **Analytic functions** that provide sophisticated analytic capabilities for use in BI analyses

In general, information producers can create most of these BI components. Certain BI components, however, such as widgets and analytic functions that need to be programmed, require the development skills of BI/DW builders.

Types of BI Required by Information Workers

There is a natural “evolution” in most BI environments to go from simple to complex. BI capabilities tend to move from basic offerings to advanced ones. Part of assessing your organization’s readiness for self-service BI will include determining the type of BI required by your users and the type of BI that already exists. To help with that, we have described three major types of BI:

Basic BI is the first or entry level of analytic capabilities for many organizations. Basic BI depends heavily on IT for batch data integration and new or enhanced reports. Uncoordinated spreadsheets may also exist, as well as data marts that have been developed throughout the enterprise. The business community that uses basic BI is generally a line of business audience and is not enterprise-oriented in implementation, architectural focus, or design. Basic reporting capabilities include established views of data, routine queries, and regularly produced or “canned” reports (such as PDFs or office products’ output). Limited ad hoc abilities (usually only drill up/down capabilities) are used for financial reporting, sales performance, and standard operational reporting. Spreadsheets play a big role in this type of BI, as do fixed analytic dashboards. Office product integration is mandatory.

Standard BI is the next level of maturity. The organization has an enterprise data warehouse and dependent data marts, rather than a set of uncoordinated marts. Due to this more organized architecture, there is additional sophistication in the data management function that includes not just data consolidation (traditional ETL processing) but also data federation (or virtualization) and changed data capture (CDC) where appropriate. The data management function includes data profiling and domain-specific data cleansing. The technical metadata captured means that the data lineage is documented. Information workers still depend significantly on IT, but they are able to do ad hoc analysis as well as create and publish reports. The types of products coming from this environment are pixel-perfect batch reports, customizable BI components, ad hoc analysis dashboards with drill up/down and slice/dice capability, performance management scorecards, automated BI (e.g., alerts, recommendations, decision workflows), and a business glossary with data lineage reporting. This type of BI also brings in a workgroup information portal that integrates BI functions and supports mobile BI where needed.

Advanced BI is the final type of BI. It has the most mature data management environment of the three and includes full-blown data quality management and a full range of data integration capabilities. The environment includes unstructured as well as structured data in its analytics and data sets. Analytics are more sophisticated and include statistical analytics and real-time BI capabilities, predictive modeling, event and content analytics, data and text mining, and embedded BI solutions and sophisticated visualizations. The information workers are far more self-reliant. While IT is still involved, the information workers are fully capable of creating their own analytics, reports, and advanced analytics.

To assess the need for different types of self-service BI, it is important to determine the types of BI in use in the organization.

Most respondents consider their BI skills to be basic or standard. Correspondingly, they need basic or standard capabilities in self-service BI.

In our survey, we found that the majority of respondents believed that their BI users' skill level was either basic (50%) or standard (44%). Only 6% said their users had advanced BI skills. This matched the responses we received when we asked what types of self-service BI were in use today. The overwhelming consensus (72%) said easy-to-use reporting and analytic capabilities (including prebuilt reports and analytics) made up their SS BI capabilities. Over half of respondents (53%) said that self-service access to (and understanding of) source data for analysis was fundamental to their environments. Exactly half said they used simple, customizable, and collaborative end-user interfaces (e.g., office integration, information portal, mobile access, collaborative features), and only 7% said they used fast BI deployment options such as SaaS or packaged BI applications. Interestingly, this result conflicts with the survey question about what features make SS BI attractive to information workers (see Figure 3). The top two reasons were "easier access to data" and "faster time to value." It appears there is a disconnect between what is being implemented and what makes SS BI attractive to information workers. This could be a serious problem in the adoption of SS BI.

Technology Solutions for Self-Service BI

This section of the report looks at technologies that can be used for enabling an SS BI environment. These technologies will be discussed with respect to the information workers' tasks that consist of a *BI supply chain* (see Figure 4).

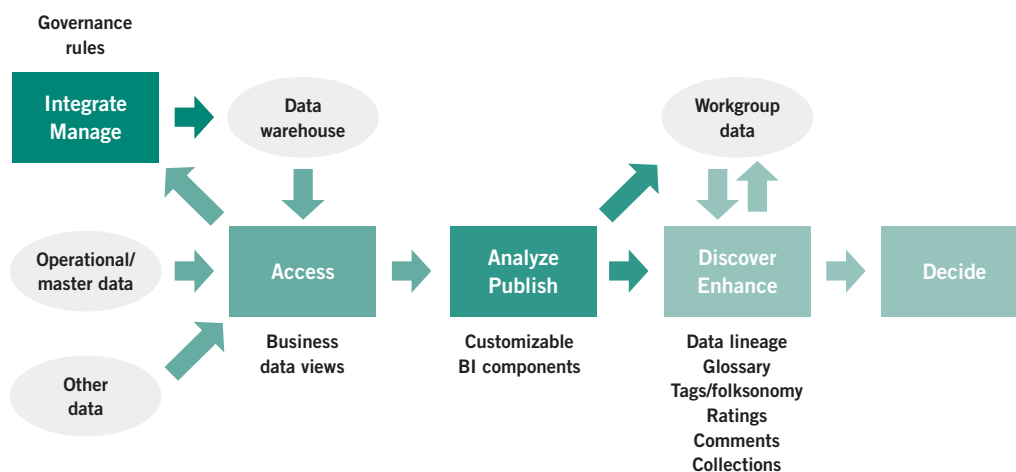


Figure 4. The BI supply chain. (Courtesy of BI Research and Intelligent Solutions, Inc.)

The BI Supply Chain

Self-service BI applies to all of the tasks in the BI supply chain, from accessing source data to using BI results to make business decisions.

The BI supply chain consists of a set of tasks that enable BI/DW builders and information producers to access and analyze data as well as deliver the BI results to information consumers and information collaborators.

Access task. The *access* task is used to find and access the source data required for analysis. Possible sources include a data warehouse, operational and master data stores, and the many other types of dispersed data that exists in organizations. BI/DW builders may define shared *business data views*

of these disparate data stores to simplify data access. These views isolate information workers from having to know detailed information about the physical location and structure of the source data.

The *access* task may pass source data to the *integrate* and *manage* tasks to consolidate source data into a shared and managed data store such as a data warehouse. Integrating the data into a data warehouse before analysis makes it easier to improve the quality of the data by allowing *governance rules* implemented by BI/DW builders to be applied to the data during the integration process.

Analyze task. Information producers iteratively *analyze* source data for use by information consumers. In some cases, information consumers may make use of customizable BI components to do their own analysis and reporting.

Publish task. The BI results from the *analyze* task are distributed directly to information consumers through interactive user interfaces and collaborative techniques such as e-mail, or indirectly by storing the results in a shared workgroup data store.

Discover task. This task helps information consumers find the BI results and related information they need to track and optimize business operations and make business decisions. During the *discover* task, information consumers interact with each other to share information and expertise and evaluate the results. BI/DW builders may maintain a *business glossary* and publish *data lineage* information to aid the *discover* task by putting the information into a business context.

Enhance task. Information collaborators use collaborative feedback mechanisms to *enhance* the knowledge content of the information used by information consumers. Techniques include *tagging*, *ratings*, *comments*, and information *collections* that identify related content both inside and outside the organization. Improving the knowledge content of the results adds business context and makes the results easier to consume and use.

The focus of self-service BI is to improve the complete BI supply chain for all three types of information workers and the BI/DW builders (see Table 1).

- The *discover* and *enhance* tasks are improved by providing user interfaces that make BI results easy to consume and enhance. Some 56% of survey respondents considered this aspect of self-service BI to be “very important.”
- The *analyze* and *publish* tasks are improved by making BI reporting and analytic capabilities easy to use. Survey respondents ranked this requirement highest, with 78% saying it was “very important.”
- The *integrate* and *manage* tasks are enhanced by making data warehousing solutions fast to deploy and easy to manage. In the survey, 31% of respondents rated this as “very important.”
- The *access* task is improved by making it easier to access and understand the source data used for analysis. Some 60% of survey respondents said this was “very important.”

