



BEST PRACTICES REPORT

Q2

2017

Accelerating the Path to Value with Business Intelligence and Analytics

By David Stodder

Co-sponsored by



Transforming Data
With Intelligence™



Accelerating the Path to Value with Business Intelligence and Analytics

By David Stodder

Table of Contents

Research Methodology and Demographics	3
Executive Summary	4
The Business Imperative: Realizing Value from Data	5
BI and Analytics: Defining Success in Delivering Value	6
BI and Visual Analytics	6
Advanced Analytics	7
Determining the Value of BI and Analytics	8
Experiences and Challenges in Reducing Time to Value.	10
Organizational Commitment to Improvement.	15
Relationship of Reducing Time to Value to Other Goals	16
Priority of Reducing Time to Value Compared to Other Objectives	18
BI and Analytics Satisfaction: Quantifying Value	19
Return on Investment	20
Determining the Downstream Impact	20
Taking Action to Accelerate Time to Value.	23
Strategies for Reducing Time to Value	23
Updating Organizational and Governance Processes.	24
Enhancing the Role of Business Stakeholders	25
Encouraging Guidance from BI Teams	26
Helping Business Users Interpret Analytics	26
Making Governance a Help, Not a Hindrance.	28
Technology Priorities for Accelerating Value.	29
Confidence in As-Needed Data Access	31
Big Data Access and Interaction	31
Capitalizing on Data Platform Trends for Analytics.	33
Importance of Data, Metadata, and Semantic Integration	33
Vendor Products	36
Recommendations	39
Research Co-sponsor: SAS	41

© 2017 by TDWI, a division of 1105 Media, Inc. All rights reserved. Reproductions in whole or in part are prohibited except by written permission. Email requests or feedback to info@tdwi.org.

Product and company names mentioned herein may be trademarks and/or registered trademarks of their respective companies.

About the Author



DAVID STODDER is senior 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 and Checklist Reports on data discovery, data visualization, customer analytics in the age of social media, BI/DW agility, mobile BI, 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. You can reach him at dstodder@tdwi.org, [@dbstodder](https://twitter.com/dbstodder) on Twitter, and on LinkedIn at [linkedin.com/in/davidstodder](https://www.linkedin.com/in/davidstodder).

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, analytics, and data management research and contributes to knowledge transfer and the professional development of its members. TDWI offers a worldwide membership program, six major educational conferences, topical educational seminars, role-based training, onsite and online courses, certification, solution provider partnerships, an awards program for best practices, live webinars, resource-filled publications, an in-depth research program, and a comprehensive website: 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 management technologies, concepts, or approaches that address a significant problem or issue. Research for the reports is conducted via interviews with industry experts and leading-edge user companies and is supplemented by surveys of business and IT professionals. To support the program, TDWI seeks vendors that collectively wish to evangelize a new approach to solving problems or an emerging technology discipline. By banding together, sponsors can validate a new market niche and educate organizations about alternative solutions. To suggest a topic that meets these requirements, please contact TDWI senior research directors Fern Halper (fhalper@tdwi.org), Philip Russom (prussom@tdwi.org), and David Stodder (dstodder@tdwi.org).

Acknowledgments

TDWI would like to thank the people who contributed to this report. First, we appreciate the many users who responded to our survey, especially those who agreed 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: James Powell, James Haley, Peter Considine, Michael Boyda, and Denelle Hanlon.

Sponsors

Cambridge Semantics, Inc., Looker, Modemetric, Inc., SAP, SAS, Tableau Software, Unifi, and Zoomdata, Inc., sponsored the research and writing of this report.

Research Methodology and Demographics

Report purpose. Organizations need to accelerate the pace with which they can realize business value from data. The focus is on improving “time to value,” which is the length of time it takes from the beginning of a project to the delivery of anticipated business value. Today, as organizations grow more reliant on data to support strategic and operational decision making, delays in developing and implementing business intelligence and analytics are becoming less tenable. TDWI finds that organizations are employing new technologies and practices to realize business value from data and analytics sooner.

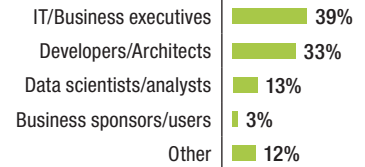
Survey methodology. In March 2017, TDWI sent an invitation via email to the BI and data professionals in our database, asking them to complete an Internet-based survey. The invitation was also posted online and in publications from TDWI and other firms. The survey collected responses from 230 respondents. From these, we excluded those who identified themselves as academics or vendor employees. The resulting 224 responses form the core data sample for this report. (Survey branching explains the varying number of respondents per question.)

Research methods. In addition to the survey, TDWI conducted telephone interviews with technical users, business sponsors, and data management experts. TDWI also received briefings from vendors that offer products related to the topic of the report.

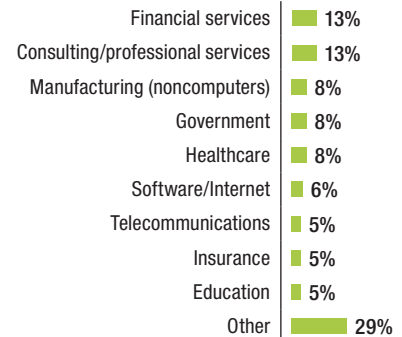
Survey demographics. The majority of survey respondents are business or IT executives (39%), followed by developers and architects (33%), data scientists and analysts (13%), and business sponsors/users (3%).

The financial services and consulting industries (13% each) dominate the respondent population, followed by noncomputer manufacturing (8%), government (8%), healthcare (8%), and other industries. Most survey respondents reside in the U.S. (54%), Europe (13%), or Canada (12%). Respondents come from enterprises of all sizes.

Position

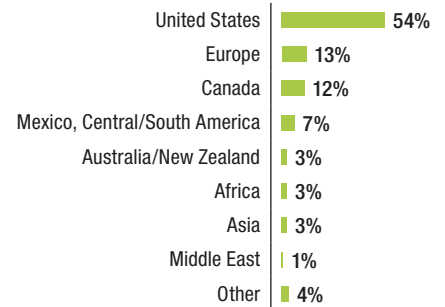


Industry

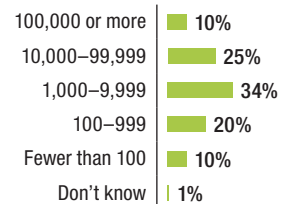


(“Other” consists of multiple industries, each represented by 3% of respondents or less.)

