

TDWI RESEARCH

TDWI BEST PRACTICES REPORT

FIRST QUARTER 2013

# ACHIEVING GREATER AGILITY WITH BUSINESS INTELLIGENCE

Improving Speed and Flexibility for BI, Analytics, and  
Data Warehousing

By David Stodder

## Research Sponsors

Attivio

Informatica

Jaspersoft

MicroStrategy

SAP

Tableau Software

WhereScape

---

# ACHIEVING GREATER AGILITY WITH BI

---

By David Stodder

## Table of Contents

<b>Research Methodology and Demographics</b> . . . . .	<b>3</b>
<b>Executive Summary</b> . . . . .	<b>4</b>
<b>Why Organizations Need Greater Agility</b> . . . . .	<b>5</b>
Focus on Improving Technology and Development Methods . . . . .	5
Responding to Turmoil: An Information Imperative . . . . .	6
Supplying Users with Diverse but Relevant Data . . . . .	9
Improving User Satisfaction with Data . . . . .	10
<b>Managed Self-Service BI and Analytics for Agility</b> . . . . .	<b>12</b>
Overcoming Barriers to Managed Self-Service BI and Analytics . . . . .	14
<b>Addressing New and Changing Data Requirements</b> . . . . .	<b>15</b>
Handling Changes to Data Elements and Management Processes . . . . .	16
<b>Technology Strategies for Meeting Agile Demands</b> . . . . .	<b>21</b>
Choosing the Right ETL and Data Integration Options for Agility . . . . .	21
Options for Increasing the Breadth and Depth of Analytics . . . . .	23
<b>Improving User-Developer Collaboration</b> . . . . .	<b>23</b>
<b>Applying Agile Methods to BI/DW Development</b> . . . . .	<b>25</b>
Agile Objective: Delivering Continuous, Incremental Value . . . . .	25
Tracking Adoption of Agile Methods for BI/DW . . . . .	27
Goals and Challenges for Agile BI/DW . . . . .	29
<b>Vendor Products</b> . . . . .	<b>32</b>
<b>Recommendations</b> . . . . .	<b>35</b>



### About the Author

**DAVID STODDER** is director of TDWI Research for business intelligence. He focuses on providing research-based insight and best practices for organizations implementing BI, analytics, performance management, data discovery, data visualization, and related technologies and methods. He is the author of TDWI Best Practices Reports on mobile BI and customer analytics in the age of social media, as well as TDWI Checklist Reports on data discovery and information management. He has chaired TDWI conferences on BI agility and big data analytics. Stodder has provided thought leadership on BI, information management, and IT management for over two decades. He has served as vice president and research director with Ventana Research, and he was the founding chief editor of *Intelligent Enterprise*, where he served as editorial director for nine years.

### 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, on-site courses, certification, solution provider partnerships, an awards program for best practices, live Webinars, resourceful publications, an in-depth research program, and a comprehensive website, [tdwi.org](http://tdwi.org).

### About the TDWI Best Practices Reports Series

This series is designed to educate technical and business professionals about new business intelligence, analytics, and data warehousing technologies, concepts, and 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 BI professionals.

To support the program, TDWI seeks vendors that collectively wish to evangelize a new approach to solving BI and analytics 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 Research Director David Stodder ([dstodder@tdwi.org](mailto:dstodder@tdwi.org)) to suggest a topic that meets these requirements.

### Acknowledgments

TDWI would like to thank many people who contributed to this report. First, we appreciate the many users who responded to our survey, especially those who responded to our requests for phone interviews. 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.

### Sponsors

Attivio, Informatica, Jaspersoft, MicroStrategy, SAP, Tableau Software, and WhereScape sponsored the research for this report.

# Research Methodology and Demographics

**Report Scope.** Agility is an important business benefit that organizations seek from business intelligence (BI), analytics, and data warehousing systems, but it is also one of the toughest to achieve. Professionals responsible for these systems are under pressure to deliver faster time to value and greater flexibility. To overcome slow development, leading firms are implementing agile methods that break from traditional approaches. Organizations are pushing forward with self-service BI, data discovery, data virtualization, agile data warehouse development tools, and more. This report will examine organizations' experiences with agile methods and technologies and recommend best practices for improving BI and data warehousing agility.

**Survey Methodology.** In August 2012, TDWI sent an invitation via e-mail to business and IT executives; VPs and directors of BI, analytics, and data warehousing; business and data analysts; IT application managers; and other professionals, asking them to complete an Internet-based survey. The invitation was also delivered via websites, newsletters, and publications from TDWI. The survey analysis drew from a total of 408 responses. A total of 295 completed every question. Answers from respondents who answered enough questions for their input to be valuable are included in the results. Thus, some questions have different numbers of responses. Marketing and sales personnel from technology vendors as well as academics were excluded.

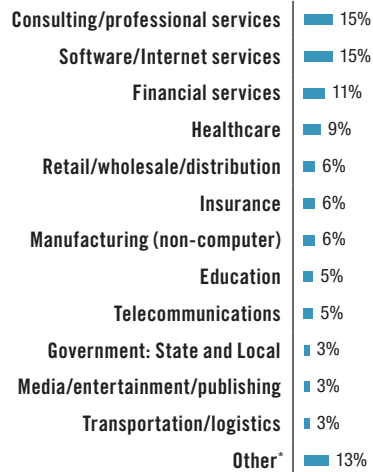
**Survey Demographics.** The largest percentage of survey respondents is business executives and sponsors/users (47%); included in that group are business or data analysts and scientists (25%). Forty-four percent are data and IT professionals, with IT application managers and developers making up the largest part (24%) and BI directors accounting for 12%. Consulting and professional services and software/Internet services respondents made up the two largest industry segments (each 15%), followed by financial services (11%) and healthcare (9%). Most respondents reside in the U.S. (53%) or Europe (18%), but other regions account for 29%.

**Other Research Methods.** TDWI conducted telephone interviews with business and IT executives, VPs of BI/DW, business and data analysts, BI directors, IT application managers, and recognized experts in agile methods, BI, and data warehousing. TDWI also received briefings from vendors that offer related products and services.

## Position

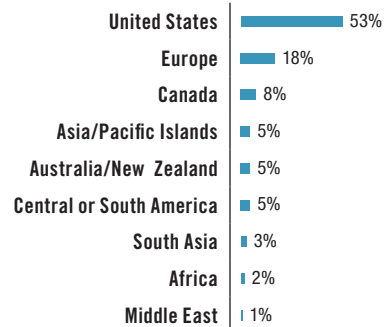


## Industry

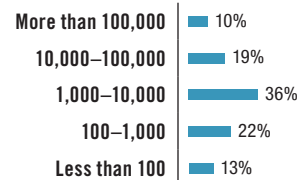


\* "Other" consists of multiple industries, each represented by 2% or less of respondents.

## Geography



## Number of Employees



Based on 408 survey respondents.

## Executive Summary

Faster decision cycles, competitive pressures to seize fleeting opportunities, and the continuing need to adjust to upheavals in an interconnected global economy are driving demand for business intelligence and analytics that better support business agility. Organizations need flexibility; yet, even as some organizational structures are shifting to support fluid decision making and faster response to changing conditions, the BI systems that deliver vital data and provide the raw material for analytics are not keeping up.

**Professionals must shift development and deployment approaches so that systems are responsive to agile business needs and oriented toward self-service.**

Whether they are part of IT or business functions, professionals responsible for designing, developing, and deploying BI, analytics, and data warehousing (DW) systems are feeling the heat. Applications that merely give users one report after another are not adequate for agility. Professionals must shift development and deployment approaches so that systems are responsive to agile business needs and oriented toward providing self-service functionality to free users from dependence on IT. Self-service BI, however, must be part of a balance; data professionals must balance user freedom with data governance and the need for stable performance for all users.

This TDWI Best Practices Report focuses on how organizations can achieve greater agility with BI, DW, and analytics through adjustments in technology and development strategies. The report provides analysis of an in-depth research survey and user stories to reveal current strategies and future plans for achieving higher agility. The report offers recommendations for making flexibility, shorter time to value, and self-directed functionality higher priorities in BI, DW, and analytics.

Many leading organizations are implementing agile software development methods for BI, DW, and data integration systems. These methods form an alternative to traditional “waterfall” methods and cycles. Agile methods aim at closer collaboration between users and IT developers; they propose iterative cycles to deliver value incrementally rather than only at the end of full waterfall cycles. This report discusses agile method adoption.

Technology options are maturing to support agility as well. BI and data discovery tools now support self-directed data discovery and access to a broader array of data sources. Unified information access (UIA) tools and data integration middleware are bringing together the heretofore separate worlds of structured, semistructured, and unstructured data. Data virtualization is giving IT new options for providing faster access while also performing necessary profiling, quality, and governance steps on data as it is accessed from multiple sources. Mobile, cloud, and open-source options are providing better ways of delivering data and getting critical BI and analytics applications to users more rapidly.

**It is an exciting time for organizations that have been frustrated with the slow pace of BI and DW development.**

It is an exciting time for organizations that have been frustrated with the slow pace of BI and DW development and concerned that the results are not delivering enough value and flexibility. Technology and development practices are evolving to support a world in which change, not stasis, is the constant.

## Why Organizations Need Greater Agility

Agility—the ability to sense change, adjust behavior, and take advantage of unexpected opportunities—is a highly desirable quality. Agility implies speed, and certainly, enormous advantages accrue to organizations that can respond quickly to changes in their environments. Speed, however, is not the only attribute of agility. It requires movement with “quick easy grace,” to quote *Merriam-Webster’s* definition; thus, agility combines speed with balance and direction. Critical to enabling “grace” is a strong but flexible core infrastructure that can deliver when called upon.

Knowledge is vital to agility, which puts a spotlight on the role of business intelligence (BI), analytics, and data warehousing (DW) systems. These systems must form a core information supply chain that keeps decision makers informed about what has happened, what is happening now, and what could happen. The information that flows from BI, analytics, and data warehousing systems can help organizations find the right decision-making balance that avoids the extremes of snap, in-the-moment decisions that may be out of alignment with corporate strategy on one hand, and rigid processes that force personnel to stick with “the way we’ve always done it”—despite circumstances that demand something different—on the other.

Many organizations are under pressure to adjust strategies and tactics amid fast-changing markets, shifting customer preferences, new regulations, and economic uncertainty. However, most respondents to the survey for this TDWI Best Practices Report regard their organizations as “average” in their ability to adjust to change and take advantage of emerging opportunities. Only 1 in 10 report that their ability is excellent, while about 1 in 6 say it is “poor.”

To improve, organizations need to uncover where they have blind spots or are missing signals amid the noise; where choke points restrict the flow of integrated information to decision makers; and where current processes, rules, and practices need to be optimized to fit new circumstances. Organizations must tap diverse streams of information to increase awareness. They must use information effectively to fuel continuous improvement cycles in their processes, employee actions, and partner relationships.

### Focus on Improving Technology and Development Methods

These objectives all demand improved data access, analysis, and sharing. They demand reduced delays in getting new BI, analytic applications, and data warehouses out of development and into the hands of users. TDWI Research finds that these applications and systems are clearly regarded as crucial to agility: that is, they are critical to the ability to adjust to change and take advantage of emerging opportunities. More than half of respondents regard BI, analytics, and data warehousing systems as very important, and more than one-third said they were at least somewhat important to agility.

This report examines what organizations are doing to improve agility and the challenges they are encountering in adjusting BI, analytics, and DW systems to make them more responsive to agile business objectives. In many cases, traditional development methods and technologies have not provided enough support. New methods and technologies are enabling organizations to overhaul traditional approaches.

The innovations are largely aimed at three goals: increasing flexibility, providing faster time to value, and supporting collaborative relationships between users and IT developers. A collaborative relationship allows business and IT professionals to jointly refine application requirements over time as the systems’ users become familiar with the data rather than wait to address them in a whole

**BI, analytics, and DW systems can help organizations find the right decision-making balance.**

**New methods and technologies are enabling organizations to overhaul traditional approaches.**

new change management cycle. Meeting these three goals is particularly necessary in this “big data” age, when most firms have both structured and unstructured data streams flowing in at all times. Organizations want to analyze the data promptly so that personnel can take advantage of insights sooner, when they matter most.

**Users today need timely, data-rich metrics to help them discover what changes will lead to improved performance.**

Another reason BI agility is essential today is an increased interest in implementing performance metrics. Users today need more than just static reports and dashboards; they need timely, data-rich metrics to help them discover what changes will lead to improved performance. In industries such as healthcare, metrics are mandated by regulations. Users who are accountable for these metrics need freedom and flexibility to explore data and tailor the way they consume, analyze, and share what they find so that they can discover why performance is out of line with expectations.