Not surprisingly, these survey results correlate well with the results discussed earlier that detail the types of self-service BI in use in organizations today.

Making BI tools easy to use was the top-ranked self-service BI objective in the survey results.

BI/DW BUILDER AND INFORMATION PRODUCER	BI/DW BUILDER	INFORMATION PRODUCER	INFORMATION CONSUMER AND COLLABORATOR
Access	Integrate Manage	Analyze Publish	Discover Enhance
Make it easy to access data (60%)	Make DW solutions fast to deploy and easy to manage (31%)	Make BI tools easy to use (78%)	Make BI results easy to consume and enhance (56%)

Table 1. The four objectives of self-service BI. (Courtesy of BI Research and Intelligent Solutions, Inc.) The numbers in parentheses document the percentage of respondents that rated the objective as “very important.” Based on 587 respondents.

New and Evolving Technologies for Self-Service BI

New and evolving technologies that help achieve the four objectives of self-service BI are summarized in Table 2. The sections that follow discuss each of these technologies in terms of how they support the four objectives of SS BI in Table 1.

BI/DW BUILDER AND INFORMATION PRODUCER	BI/DW BUILDER	INFORMATION PRODUCER	INFORMATION CONSUMER AND COLLABORATOR
Access	Integrate Manage	Analyze Publish	Discover Enhance
Data virtualization <ul style="list-style-type: none"> • Business views (60%) • Data federation (44%) • Other data types (31%) 	Analytic DBMS (20%) Cloud data platform (11%)	Easy BI <ul style="list-style-type: none"> • Prebuilt reports (52%) • Prebuilt analyses (44%) • Easy data mining (44%) • In-memory analysis (40%) • Prebuilt functions (36%) • BI Web widgets (32%) • BI mash-ups (31%) BI automation (48%) SaaS BI <ul style="list-style-type: none"> • SaaS BI tools (9%) • SaaS BI packages (7%) 	Easy UI <ul style="list-style-type: none"> • Office support (46%) • Glossary (43%) • Visualization (41%) • Search (37%) • Data lineage (32%) • Portal (31%) Collaborative UI <ul style="list-style-type: none"> • Collaboration (38%) • Usage tracking (33%) Mobile UI (26%)

Table 2. New and evolving technologies that enable self-service BI. (Courtesy of BI Research and Intelligent Solutions, Inc.) The numbers in parentheses document the percentage of respondents that rated the technology as “very important.” Based on 587 respondents.

Making BI Results Easy to Consume and Enhance

From an information consumer and information collaborator perspective, the main objective of SS BI is to make BI results easier to consume and enhance. This is achieved by publishing BI results through enhanced user interfaces that are tailored to each information worker's needs, that is, interfaces that an information worker is familiar with and comfortable using. Technology improvements here include not only easy-to-use interfaces, but also interfaces that support both collaborative and mobile computing.

Easy User Interfaces

Office product integration. Many information consumers are looking for BI to be published through less sophisticated and more familiar interfaces. Information workers, for example, employ office suites from companies such as IBM and Microsoft to produce documents and presentations, as well as to interact and share information. It is, therefore, not surprising that most BI vendors have made office-suite integration a high priority to improve ease of use. In the survey, office suite integration came out on top when respondents were asked to rate requirements for enhanced BI user interfaces. As Figure 5 shows, some 46% of respondents rated this requirement as “very important.”

Office suite integration, a business glossary, and advanced visualization are what users want most in a self-service BI user interface.

There are several approaches to integrating BI into office suite products. The simplest is to allow BI results to be delivered via e-mail. The results may be incorporated into the text of the e-mail message or embedded in a document, spreadsheet, or presentation before the results are e-mailed. This is a popular approach for delivering results to consumers outside of the organization. Free cloud-based e-mail systems such as Google's Gmail are also sometimes used.

Using a workgroup portal. Another option is to publish and manage the BI results using a workgroup information portal. This provides shared access to the results, enables better governance, and reduces the network overhead of publishing results to individual information consumers. Authorized consumers can retrieve BI results from the portal on an as-needed basis. One product that dominates the workgroup portal marketplace is Microsoft SharePoint, which is supported by most BI vendors. About one-third (31%) of survey respondents rated a portal as a “very important” requirement.

Rate your requirements for an enhanced end-user interface for self-service BI.

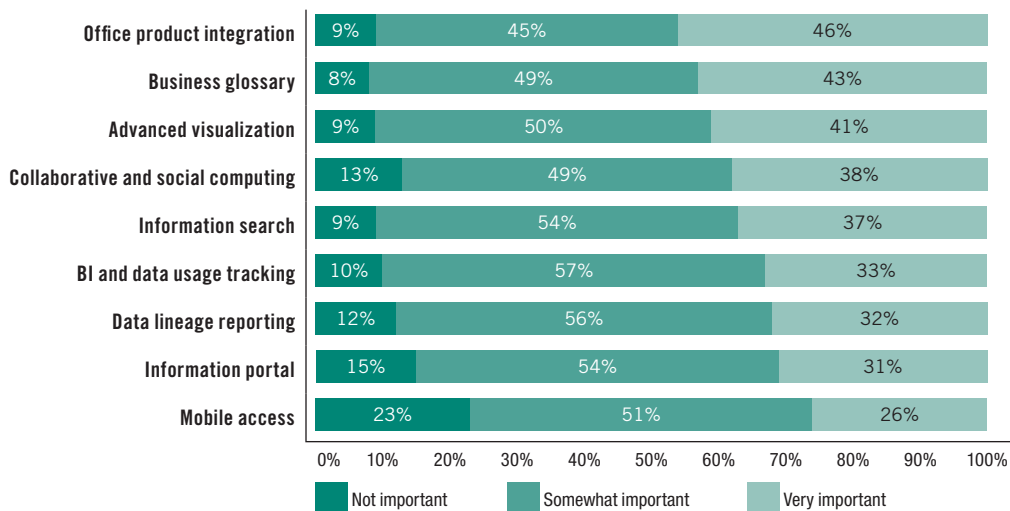


Figure 5. Based on 587 respondents. Sorted by “very important.”

Less experienced users would like Google for BI.

The role of search. Some 37% of survey respondents rated search as a “very important” requirement. If we had asked if they would like “Google for BI,” we suspect the number would have been much higher! Less experienced information consumers prefer a search-type interface to the more complicated query interfaces used by experienced information providers. Search is likely to play an ever-increasing role in self-service BI.

Enterprise search provides a powerful capability for discovering and navigating many different types of corporate data, including information managed by the BI and data warehousing environment. Many BI vendors provide interfaces to enterprise search products. Search, like many other technologies that are converging with BI, applies to other types of IT applications, and BI/DW builders must coordinate search implementation with the corporate strategy for deploying enterprise search throughout the organization.

Several BI vendors also offer their own integrated BI search capability, which provides less functionality but is usually easier to implement than enterprise search. BI search aids the *discover* task by making it easier to find objects in the BI repository such as queries, reports, analyses, and so on. Some BI search tools also support the searching of workgroup documents and data.

In most cases, the BI search capability is integrated into the vendor’s BI development platform, which is well suited to information producers, but not necessarily information consumers. To improve self-service, information consumers are better served by a search capability that is integrated with the tools and interfaces (e.g., office suite, workgroup information portal) they use to consume BI and other types of business information.

Data lineage reporting and a business glossary. As already mentioned, data lineage information and a business glossary add business context to BI results and make the results easier to consume and understand. Vendors that provide this type of business information do so through standard interfaces built into the BI tools they supply. They rarely make these facilities available to external products. It is interesting to note that during the customer interviews for this report, some customers were using Wikis to create a business glossary. This approach makes the glossary information easy to maintain and consume. In the survey, a business glossary was rated “very important” by 43% of respondents. Surprisingly, data lineage information rated lower, with 32% of respondents saying this requirement was “very important.”