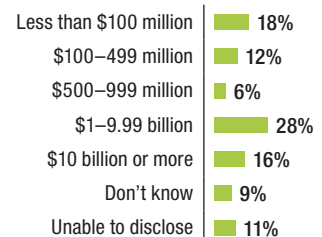
Geography



Number of Employees



Company Size by Revenue



Based on 224 respondents who completed every question in the survey.

Executive Summary

Business stakeholders fear that decisions based on slow and outmoded reporting and limited functionality will not be good decisions.

With decisions riding on the timeliness and quality of analytics, business stakeholders are less patient with delays in the development of new applications that provide reports, analysis, and access to diverse data itself. Executives, managers, and frontline personnel fear that decisions based on old and incomplete data or formulated using slow, outmoded, and limited reporting functionality will be bad decisions. A deficient information supply chain hinders quick responses to shifting situations and increases exposure to financial and regulatory risk—putting a business at a competitive disadvantage. Stakeholders are demanding better access to data, faster development of business intelligence (BI) and analytics applications, and agile solutions in sync with requirements.

Business stakeholders also want a higher return on investment (ROI) in BI, analytics, and data management. The power of information is not in question; rather, decision makers want more information sooner. Thus, one of the key ways to achieve higher ROI is by reducing the “time to value”—that is, how long it takes from the inception of a BI or analytics project to its completion and delivery of anticipated business value.

This TDWI Best Practices Report focuses on current experiences with realizing value from BI and analytics and how organizations can accelerate the path to higher value. The report looks at multiple factors impacting the ability of organizations to quickly derive greater value from data and analytics, including the organizational issues, practices, and development methods that are often just as important as keeping pace with technological innovation.

Organizations show support for spending to reduce time to value; however, this is only one of among several key goals important to gaining overall business value.

TDWI research uncovered a number of important issues that can determine the level of “downstream” value delivered by BI and analytics. Among them are the following:

- Poor project definition and scoping are often why organizations do not realize anticipated value from BI and analytics and why ROI falls short. Projects also need strong, consistent leadership and realistic budgets.
- Self-service BI, visual analytics, and data preparation are important trends, in part because organizations do not have enough skilled personnel to develop applications. Use of self-service data preparation functionality integrated with self-service BI and visual analytics can offload tasks from IT and enable users to do more on their own.
- Insufficient data quality, consistency, and completeness, as well as poor knowledge about the data’s lineage, can slow down the realization of value. Organizations are showing significant interest in metadata, data cataloging, and semantic integration.
- The majority of organizations surveyed show support for spending to reduce time to value. However, reducing time to value is only one among several key goals that organizations must balance to realize overall higher business value; for example, most research participants see increasing the accuracy of data, reporting, and analysis as just as important.
- Our research finds that self-service experiences must be managed and well-governed to avoid data chaos and missteps that could make it harder to achieve value sooner.

TDWI advises business and IT leaders to consider all the factors that contribute to the BI and analytics projects, including user ability to access relevant data and organizational ability to react with agility and flexibility. Accelerating the path to value depends on improvements in technology, methods, practices, and leadership.

The Business Imperative: Realizing Value from Data

Clive Humby, chief data scientist at Starcount, is credited with coining the oft-repeated phrase “data is the new oil.” However, Michael Palmer, executive vice president of member relations with the Association of National Advertisers (ANA), made an important observation about Humby’s notion. He wrote, “[Oil is] valuable, but if unrefined it cannot really be used. It has to be changed into gas, plastic, chemicals, etc., to create a valuable entity that drives profitable activity; so must data be broken down [and] analyzed for it to have value.”¹

Leaders at organizations of all sizes and across all industries know that to drive product and service innovation, operational efficiency, customer intelligence, and other competitive advantages, they must refine the “new oil.” Data can no longer be an afterthought—a mere byproduct of transactions and business processes. Amazon, Facebook, Google, LinkedIn, and Uber have prospered to a large degree because the creation of value from data is at the core of their business model. From start-ups to established firms, business leaders are studying what these innovators have accomplished and how to use data effectively to reach goals and objectives.

Leaders and innovators have prospered by putting the creation of value from data at the core of their business model.

Palmer’s point that only refined data has value is important to keep in mind when strategizing to put data to swift, effective use. Technologies and practices for BI, analytics, visualization, data preparation, data integration, and data management are critical to refining data so that it can be used. As business leaders expand their visions of what they would like to do with data, existing technologies and practices in these areas come under pressure to keep up. Organizations must be increasingly flexible, scalable, and capable of delivering the value of data faster and easier.

This TDWI Best Practices Report examines experiences, practices, and technology trends critical to realizing value from data sooner. TDWI research finds that organizations are dissatisfied with the time it takes for the chain of processes involved for business intelligence (BI), analytics, and data warehousing to deliver valuable data and insights to business users. In a recent TDWI survey, research participants indicated that data preparation, essential to BI and analytics, was taking too long. Nearly half (48%) answered that it was “very important” to reduce the amount of time and resources spent on data preparation processes for BI and analytics, and another 38% said it was somewhat important.²

Traditionally, BI and data warehouse development have required a lot of patience on behalf of business users as IT progressed through a long procession of steps from vision to finished systems. Technologies for self-service BI, data discovery, and visual analytics have enabled users to enjoy a shorter path to value, as have the latest self-service data preparation solutions. Cloud-based and software-as-a-service (SaaS) solutions also offer significant ways of reaching value faster. Agile methods are improving user-developer collaboration and are enabling organizations to gain at least incremental value sooner. Even so, delays remain—and not always due to technology issues. Organizational, governance, and other factors contribute to latency. This report will look at the variety of factors that need to be addressed to speed time to value.

Technologies for self-service have enabled users to enjoy a shorter path to value, but delays remain, not always due to technology.