Three major areas of technology innovation, all important to achieving agility goals, will be examined in this report:

**Decision makers are demanding tools that will allow them to access, analyze, profile, cleanse, transform, and share information without having to wait for IT.**

- **Managed self-service BI and analytic data discovery of structured and unstructured data.** Decision makers are demanding tools that will allow them to access, analyze, profile, cleanse, transform, and share information without having to wait for IT developers to do all the work. They need access to more than just historical, structured data found in traditional systems such as data warehouses. Unified access to both structured and unstructured data is growing in importance as decision makers seek to perform more complete, context-rich analysis. They also need timely access to the most current information in operational systems, but without degrading the performance of those systems.
- **New data warehousing and integration options, including virtualization.** Data integration plays a critical role, but it can also be the source of challenging and expensive problems. Organizations are evaluating the range of options, including data federation and virtualization, that can give users managed self-service. This means users can work iteratively with IT to create comprehensive views of data in place without having to physically extract and move it into an application, data mart, or specialized data store. An added benefit of data federation and virtualization technologies is that they can give organizations a common data access layer; various BI tools can then access data but the users of these tools are insulated from changes to the underlying data sources.
- **Agile development methods.** The use of agile methods has become a mainstream trend in software development along with related disciplines for lean development. Agile methods for BI and data warehousing are less mature, but many organizations have leveraged them to remove the wait and waste of traditional data integration processes.

### Responding to Turmoil: An Information Imperative

To set the context for how technologies and practices address organizations’ objectives, TDWI looked at which factors are having the most disruptive impact and are requiring increased business and IT agility. The two factors that most research survey respondents regard as “disruptive” are economic/global instability and increased competition (72% respectively for each, with 21% indicating “very disruptive”; see Figure 1).

**Fluctuations in financial markets and investment add to uncertainty.**

In this century, economic instability is an almost constant concern, as are wars, terrorism, political uprisings, debt crises, weather catastrophes, and more. These directly or indirectly impact enterprises in all industries as economies grow more interdependent. Fluctuations in financial markets and investment add to uncertainty and make organizations reticent about launching new initiatives

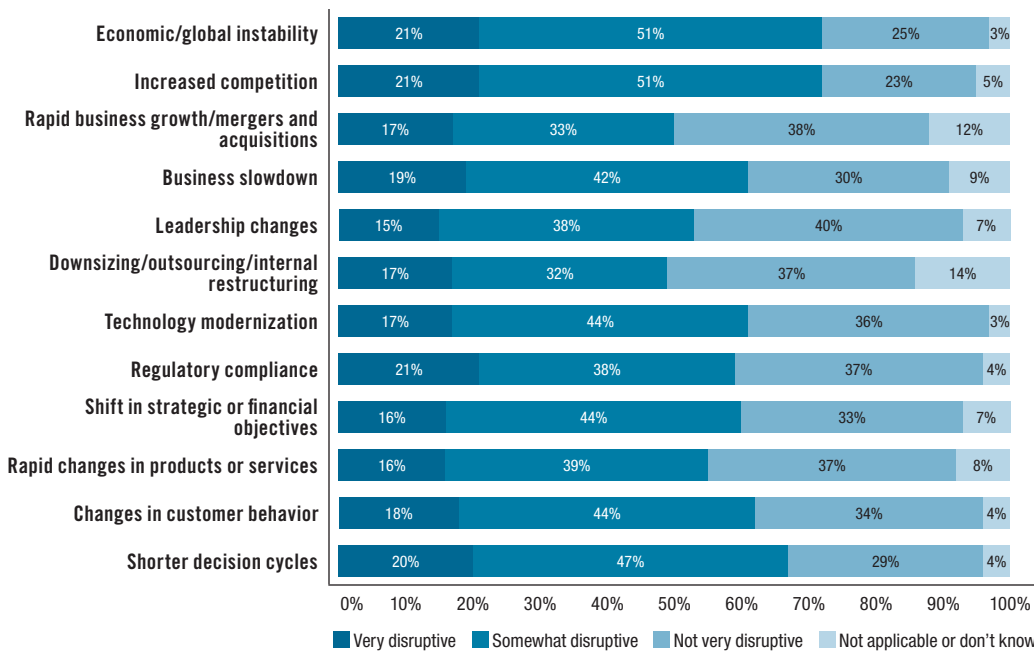


without better information about risks, competition, and so on. Yet, the pace of change—accelerated by the entry of startups that compete by exploiting new technology platforms and data innovations—can leave organizations that stand pat vulnerable.

Amid this instability and increased—sometimes unexpected—competition, executives and managers doubt whether their forecasts will hold true. Operations managers have difficulty allocating resources and personnel because they lack confidence in their organizations’ planning and budget assumptions. In addition, regulatory changes must be addressed; 59% of respondents said that regulatory compliance is a disruptive factor and 21% said it was very disruptive (although 37% said it was not very disruptive). Agile business management, feeding off steady flows of timely information, is necessary for adjusting plans and strategies to unfolding economic and regulatory events.

**Operations managers have difficulty allocating resources and personnel because they lack confidence in their organizations’ planning and budget assumptions.**

**To what degree are the following business factors having a disruptive impact on your organization, requiring increased business and IT agility?**



*Figure 1. Based on answers from 402 respondents; about 12 responses per respondent, on average.*

**Financial metrics require data transparency.** Difficulty in handling shifts in strategic or financial objectives was cited by 60% of respondents overall as a disruptive factor, and it was the top one cited by the 16% of respondents who indicated that their organization’s agility was poor. Constant instability highlights the need for transparency in financial and operational reporting and planning. When decision makers revise strategies and tactics, they need to be able to interact with data they see in reports and dashboards. They need to drill down into high-quality data, look at the impact of different variables, and try what-if scenarios. Where decision making is a collaborative process, managers need visibility into decision histories, including contextual notes that colleagues might have made about budget and planning assumptions. Single views of “the truth” can help users base decisions on one standard set of facts rather than lose time in debates over who has the best data.

**When decision makers revise strategies and tactics, they need to be able to interact with data they see in reports and dashboards.**

### Analytics Required for Faster Decision Cycles

Other leading factors highlighted as among the most disruptive by respondents were shorter decision cycles (67%, of which 20% indicated were “very disruptive”) and changes in customer behavior (62%, of which 18% indicated were “very disruptive”). To meet the challenges of new business conditions and customer preferences, most organizations would like their “decision cycles,” or processes for getting from the beginning to the end of a strategic or tactical decision, to run faster.

**Firms that can feed insights sooner and more frequently to decision makers will realize advantages over firms that are locked into slower decision cycles.**

Firms that can analyze data and feed insights sooner and more frequently to decision makers in executive management, finance, marketing, and operations will realize advantages over firms that are locked into slower decision cycles. In marketing, for example, managers can use analytics to discover more rapidly which campaign strategies are having the most positive influence on triggering customer purchases in their preferred segments. They can then double down on those interactions and eliminate costs by retiring less effective strategies. Delays in decision making can expose organizations to lost opportunities, higher costs, and reduced productivity.

Organizations want to deploy technologies that can increase “speed to insight,” enabling users to gain the benefits of analytics and apply them more quickly to decisions and actions. These technologies include self-service BI and data discovery, data visualization, and in-memory computing. We will explore these technology strategies later in this report.

The user story below illustrates how the City of Charlotte, North Carolina, implemented data discovery and a unique way of building BI best practices to support faster decision cycles.

#### USER STORY

##### THE CITY OF CHARLOTTE RESPONDS WITH BI TO FASTER DECISION CYCLES.

“Pressures on city government are no different from those on commercial businesses,” observed Jim Raper, manager of Technology Management’s data administration team for the City of Charlotte, North Carolina. “We have requests for increasingly more data while decision cycles are getting tighter. The downside of making the wrong decision—or not making the right one quickly enough—is getting deeper. Managers are less concerned with what tool they have or how the data warehouse is built. They just want quick, accurate, and consistent answers in a format they can use to make an informed decision.”

For the City of Charlotte, the key to delivering the agility managers need is applying best practices. “Best practices mean that you have a repeatable process,” said Raper. “We can be assured that the end product will be a quality product that will be delivered faster, cleaner, and presented in the best form.”

The City of Charlotte has a creative way of sharpening its Business Intelligence and Data Warehousing best practices: a “BI Olympiad.” Every two years, the organization’s departments compete for the best and most innovative way of visualizing and analyzing data. The “kicker,” as Raper calls it, is that the contestants must deal with a mock sudden crisis that changes everything, such as a hurricane or a bioterrorist attack. The departments have 24 hours to adjust their reports and dashboards and present their solutions in front of senior management. “This puts tremendous pressure on the analytical teams to be agile,” said Raper. It also gives the City of Charlotte a way to hone its best practices.

The City of Charlotte does not mandate a particular BI tool. “We have a little of everything,” noted Raper. However, the majority of the City’s departments are now using Tableau, particularly to “find out what they don’t know,” he said. “Business managers and analysts use Tableau to dig into the data, create visualizations with data from different sources, and do it quickly.” Technology Management is responding to nonstop analytical demands for data by revamping its data warehouse using the Data Vault Modeling methodology, which it has

been implementing in a portion of its data warehouse for several years. “By revamping with this methodology, we will have a better ability to update the warehouse with data from various sources, at any given time, to meet the growing demands of our customers.”

### Supplying Users with Diverse but Relevant Data

As pressure mounts to discover data insights that could help accelerate decision cycles, many organizations seek to capture “big data” by increasing their data volume and variety. However, this can lead to the paradoxical problem of information overload and the inability to isolate what is most relevant to a decision or action. Users need more data and a greater variety of it, but they typically lack the tools and practices to reduce the noise and focus on the data they really need. Instead, they spend too much time in ad hoc querying for the right data and searching for relevant unstructured content.

The ability to bring together structured, semistructured, and unstructured data into a single view can give greater dimension and context to all data elements. In most organizations, however, the different types of data are encased in application, content, or database silos. Many of these sources are hard to access and integrate because tools generally are specialized for certain types of data or schema. Direct access to other sources such as operational systems may be restricted by IT because of performance degradation concerns. Some organizations are able to deploy prebuilt adapters to various types of data sources, which can give them the necessary agility to quickly get to data without requiring help from IT.

**Delivering access and analysis of varied data sources.** Semantically rich and context-sensitive data integration middleware has enabled some organizations to field queries to more varied data sources than were accessible via single-application data marts or warehouses. Middleware of this sort can be used in data virtualization architectures to manage queries, sending them to the right sources and formulating result sets.

**Unifying access to structured and unstructured data.** A category of technologies and practices on the front end that addresses the divide between structured and unstructured information is unified information access (UIA). UIA tools integrate search, text analytics, and BI to reduce the need for multiple interfaces and enable users to reach sources that may be relevant but are not represented in their BI systems’ metadata. Some tools have business glossaries that allow users and developers to work with business master definitions and metadata classification. More than three-quarters of research respondents said that UIA technologies are either somewhat or very important to their users’ analysis and collaboration on information.

“One major challenge is educating folks about unstructured data and what it takes to get insight from it,” said Rik Tamm-Daniels, VP of technology for the Channels and Alliances division at Attivio. “Not only is there a difference between unstructured and structured—that is, what is coming from a database or data warehouse and visualized in a BI tool—but there is also a difference between unstructured data and unstructured content. At Attivio, we separate those two because the way you get insight from unstructured content, where the insight comes from human-created text, is not the same as the way you treat machine log data, for example. However, while it’s important to educate about the distinction, it is very important to bring the three types together. Just about every business process touches all three kinds of information.”

**The ability to bring together structured, semistructured, and unstructured data into a single view can give greater dimension and context to all data elements.**

**Research respondents said that UIA technologies are important to their users’ analysis and collaboration on information.**

The drawback of enterprise BI is that deployments can become one-size-fits-all applications that leave users looking elsewhere to meet specific needs.

### Improving User Satisfaction with Data

Diversity in users’ roles and responsibilities is a major challenge for IT developers in providing data. Executives, managers, and front-line workers in operations all have distinct needs, which is one reason why it has been difficult to satisfy them with enterprise BI systems. These systems can make it easier for personnel across organizations to access corporate, vetted data, use enterprise performance metrics, share standardized reports and dashboards, and more. Operational enterprise BI systems can push timely data out to users, providing at least intraday updates if not in intervals closer to real time. However, the drawback of these approaches is that deployments can become one-size-fits-all applications that leave users looking elsewhere to meet specific needs.

In addition, just providing data access is only the first requirement; most nontechnical users need guided BI experiences to be productive. “Most of the focus in BI has been on the technology,” said Suzanne Hoffman, senior director of analyst relations with Tableau Software. “The core challenge, though, is teaching people *about the data*. How do we measure it? How do you relate one data element or file to another? For better agility, data has to be put in a format that makes it relevant to the decision process. Technology must be out of the way so its complexity is less of an impediment to making BI pervasive and making data interactivity easier.”

We asked research respondents how satisfied different types of users in their organizations are with their ability to access and analyze information to achieve objectives for which they are held accountable (see Figure 2). Current levels of satisfaction are lukewarm. The highest level of satisfaction is in finance, but even here, the percentage was just over half (56%). Users in finance are often among the most experienced users of BI, since many BI systems were originally crafted for reporting and analysis of financial numbers.