Advanced visualization. As organizations move toward the use of more sophisticated BI techniques such as advanced statistical and geospatial functions, data and text mining, and predictive analytics, they need to expand the use of these techniques to a wider audience of both information producers and information consumers. For information producers, this requires making these techniques easier to use; we’ll discuss this in detail in the section “Making BI Tools Easy to Use” (page 20). For information consumers, the results need to be easier to consume and use, and the solution here is to employ more sophisticated visualization techniques. These vary considerably, from using technologies such as Google Maps to display location-specific data, to visualization approaches such as small multiples, scatter plots, heat maps, enclosure diagrams, node links, arc diagrams, and more.² Advanced visualization ranked third highest in the survey for enhanced user interface requirements, with 41% of respondents saying this was a “very important” requirement.

Providing a collaborative interface ranked fourth in user interface requirements for self-service BI.

Collaborative User Interface

The collaborative environment has changed dramatically with the addition of social computing technologies such as social networking (including communities and personal profiles), blogging and microblogging, as well as information tagging and bookmarking. Many of these technologies provide

significant benefits to information consumers by directly or indirectly making BI results easier to consume and enhance. In the survey, 38% of respondents rated the use of collaborative and social computing in the BI environment as “very important.” Overall, it ranked fourth in the list of requirements for an enhanced user interface for self-service BI.

Combining BI with the collaborative environment provides three key benefits (see Figure 6):

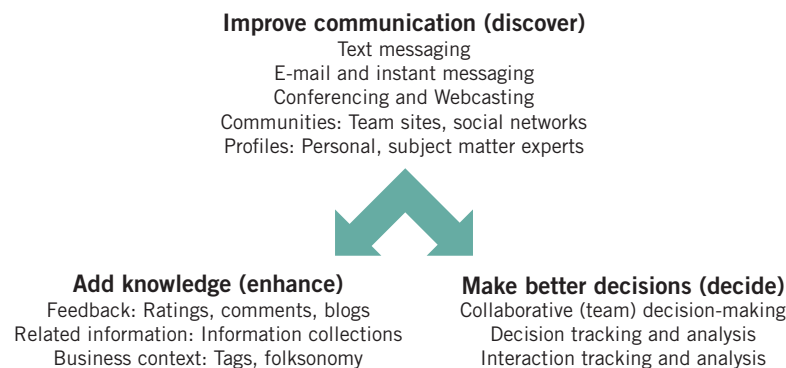


Figure 6. The three benefits of combining BI and collaboration. (Courtesy of BI Research and Intelligent Solutions, Inc.)

- **Improves information consumer communication, information dissemination, and expertise sharing.** Communication and information dissemination can be done using e-mail, instant and text messaging, and through Web conferences and seminars. Social networking and associated communities and profiles enable the sharing of expertise and best practices.
- **Enables information collaborators to increase the knowledge content of BI results.** Published BI results can be enhanced through feedback mechanisms such as ratings, comments and annotations and, in some cases, blogs. Grouping BI results with related documents and other types of information to form an *information collection* also adds knowledge to BI content, which leads to more informed decision making. Business glossaries that help information consumers understand the business context of results can be enhanced with a “folksonomy” and associated tagging tools.
- **Enables information collaborators to make better decisions through collaborative decision making.** Communities enable groups of people to work together to make team decisions. This approach is particularly beneficial if the decisions made and the information used in those decisions are maintained in a historical record. This enables best practices to be recorded and allows information producers to track the types of information that provide useful content for decision making. One-third (33%) of survey respondents rated BI and data usage tracking as “very important.” The use of social network analysis to track interactions between information workers can also be beneficial in the BI environment. This analysis enables organizations to identify key decision makers and influencers as well as areas of expertise in an organization.

The development of a collaborative and social computing infrastructure is an enterprisewide initiative and it is important that BI tools support this infrastructure, that is, BI needs to be added to the collaborative environment, rather than collaboration technology being added to BI tools. This does not preclude BI vendors from adding entry-level collaborative features to their products to allow information consumers to interact with and information collaborators to enhance BI results. Full collaboration, however, should be deployed through the information worker’s user interface of

choice. As already mentioned, in many cases this will be a workgroup information portal or a mobile device interface.

Mobile User Interface

Mobile BI usage is likely to change given the growth in mobile technology.

According to IDC,³ by 2013 there will be 1 billion mobile devices accessing the Internet. This growth in the use of mobile technology will have a dramatic impact on the way information is accessed and used. Mobile technology will have an equal impact on the way BI is consumed. Although the use of mobile BI ranked last in requirements for an enhanced user interface, with only 26% of respondents rating it as “very important,” this situation is likely to change quickly as mobile BI products mature and BI users become more aware of the benefits mobile BI offers. If the survey results for “somewhat important” are taken into account, the importance rating for mobile BI increases to 77%. Benefits of mobile include:

- **An easy user interface for consuming BI results.** The form factor of the growing tablet marketplace offers significant advantages here.
- **The ability to expand the use of BI to a wider user audience.** The ease of use and pervasiveness of mobile devices makes BI accessible to less technical users.
- **Motivating new information workers entering the workforce.** Younger workers expect to be *always connected*, and the use of mobile BI will be a natural fit here.

The use of mobile user interfaces and devices will be primarily for information consumption and possibly some basic information collaboration. The form factor of these devices is not well suited to significant information production. For the BI/DW builder, the main challenges will be to incorporate mobile BI tools into the organization’s mobile infrastructure. As the number of mobile applications and mobile device grows, it will be necessary for organizations to have a common infrastructure for developing, deploying, and managing mobile applications.

Making BI Tools Easy to Use

Making BI reporting and analytic capabilities easy to use received the highest rating of the four objectives of SS BI. Some 78% of survey respondents rated this as “very important.” Given that 81% of respondents were either corporate IT professionals or consultants, this is not a surprising result. These latter professionals focus on making the life of the information producer easier. As discussed earlier, the role of the information producer is to analyze data and publish the results for use by information consumers, so BI tools that are easier to use help improve their productivity. In some situations, they may also enable information consumers to further analyze the results published by information producers.

In the sections that follow, three technology areas are discussed for making BI tools easier to use: easy BI, BI automation, and SaaS BI.

Easy BI

Many information workers do not require the level of sophistication provided by the BI tool sets of mainstream BI platform vendors. Less experienced information workers often find these BI tool sets too complex for developing BI applications or for consuming BI results. Easy BI, then, has two main requirements:

1. BI tools must be easier to use by less experienced information producers when developing BI applications.
2. BI tools must be easier to use by information consumers when consuming BI results.

At first glance, the second requirement appears to be the same as that already covered in the “Easy User Interface” section. The difference is that easy BI is about making the tools easier to use by *all* types of information workers, whereas an easy user interface focuses on making BI results easier to consume by information consumers.

There are several approaches to supporting easy BI:

- **Create predefined report templates, parameterized reports, stored analyses, and dashboard analytics** that can be used and customized by less experienced information workers. These BI components are created by BI/DW builders or more experienced information producers. Most BI vendors support this approach. In the survey (see Figure 7), 52% of respondents rated predefined reports as “very important” and 44% said predefined analyses were “very important.”
- **Create predefined BI Web widgets and mash-ups** that can be assembled and customized easily by less experienced information workers using a Web interface or workgroup information portal. In the survey, the requirement for predefined BI widgets and mash-ups rated lower than predefined reports and analyses, but about one-third of respondents still said these were “very important” requirements.
- **Use BI tools that are designed for less experienced users.** These types of tools either contain less BI functionality or provide a graduated approach to BI usage that enables users to evolve from simple to more complex features as they gain experience. They are also sometimes focused on supporting specific types of BI processing, such as an operational BI dashboard or predictive analytics. Many of them come from smaller, best-of-breed vendors, but some are also offered by mainstream BI vendors as entry-level or express editions of their products.
- **Deploy packaged on-premises or SaaS BI applications.** These applications come prebuilt and can usually be customized to suit the needs of the business. Sometimes they are incorporated in packaged operational CRM, financial, or ERP application solutions, but often they are available as standalone solutions that are focused on specific horizontal business domains or vertical industries. This approach is discussed in more detail in the section “SaaS BI” (page 23).