In addition to speed, organizations need agility so that decision makers can answer unexpected questions, analyze new data, and share insights in time to make a difference. Our previous research has found that to enhance agility, organizations need to address not only the users’ front-end—and increasingly self-service—BI and analytics workspace but also the data pipeline. Users suffer inefficiency and time lost to unproductive manual data preparation, including moving and extracting data from one platform to another, manually building visualizations and models, and handwriting queries. These issues not only slow time to insight but also inhibit user

¹ See Michael Palmer, “Data Is the New Oil,” blog post, ANA.com, November 2006. http://ana.blogs.com/maestros/2006/11/data_is_the_new.html

² See *TDWI Best Practices Report: Improving Data Preparation for Business Analytics* (2016), online at tdwi.org/bpreports.

pursuit of new perspectives on the data.³ This report will look at what issues organizations are having that stand in the way of greater agility and how they might solve them.

BI and Analytics: Defining Success in Delivering Value

In the context of business intelligence and analytics, what is meant by “delivering value”? To provide an answer, we must first consider briefly what is meant by BI and analytics and the intended use of each. Both are broad terms with many overlaps, and there are healthy debates about which one subsumes the other.

BI and Visual Analytics

The ultimate goal of BI's evolution has been to enable users without deep technical knowledge to view, analyze, and communicate with data.

Business intelligence is an umbrella term that can cover everything from the discovery and collection of data to its transformation, analysis, and presentation for fact-based decision making. In the nearly three decades since the term was first applied to software, BI technologies, applications, and practices have been evolving toward making data access, analysis, and presentation easier. This evolution has led in recent years to highly visual, self-service BI and analytics with dashboards as the central interface for data access, viewing charts and other visualizations, monitoring alerts and metrics, and receiving collaborative information such as messages and annotations to reports and analysis. The ultimate goal of BI's evolution has been to make it possible for users without deep technical knowledge of programming, data access, data modeling, and other skilled tasks to view, analyze, and communicate with data.

Software vendors provide BI reporting, visualization, and analytics functionality in standalone tools (or suites of tools) and SaaS or cloud-based services, as well as embedded in other applications and cloud-based services. Visual BI and analytics products routinely run on mobile devices either natively or via a Web browser.

Most BI systems deal primarily with historical structured data, but the technology has been expanding to include semistructured and unstructured data. Alongside traditional query and reporting functionality, some BI solutions provide search and natural language processing (NLP) capabilities for working with text content and unstructured data.

Traditionally, BI has been strongest in enabling users to examine reports and selectively query data to gain historical insights (i.e., learn what has already happened). Greater access to near-real-time data now enables BI systems to provide monitoring views of the current state (i.e., what is happening now). When integrated with online analytics processing (OLAP), users can examine data more deeply to discover the *why* and *what* of their results. In addition, by using predictive analytics tools, users can build models to forecast and foresee what could happen in the future.

Self-service visual analytics solutions help bridge the gap between reporting-centric BI and advanced analytics.

Visual analytics solutions fall under the BI umbrella but put the emphasis on data discovery and using visualization to explore data from different perspectives. Whereas traditional BI systems are built around reporting, these solutions center on the experience of analysis through intuitive, graphical interfaces. Visual analytics solutions support collaboration, including through data storytelling—that is, using visualizations to build narratives about how analytical conclusions were reached and why they are significant to the organization's decisions, strategies, and operations. Self-service visual analytics solutions give users greater ad hoc querying capabilities to answer why something is happening and can help organizations bridge the gap between rigid, reporting-centric enterprise BI systems and advanced analytics.

Advanced Analytics

As analytics becomes more advanced, it combines elements of statistics, programming, computer science, operations research, data visualization, and data science. Advanced analytics dives deeper with data mining and text mining to help organizations learn from data and look for trends, patterns, and correlations to determine what will happen next. For example, the technologies and practices can be used to evaluate current performance (and predict future performance) of marketing campaigns, product and service launches, or fraud detection programs to develop strategies for achieving better outcomes.

Many advanced analytics projects deliver value through predictive and prescriptive analytics, enabling decision makers to understand probable outcomes and develop recommendations for action. Advanced analytics projects have typically been the province of experts in the fields mentioned above. However, as artificial intelligence (AI) and machine learning begin to automate data preparation, model development, and scoring steps, advancing beyond simpler BI reporting and analytics will become less intimidating for business users and analysts.

BI, visual analytics, advanced analytics, and supporting technology solutions for data preparation, integration, and management are horizontal; they can be tailored to fit a variety of business purposes or domains. This means that the value of BI and analytics is closely tied to what these technologies and practices contribute to performance management and enabling an organization to align personnel and operations with overall strategies for improving outcomes. Similarly, if an organization applies predictive analytics to optimize marketing personalization or customer retention, the value of predictive analytics is pegged to the degree to which an organization attains its desired marketing outcomes.

The value of BI and analytics is closely tied to what they contribute to performance management and alignment with strategies for improving outcomes.

Thus, it can be hard to measure the value of BI and analytics because their true impact is usually “downstream,” where personnel are focused on business goals such as closing a sale, keeping profitable customers loyal, and optimizing inventory. The bottom line is whether users can take data insights and apply them to answer business questions, solve problems, and execute according to their planned strategy.

Nonetheless, we can identify the following general areas where BI, analytics, and supporting data management and infrastructure technologies and practices should deliver value:

Actionable information. Can the system give users relevant information that applies to the roles, responsibilities, and decisions they need to make? Data visualization should play an important role in making BI and analytics results easily understood and actionable.

Single view of integrated data. Often called the “single view of the truth,” the goal of many BI and data warehousing systems is to enable users to view all the available data about a topic of interest, such as a customer. The data should have good quality, be consistent, and not be redundant.

Productivity and efficiency. Users should be able to spend less time on tedious, mundane tasks. Organizations should examine workflows associated with producing reports, building analytical models, and providing data access to users for analytics. They should aim for more efficient and repeatable patterns, which is key to operationalizing BI and analytics across the organization.

Speed. With organizations seeking to shorten decision cycles, it is important for BI and analytics to reduce latency in decision making and accelerate speed to insight and action.

Autonomy. BI and analytics systems can deliver value by enabling users to do more on their own without IT help. Users will always need guidance and mentoring, but over time they should be able to accomplish objectives increasingly on their own.

Communication and collaboration. BI and analytics, particularly with good use of visualization, should enable users to communicate data insights and share them collaboratively with colleagues, partners, and customers. As mentioned earlier, data storytelling is an important communications capability that BI and analytics should support.