**How satisfied are users in the following business functions with their ability to access and analyze the information they need to achieve objectives for which they are held accountable?**

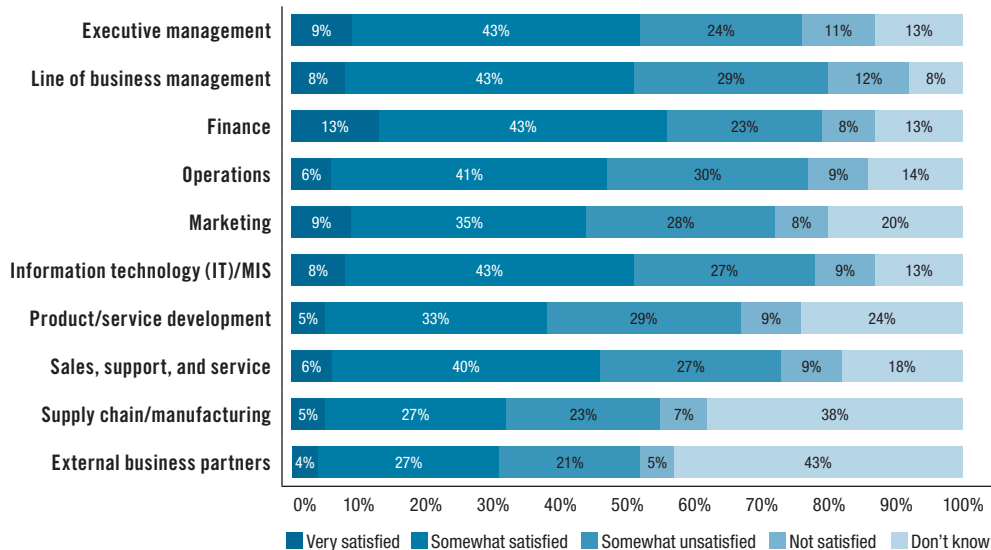


Figure 2. Based on answers from 408 respondents; about 10 responses per respondent, on average.

The needs of finance executives and managers are moving beyond simple reporting or getting data extracts into spreadsheets or online analytical processing (OLAP) cubes. Risk assessment has become

a major concern; finance personnel need timely data to feed risk metrics and supporting analytic processes. Historical data that is not updated frequently must be supplemented, or even supplanted, by data that is updated several times a day or in near real time. To elevate finance analysis to an enterprise view, users need to tap data that lives outside often aging accounting and budgeting applications.

Corporate finance departments often have to oversee a dizzying variety of planning, forecasting, budgeting, and consolidation processes happening throughout their organizations, typically in a loosely coordinated fashion at best. Getting a single, consolidated view of the truth has been difficult given that fully enterprise financial management is rare. Agility is often lost simply due to difficulty in integrating data from across organizations. Cost assumptions and metrics definitions can differ from one division to the next.

**Agility is often lost simply due to difficulty in integrating data from across organizations.**

### Performance Management Can Enable Agility

Performance management can improve user satisfaction by providing strategic context for data coming from diverse sources. These initiatives are frequently undertaken to help finance executives and operations managers gain a single view of data within a dashboard of metrics associated with key processes and operations. Many organizations view performance management as vital to agility because the effort focuses attention on performance objectives rather than on sorting out confusion from static presentations of data drawn inconsistently from different parts of the organization. The metrics and key performance indicators can frame real-time views of data so that decision makers can see daily trends, anomalies, and where changes need to be made immediately to align activities with objectives.

**Metrics and KPIs can frame real-time views of data so that decision makers can see where changes need to be made immediately to align activities with objectives.**

The Cleveland Clinic, a multi-specialty academic medical center widely regarded as one of the top healthcare providers in the U.S., uses enterprise performance management implemented with SAP BusinessObjects to compare strategic objectives with actual performance data. Winner of the 2011 TDWI Best Practices Award for performance management, the clinic addresses what is often the most challenging aspect of performance management—defining metrics and getting agreement on them—by creating teams to do so, with a governance board offering official authority and oversight. “We didn’t have a governance board in place when we first developed our enterprise BI systems, and that caused problems for us,” said Andrew Proctor, senior director of BI at the Cleveland Clinic. “People would be unhappy with the wait and go over heads to make a pitch to put a higher priority on their project even though it may not have been the most strategic for the organization. Governance helps alleviate this problem; the board gives us some cover and a place for people to go if they feel that their project should be ranked higher.”

**Data interactivity is a priority for lines of business and operations.** TDWI Research finds that line-of-business (LOB) managers show the least satisfaction with the information they are getting to achieve objectives for which they are held accountable, often via key performance indicators or other performance management metrics. Referring again to Figure 2, nearly one-third (29%) are “somewhat dissatisfied” and 12% are “not satisfied.” Users in operations have around the same levels of dissatisfaction (30% are somewhat dissatisfied and 9% are not satisfied).

**LOB managers show the least satisfaction with the information they are getting to achieve objectives for which they are held accountable.**

Nontechnical users in LOB, operations, and other departments need increased data interactivity but also strong guidance. “We are seeing demand for interactive reports that provide these users with some controls for data manipulation, sorting, pivoting, visualization, and so on, but not by just giving them a blank slate,” said Mike Boyarski, director of product marketing at Jaspersoft. “Many organizations would like BI professionals to create a handful of reports that can then be turned

into dozens or hundreds for a range of users. They want the reports to have interactive capabilities, enabling users to fine-tune them so that each time a report is run it is personalized for their needs, without having to go back to the original report that was developed by the professional and having to modify and edit it.”

## Managed Self-Service BI and Analytics for Agility

**High among self-service capabilities that users seek is interactivity with the data so that they can drill down, even if just a few steps.**

Nontechnical users in management and operations need to get beyond canned reports, basic spreadsheets, and static dashboards. They could then drive data access and analysis themselves and be free from having to ask IT for every new report and dashboard, or every change to existing ones. High among self-service capabilities that users seek is interactivity with the data so that they can drill down, even if just a few steps beyond what canned reports and dashboards provide. Many users want to dig even deeper and perform what-if, discovery analysis to examine what happens if they make changes to certain variables. OLAP tools have long provided functionality for some deeper analysis and for turning data cubes to gain different perspectives. However, OLAP has proven difficult to use. The current generation of self-service BI and analytics tools aims to provide some of the deeper interaction qualities of OLAP but in an environment that is easier to use.

The “self-service” or self-directed wave in BI, analytics, and data discovery technology is strong; more than half of TDWI Research respondents said that increasing users’ self-reliance with BI and analytics and reducing their dependence on IT are very important goals, with one-third indicating that these are somewhat important. The percentages are similar when filtered for either IT or non-IT titles, suggesting that meeting self-service objectives is a priority on both business and IT sides.

Respondents indicated that users’ requesting to do more on their own (67%) is the most common reason why organizations are implementing self-service BI and analytics (see Figure 3). The second most prominent reason helps reveal why they want to do more on their own: 58% said that self-service functionality is important because “IT cannot keep up with changing business needs.” Users are frustrated with the IT backlog and with having to wait for new applications and features to be deployed even as strategic business needs grow more urgent. In addition, 31% of respondents selected “IT lacks adequate BI/analytics expertise,” a factor that could be contributing to the backlog problem and suggests that within some organizations there is a lack of confidence in IT’s BI and analytics capabilities.

### What are your organization’s main reasons for implementing self-service BI and analytics?

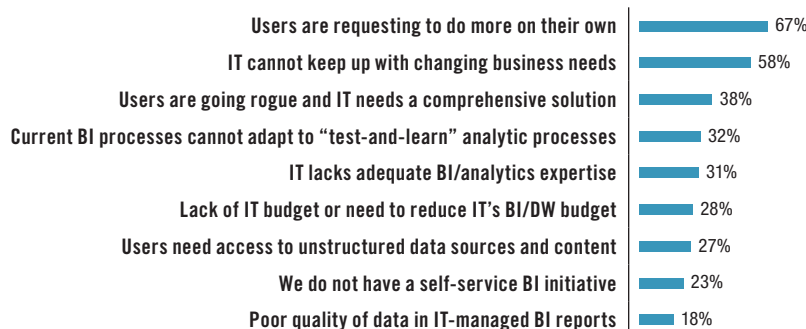


Figure 3. Based on answers from 377 respondents; respondents could select more than one answer.

If users cannot get what they need, they are likely to resort to other measures, including “going rogue,” which was the third most common reason (38%) why respondents’ organizations are implementing self-service BI and analytics. IT has historically had a difficult time putting constraints on users’ consumption of data in spreadsheets, including simply loading data from enterprise BI systems in “spreadmarts” that are not governed by IT. Out of frustration with IT, business users in some organizations will also fund the development of “shadow” IT projects for running analytics on standalone data marts or in cloud-based analytic sandboxes. However, this can lead to the proliferation of these “spreadmarts,” often with data that is private or sensitive, which increases both complexity and risk—since these “spreadmarts” cannot be retired for many years for compliance reasons.

Many CIOs and IT managers now realize that it is futile to try to restrain users from implementing their choice of BI tools, analytic processes, or sandboxes in the cloud. IT and business sides increasingly have a mutual interest in deploying self-service tools in a “managed” fashion to achieve a balance between user freedom and proper data management and governance. As analytics become more prevalent, self-service will change from a need for reports to a need for access to (sometimes raw) data. IT must accommodate needs for running iterative, “test-and-learn” analytic processes against either raw or extracted data, which 32% of respondents cited as a reason for implementing self-service technologies. These requirements often run counter to IT’s carefully scheduled routines for standard BI reports and periodic, predetermined data extracts.

**Managed approaches rein in data chaos.** “The greater the number of little systems that organizations have, the harder it is for them to be agile,” said Adam Binnie, general manager and global VP of Business Intelligence Solutions at SAP. “You can’t change the systems in the aggregate; if you are going through some kind of transformation, every additional source you have to touch can become an impediment to change. Organizations might be able to set up self-service BI tools quickly, but they also need to create an environment that can be managed so that changes can ripple out to these personal workspaces. It’s like a supermarket: You can buy whatever groceries you want there because the store has a very well-structured supply chain. Organizations need a reliable and organized data supply chain to make self-service work.”

The user story below describes how Illuminate Education used BI tools embedded in applications to improve ease of use for BI and ETL processes.

**If users cannot get what they need, they are likely to resort to other measures, including “going rogue.”**

**IT must accommodate needs for running iterative, “test and learn” analytic processes against either raw or extracted data.**

### USER STORY

#### ILLUMINATE EDUCATION INCREASES AGILITY WITH BI AND ETL EASE OF USE.

School districts are faced with new requirements for performance and accountability. Despite a general lack of IT infrastructure, districts need to find ways to use information systems effectively to provide their many types of users with access to integrated views of disparate data. Meeting new regulations is a key concern, but many districts would also like to replace manual examination of disparate data sources with software to gain more rapid insights into how they can improve instruction and adjust to changing needs.

Illuminate Education, a specialized software solution provider, addresses these challenges by providing school districts with integrated data management applications for tracking and monitoring student performance, attendance, discipline, special education needs, and other metrics and data. Its Illuminate Student Information, Data and Assessment, and Illuminate Special Education applications provide administrators and teachers with prebuilt reports and query tools based on Jaspersoft BI Suite tools, relieving them of having to bring in developers to spend weeks custom coding and testing each new report. Illuminate implements iReport Designer and other Jaspersoft tools embedded inside its applications; the tools provide central management of report creation to

avoid chaos, while also delivering flexibility for shaping reports and interacting with data to suit district users' particular data needs.

Given the range of data sources that district users need, such as assessment data resulting from state high school exit exams, it can be difficult to provide access to each one due to different file formats. Illuminate has been able to employ JasperSoft ETL to take data integration complexity out of the hands of users. Scripts are deployed inside applications as Java binary objects with Web wrappers to make it simpler for users to add data to their Illuminate application databases and reports. The ETL infrastructure increases users' self-service capabilities so that they can be agile in using the BI applications to respond to new data requirements without delay.

### Overcoming Barriers to Managed Self-Service BI and Analytics

TDWI Research finds that the leading concern regarding self-service BI and analytics is whether users have the requisite skills, training, and budget. This suggests that IT must still play a managing role in guiding the self-service experience, especially with regard to training. The second highest concern—the combination of data governance and security—also highlights the importance of IT's role. About half of respondents indicated that governance and security concerns create a barrier to increasing users' self-reliance and reducing their IT dependence. The research finds that the problem becomes more acute as organizations get larger.

**Poor data quality and slow or inadequate access to the appropriate data can thwart dreams of self-service functionality.**

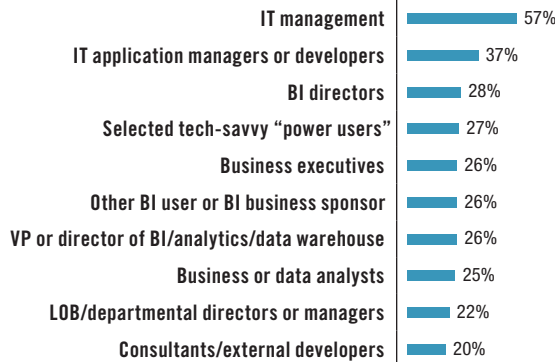
Our research finds that the third and fourth highest-ranking barriers are inadequate data quality and delays due to slow data warehousing and ETL processes for supporting users' agility needs. Poor data quality and slow or inadequate access to the appropriate data can thwart dreams of self-service functionality. "If we're not careful with self-service BI, we could create a new hairball in the fraction of the time it took to create the old hairball because the data integration and ETL requirements can be very slow and complex to figure out," said a BI director at a large consumer packaged goods organization. Often the primary reason for this concern is that users' BI tools simply point to data in the various data sources, with little regard for quality. Instead, data quality is typically an afterthought that requires new tools and extra work. In the meantime, decision making is compromised.