At the other end of the skills spectrum, even experienced information producers may require easy-to-use tools. These information workers are looking to exploit advanced BI capabilities such as data and text mining and predictive analytics. In the survey, for example, 44% of respondents rated user-friendly or easy data mining as “very important” (see Figure 7). These information producers are looking for solutions that don’t require them to have a Ph.D. in statistics! This adds a third requirement for easy BI: *make BI tools easier to use by information producers for developing sophisticated BI applications.*

Prebuilt reports/analyses and easy data mining are what users want most in easy-to-use BI tools.

Easy BI also applies to experienced users who need more sophisticated analytical capabilities.

Rate your self-service BI requirements for easy-to-use reporting and analytics.

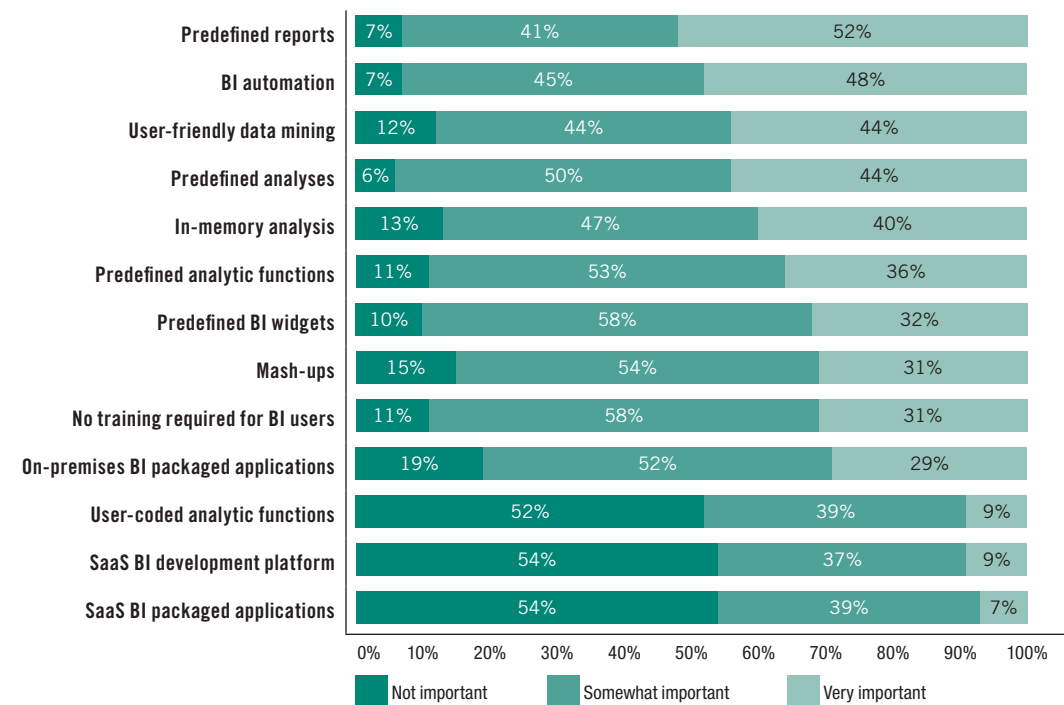


Figure 7. Based on 587 respondents. Sorted by “very important.”

Advanced BI involves using more sophisticated analytic processing and algorithms/functions.

Often, information producers know how to use advanced analytic functions (for forecasting, scoring, and so on) but not how to code them. This is why an increasing number of BI vendors are adding predefined analytic functions to their products and/or supporting analytic functions developed by third-party vendors. Some 36% of survey respondents rated predefined analytic functions as “very important.” Only 9% of respondents rated the ability for information producers to code their own analytic functions in languages such as R as “very important.”

As analytic processing becomes more sophisticated, performance becomes a key issue for ease of use (i.e., to reduce user frustration). This is why the ability to exploit the larger memory sizes of modern computers (often called *in-memory analysis*) and the ability push the processing of analytic functions into the underlying DBMS (often called *in-database processing*) become important. These are key distinguishing features for advanced BI products. In the survey, 40% of respondents rated in-memory analysis as “very important.”

BI Automation

BI automation ranked second in requirements for making BI easier to use.

For many information consumers, the information provided by the BI environment is important in their jobs, but they don’t want to have to be data experts or spend a large portion of their working day running reports and analyses and wading through the results. Instead, they want to be told when the BI results indicate they need to make a business decision or take business action. Examples of such workers include store managers, call center staff, salespeople, and so on. The solution to improve ease of use here is BI automation.

Several techniques can be used to automate the handling of BI results:

- **Alerts** where the information consumer is informed via e-mail, instant message, screen message, or highlighting of a result that it is out of bounds and requires action. Such alerts are triggered by business rules that identify thresholds for abnormal results.
- **Recommendations** that extend the concept of alerts by offering suggestions for possible courses of action.
- **Decision workflows** that help information consumers make decisions based on best practices. In some cases, a workflow may identify other sources of information or expertise or further analyses that can be run to aid decision making.
- **Automated actions** where decisions and actions are fully automated based on business rules and/or predictive models. Fraud detection and action taking and algorithmic trading are examples of applications here.

BI automation makes BI results actionable because the results are put into a business context of acceptable or unacceptable results. This was the second highest requirement for making BI easy to use, with 48% of survey respondents rating it “very important.”

SaaS BI

Cloud computing is gaining significant attention from organizations because it potentially offers a faster and lower-cost approach to developing, deploying, and maintaining IT applications. From a BI and data warehousing perspective, there are three aspects to cloud computing that are of interest:

- **Packaged software-as-service (SaaS) BI applications that can be deployed in a cloud environment.** Like on-premises packaged BI solutions, these solutions offer the benefits of fast development and deployment as well as on-demand and elastic scalability. Deploying packaged applications in a cloud environment provides the additional benefit of a pay-as-you-use subscription model with lower up-front and predictable costs, which reduces risk.
- **SaaS BI tools that can be used to develop BI applications for deployment in a cloud computing or on-premises environment.** This approach reduces the need to install in-house development tools, which speeds development and possibly lowers costs. It is also a good approach for evaluating tools and building prototypes.
- **Data warehousing in the cloud.** This approach is discussed in the section “Cloud-Based Data Platforms” (page 25).

Surprisingly, both SaaS BI packaged applications and SaaS BI tools were rated low on the list of requirements for making BI tools easy to use. SaaS BI packaged applications were rated as “very important” by only 7% of respondents. In comparison, on-premises packaged BI applications received a “very important” score of 29%. The number of respondents saying a SaaS BI development tools platform was “very important” was 9%. These results may be due to a lack of understanding of the benefits of SaaS BI and/or the level of maturity of the SaaS BI solutions. It is important to note, however, that the importance rating increases to 46% for both SaaS packaged BI applications and SaaS BI tools if the survey results for “somewhat important” are taken into account.

Industry interest in cloud computing and SaaS BI means these technologies should show a steady growth in the next few years.

Simplifying data warehouse deployment and management enables business units to build their own data warehouse solutions.

Making DW Solutions Fast to Deploy and Easy to Manage

Referring back to Table 1 (page 16), you can see that the objective of making data warehouse solutions fast to deploy and easy to manage is related to the *integrate* and *manage* tasks of the BI supply chain. These tasks involve consolidating source data in a data warehousing environment and managing data warehouse databases. Improving the speed of data warehouse deployment and simplifying database management increases the productivity of BI/DW builders, which enables them to deliver BI solutions to information workers faster. This in turn reduces the time to value for BI investments.