Alignment with goals and strategies. BI and analytics systems should help users understand, monitor, and analyze KPIs and metrics to see how their daily activities and decisions fit into larger goals and strategies, such as financial performance, customer satisfaction, or operational efficiency.

Innovation. BI and analytics systems should support innovation by providing access to more diverse data and making it easier for users to view and interact with data in new and different ways. BI and analytics can help decision makers use data to challenge “the way we’ve always done it” assumptions and provide alternatives to hunches that are not fact based.

Determining the Value of BI and Analytics

Undoubtedly, readers can identify additional areas where BI and analytics are capable of delivering value. For this report, we asked participants to tell us how their organization determines whether BI and analytics applications, services, and systems are successfully delivering value. Although we received numerous interesting responses (more than we can publish), the following is a representative sample that illustrates how organizations define BI and analytics value:

Q. In your own words, please describe briefly how your organization determines whether BI and analytics applications, services, and systems are successfully delivering value.

- “It’s about whether the business has the ability to make decisions as their needs change. It’s about the four rights: Do they have the right information, at the right time, in the right format, to the right people?”
- “If reporting tools, metrics, and visualizations are providing accurate, actionable data, they are adding value to the organization.”
- “When these systems help me [run] my business faster and smarter, give me competitive advantage, and reduce my effort in analyzing data to make decisions.”
- “We measure on outcomes. As an organ and tissue transplant organization, we need to increase donors, authorizations, and organs transplanted. The metrics surrounding this are highly variable. BI is a success when we increase numbers in each category.”
- “We judge success based on our ability to assess, using data analytics on agency data, the degree to which executive branch agencies know the status of their resources, their current performance, and how that compares to their required performance.”
- “Senior-level executives need information on the sales and revenues first thing in the morning, so information accuracy and timely delivery is the top key success factor. As business embarks on new initiatives to bring about a change in the business process, primarily to improve sales and revenues and cut down costs and losses, analysis and information need to be available immediately and accurately. A mature BI/data warehouse platform that is capable of delivering information with the latest technologies is the second important success factor.”
- “Analytical or BI projects are always part of our corporate IT portfolio. They have to follow a strict cost-benefit calculation and be justified from a business perspective if they are to be executed. They are not purely ‘IT-driven.’”

“BI is a success when we increase numbers in each category.”

- “Value is determined by the degree to which the measures (that were identified in the project) are accepted (by the business sponsors and their users) as being realistic. The diligence (regarding acceptance that value is being delivered) varies inconsistently across the business areas within the firm.”
- “The primary KPI for analytics is an annual management survey of satisfaction with corporate functions (such as analytics). The other key metrics of success include report/application utilization rates (number of users, number of times accessed) and cost savings achieved through automation.”
- “We use KPIs to measure the before/after of our BI system implementations. We also make evidence-based decisions for any project or initiative that requires approval. BI is both a required cost of doing business and a value-driving tool.”
- “A finance-based BI competency center (BICC) is in place. We have a project gating process with mandatory business case stated. We have data governance processes.”
- “Self-service model enabled many power analysts across [the] business who are building faster business insights. Our team center of excellence (CoE) helps [with] building analytical models (predictive and prescriptive) and measures model impact to the business.”
- “We are promoting agile development methodology for BI projects and constantly validating value with business users and line of business. A successful BI project is one that is used. That’s one of our key metrics.”
- “Projects must justify operational contribution measured by increased sales, reduced costs, or improved working capital.”

“We use KPIs to measure before/after our BI system implementations. We also make evidence-based decisions for any project or initiative that requires approval.”

As we can see, some organizations determine value broadly but qualitatively—that is, considering whether applications are being used and if BI and analytics deliver (as the first respondent put it) on the “rights.” Others tie value more specifically to results in terms of business or operational outcomes, which may be measured through KPIs dedicated to monitoring the value of BI and analytics projects. Some organizations empower BICC or CoE committees to define the expected value of current or proposed projects, and then measure the impact once the projects are launched.

USER STORY WITH SINGLE SOURCE OF TRUTH, ST. MARY’S BANK DELIVERS IMPACTFUL BI

“I joined St. Mary’s Bank in 2014 to lead a core systems replacement—a ‘rip and replace,’” says Melissa Pomeroy, vice president of business information systems at the nation’s oldest credit union.

“We had been on this old series of systems for so long, there was so much data to clean up.

“We hired a data consulting group that built what is now our data warehouse. Previously, we had disparate systems and no concept of a single source of truth. With the consulting firm, we loaded our old legacy system data into the warehouse, set Tableau on top of it, and built dashboards that incorporated a set of business rules. Each department would go to its dashboard and it would show them the exact list for that day of what data they needed to clean up.

“That was our first, possibly unorthodox, application of Tableau, and it was a success. After that, we wanted to step out of reporting and into true business intelligence. We wanted to provoke action and generate excitement. We also wanted to promote some friendly competition among our nine branches. We had one resource who spent many hours a week creating a multiple-page spreadsheet—an extremely manual, color-coded spreadsheet that tracked the sales goals for each of our branches. At the beginning of each month, this spreadsheet—which contained information manually populated from multiple systems—was emailed out to all the branch managers.

“Fast forward, what we now have is a series of branch manager dashboards available to all managers and supervisors on demand. These dashboards are updated daily and provide MTD, QTD, and YTD product sales and gap-to-goal by branch and by individual sales and service representative. It shows top performers for each product and a report card for each sales and service rep. This is definitely our most-used dashboard and has had an immediate impact on our branches.

“We’re starting to hit our stride in terms of getting people excited. Now we’re looking to ‘infiltrate at the highest levels.’ We want all our leaders to be using the new BI system and leveraging the single source of truth. We want everyone to easily understand how to use this readily available data to improve the operations of their particular department, as well as gain meaningful insight that can drive key business decisions.”

Experiences and Challenges in Reducing Time to Value

Most decision makers would agree that when it comes to information, sooner is better. Knowledge workers at nearly all levels within organizations today need access to quality data and analysis to inform their decisions and actions. They can be more productive, make fewer mistakes, and offer timelier ideas for innovation, cost reduction, and improvement if they are able to work sooner with relevant data and analysis. In addition to enabling an organization to respond proactively to real-time customer behavior, data processing and analysis speed is essential to evaluating risks and protecting an organization from fraud, abuse, or regulatory violations.