**IT controls most BI/DW development.** Reflecting concerns about maintaining control of data quality and the management of performance and other matters, TDWI Research finds that IT management remains the chief authority for developing and deploying BI and analytics tools as well as implementing updated features and data access for existing systems (57% said that IT has this authority; see Figure 4). The next highest percentage of respondents said that IT application managers or developers (37%) have this authority.

A little over one-quarter (27%) said that selected tech-savvy power users have the authority to develop or change BI and analytics systems; the percentages for other kinds of business users also hovered around one-quarter of respondents. In larger organizations with more than 10,000 employees, the percentages of respondents indicating that VP or directors of BI, analytics, and data warehousing and BI directors have this authority rises to around one-third.



**Who in your organization is authorized to develop and deploy BI/analytics tools and/or implement updated features and data access for existing systems?**



*Figure 4. Based on answers from 364 respondents; respondents could select more than one answer.*

## Addressing New and Changing Data Requirements

For many organizations, the shift of BI and analytics systems to center stage over transaction systems has not been easy. Most BI and data warehousing systems began as stepchildren to online transaction processing (OLTP) systems. In the early days (and still today, in many firms) queries and reports would run in batch at off hours. Analysts would have to hunt for spare machine cycles to perform deeper data analysis.

Data warehouse design and development managers have traditionally had to work around resource constraints. Newer technology options, such as virtualization, in-memory computing, Hadoop, and MapReduce, may (over time) render some of these resource constraints less relevant. The choices for how to respond to agility needs are evolving as technology options mature.

TDWI Research investigated how well organizations are responding to the need to adjust or update BI, analytics, and DW systems. Of the possible changes to user or project elements that we listed in the survey, the three that the most respondents indicated as either somewhat or very difficult are changes to business rules and/or processes (76%), structural or operational changes impacting projects (74%), and changes to project goals or mission (74%). See Figure 5.

Changes to business rules can present difficulties for BI and DW systems in a number of ways. One is that that rules are often not well documented; it can be hard to know which data elements and fields are affected by changes to them. Some rules are very stable, while others must be fluid to allow the organization flexibility. Rules could be stored in BI reports, OLAP cubes, ETL layers, or elsewhere. To understand how rules impact data and transformations, organizations need knowledge about their data. This can be built up through profiling, validation, data relationship discovery, business rules mining, and other related processes.

**Newer technology options could render some resource constraints less relevant.**

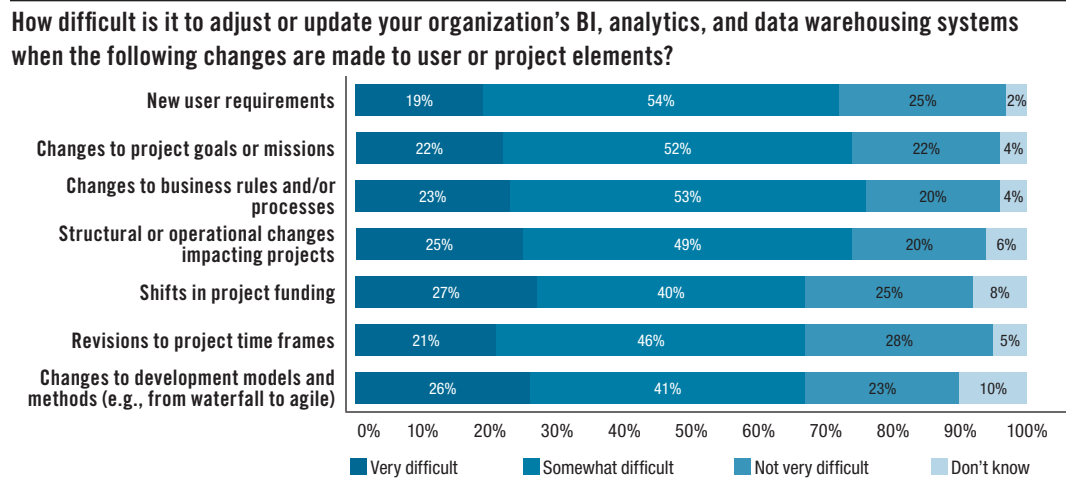


Figure 5. Based on answers from 401 respondents; about seven responses per respondent, on average.

**Not surprisingly in this era of big data, adding or integrating unstructured data or content is a major challenge.**

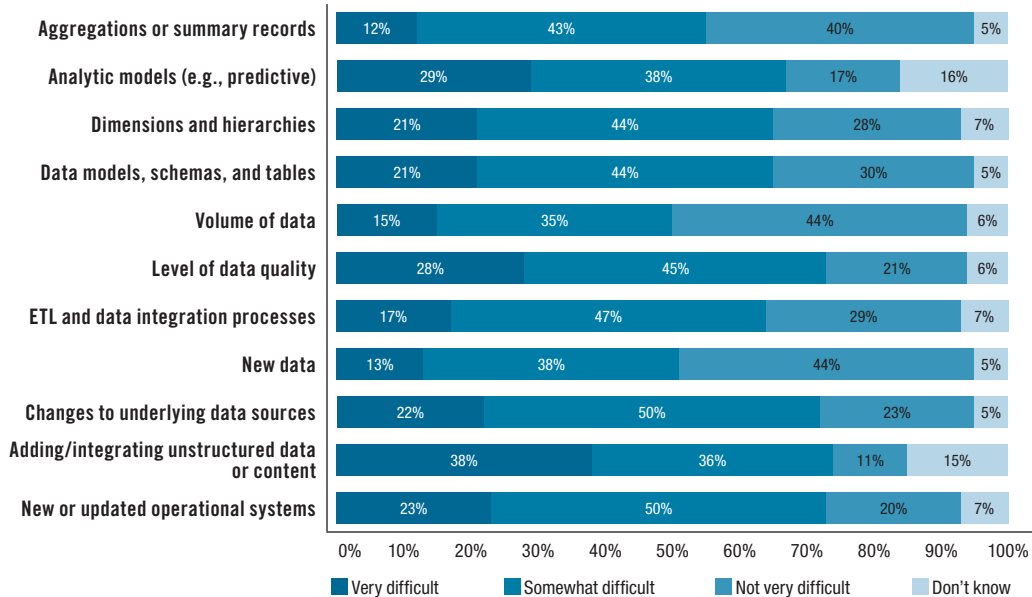
### Handling Changes to Data Elements and Management Processes

The majority of organizations surveyed by TDWI Research face difficulties when there are changes to the data elements and management processes that we identified in Figure 6. Not surprisingly in this era of big data, adding or integrating unstructured data or content was the challenge cited by the largest percentage as difficult (74%, with 38% indicating that it is a “very difficult” problem).

Unstructured data does not conform to the relational table structures that predominate in BI and DW systems. With online customer behavioral data, social media data, machine data, and other sources growing in volume, many organizations want to integrate it all with structured data so that users can gain the most complete view. Interestingly, changes in data volume—perhaps the most obvious big data challenge—was the least difficult problem for research respondents. Only half said it was a difficult problem and nearly the same percentage (44%) said it was not very difficult.

Organizations are having more difficulty with changes in the level of data quality (73% cited it as “difficult,” with 28% indicating that it is a “very difficult” problem). Quality problems often arise when there are changes to underlying data sources, which a high percentage of respondents said was a problem (72%, with 22% indicating it is very difficult). New or updated operational systems continue to be a difficult challenge (73%, with 23% citing it as very difficult); these systems feed most BI and DW systems. Transaction data, especially when coming from multiple applications, can be redundant and show uncertain data quality, with application-specific values not well documented.

**How difficult is it to adjust or update your organization’s BI, analytics, and data warehousing systems when changes are made to the following data elements or management processes?**



*Figure 6. Based on answers from 381 respondents; about 11 responses per respondent, on average.*

The following user story describes how Relay Technology Management uses UIA to tap unstructured and structured information to enable its customers to apply a more complete view to innovate in the life sciences industry.

**USER STORY**

**RELAY’S ANALYTICS GENERATE BUSINESS VALUE FROM UNIFIED INFORMATION.**

The life sciences industry is awash in the diversity of big data. Streams can include not only business data but also patent records, clinical trial data, scientific literature, disease alerts, drug makers’ press releases, and more. These sources carry information that could indicate that life sciences organizations must quickly adjust manufacturing, research and development, or trade strategies. Unfortunately, many firms find that their ability to change is mired in slow, manual efforts at tracking, integrating, and analyzing information. Relevant and timely business intelligence and analytics can therefore be crucial to agility.

Relay Technology Management, a life sciences trend analytics and BI software provider, helps organizations identify promising opportunities for drug development through integration, aggregation, and analysis of diverse sources of scientific, business, market, and clinical trial data. The centerpiece of the company’s Relay Innovation Engine (RIE) and Business Development (BD) Live, a software-as-a-service offering powered by RIE, is the Relay Relative Value Index (RVI). The index, according to the company, “offers the relative value of life sciences assets at a point in time or over specific time spans” so that organizations can view an “objective comparison of life sciences assets to each other.”

Relay implements Attivio’s Active Intelligence Engine (AIE) to provide unified information access and analytics against the millions of scientific publications, patents, disease, and clinical trial literature. Rather than be limited to structured information silos and predetermined schemas, AIE enables Relay to integrate structured and unstructured data and help its users uncover correlations between sources through examination of data

relationships. Relay uses AIE to integrate quantitative analysis with search and text analysis. “When you can combine two sources,” said Brigham B. Hyde, Ph.D., Relay’s managing director and cofounder, “you don’t just get one plus one equals two. You get factorial advantage because you can create value solely from the combination. We can combine business and science data and essentially create whole new data sets.”

Relay has been able to build a system that can not only scale to handle the quantity and diversity of information, but can also implement BI tools and Attivio’s AIE to support “users who don’t know what they are going to ask,” said Hyde. Users do not write complex SQL queries; “they write ontology-driven queries,” Hyde explained. The ontology layer provides classifications of terms used in a domain such as “Parkinson’s disease,” and rules for combining terms across sources so that assertions and analyses are relevant. Relay’s ontological layer is critical to getting users beyond mere access to see correlations across sources.

Relay’s BD Live and RIE allow users to drill down through visualizations to see documents themselves and understand why Relay’s RVI made a particular assessment. “Users need the transparency provided by drill-down features to build their trust in what our systems are telling them,” Hyde said. “We see data visualization as kind of the bridge between trusting what the computer says and manual effort.”

### Agility Demands for Data Push More Rapid Development

**One-third of organizations are able to deliver new BI and analytics features and functions on a monthly basis.**

TDWI Research finds that the largest percentage of respondents’ organizations is able to deliver users new BI and analytics features and functions on a monthly basis (29%), with 23% delivering them less frequently (see Figure 7). Nearly one-fifth (19%), however, can deliver new features and functions at a daily or hourly pace. The percentage able to deliver features and functions at this faster pace is nearly twice as high at organizations where respondents told us they are “very satisfied” with their ability to access and analyze information. This suggests a correlation between user satisfaction and speedier delivery of new features and functions.

TDWI Research finds that for the largest share of respondents (45%), the percentage of reporting requirements that change at least monthly, if not more frequently, is 25% or less. For about one-quarter of respondents, up to half of their reporting requirements are changing that often.

#### What is the highest level of frequency with which IT/data or business teams are able to launch new features and functions for BI/analytics systems?

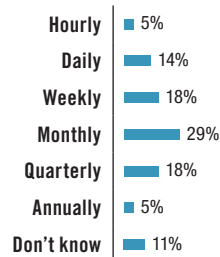


Figure 7. Based on answers from 364 respondents.

### Users Need Access to Data Existing Outside the Warehouse

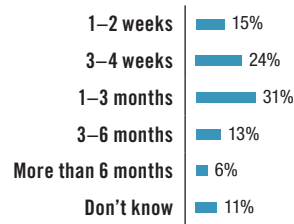
**Users need DW managers to bring in new data.**

TDWI Research finds that among our respondents, a fairly high percentage of their reports need data that is not currently in the warehouse. For nearly one-third of respondents, up to half of their reports need such data, and for about the same percentage, more than half of their reports need data located outside their data warehouse. The conclusion we can draw is that, at a fairly steady pace,

users are requesting changes to reporting requirements and need data warehouse managers to bring in new data that is not currently in the system.

For the largest share of respondents' organizations (31%), it takes from one to three months to add data into the data warehouse and make it available for reporting, with 19% indicating that it takes even longer (see Figure 8). However, the good news is that many respondents in our research are able to add new data more rapidly; 15% can do this in just one or two weeks.

**On average, how long does it take to add new data into the data warehouse and make it available for reporting?**



*Figure 8. Based on answers from 361 respondents.*

Some organizations are leveraging Hadoop. They save data in HDFS files and apply various tools to give users quick access before going through the formal ETL and data quality processes normally involved in getting data into a data warehouse. This is particularly important for new data sources such as Web logs that may or may not produce data that users want.