In some situations, simplifying the development and management of a data warehouse enables business units to deploy their own data warehousing solutions independent of the central IT group. IT departments often resist these independent solutions, believing they lead to data anarchy and a loss of control and governance over the BI environment. The term *independent data mart* or *spreadmart* is often used to describe these independent solutions.

Given the availability of low-cost commodity hardware and packaged data warehouse appliances, the lumping of these independent solutions into a category labeled *independent data mart* is too simplistic. New and evolving data warehouse approaches enable BI applications to be built that are not possible, or are too expensive, using more traditional enterprise data warehousing approaches. They also enable information producers to create experimental data warehouses and analytic sandboxes to determine BI requirements for more robust, IT-developed solutions. Where longer-term solutions are deployed independently of IT, filtered data and BI results from these environments are often delivered and integrated into the more traditional enterprise data warehouse (for more information on this, see “Organizational Considerations” in the “Getting Started” section, page 29). These new and evolving approaches extend, rather than replace, the traditional enterprise data warehouse.

Two main types of products need to be considered here: analytic DBMS platforms and cloud-based data platforms.

Analytic DBMS Platforms

An analytic DBMS platform is an integrated solution for managing data and generating analytics that offers improved price/performance, simpler management and administration, and superior time to value compared to non-specialized offerings. This platform may be delivered as a software-only solution, as a packaged hardware/software appliance, or in a cloud-based form.

Analytic DBMS platforms extend traditional, “universal” relational DBMSs by using technologies such as massively parallel processing, enhanced physical storage structures, data compression, support for mixed workloads, in-database analytic processing, and automated administration tools. Both traditional and new, independent DBMS vendors provide these platforms. More traditional DBMS companies have also acquired several of the independent vendors.

Analytic DBMS platforms are optimized to handle increasing data volumes while also dealing with the increasing complexity of analytical processing. In general they are designed to handle mainly structured and well-defined data. At the same time, several companies are offering non-relational products (sometimes incorrectly called NoSQL or Non-SQL solutions: some actually do support an SQL subset, but they are still non-relational in nature) that are optimized primarily for handling large volumes of data that has unknown, ill-defined, or overlapping data schemas. The term *unstructured data* is often used to describe this latter type of data. An important solution in

this category is the Hadoop open source distributed computing framework. A few vendors are also starting to provide the best of both worlds by incorporating some of the key features of the non-relational systems approach into the underlying infrastructure of an analytic DBMS platform.

It is important to realize that universal relational DBMSs, analytic DBMS platforms, and non-relational systems are not mutually exclusive (see Figure 8). Each approach has its benefits, and in the future, it is likely that most organizations will employ some combination of all three of them. The key is to build a data infrastructure that enables all three to coexist. From a SS BI perspective, however, a packaged appliance approach offers the best option. In the survey (see Figure 9), 20% of respondents rated a packaged appliance as “very important.” Only 6% rated non-relational or Hadoop solutions as very important. This latter result is probably due to the immaturity of the technology and also because non-relational systems are designed for performance and scalability rather than ease of use.

New database and data warehouse technologies extend, rather than replace, the traditional enterprise data warehouse.

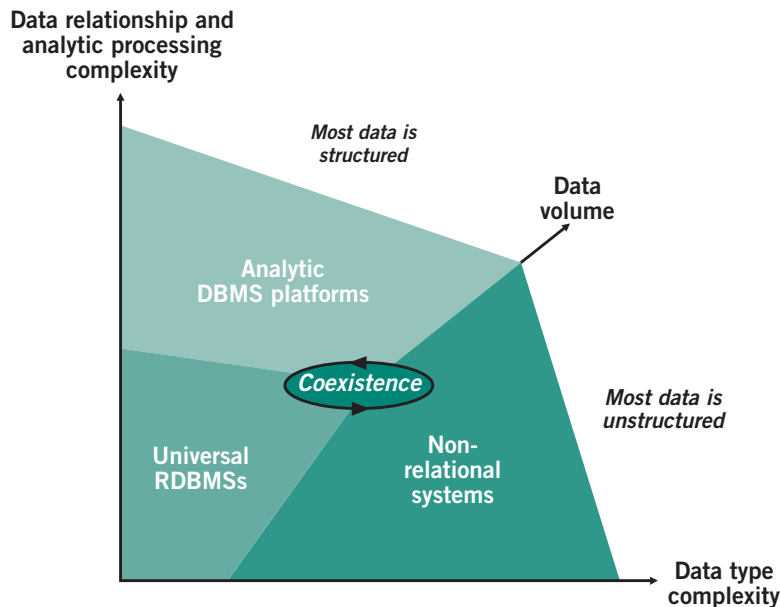


Figure 8. The extended data warehousing environment. (Courtesy of BI Research and Intelligent Solutions, Inc.)

Cloud-Based Data Platforms

Most analytic DBMS platforms are deployed on-premises as an adjunct to an enterprise data warehouse. In some situations, they may be used for building a full enterprise data warehouse, but this is less common. A third option is to deploy the analytic DBMS in the cloud; several vendors offer this capability. The benefits are the same as those outlined above for SaaS BI, that is, faster development and lower up-front costs. This approach can also be used for evaluating products and for building prototypes. As shown in Figure 9, 11% of survey respondents rated data warehousing in the cloud as “very important.” The importance of this approach is likely to increase as the use of cloud computing matures in organizations. The biggest challenge will be data integration and governance in a mixed public cloud and on-premises environment.

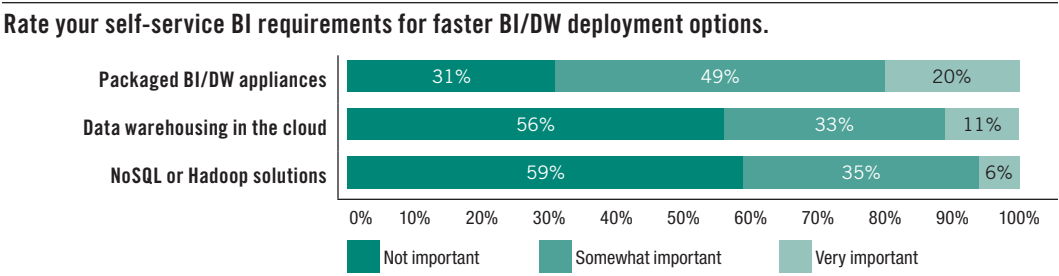


Figure 9. Based on 587 respondents. Sorted by “very important.”

Making It Easy to Access Source Data

The last of the four objectives of SS BI is to make it easier to access source data. The main focus here is to make it easier for BI/DW builders to access the growing number of dispersed data sources that exist in most organizations. However, this objective also applies to information producers who need to access and analyze data without first integrating it into a data warehouse, or who need to process data from a data warehouse in conjunction with other internal or external data sources. In all of these scenarios, data virtualization is an approach that can help reduce the complexity of accessing source data.

Data Virtualization

Data virtualization and associated data federation technologies enable BI/DW builders to build shared business views of multiple data sources so that the users do not have to be concerned about the physical location or structure of the data. These views are sometimes known as *virtual business views* because, from an application perspective, the data appears to be consolidated in a single logical data store. In fact, it may be managed in multiple physical data structures on several different servers. Data federation tools support access to different types of data sources, including relational databases, non-relational systems, application package databases, flat files, Web data feeds, and Web services. In the survey (see Figure 10), 60% of respondents rated business views of source data as “very important,” and 44% said on-demand access to multiple data sources using data federation technologies was “very important.” These features were the top two requirements for easy access to source data. Some 31% of respondents rated access to unstructured data and other types of data sources as “very important.”

Business views of data were the top-rated requirement for easy access to source data.