Too often, knowledge workers are using inefficient means of working with data such as spreadsheets or simple, canned reports.

Organizations therefore need BI and analytics applications, services, and systems to play critical roles in reducing how long it takes knowledge workers to access the right data, process and analyze it, and distill it into something that is actionable to support decision making. Too often, knowledge workers are using inefficient means of working with data such as spreadsheets or business applications that provide simple, canned reports with little analytical functionality. A key mission of BI and analytics must be to accelerate time to insight—that is, to enable users to understand the significance of trends, patterns, and unexpected changes in the data quickly so they can make timely, high-impact decisions. Firms should continuously evaluate their BI and analytics technology, practices, and organizational culture to ensure they are speeding time to insight and reducing latency in data-driven decision making.

We asked research participants broadly their level of satisfaction with the “time to value” of BI and analytics projects—that is, the amount of time it is taking for their most recent projects to deliver intended value. More than a third (41%) are “somewhat satisfied” and just 10% are very satisfied, indicating that there is significant room for improvement. Nearly a third (31%) are somewhat unsatisfied and 14% are not very satisfied (4% did not know; no figure shown for these research results).

Over a third of research participants said their projects are delivering value somewhat faster; 24% said delivery of value is slower.

To investigate satisfaction with time to value further, we asked research participants about the pace with which their organization’s newest BI and analytics projects are delivering their intended business value and whether there has been improvement over the past 12 months (see Figure 1). Just over a third (35%) said projects are delivering value somewhat faster, while only 8% said projects are delivering value much faster. About a quarter (24%) indicated that projects are delivering at either a somewhat or much slower pace, and 28% are seeing no change (5% don’t know). The good news is that more organizations are seeing faster delivery of value than are not; however, more than half are experiencing either no change or a slower pace.

Over the past 12 months, are your organization's newest BI and analytics projects delivering their intended business value at a faster pace, at about the same pace as the previous 12 months, or at a slower pace?

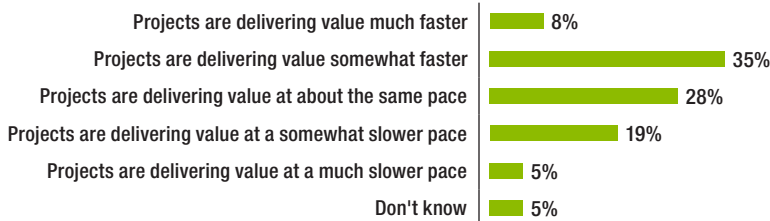


Figure 1. Based on answers from 189 respondents.

Of course, reducing time to value is not easy. The challenges are complex and involve a mixture of technology, data architecture, people, organizational, budget, and governance factors. Organizations are often unable to realize the full benefit of newer technologies because of problems in people and process areas. We asked research participants to identify their organization's most significant obstacles to reducing the time it takes for BI and analytics projects to achieve intended objectives. Figure 2 shows how participants ranked the challenges; the highest are those that the most participants ranked in their top five. The results show that significant percentages of participants' organizations are experiencing each one of the challenges.

What are your organization's most significant obstacles to reducing the time it takes for BI and analytics projects to achieve their intended objectives?

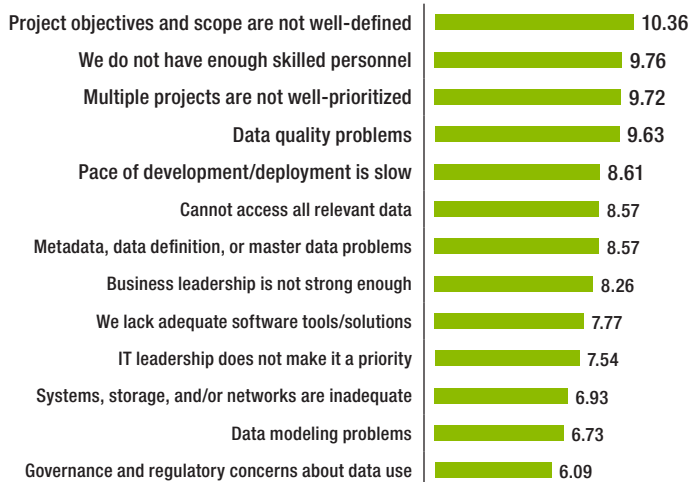


Figure 2. Based on answers from 197 respondents who ranked at least their top five. Ordered by highest weighted score based on ranking.

Additionally, TDWI asked research participants to provide more detail in their own words about what factors are either helping to accelerate BI and analytics projects in their organization or are contributing to their delay. As part of our discussion of the findings from Figure 2, we provide some of the research participants' responses about the following common challenges.

Research participants cite problems with project definition and scope as major obstacles to realizing faster time to value.

Project objectives and scope are not well-defined. This was the number one ranked obstacle for 32% of research participants; 12% put it second on their list (breakout of percentages not shown in Figure 2). A significant percentage (15%) said their chief obstacle was that “multiple projects are not well-prioritized,” with 18% citing this as their number two challenge. Project planning and management are critical to BI and analytics success, especially as projects grow and the capabilities are extended to more users. In TDWI research interviews, participants noted that as the scope of a project broadens and the number of users expands, BI teams often remain the same size; in other words, they must do more with less. This means that BI team efficiency and productivity are critical; good planning and leadership to keep projects focused on stated objectives are essential.

Research participants related their experiences in comments about project challenges, including project definition, funding, and leadership:

- “We are moving faster due to improved processes, increased experience, and greater discipline focusing on BI-related projects. Our BI team is asked to contribute on non-BI-related projects as a result of our enterprise-level data and process awareness.”
- “Projects have been delivered at a pace that delivered value to the client by ensuring the project scope was maintained and the priorities were agreed upon by all stakeholders to successfully execute the solution. Ensuring proper access to all data sources necessary for execution (or a relevant subset of data) for proper profiling and testing was important to establish in the initial stages of the project’s start to develop, build, and formally test the solution. Capturing functional requirements necessary for the project’s delivery and properly communicating the requirements to the technical team were important for solution delivery and execution in a timely manner.”
- “There has been a better agreement with the business units in the priorities for business, which has primarily been spearheaded by the C-level teams. Project funding has been better forecasted. Required business units and technology/architecture teams have been included quite early in the project phases.”
- “Our internal infrastructure has changed and is managed centrally, which gives analysts less flexibility for testing and validating and less resources for development.”
- “Projects are slower due to lack of clarity [and] organizational boundaries in a highly dependent system.”
- “Less clarity through scope and requirements definition has caused extended timelines.”
- “We are slowed by a lack of internal measurements on the impact of the project, making [it] hard to course correct.”
- “Projects get bogged down in IT processes; processes and technologies have not changed.”
- “We are doing more complex projects that, even though better, are still taking some time.”