“We are seeing organizations using Hadoop to let users and data analysts determine whether they want to explore the data further,” said David Lyle, VP of product strategy for the Office of the CTO at Informatica. “If so, they can kick it over to a data warehousing team that will interview business users or data analysts to determine the benefits of digging deeper into this data. This team can then architect it and build capabilities for proper data access, analysis, and governance.” With a two-phased approach such as Lyle describes, business users can look at the data and provide feedback about its quality and relevance before the organization goes through the rigorous processes of putting it in the warehouse.

**Implementing data virtualization to increase access speed.** Data virtualization allows organizations to access multiple, distributed systems through a single layer so that users do not have to write queries to each system individually. Quick access to multiple sources that are outside the data warehouse is critical to supporting agility objectives. Some data virtualization technology solutions go beyond simple data federation to enable managed self-service for business users, real-time data transformation, profiling and cleansing, governance, and instant reuse of ETL, among other capabilities, so that users are accessing appropriately prepared and vetted data. As with the Hadoop approach discussed above, IT developers and analysts can use virtualization to show virtual data tables to users, collaborate with them to determine whether the data is what they need, and then apply ETL processes to get the data properly into the data warehouse.

The following user story describes how HealthNow implemented data virtualization and was still able to apply data governance, which is critical for organizations in the healthcare industry, where data usage regulations are stringent.

**Some organizations are leveraging Hadoop to give users quick access before going through formal ETL and data quality processes.**

**Data virtualization allows organizations to access multiple, distributed systems through a single layer.**

### USER STORY

#### **HEALTHNOW APPLIES DATA VIRTUALIZATION TO INCREASE USER SATISFACTION AND EASE GOVERNANCE.**

Legislative reforms, regulatory mandates, and changes in patient expectations have the healthcare industry in turmoil. Organizations are under pressure to increase their information prowess for both business management and patient care. HealthNow New York, one of the state's top healthcare companies (with 815,000 members, 13,000 client companies, and 2,100 employees) had to solve its data access and integration problems so that it could use information effectively to improve health outcomes, increase operational efficiency and profitability, comply with new regulations, and safeguard information privacy and security.

HealthNow's rapid growth had created a data environment that was a "hodgepodge of legacy stores built on top of each other, with no true enterprise view," said George Yuhasz, the firm's director of Data Process and Governance. With data spread across numerous departmental and personal databases, HealthNow had conflicting definitions of attributes and data entities. Operational repository updates and data integration had to be done manually with custom scripts; the data warehousing team had to respond to reporting and data access requests piece by piece. Building persistent data extracts and other development was taking too long. Frustrated users' "shadow IT" projects threatened to create even more confusion.

HealthNow made it a goal to develop a single, common enterprise framework and data integration architecture. Rather than focus solely on building an enterprise data warehouse, HealthNow chose to make data virtualization, implemented with Informatica Data Services, a key part of its solution for enabling a reporting view of disparate data sources. "We have been able to set up virtualized access pretty quickly to give users an ability to at least ask questions and see what the data looks like, with caveats in place that this mode would not necessarily perform at an industrial-strength level," said Yuhasz. "It gained traction pretty quickly from the standpoint of enabling quick prototypes of reporting layers for analytics and for doing application updates for Web services."

Yuhasz described a second advantage of virtualization: "We could say to the users, 'okay, since we keep coming up with the need to create enterprise repositories for you to query yet finding that when we need to add fields it is taking too long, what we're going to do is start to enable you to have some heavily managed yet open environments in sandbox facilities.'" Yuhasz' group implemented sandboxes to provide access to carefully governed source data and monitor what users did with it. The sandboxes let his team put essential controls in place so that they did not become phantom enterprise data stores or the basis for shadow IT organizations.

"We did this together with users as a partnership rather than through a more typical order-taking IT service delivery model," Yuhasz explained. "It required trust between the technology and analytical teams." Yuhasz said that virtualization has enabled HealthNow to "do agile, first-pass development prototypes of what we could ultimately make persistent data repositories look like, including all the necessary security, quality, and governance measures in place."

## Technology Strategies for Meeting Agile Demands

It takes not one, but several types of technology to deliver the data and analytics that businesses require in their pursuit of agility. Organizations need traditional and new technologies to work together to support, rather than obstruct, business and IT professionals as they try agile methods of development and deployment for greater flexibility and shorter time to value. Throughout this report, we have looked at how technologies fit agile objectives. In this section, we will look at research results that focus on which technologies organizations are currently using, plan to use, or have no plans to implement to address agility requirements.

Looking at front-end BI and analytics first, not surprisingly, the three technologies showing the highest current-use percentages of respondents are the mainstream BI tools: reporting and performance metrics (65%), OLAP (56%), and dashboards or portal interfaces (54%). Mobile BI and analytics tools are relatively new and thus show only 14% of respondents currently using them, which was the lowest of all the technology selections that our survey offered. However, more than three times that many respondents plan to implement mobile BI and analytics in the future. As users adopt mobile tablets and sophisticated smartphones, TDWI expects that the excitement about the role these devices could play in improving agility will translate into higher levels of BI implementation.

A good example of how mobile BI and analytics are improving agility is the experience at Novation, a leading healthcare supply chain and contracting firm that provides its alliance members with contract, price, and spend management services. (Novation won the 2012 TDWI Best Practices Award for Emerging Technologies and Methods.) Implemented with MicroStrategy Mobile, Novation's applications are useful to physicians and procurement line personnel who move about hospitals and are never tethered to one place. The applications enable these nontechnical healthcare professionals to monitor price variations within the market and review same or lower-priced products that offer the same quality of care. MicroStrategy Mobile's data visualization functionality allows Novation applications to exploit the touch and gesture features of the Apple iPads and iPhones that its customers are using.

**Improving insight with visual analysis and data discovery.** TDWI Research finds that one in four organizations are currently using visual analysis and data discovery tools, and about two in five plan to do so, with about one-fifth saying they have no plans for these tools.

More than just eye candy, data visualization is critical to user productivity, especially for those who are not adept or experienced at working with typical tabular, data-heavy reports. BI and data discovery tools are implementing data visualization to increase ease of use and improve users' ability to see patterns and trends that would be more difficult to spot in traditional reports or limited dashboards.

### Choosing the Right ETL and Data Integration Options for Agility

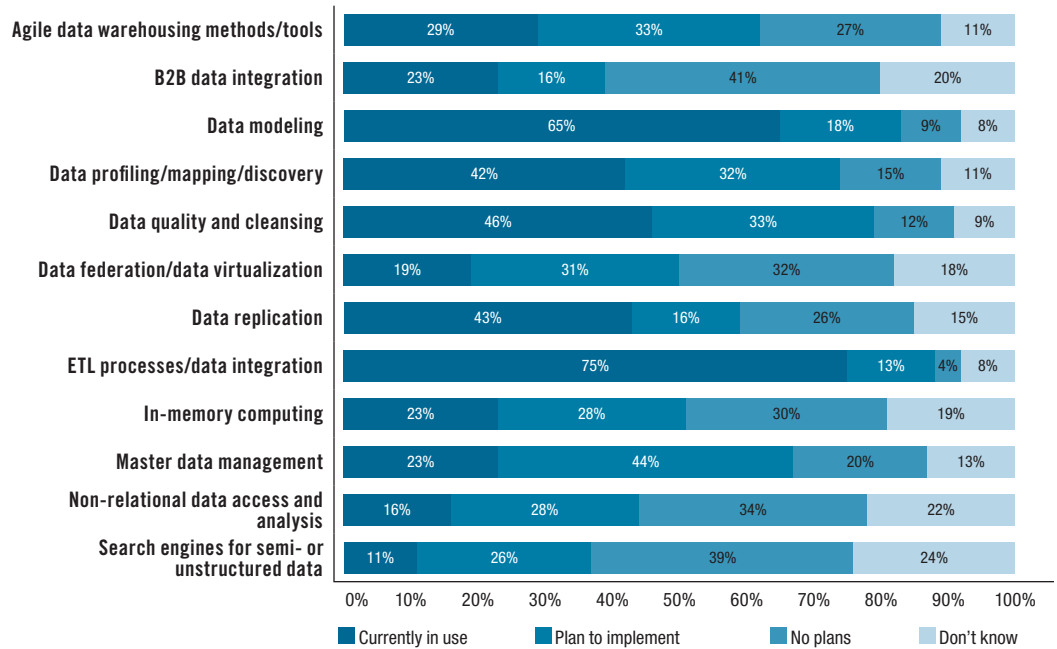
Let's turn our attention to back-end data management and integration technologies and methods currently in use. Not surprisingly, our research shows that most respondents' organizations (75%) are using ETL processes and data integration (see Figure 9). About two-thirds (65%) are using data modeling, while somewhat lower percentages are using data quality and cleansing (46%) and data profiling, mapping, and discovery (42%). Survey results for these latter two, however, show that nearly a third of respondents are planning to implement them in the future. TDWI finds that most organizations are moderately satisfied with their ability to address data quality problems.

**Organizations need traditional and new technologies to work together to support, rather than obstruct, business and IT professionals.**

**One in four organizations are currently using visual analysis and data discovery tools.**

**Most organizations are moderately satisfied with their ability to address data quality problems.**

**Which of the following data management and integration tools or services are currently deployed or are planned to be deployed to address agility requirements with BI, analytics, and data warehousing systems?**



*Figure 9. Based on answers from 343 respondents; nearly 12 responses per respondent, on average.*

**Poorly managed processes can be a drag on agility.**

ETL is a core data warehousing process. However, poorly managed processes can be a drag on agility. As each new business requirement is addressed, organizations will often amass hundreds if not thousands of extraction, transformation, and loading (ETL) processes until they bog down performance and make it exceedingly complex to make changes. “Orphaned” ETL processes that no longer have an owner or purpose become common. Reducing the morass of data integration and ETL processes should be a key part of improving agility and implementing agile methods. Our research finds that most organizations are moderately satisfied with the efficiency of their ETL development and deployment. In general, a best practice is to think about ETL testing and proactive monitoring of ETL operations and development up front in the project to alleviate challenges later.

Organizations that are maturing in their use of agile methods are seeking to use them to improve the quality and speed of development of ETL and data integration processes (agile methods will be discussed in more detail later). Some are using tools to automate or encapsulate ETL, data quality, and related steps to shield users from data complexity and reduce hand coding by IT developers.

**Speedier development is a desirable goal, but organizations must resist the urge to cut corners.**

Although speedier development is a desirable goal, organizations must resist the urge to cut corners. Shortcuts can set organizations up for even more confusing problems when processes are not documented and are applied without proper management. “Using faster agile methods or virtualization technologies cannot be excuses for doing development wrong,” said Michael Whitehead, CEO and cofounder of WhereScape. “You still need to do development properly. Using agile methods, for example, should be just a better way of getting to where you were planning to go with your data warehouse development in the first place. Agile methods should give you a better way of getting there.”



## Options for Increasing the Breadth and Depth of Analytics

**In-memory computing is growing for agile analytics.** In recent years, the cost of computer memory has fallen while the amount of addressable memory has continued to increase. Adoption of 64-bit operating systems by software developers has made it easier for users of BI, analytics, data marts, and warehousing systems to exploit very large memory spaces. As shown in Figure 9, TDWI Research finds that adoption of in-memory computing is not yet widespread; 23% are currently using it and 28% are planning to implement it. In-memory computing plus advancements in compression techniques could enable users to apply more advanced analytics unconstrained by the performance obstacles and delays of having to retrieve data from disk.

However, in-memory computing is not always the right solution. A key concern is periodicity; if users want real-time data, organizations need to investigate how frequently the in-memory system can refresh the data. Organizations that are supporting a large number of users may face considerable challenges in keeping all of their users' individual in-memory systems updated, especially if these users are implementing customized dashboards and analytics. If more traditional systems have adequate throughput, the alternative of sending live queries to databases may be a better choice for accessing real-time data.

**Unified information access is important for breadth of analysis.** With unstructured and semistructured data sources growing, unified information access, as discussed previously in this report, could become an important technology option. The UIA category includes tools for integrating agile BI front ends with search, business glossaries, and querying capabilities for accessing all types of sources. The objective of UIA is to reduce the time and difficulty involved in working with different types of information. Our research finds that about three-quarters (77%) of respondents regard UIA as important, with 33% of those indicating it is very important.

**Cloud and software-as-a-service (SaaS) for BI are not yet the mainstream.** TDWI Research examined whether organizations are currently implementing cloud or SaaS to improve BI and analytics agility. We find that the majority of organizations is not; almost half (47%) have no plans to implement cloud or SaaS and just 14% are currently doing so. BI or analytic sandboxes in the cloud are being implemented by just 14% of respondents' organizations. About one-fifth (19%) of respondents have deployed data or analytic services in the cloud. We can conclude that organizations are still in the early stages of cloud BI and analytics.

Virtualization technologies integrated with cloud data services could be a boon for data governance, which is an area of major concern for IT regarding cloud. "Cloud and SaaS for BI and DW normally scare IT, but if organizations are using cloud services, the irony is that they could have much better governance if users are implementing cloud services," said Informatica's David Lyle. "Everything a user does could be audited and logged using data governance tools. IT could track who did what to the data, when they did, what data they needed and how long it took, and more. All of this could be stored in a repository that is viewable by IT."