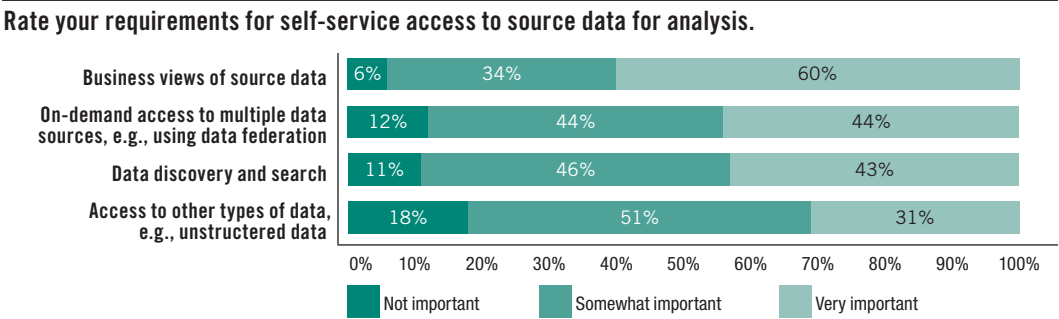


Figure 10. Based on 587 respondents. Sorted by “very important.”

Applications access source data through the virtual business views using languages such as SQL and XQuery and through interfaces such as Web services. Of course, there are performance implications of dynamically assembling data from multiple sources at query run time. This approach is not suitable for accessing and joining large volumes of data from multiple heterogeneous data stores. It is also not well suited for data that is of poor quality or involves highly complex data relationships.⁴

The performance boundaries of the data virtualization approach depend on the architecture and features of the data federation product. In some products, the data federation technology is embedded in the front-end BI tool, whereas in others it operates on a separate server. Invariably, the server approach provides better performance and scalability.

Information producers use virtual business views to access and analyze data stored in one or more data sources. One of these data sources may be a data warehouse. BI/DW builders typically define and construct the virtual business views.

The business views offered by the data virtualization approach not only have the advantage of simplifying data access and providing a *semantic data layer*, but also enable BI/DW builders to implement data security controls and to provide a certain level of performance control by incorporating pre-optimized queries in the views.

The architecture of the data virtualization capabilities needs to be considered if good performance is to be achieved.

Getting Started

The previous section described the technological underpinnings of the four SS BI objectives in great detail. It is important to realize that there are two opposing forces at work—the need for IT to control the creation and distribution of BI assets and the demand from information workers to have minimal IT intervention. Companies determining whether self-service BI is right for them must reach a middle ground in which information workers have free access to data, analytics, and BI components while IT has oversight into the self-service BI environment and can monitor its utilization. This gives the information workers the sense of independence and self-determination they want while giving IT the ability to monitor the SS BI environment and apply governance over necessary aspects. This conflict is elegantly demonstrated in the following set of vendor quotes:

BIRST **BRAD PETERS, CEO**

“Most IT organizations don’t really understand the roles of users. People least experienced in BI ask the toughest questions because they don’t understand how difficult it is to do. IT incentives are shifting from IT functions to compliance, and regulatory compliance roles and self-service BI is not compatible with this direction. Therefore, IT has no incentive to promote or provide self-service. The solution is to take the shackles off the users—not put them on.”

IBM **JANE FARGUHAR, BI AND PM PRODUCT MARKETING MANAGER**

“The economic downturn has hit IT hard. Fewer IT resources mean IT becomes a bottleneck. Business users then get frustrated with the slow response from IT. If they don’t get what they need fast enough, they will do an end run. So giving users self-service access to the BI environment is a good thing as it gives users the information needed to make business decisions and allows IT to focus on their core strengths.”

⁴ These topics are discussed in more detail in the TDWI Premium Member publication *Ten Mistakes to Avoid When Using Data Federation Technology* by Claudia Imhoff and Colin White.

INFOBRIGHT

SUSAN DAVIS, VP OF MARKETING AND PRODUCT MANAGEMENT

“The key to success in self-service BI is to start with a profile of the users and an understanding of their needs and then match the tools to the job. ‘One size fits all’ doesn’t work anymore, which is why there are so many new, compelling technologies today; specialization is necessary. Increasingly it is about speed to data, getting IT out of the middle, providing detailed data as well as summarized data, and allowing the business user to mine the data in any way they need to. The days of just providing canned reports with limited customization are behind us—users must have the ability to do ad hoc analytics with the speed of pre-specified reports. Sometimes, organizations learn more from just doing something than spending months in the planning phase.”

NEUTRINO CONCEPTS

PATRICK FOODY, CHIEF TECHNOLOGY OFFICER

“There needs to be a shift of the ownership and governance of the data from the IT department back to the user community. This is not promoting chaos, but allowing freedom of information and the ability for the user to access and manipulate data in the format that they want. Internet search engines have made keyword search the preferred method for users to discover and retrieve data. Delivering a ‘Google-style’ search capability for information workers reduces the need for the user to be skilled in a BI application, special query language, or have any knowledge of the underlying structure of the data, which makes them more productive and self sufficient. They also gain the ability to answer questions that were not thought of at implementation time—something that is more difficult to achieve with some traditional BI tools, which need to be pre-configured at the outset.”

PIVOTLINK

JENNY VICTOR, DIRECTOR OF PRODUCT MARKETING

“It’s crucial to stop thinking about BI as a data problem and focus instead on business goals and outcomes that drive growth and profitability. Self-service BI solutions empower users to start with what they need to measure, while giving them the freedom to explore data from any on-premises or cloud source for collaborative decisions. This new approach to BI overcomes many of the factors that hinder BI adoption and success by giving business users more power and flexibility while elevating the critical role IT plays in overall IT infrastructure, data governance, and security.”

QUEST SOFTWARE

OMAR MASRI, BUSINESS ANALYST AND LEAD ARCHITECT FOR BI SOLUTIONS

“Self-service BI is the ability to answer business questions through a BI asset that has not been previously prepared by IT or a developer. However, we feel that self-service BI is not a sufficient description. It leaves out data integration and connectivity. We prefer to use the term *personal BI solution*. A personal BI solution has the completeness of an enterprise BI solution, but is tailored for the personal experience.”

SAP

EMILY MUI, DIRECTOR OF SOLUTION MARKETING

“Self-service BI requires IT organizations to place a high emphasis on two key attributes: ease of use and quality of information. Only when both these requirements are met can users have confidence in the information they find and be empowered to analyze and use it in their decision-making process. IT needs to focus on the fundamentals of providing solid data and metadata, with easy addition of new data sources, all while allowing users to easily manipulate this information, enabling them to answer unimagined questions without being constrained by predefined data models.”

SAS**ROBERT CRAIGE, BUSINESS INTELLIGENCE MANAGER**

“To be successful in self-service BI, you have to have done sufficient data quality processing; otherwise, you will have problems. No matter how easy it is to use and consume, if the core set of data is not trusted, the business users may not use it. In addition, there will always be data that is not governed but is needed for decision making. You also need to have guidelines about how the data can be used and what analytics make sense. Training and education are always issues here. Users must understand what analytics make sense and the analytic to use in each circumstance.”

TABLEAU SOFTWARE**ELISSA FINK, VP OF MARKETING**

“Access to prebuilt or parameterized reports isn't enough. Self-service BI needs to support individual data discovery when business questions are being asked. The objective is to empower the business users to discover data. They need to perform their own analysis on their own time frame, not on IT's schedule. This is good for IT, too—they can then focus on strategic issues and get out of the report-writing business. Self-service BI should also allow people to blend data from a variety of sources as questions and issues arise—not months after, as can happen with traditional BI platforms. After all, if your application cannot access the right sets of data right when they're needed, you're not going to get the information you need to do your job well.”

For guidance, a set of practical recommendations is supplied in the next section to ensure a successful SS BI environment. These include organizational considerations, knowing who your audience is, and best practices. These recommendations take a pragmatic, middle-ground approach to mitigate the two conflicting forces for SS BI.

Organizational Considerations

SS BI is a very different environment from traditional BI—the business community takes over many of the roles that IT had held in the past. The information workers have their own techniques, and in many cases, their own technologies for accessing data, creating analytic results and reports, and distributing these throughout their groups. An important question becomes: “What procedures and policies are needed throughout the SS BI information supply chain to ensure that chaos will not occur?” There are several areas where new procedures or policies are needed to ensure that SS BI does not equate to anarchy!