“We are slowed by a lack of internal measurements on the impact of the project, making it hard to course correct.”

We do not have enough skilled personnel. Almost half (45%) of research participants cited this as one of their top three obstacles to reducing time to value, with 12% selecting it as their number one obstacle. Adoption of self-service BI, analytics, and data preparation solutions can help organizations shift more tasks to users so that BI teams are less burdened by routine tasks, such as developing reports, models, and dashboards. If self-service technologies are easy enough to use, business users can mature in their proficiency and gain skills to do more advanced projects on their own, rather than wait for IT development personnel to do the work for them.

In comments, research participants related their experiences regarding skills, personnel, and collaborative team challenges:

- “Our BI team has developed more experience and analytics skills are in place, so projects are getting done faster.”
- “Our projects are moving faster because we have passed the learning curve of cloud technology.”
- “Source-system teams and BI teams are starting to work together. Business partners are prioritizing the demand based on resource limitations. Effort has been spent on infrastructure stabilization.”
- “Dedicated resources and skills development would improve speed to value.”
- “We have a larger number of reports, analytics, and users to support but the resources and procedures in our organization remain unchanged. The expanded scope of the team leaves resources stretched thin.”
- “Turnover of personnel and poorly defined and managed requirements have led to a slower delivery cycle.”
- “There was a huge restructuring of our business with some workforce reduction. Less staff means less getting done.”

“Turnover of personnel and poorly defined and managed requirements have led to a slower delivery cycle.”

Data quality problems. Issues with data quality, including integrity, consistency, and completeness, often slow down projects because problems need to be addressed before users can be confident in the reporting and analysis. If data quality problems are not addressed, the downstream BI and analytics will be flawed, often requiring work to be redone and further slowing time to value. Overall, data quality problems ranked fourth among obstacles. Almost half (46%) cited data quality problems among their top three obstacles, with 14% putting it as their first choice.

Research participants related their experiences in comments about data quality challenges and data preparation challenges generally:

- “Projects are moving faster because we have better data quality.”
- “New technology is allowing users to prepare data on their own, so they can better set the pace of projects.”
- “Tools are more scripted and data velocity is high, but the quality and integrity of data points are being lost.”
- “Our slower pace is due to having to explain increasing levels of anomalies found through analysis of the data.”
- “Data quality and governance issues related to change/release management are still a problem.”
- “Projects are slower because our data ecosystem is fragmented.”

Pace of development/deployment is slow. Figure 2 shows that this obstacle ranked fifth overall. In the breakout of participants' rankings, a little under a third (29%) of research participants said this was one of their top three obstacles. Development and deployment of BI and data warehousing systems have traditionally taken a long time. Many organizations are working with agile development methods to provide users with incremental value rather than waiting for the end of long waterfall development cycles. Organizations also have technology

options such as pre-built components and appliances for BI, analytics, and data warehousing as well as cloud or SaaS solutions.

In comments, research participants provided feedback about their experiences related to development and deployment challenges:

“Projects are going faster because we have better collaboration on specifications and rollout plans.”

- “Projects are going faster because we have better collaboration on specifications and rollout plans. We have improved communication between business and IT on usage and new processes.”
- “Transformational change and other major change programs within the organization have meant reduced capacity for shortening analytics project delivery time frames.”
- “We have had success by delivering in small increments with multiple sprints/iterations. We are enabling prototyping before the final product.”
- “Business users are becoming more aware of the value of BI data and therefore are more willing to be involved with getting the up-front business rule/data modeling correct. They understand the need for involvement in testing, for example, before we can deploy systems. Even though they are busy, users are becoming more prepared to put time into IT BI projects because they see that there is something in it for them.”
- “We have just started to embrace agile and DevOps methods, but the benefits still need to show.”
- “Leadership is taking a very myopic approach to BI and data analytics, attempting to buy one enterprise solution to fix all problems instead of buying small solutions to fix actionable problems.”

Cannot access all relevant data. Users often need to reach key sources of data to gain the “single view of the truth” in terms of data about customers, product lines, or other objects of interest. Although overall this obstacle ranked sixth in Figure 2, in analyzing the breakout of participants' rankings, we found that just under a third (31%) of research participants indicated this was one of their top three obstacles; 7% said it was their leading challenge. Unable to provide access to all data in a centralized data warehouse or repository, many organizations are setting up big data lakes and cloud-based storage and then deploying federated data integration solutions to enable access.

Research participants offered feedback regarding the impact of data access and integration technology challenges on how fast BI and analytics projects can deliver value:

“Project delivery is faster because we are able to leverage in-memory capabilities.”

- “Project delivery is faster because we are able to leverage in-memory capabilities using established data sets to provide rapid prototypes and data integration on the fly.”
- “Projects are moving faster because we have new analytics tools and direct, virtual data access instead of ETL to the data warehouse.”
- “We benefit from strong data warehousing design, architecture, and infrastructure. With more data available in the data warehouse, more user data access problems are fixed.”
- “The bigger and more complex the solution becomes, the more difficult it is to add new ETL [and] new applications and to perform support processes.”
- “Projects slow down due to a dire lack of understanding about the need for data models to serve BI. Projects are also slower because we do large-scale enterprise waterfall development.”

USER STORY NORTHWESTERN MEDICINE BALANCES SELF-SERVICE AND STANDARDIZATION

As director of analytics for Northwestern Medicine in Chicago, Danny Sama faces some unique issues.

“In healthcare, our world doesn’t fit as cleanly into fact and measures and dimensions as, say, banking might,” he says. “If you look at all the KPIs the operating units want to look at, it’s in the 300–400 range.