## Improving User-Developer Collaboration

Many organizations are attempting to break down walls between users and developers in an effort to improve communication, development efficiency, agility, and iterative development. With improved collaboration, users and developers together can identify bottlenecks and uncover where time is being wasted due to development, testing, and deployment steps that are out of sync with changing requirements. The largest percentage of TDWI Research survey respondents (30%) indicates that

**Organizations may face considerable challenges in keeping many users' individual in-memory systems updated.**

**The majority of organizations is not currently implementing cloud or SaaS to improve BI and analytics agility.**

**Users and developers can collaborate to identify bottlenecks and uncover where time is being wasted.**

**Although collaboration is important, in most organizations data analysts work in a separate department from business teams.**

their IT and data teams work “moderately closely” with business teams and 26% work “very continuously and closely.”

Looking further into organizations’ personnel and team approaches to developing BI, analytics, and data warehousing systems, TDWI finds that although collaboration is important, in most organizations data analysts work in a separate department from business teams. Nonetheless, an increasing number of data analysts serve a cross-team function and are therefore not dedicated exclusively to one team. Fewer organizations have data analysts working in a fully decentralized fashion where they are embedded within business teams. Many IT organizations collaborate with users by developing prototypes and doing live demonstrations using real-world data to define use cases. This allows users to judge the fit and feasibility of applications as they learn about the data.

The following user story illustrates how Learning Care Group instituted procedures to get users’ feedback to developers much sooner so that business and IT could improve productivity and quality through collaboration.

### **USER STORY**

#### **LEARNING CARE GROUP USES DATA WAREHOUSING TOOLS TO REDUCE TIME TO VALUE.**

To realize business benefits from rapid growth, organizations need agile and flexible BI and data warehousing systems that can handle new user requirements and scalability challenges. Mergers and acquisitions that build growth can introduce data access, transformation, and integration complexity. Each acquired entity typically brings aboard not only its own underlying point-of-sale (POS) and other business applications, but also different data definitions, metrics, and data models. Complexity and data quality can be major sources of frustration as users try to measure and manage performance at all levels across the enterprise without a single view of data.

Learning Care Group (LCG), one of the largest for-profit childcare providers in the U.S., has grown rapidly in recent years to offer five brands, including La Petite Academy, Childtime, Tutor Time, The Children’s Courtyard, and Montessori Unlimited, and more than 950 centers that serve approximately 150,000 children. Staying within the confines of a limited budget, the company needed to develop a data warehouse to provide a single source of truth, consolidate data needs from various business functions, and improve data quality. Budget constraints meant that not only expenses but also time to value were critical; LCG could not afford extended development cycles that did not bear fruit.

LCG used WhereScape RED tools to increase agility by taking a different approach to building, deploying, and managing its data warehouse. “Rather than just keep on developing and developing and then taking a look at the data only to find out that it wasn’t right, we created a system where we could put the data in front of users fairly early on in the process to determine quality and usefulness,” said Ahmad Malik, Director of IT Application Services at LCG. Aiming for an iterative development approach with users, LCG established a data warehouse project committee for weekly, face-to-face discussions to gather feedback about development. The approach has allowed LCG to accelerate the pace of projects. IT has used the process to consolidate silos and reports and increase self-service BI through implementation of Information Builders’ WebFOCUS.

“Putting data in front of users early helps us avoid doubling efforts by having some personnel focused on extracting data and others on development,” said Malik. “Rather than just go through the usual requirements gathering, we look at the data first to determine whether to go forward with a project or not. We are now able to spend more of our time setting up views of the appropriate data and cleansing and transforming it rather than extracting what may not be useful data per each user’s request.” LCG’s IT group is making efficient use of limited resources while users are more satisfied with the data they are getting for finance, marketing, and enhanced interaction with parents and children.

## Applying Agile Methods to BI/DW Development

A strong trend in BI and data warehousing is the adoption of agile software development methods. In many organizations, IT managers and developers are scrutinizing traditional “waterfall” development as potentially one of the reasons why projects take too long and fall short of delivering value.

Although the spirit as well as many of the core principles of agile (sometimes previously referred to as “lightweight”) software development have long been part of the software industry’s culture, agile methods were formally defined in a 2001 “manifesto” written by a small group of top software developers who had been working separately to implement extreme programming, scrum, and other waterfall alternatives (see [www.agilemanifesto.org](http://www.agilemanifesto.org)). The manifesto has been helpful in guiding organizations as they seek credible alternatives to the rigid and heavily managed world of waterfall development.

Waterfall development cycles are made up of carefully sequenced steps for requirements capture, analysis, design, coding, integration, testing, installation, and maintenance. Such orderly, linear development has long been seen as critical for highly complex projects. Waterfall methods have been most successful where there are clear, predetermined, and stable objectives. Organizations have encountered frustration when they have tried to shoehorn projects with evolving and less clear objectives into waterfall cycles. BI and analytics projects often fall into this latter category; subject matter experts may have to explore data and see examples of how it is presented before they can effectively define the software’s objectives.

**Perfecting requirements too much can lead to delays.** Given the importance in waterfall methods of getting the “big requirements (or design) up front” (known in software development jargon as BRUF or BDUF) to a complete and perfect state, early development steps can take a long time. “Requirements creep, also known as scope creep, is contained through a change management process (or more accurately, a change prevention process),” write Scott Ambler and Mark Lines, two contributors to the agile manifesto.<sup>1</sup> “The goal is to minimize, if not prevent, requirements creep so as to stay on budget and schedule.” Arguing that BRUF (or BDUF) lead to “significant wastage,” Ambler and Lines recommend an agile approach to requirements because this “evolutionary approach to development is much less financially risky than serial development.”

Once the requirements are documented in a waterfall approach, developers typically work separately from users so that they can move through the steps without interference using a stable set of specifications. As steps are completed, the cycle “flows” to the next step until a finished product or prototype is available for users. With big projects such as transaction-oriented applications or enterprise data warehouses, this end result may not reach users until months if not years have passed. Fixing errors or dealing with changed requirements usually waits until the “maintenance” cycle. In this way, projects executed with waterfall methods can simply take too long for the stakeholders to realize the intended business value.

**IT managers and developers are scrutinizing traditional “waterfall” development.**

**Projects executed with waterfall methods can simply take too long for the stakeholders to realize the intended business value.**

### Agile Objective: Delivering Continuous, Incremental Value

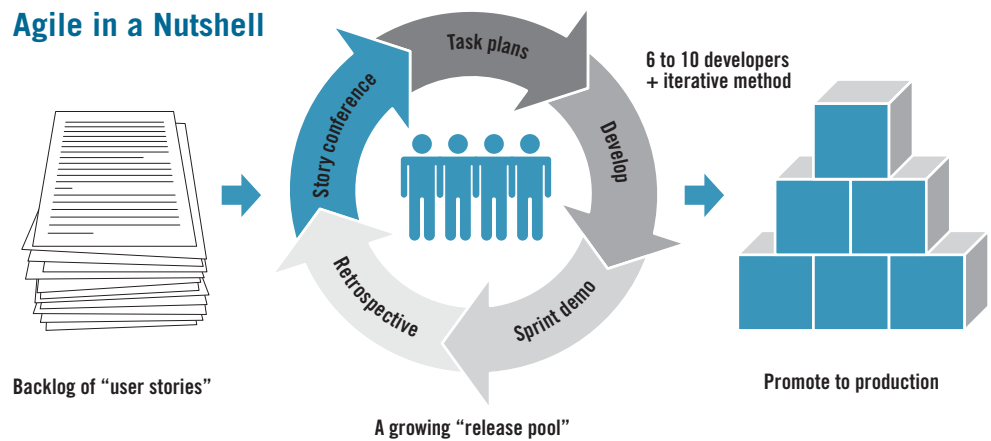
Agile development methods function with shorter, incremental cycles. These produce pieces of software that users can evaluate along the way rather than having to wait until the end of a complete cycle for a final product release or prototype. “You start working with just-in-time requirements and just-enough software architecture and you deliver small little pieces,” said Ralph Hughes, chief systems architect with Ceregenics, an agile BI and data warehousing services provider.

<sup>1</sup>Ambler, Scott, and Mark Lines [2012]. *Disciplined Agile Delivery: A Practitioner’s Guide to Agile Software Delivery in the Enterprise*, IBM Press.

**Product owners are often embedded with developers in agile teams so that they can convey information and prioritize work.**

**Scrum iteration cycles aim for agility and collaboration.** Using scrum, the most popular agile development method, “product owners,” who represent business-side stakeholders in their collaboration with developers, will use a template to help them define, in single sentences, the business needs for the product. “In traditional terms, a product owner is in many ways an empowered business analyst without the burden of the bureaucracy surrounding BRUF,” write Ambler and Lines. Product owners are often embedded with developers in agile teams so that they can convey information to the team from stakeholders and prioritize work.

The team puts the business-need statements in a prioritized order, which (as shown in Figure 10) becomes the product backlog of “user stories,” expressed in the language of business stakeholders rather than developer-speak. Beginning at the top of the list, the team’s developers take the user stories and “as fast as they can, turn the requests into shippable code,” according to Hughes. Using a scrum approach as depicted in the figure, the team iterates through a cycle of story conferences, task plans, development, sprint demos, and retrospective analysis.



*Figure 10. Agile development in a nutshell based on scrum method use. Courtesy of Ralph Hughes, Ceregenics.*

With every spin of this cycle, the team takes a few user stories off the top of the backlog, works on them, and places the resulting code in a “release pool.” When the product owner deems the features gathered in the release pool to be a usable and valuable set of enhancements, he or she will ask the developers to push that stack into production, thus achieving a “release” of new software. If the project is an agile data warehouse, for example, the team could at this time load the data, train the users, “and get users working on this small piece of the warehouse while the agile team continues to build out more features in a cyclical process,” said Hughes.

**Agile teams must recognize that once users begin to work with pieces of the project, they will likely have a different perspective on what they need.**

Scrum and other agile methods embrace one of the 12 principles from the agile manifesto: “Welcome changing requirements, even late in development; agile processes harness change for the customer’s competitive advantage.” Agile teams must recognize that once users begin to work with pieces of the project and access and analyze data associated with it, they will likely have a different perspective on what they need. “One of the toughest parts of being in business today is dealing with the ‘unknown’ unknowns,” observed Hughes. “Agile methods such as scrum give us an approach that pushes unknowns to the surface and provides a set of techniques and practices for managing them.”

## Brief Time Boxes Spur Continuous Value Creation

Projects that are implementing scrum typically feature two- to four-week “sprints” as the “time box,” or unit of development time for each “increment” of a project. Whereas long waterfall cycles carry the danger of baking into products numerous design mistakes and bad pieces of code that remain undiscovered until final release, the shorter cycles used in agile development allow projects to “fail fast” so that errors can be corrected more quickly. Complete projects may still take months or years until they reach a finished stage; with many BI or data warehousing projects, products are refined continuously and are therefore never really “done.” However, unlike with waterfall methods, agile methods give users incremental deliverables that provide business value along the way.

With agile, the “stakeholders,” who are the project’s business beneficiaries, get to work with and provide feedback about portions of the project. They can also work with data associated with the portions so that the team can adjust the project’s ultimate objectives if priorities change after users begin viewing the data. “Stakeholder collaboration with the agile team’s developers, typically through the product owners, is the key to lowering the risk of a project,” said Hughes. In a waterfall regime, Hughes observed, “IT disappears for nine months and then comes back; the big risk is that the business will have changed and stakeholders will have forgotten why they engaged in the project in the first place. Being able to poll the user community, ask what they need, and then deliver it in a time frame when they are still mentally engaged in the effort is absolutely vital.”

**“Stakeholder collaboration with the agile team’s developers, typically through the product owners, is the key to lowering the risk of a project.”**

## Tracking Adoption of Agile Methods for BI/DW

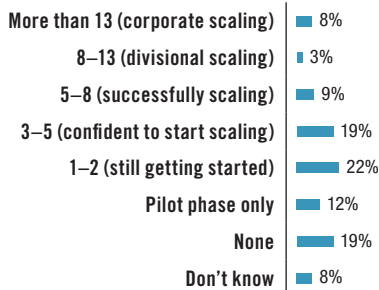
In May and June of 2012, TDWI and Ceregenics jointly conducted a research study into the BI and DW community’s experiences and impressions about the implementation, scope, and scale of agile development. (This research was separate from the main research study conducted for this TDWI Best Practices Report.) TDWI and Ceregenics wanted to know whether organizations have been successful in using agile techniques and disciplines for BI/DW to improve productivity, quality, customer satisfaction, costs, and other metrics.

Just over half of respondents in the research study were found to have at least one year’s experience with agile, with 11% indicating that they have over five years’ experience. The research finds that organizations that have gotten past the early stages with agile appear to be sticking with it. At the same time, just under half of respondents have either no experience with agile (25%) or less than a year (23%). Interviews conducted for this research study suggested that interest in agile is stronger than experience; some respondents said that their organizations are trying to follow the goals of agile development but are not yet rigorously applying the methods.

We asked how many agile projects respondents’ BI/DW organizations are currently running or have previously run. Underlining the observation that most organizations are still in the early stages of implementation, the largest percentage of respondents (22%) has just one or two projects underway; 12% are in the pilot phase and 19% do not have any projects (see Figure 11). Organizations that do have experience and confidence in agile are beginning to scale up to enterprise deployments; 20% have more than five projects that they are either currently running or that they have previously run.