Governance must still have a role. But how does an organization set up governance in such a distributed environment, and who in the company is responsible for it? With SS BI, the number of moving parts increases significantly, and many may not be under any sort of central control. Despite this, governance does indeed have a role in each of the four objectives of the BI supply chain (see Figure 4, page 14) and their associated activities.

Governance is still very important in self-service BI.

The first objective was “Make BI results easy to consume and enhance” (the *discover* and *enhance* tasks). Governance here consists of the ability to add comments and rate analytic components and results as well as the people creating them. This rating and annotation system can be used to determine the value of each component or result. If a report receives a low rating and few annotations or comments, then its value must be considered minimal and it may be subject to deletion. This type of feedback can be quite useful to people searching for analytics to help with their decision-making, and it can serve as notice to the information producer that changes are needed in his or her output. The second role for governance is to ensure that the information workers have access to information about the data they are using; that is, information workers must know whether the data they are

accessing is from a governed source (e.g., a data warehouse or master data environment) or from an ungoverned source (e.g., individual spreadsheets, external data).

The second objective is “Make BI tools easy to use,” which corresponds to the *analyze* and *publish* tasks. Governance for this activity can be enforced by the use of prebuilt components such as report templates, customizable dashboards, and widgets. Governance occurs when information workers are encouraged to reuse these components and create others that can be shared and reused throughout the information worker population. The BI/DW builders must recognize their responsibility to create these reusable components and encourage their usage.

Third is “Make data warehouse solutions fast to deploy and easy to manage.” This brings in the *integrate* and *manage* tasks in the supply chain. This area is a bit more complicated due to all the deployment options available for SS BI. Governance becomes clearer when we examine how SS BI may be implemented. For example, there are two use cases for data warehouse appliances: They can be used to pre-stage data for the data warehouse, or they can be used to perform extreme analytics such as data exploration or ad hoc analytics. This latter case may have the appliance residing next to, rather than being part of, the data warehouse. In either case, governance can be invoked through standard ETL processes to control what data is used to populate these appliances. Another role of governance will be to put in place a mechanism for user-defined analytics to be brought back into the governed environment (that is, the data warehouse) for use by others once they are vetted and found to be of value.

The final objective is “Make it easy to access source data.” Governance has a role in *access* tasks to identify the data sources that are governed versus those that are ungoverned. The BI/DW builder should access sources of data through a unified business semantic layer to ensure standardization of access and an understanding of the governed versus ungoverned status of the data being accessed.

The role of IT in self-service BI changes to one of monitoring how data and BI components are used.

IT must still have a monitoring and oversight responsibility. SS BI does not mean that IT no longer has a role to play. In fact, IT has the very important role of the BI/DW builder and of monitoring and maintaining oversight over the environment. While SS BI may empower information workers to do their own analyses, the BI/DW builders must have the ability to administer and manage the infrastructure of the environment. They must have insight through *monitoring* and *oversight* capabilities into what the information workers are doing in the SS BI environment.

Monitoring means examining the performance of the environment, ensuring access to sources through the creation of unified business semantic layers, and determining whether sources can be certified as governed. They should monitor the overall environment to determine if queries are performing in a suboptimal fashion and, if so, jump in to tune these queries.

Oversight entails deciding whether a source of data used in an analytic is governed. It also means that the BI/DW builder can see the usage of any BI component, can determine who published it, identify the data sources used, and see who else is using it. They can determine if a particular analytic is quite popular or is now mission-critical. If it is, then the BI/DW builder can move it back into the governed environment where it can be standardized, secured, validated, and perhaps even audited for correctness. They can then make it available across the enterprise more easily.

Line-of-business IT staff or experienced information producers must take on some of the previously traditional central IT roles. If the BI/DW builder comes from line-of-business IT or from the information producer community, they must maintain and monitor data security (perhaps through the business semantic layers) and ensure privacy policies are enforced. BI technology selection may

also fall to these people rather than central IT. They may be responsible not only for selecting BI tools appropriate for their users, but also for their maintenance.

BI and SS BI must be part of an expanded set of technologies. The final organizational consideration is a realization that BI is part of a larger whole. BI groups can no longer make unilateral decisions about what data to use, what technologies to employ, or even what analytics to create. These decisions must now be made in a more collaborative fashion that includes the information workers.

A second consideration is the fact that BI should be a part of a bigger IT environment. Decisions about BI's infrastructure and technologies should be made with an understanding of how these fit in with the enterprise's bigger picture, including technologies for search and mobility as well as social analytics and other forms of non-traditional analytics (such as event and content analytics). BI is no longer standalone but must fit into this larger, overarching architecture.

BI technology decisions can no longer be made independently of other enterprise technology solutions such as search, collaboration, and mobile computing.

Knowing Your Business Users

The workforce is evolving, as evidenced by the shift in workforce demographics. Baby boomers are starting to retire, and younger workers are slowly replacing them. Expectations for workplace tools change as workers who have grown up with computers and the Internet enter the workforce. For example, new employees right out of college are always “connected”; their information expectations are drastically different from their predecessors in terms of how and when they get information. They are also used to doing things for themselves without going through IT.

New information workers often use formal business processes, but they also develop their own collaborative workflows. These new workflows are used to transfer and share knowledge and to make specialist knowledge available to non-experts. Think about how young people today get information, make decisions, and gather information. Their expectations are that the companies that they work for will have similar capabilities that they had while in school: Facebook-like social collaboration, Twitter-like social media capabilities, and Google-like business search abilities.

Many of these new information workers are very collaborative and enjoy making decisions with input from others or looking up information for themselves. These traits should be welcomed into businesses and supported by the technological environments, especially SS BI. The key to creating the appropriate SS BI environment is to know your users!

Know your information consumers. Their BI capabilities include running canned reports and queries, using dashboards, portals, or mash-ups, and creating simple metrics or key performance indicators (KPIs). The technology used should support the need for minimal training. Technologies should include templates for reports, queries, parameterized selection criteria for sorting, filtering, ranking, dashboard wizards, portal and mash-up technology, a rich semantic business layer, and easy drill up/down functionality.

Know your information producers. Their BI capabilities include the ability to create what-if scenarios with write-back capability, to develop new analytics and even hierarchies not necessarily supported by underlying data models, and to create and examine new or not defined relationships between data entities. They also need the ability to perform ad hoc queries and explore data in an unfettered fashion. The technologies they use include data mining, statistical analysis, some form of BI workspace, mash-up capability, wizards, analytic database systems, data virtualization and/or the ability to add new data sources, and search technology.

Know your information collaborators. Their BI capabilities include the ability to add comments, definitions, feedback, ratings, links to external data, tags, and other searchable items to BI results.

Top inhibitors to self-service BI are business user skills, governance, and lack of business user training.

They need collaboration technologies combined with BI technology, social computing and free-form language technologies, search interfaces, and technology to create user communities.

Without understanding the needs and skill levels of different information workers, SS BI can be an expensive failure. We found in our survey that the number one inhibitor to SS BI was the lack of appropriate business skills (59%; see Figure 11). Certainly there is nothing more guaranteed to cause failure than presenting a segment of the business community with BI technology that is too complex or difficult for them to use.

The second highest inhibitor was a lack of data quality, control, and governance in the BI environment (55%). If the information workers perceive that the data is of low or unknown quality, they may not use it. The data may not need to be perfect, but it does need to be of consistent or predictable quality.

Other inhibitors included a lack of training for business users (39%), a lack of budget to implement SS BI (38%), a lack of management backing or awareness (38%), and a lack of appropriate BI tools (34%). For the full list of inhibitors, see Figure 11.

What are the inhibitors to self-service BI? (Select all that apply.)