“In the past, I’ve been a skeptic of self-service primarily because it’s been talked about as ‘buy this tool and self-service will create itself.’ I don’t think that’s in any way possible. Not only do you need governance and data curation, training and ongoing user support are critical to making self-service work.” Sama said they are aiming for self-service access only to the data warehouse system’s semantic layer, and to governed, curated data sets only to avoid having users access poor quality data.

“At this point, we’re 90% BI and 10% analytics. Requests come in and we can’t even assign a resource for three to four weeks because of the backlog. We’re trying to move to a model where there’s a help desk whose job is literally to just answer ad hoc questions same day and help increase adoption of self-service. I’m excited about that. I think it’s a somewhat novel idea that will pay huge dividends.

“I’m hoping that through self-service and standardization, we can free up resources to spend more time on analytics. We have about five predictive models deployed, but we’d like to see what more we can do to integrate predictive models into the electronic health records.”

Organizational Commitment to Improvement

Several of the participants’ comments offer evidence that organizational commitment is a critical factor in reducing delays in the development of BI and analytics projects. Commitment usually means allocating more budget for personnel and technology solutions. Our research suggests that the strength of support for spending is moderate.

We asked research participants how strong their organization’s support is for spending more than the cost of the cheapest solutions to provide technologies or cloud-based services needed to reduce time to value for their BI and analytics projects. Over half (53%) indicated that their organizations do support such spending, with 15% indicating “very strong” and 38% indicating “somewhat strong” support (no figure shown). Just 12% said their organization’s support was “very weak,” and 29% said support was “somewhat weak” (6% did not know). This suggests that while many organizations will increase spending, a significant segment will simply try to push harder on existing resources in personnel and technology to reduce time to value.

To get a deeper understanding of the strength of support, we asked research participants what their organizations would do to reduce time to value for a hypothetical BI project. In Figure 3, we can see that most organizations would take a conservative course; 35% would add 10%–25% more to their project budget. Smaller percentages would add 25%–50% more to the project budget (17%) or would consider adding up to or more than double their current project budget (7% and 2%, respectively). About a quarter (26%) of participants said they would spend nothing additional beyond their current project budget. Once again, this tells us that organizations are being prudent about increasing their budgets and that most will look for solutions that do not require dramatic spending increases.

Research finds that most organizations are willing to add conservatively to their budgets to improve time to value.

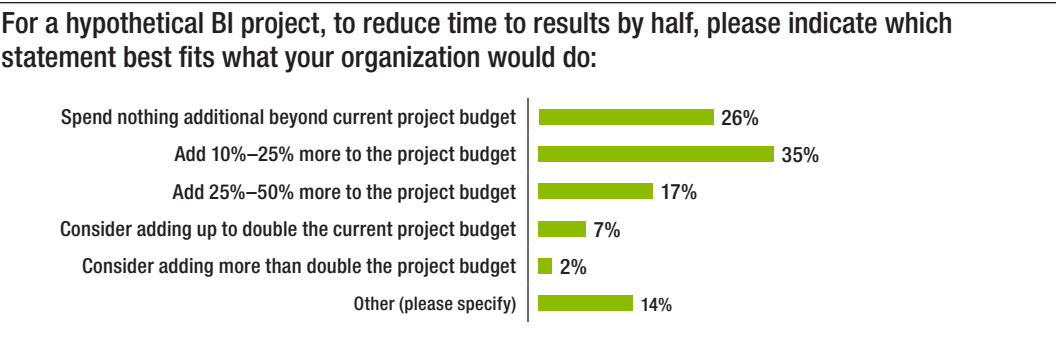


Figure 3. Based on answers from 191 respondents.

Relationship of Reducing Time to Value to Other Goals

Given the interest in reducing time to value with BI and analytics, it may seem surprising that more organizations are not willing to commit higher levels of resources to this objective. Part of the reason is that organizations are trying to balance multiple priorities in the pursuit of realizing overall business value from BI and analytics. We asked research participants about the importance of reducing time to value compared to the importance of taking steps to achieve success with other objectives (see Figure 4). Here, we can look at some of the objectives we offered in the question and what the survey results say about their importance compared to reducing time to value:

Reducing time to value is more important than democratizing BI and analytics for the majority of research participants.

“Democratizing” BI and analytics is less important than reducing time to value. Compared to the other objectives we offered in this question, this one garnered the highest percentage of respondents (40%), indicating that reducing time to value is more important. Just over a quarter (28%) said reducing time to value is just as important as this objective, while 25% said it is less important (7% don’t know). Although it obviously depends on the use case, this tells us that the majority of organizations put a higher priority on steps they can take to move projects along faster to deliver value.

Reducing time to value is somewhat less important than increasing accuracy of data, reporting, and analysis. Nearly a third (31%) said it is more important to deliver on this goal than to reduce time to value; 41% said it is as important. Of course, for many users and use cases, such as financial or other business reporting, increasing accuracy is central to the overall value of BI and analytics. Also, organizations may expect that it will take longer to develop and deploy a series of systems (including for ETL and data warehousing) that can take data through the pipeline from a raw state in source systems to a prepared state for reporting, dashboards, and analysis.

How important is the goal of reducing time to value compared to the importance of achieving success with the following BI and analytics objectives?