**Organizations that have experience and confidence in agile are beginning to scale up to enterprise deployments.**

**How many agile development projects is your BI/DW organization currently running or has previously run?**



*Figure 11. Based on answers from 394 respondents. Research survey and analysis conducted jointly by TDWI and Ceregenics.*

**Organizations experienced with BI/DW agile development often find that they need some pipelining of work functions rather than strict scrum cycles.**

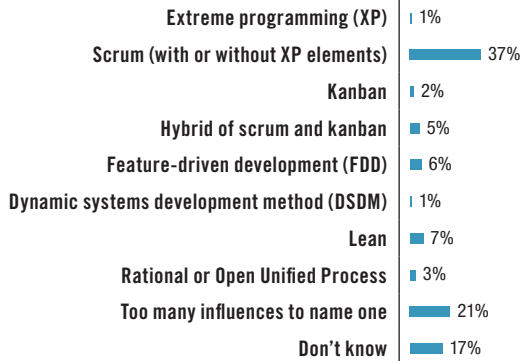
**Scrum is easiest, but hybrids find appeal.** Scrum is the most prevalent agile method; 37% of respondents indicated that this is what they use (see Figure 12). Scrum is regarded as easy to learn and simple for a facilitator to keep on track. In addition, since scrum is widely used, it is easier to find professionals with experience to share. However, the specific challenges of BI/DW, which can include the need for longer cycles, make it important for organizations to find scrum masters who have experience not only with the agile methods but also with BI/DW development. Generic agile approaches can put too much pressure on teams to promote code into release pools after every sprint. Organizations experienced with BI/DW agile development often find that they need some pipelining of work functions rather than strict scrum cycles so that team members have full sprints to address specific requirements.

Figure 12 lists the level of implementation of other types of agile methods. Beyond “too many influences to name one” (21%)—and indeed, many organizations use multiple methods—the next highest percentage of respondents say they use the lean method (7%), an established but more rigid approach than scrum based on the Toyota Production System. Lean can be useful to organizations that have been successful with scrum but are interested in creating more structure and repeatability around certain processes. Only 2% are implementing kanban, another method with its origins in Toyota for scheduling production to meet lean and just-in-time objectives.

**“Once you’ve got your agile team understanding the idea of delivering value continuously, you can then take off the pressure of the time box and focus more on a continuous flow.”**

Although it is still a small percentage, more than twice as many respondents (5%) said they are implementing a hybrid of scrum and kanban, often called “scrumban.” This method applies key principles of kanban to establish a more evolutionary approach to change. This can be important for organizations that are pursuing other process efficiency methodology goals. Analyzing the research results, Hughes was surprised that a higher percentage was not using scrumban, which in his practice he finds to be increasing in popularity. “Once you’ve got your agile team understanding the idea of delivering value continuously, you can then take off the pressure of the time box and focus more on a continuous flow. This requires some maturity, but it can reduce much of the process overhead that can come with scrum. I would predict that we will see more people applying hybrid scrum methods in the future.”

### What is the primary agile method employed by your BI/DW organization?



**Figure 12.** Based on answers from 399 respondents. Research survey and analysis conducted jointly by TDWI and Ceregenics.

## Goals and Challenges for Agile BI/DW

Whether they are combined into hybrid approaches or used separately, agile methods have a shared goal of relieving organizations of the delays and lost business value that can result from slow and rigid waterfall development cycles. “Agile processes promote sustainable development,” states the agile manifesto. “The [business] sponsors, developers, and users should be able to maintain a constant pace indefinitely.”

We can look at four areas where agile methods are contributing to BI/DW as well as some of the challenges that our research found associated with them.

### Small, Self-Organizing Teams Can Improve BI/DW Design and Development

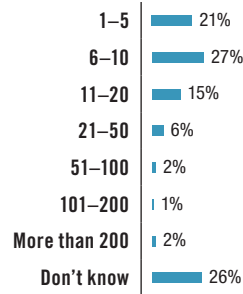
Agile teams are strengthened if they include members from different functions and are “self-organizing,” rather than organized according to corporate or IT hierarchies. Teams generally need training and coaching to help them through the first few rounds of iterations. If scrum is the method, the scrum master acts as a facilitator (not project leader, since scrum teams do not technically have leaders responsible for outcomes). He or she ensures that in daily or regular meetings, team members describe what they have done and will do, and what kinds of impediments or barriers they are confronting.

Our research finds that the most successful teams are small, with fewer than 10 people (see Figure 13). The highest percentage of respondents (27%) said that their most successful teams have 6 to 10 members. For 21%, the largest agile teams with which they have been successful is even smaller: 1 to 5 members. With large projects, therefore, organizations should consider keeping with the small-team concept and dividing work among many small teams rather than consolidating agile teams into one large group.

Co-located teams, where members are able to meet face-to-face, sometimes in a special project room or spot designated for scrum meetings, show the highest rate of success in our research. Development teams that are “near” located—that is, in different cubicles, offices, or floors—are more successful than those with personnel offshore, but not as successful as co-located teams.

**Agile teams are strengthened if they include members from different functions and are “self-organizing.”**

**What is the largest number of team members with which your BI/DW organization has been successful with agile approaches?**



*Figure 13. Based on answers from 325 respondents. Research survey and analysis conducted jointly by TDWI and Ceregenics.*

**Learning which requirements need to change can take time; too little iteration will not reveal them.**

### Addressing Change Requirements as Part of Iterations Can Reduce Delivery Delays

Many projects hit delays in delivering business value when at the end of waterfall cycles developers must fix products due to changed requirements. Agile teams are in a better position to welcome continuous communication from stakeholders about changes. However, learning which requirements need to change can take time; too little iteration will not reveal them. Organizations should choose their initial projects carefully to ensure that there will be enough iteration. “It is better to start agile with a project that is going to give you four to six iterations of two or three weeks each,” said Hughes. “Then, you will really start to see why agile is different.”

With modern BI tools, iterations for projects to develop front-end BI dashboard applications can be quick, with some involving just two-week turnarounds. Projects for building ETL or data integration routines will usually take more time and require longer iteration periods. “If you’ve got five layers to your architecture, that’s like building five applications at once,” said Hughes. Thus, organizations need to have different time boxes and different expectations for completion depending on what they are developing. Organizations that have deployed software or are implementing techniques for changed data capture, data quality, data virtualization, and other potentially time- and labor-saving functions could see shorter iteration lengths for ETL and data integration projects.

**“Classic project management tools may work against you. With agile, you actually reverse some of the usual processes.”**

### Project Management Tools May Not Provide an Accurate View of Agile Processes

Just over half of the research study’s respondents said that they are using project management tools to support their agile BI/DW projects. While some organizations just use spreadsheets, project management tools are relatively common for managing plans, schedules, resources, costs, budgets, and more. However, organizations implementing agile methods have to be cautious with these tools if they are too geared to waterfall development. “Classic project management tools may work against you,” said Hughes. “With agile, you actually reverse some of the usual processes. You build before you get a thorough design. You don’t design completely; and you don’t have a committee review a set of construction details before you start programming. Project management tools may not understand this.”

### Productivity, Quality, and Stakeholder Satisfaction Rise; Cost Management a Challenge

Our research shows that agile method implementation can improve the productivity of BI/DW development and reduce costs and risk, while increasing the quality of deliverables and customer (or



stakeholder) satisfaction (see Figure 14). More than half (55%) of respondents said that productivity is higher with agile and only 7% said it was lower. However, our research did note some areas where organizations would like to see improvement. We found that insufficient governance, documentation, planning, and analysis are matters of concern because they can hold back productivity gains.

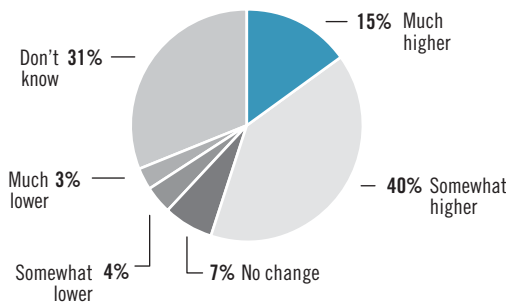
Producing quality deliverables and achieving design excellence should be key objectives of agile method implementations. In our research, the largest percentage of respondents (41%) saw quality improvements with agile for BI/DW development, compared to 8% who found quality to be lower and 19% indicating no change. This means that there is room for improvement, but it also suggests that self-organized teams working in tight time boxes to push out code quickly can produce quality results up to the standards expected for BI/DW applications. Just over half of respondents (54%) see agile as providing higher stakeholder satisfaction, while just 3% said it was lower.

**Producing quality deliverables and achieving design excellence should be key objectives of agile method implementations.**

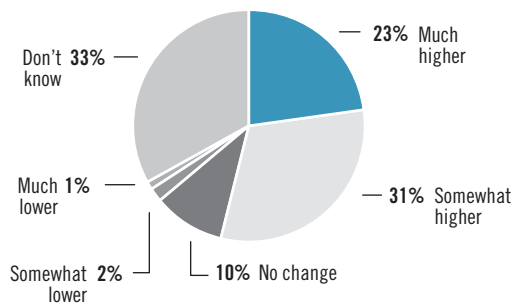
About one-third (36%) of respondents said that costs are higher; 19% said they were lower, and the same percentage saw no change (36% don't know). Although this suggests that cost is an area where agile implementations need to improve, there are some considerations that put costs in perspective. "If we have switched to a method where we have greater team productivity, better quality, and more satisfied customers, then maybe higher cost is an acceptable price to pay," said Hughes. Although some development costs may increase, the overall cost of BI/DW applications could fall due to greater efficiency, more flexibility, and customer satisfaction with the results.

**For your BI/DW organization, what has been the impact of agile development on productivity, quality, stakeholder satisfaction, and costs?**

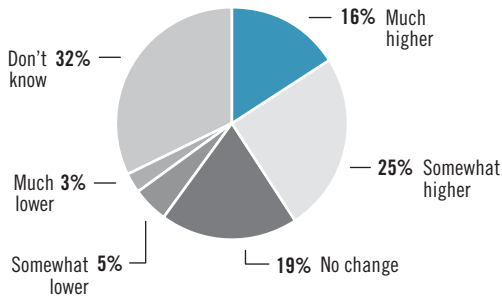
**Productivity**



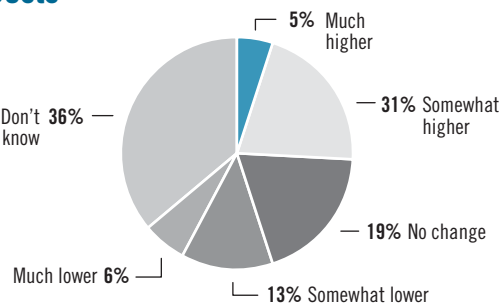
**Stakeholder satisfaction**



**Quality**



**Costs**



**Figure 14.** Agile's impact on four development KPIs. Based on answers from 339 respondents. Research survey and analysis conducted jointly by TDWI and Ceregenics.

**Longer team member engagement could account for higher costs.** Another factor in the cost equation is that agile methods tend to keep solutions architects, data modelers, and other members of teams engaged longer than with waterfall methods. “With waterfall, developers just build a spec and throw it over the wall, and then go off and work on some other project. It’s the same with data modelers, systems people, and other participants,” said Hughes. “With agile, we are working in a project room shoulder to shoulder, with just-in-time requirements and just-enough software architecture. We need those team members to stick around. We are absorbing more of their time, and of course they are charging our projects. So, costs for their input are going to go up.”

**Costs tend to be higher in the largest organizations, possibly due to “institutionalization.”**

The research finds that costs tend to be higher in the largest organizations. This could be attributable to an “institutionalization” process that can harm agile method implementations, according to Hughes. “Once agile starts to work, organizations bring in the enterprise data architecture group and the program management office, and they start auditing the teams and requiring enterprise-level specifications. I have seen such organizations then start to drift back into waterfall and lose control of costs.”

## Vendor Products

The firms that sponsored this report are among the leaders and innovators in providing tools, technology platforms, applications, and services for BI, analytics, unified information access, data warehousing, and data integration. To get a sense of where the industry as a whole is headed, here is a brief look at the portfolios of these vendors. (Note: The vendors and products mentioned here are representative, and the list is not intended to be comprehensive.)

### Attivio

Attivio’s focus is on enabling organizations to address the big data “variety” challenge by providing unified information access to structured and unstructured information. Most organizations have difficulty aggregating and analyzing information that lives in separate structured, unstructured, or semistructured silos. Attivio’s Active Intelligence Engine (AIE) combines search, text analytics, and SQL database features to enable users to gain a more complete view of their information and find correlations between sources. A critical part of AIE is its “schema-less” universal index, which is built based on whatever data and content AIE ingests. The index allows for ad hoc joins across objects without organizations having to use traditional means of predefining join keys and data relationships or having to change schema models every time users seek to include new data and content. AIE does not require “flattening,” or denormalizing data tables to support analysis; by ingesting data table by table, AIE does not lose the sense of the logical structures and data integrity. AIE supports considerable tuning of the search experience to fit users’ needs for shortening the path to information and insight.