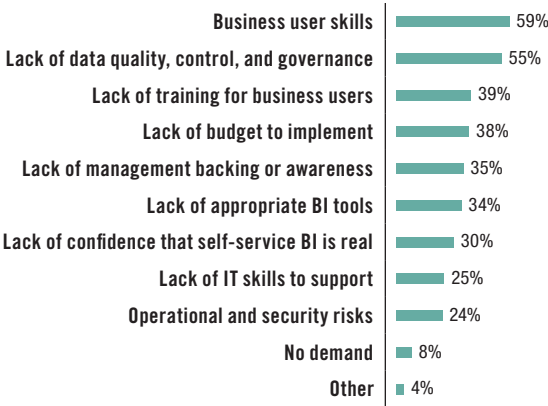


Figure 11. Based on 2,061 survey responses from 587 respondents.

Recommendations

1. Don't assume that simply installing easy-to-use BI tools creates a self-service BI environment.

It's a start, but it just isn't that simple. You must have a solid and sound infrastructure in place that supplies the required data. The infrastructure requires planning and design, data integration and data quality processing, data models for the data warehouse and marts, scalable databases, and so on. It requires an understanding of the types of data the information workers will need.

The bottom line is that your job is to make these functions look easy and appealing. Simply installing technologies will not make your BI environment self-service enabled. What will make it easier and more appealing is to have a complete and solid infrastructure in place that makes access easy, the creation of analytics simple, and the display of results easy to understand. It also means giving the right environment to the right workers. Whether consumer, producer, or collaborator, the technology must match the tasks users *want* to perform in a way that is simple and engaging.

2. IT needs to monitor the self-service BI environment.

There must be a layer of administration and manageability. Ensure that IT has monitoring and oversight capabilities when information workers deploy, share, and collaborate using BI capabilities. IT should be able to monitor the usage of any BI component that an information worker publishes, whether the data used was from a governed or ungoverned source. They should also know who else is using it. IT must be able to determine which queries are too costly, long-running, or bog down the performance of other queries. IT not only needs to monitor BI components, but also needs to secure, validate, and audit them. The key here is to ensure that business users feel they have the “power” or ability to create their analytic capabilities while IT still has the ability to monitor when they need to jump in and help out.

3. Support collaborative business intelligence.

Enable different types of information workers to share BI results and work together to define new ways of viewing and analyzing data. Start simply—use a setup that IT can configure easily and use technology that the information worker can understand and use easily. SS BI may need to mimic something information workers are already familiar with (Microsoft Office, for example). Use technology that meshes with your traditional BI environment and/or interfaces seamlessly with it. You will need to provide collaborative features that enable teams of information workers to develop and publish charts, dashboards, and so on, and the users of these analytics to rate or comment on them.

4. Don't give information workers too much responsibility.

Most information workers really don't want the entire responsibility for generating information and reports. It's not part of their job! They may find the tools and infrastructure too difficult to use, or they may forget their training before they can use the environment. Make sure that those who do construct self-service BI components also define key metrics, entities, hierarchies, and terms in a consistent fashion. They should be trained to use the existing technical and business metadata as well as the existing standards and nomenclature. You should strive to strike a balance between self-service and IT-generated delivery of information. You can do this by taking small steps toward self-service if your business users are not used to technology, fear doing something “wrong,” or feel they are not properly trained for these activities. Nothing will destroy a self-service environment faster than no one using it. It may take more handholding than you expect. One key success

factor, though, cannot be ignored—the business users must play by the rules when it comes to defining their metrics, analytics, algorithms, and so on.

- 5. Understand the information requirements of information workers and provide appropriate tools/reports/dashboards.** Understand what each group of information workers wants to accomplish with BI. What are their motivations? What are their skill sets, capabilities, and even interest in learning how to serve themselves? You may find that most of your information users are consumers with little interest in creating, producing, or generating their own reports, queries, or analytics. But be aware that information workers change their roles frequently. The best practice here is to get inside the heads of your users to understand what it is that they want to do, accomplish, or create. One suggestion is to examine or be familiar with their compensation models. Their bonus structure will give you a clear idea of what motivates them at work! In addition, keep in mind that this may be a new service to many business people. Their reluctance to embrace it may come from fear of the unknown, inertia around the way they have always done things, or ignorance about the benefits that they might receive from the environment. In any case, be prepared to change what the users can do—design ways to monitor the utilization of the environment. As users become familiar with the self-service environment, many may begin to change their role from consumer to producer, from producer to collaborator, and so on.
- 6. Create a starter set of standard reports, analyses, and widgets.** Provide a library of standard BI components (queries, reports, analyses, widgets). Make them appealing to information consumers (the largest audience). These can also act as templates for the information producers. The best practice is to make these parameter-driven and customizable. It is an amazing but true fact that one of these reports can replace hundreds of hard-coded, customized reports and analyses. The ability to select parameters based on immediate needs also makes consumers feel as though they are truly self-sufficient. They are not overwhelmed, because the BI results have simple, intuitive interfaces to filter, navigate, and analyze a predefined set of data. All of these “starter” components will help with the adoption of self-service BI simply because we all make better editors than creators. So the more that you supply, the faster the adoption.
- 7. Establish a governance committee.** The governance committee should consist of representatives from both the information worker population and IT professionals. Their responsibilities include reviewing requests for new components or modifications to existing standard ones, determining whether an existing component can satisfy a request or if a new one is needed, examining requests for self-service, determining what to provide, and identifying needed training. Governance also includes the creation of role-based access and security by a particular user group as well as the determination of which self-service objects should be promoted to the governed environment for general use. Remember that the governance committee should promote the use of self-service BI, not hinder its adoption. It is not meant to be a restrictive group, so it should perform the needed PR and communications about its purposes to ensure this message is heard.

8. Allow the data warehouse to be used with other types of data. There are times when urgent business requirements cannot be satisfied in a timely manner using the data warehouse alone. It may be that other sources of data, such as operational data, external information, or analytic data from other sources, must be brought together for the needed analytic. In this case, data virtualization provides a quick way to give rapid and flexible access to multiple data sources. However, you will need to provide a monitoring mechanism for the sources accessed to ensure that the performance of these systems is not negatively affected. The governance committee should be involved in this process.

We all know that emergencies happen—requests come in with an urgency that cannot be met through traditional mechanisms. Workarounds happen. In fact, there is data that may be needed regularly for analytics but should not or cannot be incorporated into the data warehouse—for example, real-time or sensitive data. Data federation technologies have come a long way to allow different data sources to be combined in a virtual fashion and yet act as if they were physically integrated. Data governance and some form of monitoring will be needed to ensure that the end-run or workaround can be halted if the data is subsequently incorporated into the data warehouse. Note: retrofitting can be painful!

9. Buffer less experienced information workers from the complexities of the BI environment. Use features such as Web browsers, interactive graphics, wizards, drop-down lists, and prompts to guide users through BI tasks. This will free up IT professionals from spending large amounts of time responding to requests for new data, building new reports, and so on. It also gives the information consumers a sense of control and adds to the flexibility of the overall BI environment. But beware—what’s intuitive to a BI professional is not necessarily intuitive to a naïve user. BI implementers have to think outside of their own boxes to truly understand what business users who want SS BI really need. It may mean doing their job for a day!

10. Watch your costs. This is a major product differentiator. If you already have a BI vendor’s platform in place, you can often add a self-service capability with minimal effort and cost. Many vendors offer entry-level products geared toward companies with limited budgets. Some companies use open source solutions, but there may be additional “deployment” costs. Consider software-as-a-service offerings to cut capital and IT staff costs. You must be careful not to break your budget through your self-service BI implementation! There are many deployment options available to BI implementers today that can greatly reduce the costs of these environments. However, remember to ensure that their deployment options will fit into your overall conceptual and technical architecture.



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Neutrino Concepts

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TDWI Research provides research and advice for business intelligence and data warehousing professionals worldwide. TDWI Research focuses exclusively on BI/DW issues and teams up with industry thought leaders and practitioners to deliver both broad and deep understanding of the business and technical challenges surrounding the deployment and use of business intelligence and data warehousing solutions. TDWI Research offers in-depth research reports, commentary, inquiry services, and topical conferences as well as strategic planning services to user and vendor organizations.



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