### Informatica

Informatica is best known for its PowerCenter enterprise data integration, but the company has an extended portfolio that includes products for cloud data integration, data quality, master data management, data replication, B2B data exchange (including the HParser tool for Hadoop), and more. For achieving agility goals, one of the most important is PowerCenter Data Virtualization Edition (PC DVE), which includes Informatica Data Services (IDS) and which provides self-service-based data virtualization technology through a federated architecture as a complement to ETL. PC DVE is built on the Informatica platform; taking care of the transformation path of SQL queries

to database servers without user intervention, it can push results to users working with BI reporting and analytics tools. Integration with PowerCenter's ETL capabilities gives this technology greater functionality and role-based tools for users and IT to deliver managed self-service. It can produce reusable data integration logic as well as provide "on demand" cleansing and data profiling of virtual tables, plus features for fixing transformations on the fly. IT organizations can use Informatica to set up governed and monitored data services and sandboxes for users to determine what data and functionality they require, which IT developers can then incorporate into enterprise BI and data warehousing systems. Informatica also uniquely reuses virtual views as batch ETL.

## Jaspersoft

Jaspersoft provides a suite of BI components based on open source development. These include JasperReports Library, iReport Designer, JasperReports Server, Jaspersoft ETL, and Jaspersoft OLAP. The Jaspersoft BI Suite editions range from the Community Projects edition to the full-blown Commercial products. Jaspersoft addresses both standalone and embedded sectors of the market. In either context, the product focus is on providing a "one-to-many" reporting and analytics capability, where an IT person or power user is able to build a handful of analytics views that enable casual users to hundreds or thousands of reports or data visualizations based on the core defined analytic data views. Users can manipulate and interact with the data and define its report format or visualization. Organizations can avoid chaos by basing reports and views on a managed, multi-source metadata layer that is typically developed by "professional" power users or IT developers. Although Jaspersoft's products support self-service features for a variety of user profiles (from casual to power users and data analysts), the company does not believe that nontechnical users are best served by having a blank canvas and a series of data fields in front of them. The products help organizations develop prebuilt, organized reports, dashboards, and analytic views so that nontechnical users do not have to start from scratch. Anticipating growth in cloud computing and Web services, Jaspersoft products support the REST architecture to enable contextual integration within other software applications.

## MicroStrategy

With the 9.3 release of its Business Intelligence platform, MicroStrategy stepped up its offerings in several areas important to BI agility. An upgraded MicroStrategy Visual Insight, part of Report Services, offers easy and flexible means of building dashboards and developing and sharing many styles of charts and visualizations. Users can interact with data presented in visualizations to discover patterns, spot anomalies, perform rank and time series analysis, and more, including from mobile devices. The 9.3 release introduced a metadata search engine for MicroStrategy Web that can help users find objects more quickly, including through suggested matches. The company is active in the cloud BI services arena; along with its 9.3 release, MicroStrategy introduced Cloud Express, which enables larger groups of users to speedily perform visual data discovery and create dashboards, reports, and more in a secure fashion. Organizations can shortcut data warehouse modeling and configuration steps by putting their entire BI infrastructure in the cloud with MicroStrategy Cloud Platform.

## SAP

SAP offers a broad and deep selection of business intelligence, data warehousing, and enterprise information management (EIM) technologies as well as analytic applications. SAP customers can therefore assemble these in many different ways depending on their requirements. However, for the

pursuit of agility and user self-service, one of the key themes for SAP is to use the technologies in a concerted fashion to avoid the wasted effort and chaos associated with disconnected spreadsheets and data silos. Organizations can create and layer SAP Analytic Views, for example, to serve as OLAP cubes on top of existing warehouses, columnar stores, analytic databases on SAP HANA in-memory appliances, or other sources rather than as isolated systems. Rapid Marts, part of SAP's Data Warehousing Solutions portfolio, can also be used to address immediate BI delivery needs. A key product for agility is SAP Visual Intelligence, which provides self-service capabilities for creating shareable content and organizing and interacting with data—data that is ideally offered by clean, well-organized, and governed data warehouses and similar repositories.

### Tableau Software

Tableau addresses the agility objective by providing tools that are easy to use so that BI technology complexity does not stand in the way of working with data. User interfaces to Tableau Desktop and Server products offer drag-and-drop functionality and visual analytics tools for implementing chart types such as filled maps for integrating data with geographical views, among many others. Visualizations allow people to be inventive and take BI out of its usual numeric context so that BI practices can be applied to many other types of data. Tableau's simplicity focus is aimed at enabling organizations of all sizes to expand BI use beyond expert power users and data analysts so that managers, line staff, and virtually any employee can access live data sets easily and make decisions in the context of their responsibilities. With visualization and functionality for self-service interaction with data, Tableau can move users beyond static reports or dashboards to ask what-if questions, try new hypotheses, and see the impact of business initiatives in an ongoing fashion.

### WhereScape

WhereScape aims at increasing agility and speeding up data warehouse development, but not at the expense of good planning, design, or optimal results. WhereScape software encourages developers to engage with their data as well as the other constraints within which they must design and model. Developers can use the software to work closely and iteratively with users so that the resulting systems match users' needs and are less difficult to change when data or other elements change. WhereScape 3D is a data-driven, data warehouse planning tool. With this product, developers can document constraints, model, profile, and grab slices of data to materialize, and present the data to users to make sure that it meets their requirements. WhereScape 3D's output can be given to front-end developers to build BI reports and analytics before structures for the data warehouse or ETL processes have been built. WhereScape RED is the company's flagship integrated development environment; using wizards and automation, it takes complexity, delay, and error out of standard development steps, from creating dimensions, models, and cubes to database-specific code generation, index development, and partitioning.

## Recommendations

### Adding Flexibility and Depth to Users' BI and Analytics

**Increase self-service options for users so that they can direct their own data experiences.** For most users, the most tangible expression of agile BI and data warehousing is self-service and self-directed functionality in their tools, visual dashboards, and ETL or virtualization processes. As discussed in this report, self-service should not mean leaving users to fend for themselves; IT data management plays a critical role in enabling managed self-service functionality.

**For most users, the most tangible expression of agile BI and DW is self-service and self-directed functionality.**

**Increase users' analytical power through better data interactivity and discovery.** Many users are no longer satisfied with static, tabular presentations that are not personalized to their roles and do not allow for much data interaction. "Discovery" is how users explore data to find out what they do not know. Organizations can improve the agility of BI, analytics, and data warehousing by increasing the depth and breadth of analytics available via dashboards.

**Provide better data visualization and visual analysis to nontechnical users.** Dashboards with charts and simple graphics are a strong beginning, but organizations should evaluate the growing library of visualizations offered by BI and data discovery tools. Visualization can play a key role in self-directed data exploration.

**Address agile BI and the analytics needs of mobile device users.** Executives, managers, and frontline personnel all could gain substantially from easier access to data and analytics from their mobile devices—as long as these systems pass muster for security and governance. Ensure that objectives for agile BI and analytics include the requirements of mobile device users.

### Providing Broader and Faster Access to Diverse Data Sources

**Evaluate unified information access technologies and practices.** With human-generated and machine-generated data sources exploding, organizations need to develop technology strategies for providing users with integrated access to multiple types of information. Technologies are maturing that can provide data access and manipulation functionality for both structured and unstructured data through one environment.

**Develop technology strategies for providing users with integrated access to multiple types of information.**

**Evaluate data virtualization technology for increasing speed and diversity of data access.** Rather than move data to a single source, organizations now have maturing options for enabling queries to reach multiple and diverse data sources and bring result sets back. Data virtualization can also simplify and centralize data profiling, quality processes, security, and governance by providing a single layer for many of these activities.

**Uncover and address bottlenecks in ETL and data integration processes.** As new business requirements are met, organizations will often amass ETL processes until they choke not only performance but also overall productivity. Data warehousing management tools can help organizations take a better approach to ETL development and reduce the complexity and confusion, which will benefit agility.

**Improve how BI and data warehousing systems handle new and changing data.** Our research finds that adding new sources and types of data—including unstructured—is among the toughest challenges for organizations trying to provide agile BI and DW. Where users are likely to need multiple types of data and the addition of new sources, organizations should use development methods and design systems that anticipate change.

### Applying Agile Methods to BI and Data Warehousing Development

**Focus agile methods on producing quality deliverables and design excellence.** Although speed and flexibility get much of the attention, agile development methods can significantly improve quality. Ensure that closer collaboration between users and developers aims at quality objectives by setting up appropriate metrics.

**Address changing requirements through agile method iterations.** One of the key drawbacks of waterfall methods is that they usually do not address changed user requirements until after a significant amount of work has been completed, which then must be done over. Collaboration between business users and IT developers can capture changing requirements as part of agile iteration cycles. Using technologies to let users examine the data early as part of agile iterations and ahead of formal ETL processes can be a benefit.

**Create small, cross-functional agile development teams rather than large ones.** Research by TDWI and Ceregenics supports experiential observations that smaller agile development teams are more successful than large ones. Agile teams should include stakeholders from all business and IT functions that have a role in the project, but many organizations have found that smaller teams integrated into a whole are better than one very large team.



**Attivio**  
www.attivio.com

Attivio's unified information access platform, the Active Intelligence Engine™ (AIE), redefines the business impact of our customers' information assets, so they can quickly seize opportunities, solve critical challenges, and fulfill their strategic vision.

Attivio drives business agility by integrating and correlating disconnected silos of structured data and unstructured content in ways never before possible. Offering intuitive search capabilities, advanced text analytics, and the power of SQL, AIE seamlessly integrates with existing BI and big data tools to reveal insight that matters, through the access method that best suits each user's technical skills and priorities.



**Informatica**  
www.informatica.com

Informatica is the world's number one independent provider of data integration software. Thousands of organizations turn to Informatica to gain a competitive advantage in today's global information economy with timely, relevant, and trustworthy data for their top business imperatives. Enterprises rely on Informatica for data integration, data quality, and big data solutions to gain a competitive advantage from their information assets to grow revenues, increase profitability, further regulatory compliance, and foster customer loyalty. The Informatica Platform provides a comprehensive, unified, and open approach to lower IT costs and gain competitive advantage from data residing both on premises and in the cloud.



**Jaspersoft**  
www.jaspersoft.com

Jaspersoft empowers millions of people every day to make faster decisions by bringing them timely, actionable data inside their apps and business processes. Its embeddable, cost-effective reporting and analytics platform allows anyone to quickly self-serve and get the answers they need and scales architecturally and economically to reach everyone. Thanks to a community hundreds of thousands strong, Jaspersoft's commercial open source software has been downloaded millions of times and is used to create the intelligence inside hundreds of thousands of apps and business processes. Jaspersoft is a privately held company with offices around the world. For more information, visit [www.jaspersoft.com](http://www.jaspersoft.com) and <http://community.jaspersoft.com>.



**MicroStrategy**  
www.microstrategy.com

Founded in 1989, MicroStrategy is a global leader in business intelligence technology. MicroStrategy software enables leading organizations worldwide to analyze the vast amounts of data stored across their enterprises to make better business decisions. The MicroStrategy platform delivers actionable information to business users via the Web and mobile devices, including the iPad, iPhone, and BlackBerry. Companies choose MicroStrategy for its ease of use, sophisticated analytics, and superior data and user scalability. MicroStrategy offers free reporting software and free mobile software, along with a full array of products for any size organization across all industries. To learn more about MicroStrategy, visit [microstrategy.com](http://microstrategy.com).



**SAP**  
www.sap.com

As market leader in enterprise application software, SAP (NYSE: SAP) helps companies of all sizes and industries run better. From back office to boardroom, warehouse to storefront, desktop to mobile device—SAP empowers people and organizations to work together more efficiently and use business insight more effectively to stay ahead of the competition. SAP applications and services enable more than 194,000 customers in more than 120 countries to operate profitably, adapt continuously, and grow sustainably. For more information, visit [www.sap.com](http://www.sap.com).



**Tableau Software**  
www.tableausoftware.com

Tableau Software helps people see and understand data. Tableau's award-winning software delivers fast analytics, visualization, and rapid-fire business intelligence on data of any size, format, or subject. The result? Anyone can get answers from data quickly, with no programming required. From executive dashboards to ad hoc reports, Tableau lets you share mobile and browser-based, interactive analytics in a few clicks. More than 7,000 organizations, including some of the world's largest enterprises, rely on Tableau Software. See how Tableau can help you by downloading the free trial at [www.tableausoftware.com/trial](http://www.tableausoftware.com/trial).



**WhereScape**  
www.wherescape.com

WhereScape is a privately held, international data warehousing software company.

We design, develop, sell, and support WhereScape RED, the industry's most agile, rapid integrated development environment exclusively for building, deploying, managing, and renovating data warehouses. A second product called WhereScape 3D is newly offered as the industry's first data-driven planning tool focused on data warehousing.

WhereScape's customers **build and manage their data warehouse**, data vault, and data marts **with fewer people**, and deliver results to the business community in record time: **in days or weeks**, instead of months or years.

Our mission is our customers' mission: data warehouses right, now.

## TDWI RESEARCH

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.



1201 Monster Road SW T 425.277.9126  
Suite 250 F 425.687.2842  
Renton, WA 98057-2996 E [info@tdwi.org](mailto:info@tdwi.org)

[tdwi.org](http://tdwi.org)