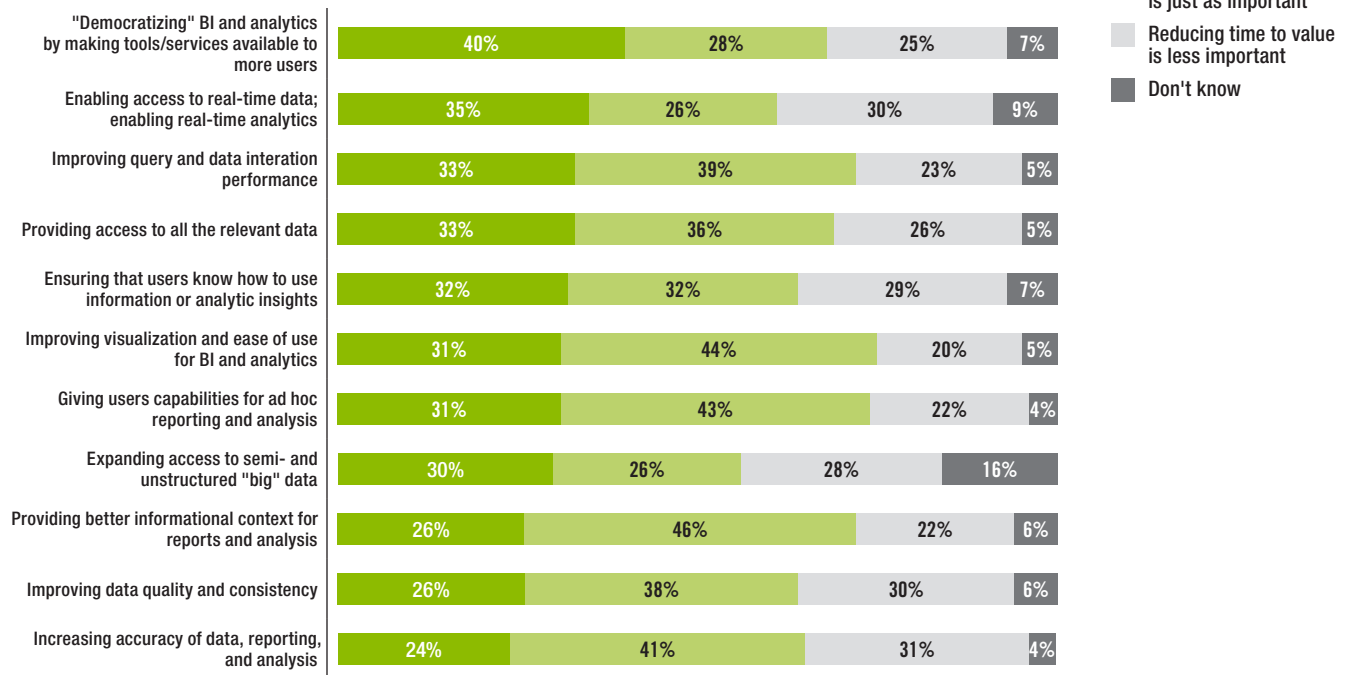


Figure 4. Based on answers from 184 respondents. Ordered by highest percentage where reducing time to value is more important.

We can see in Figure 4 that respondents view objectives for improving data quality and consistency similarly, relative to the goal of reducing time to value. Just over a quarter (26%) said reducing time to value is more important, while 30% said this is less important than the objective of improving data quality and consistency. The largest percentage (38%) regarded it as equally important. In other words, for some use cases, organizations are satisfied with lower levels of data quality and consistency—for example, where users such as data scientists want to get an early, first-cut look at whether a data source is valuable before committing to more extensive data preparation.

Reducing time to value is as important as improving visualization and ease of use, and to some it is more important. Nearly half (44%) of research participants regarded these two objectives as equally important; however, 31% said reducing time to value is more important. Less than a quarter (20%) said improving visualization and ease of use is more important. This suggests that while improvements in functionality for easier visual interaction and analysis are valuable, organizations do not want efforts in this direction to delay deployment of BI and analytics solutions.

Improving data visualization and ease of use are important, but reducing time to value is even more important, according to our research.

Again, the relative importance depends on the use case; visualization and ease of use are vital and increase the value of BI and analytics for users who are not experts. Improvement in these is also key to providing frontline personnel and other nontechnical users with quick, actionable information to support daily decisions.

Giving users capabilities for ad hoc reporting and analysis is also important. Freeing users from the limits of managed BI reporting so they can do more ad hoc reporting and analysis on their own is one of the signature objectives of self-service BI and data discovery. TDWI research finds that most organizations surveyed view this objective as having about the same relative importance to reducing time to value as improving visualization and ease of use. Nearly half (43%) see the objectives as equally important, 31% view reducing time to value as more important, and 22% view reducing time to value as less important.

Priority of Reducing Time to Value Compared to Other Objectives

To understand the importance of reducing time to value from a different perspective, we asked research participants how they would rank this goal compared to others that are typically among organizations' top priorities for BI and analytics applications, services, and systems. The largest percentage of research participants responded by ranking the goal of reducing project time to value first among the seven goals listed in the question. Here is how participants ranked them, according to our survey results (no figure shown for the research results in this section):

Reduce project time to value. Just over a third (35%) ranked this goal number one; 14% ranked it second and 14% ranked it third.

Increase utilization of current BI and analytics solutions (i.e., reduce "shelfware"). Getting more value by ensuring that users are implementing all available functionality of current systems ranked first with 20% of research participants; 16% ranked it second and 16% ranked it third.

Invest in technologies to improve performance and scalability. As BI and analytics expand, organizations need to tend to their technology infrastructure; 15% said this is their top priority, 12% ranked it second, 20% ranked it third, and 20% ranked it fourth.

Expand the number of users of BI and analytics solutions. As we saw with the previous survey question, the majority of research participants ranked reducing time to value (as well as some other goals) higher than democratization; 14% ranked it their top goal. Just under a quarter (24%) ranked it second and 16% ranked it third, while 19% ranked it fifth.

Control (or lower) total cost of ownership (TCO). This priority ranked fourth, with only 11% making reduction of TCO for BI and analytics their number one goal; the highest percentage ranked it either fourth (18%) or sixth (17%), while 12% ranked it last.

Invest in cloud services to improve business agility and elasticity. Only a small percentage (7%) selected this as their top priority for BI and analytics, but 16% ranked it second and 43% ranked it seventh.

Invest in technologies to improve availability. As users grow to depend on BI and analytics for daily decisions, availability can become an issue. However, only 6% of research participants said this is their top goal; the largest percentage (23%) ranked it fourth, while 19% ranked it fifth and 21% ranked it sixth.

Reducing time to value is more important than lowering total cost of ownership, according to our research.

BI and Analytics Satisfaction: Quantifying Value

The ultimate goal of improving time to value is to enable users to work effectively with data at the right time to impact outcomes. Projects to develop BI and analytics applications and services provide maximum value if they are delivered in sync with the organization's current initiatives, not months later. For users, deriving insights from data through implementation of BI and analytics solutions is most valuable if users can do something with the insights immediately to improve results—that is, effect reductions in cost, innovate in products and services, enable more satisfactory customer service, or meet KPIs. The closer organizations can get to delivering the right informational impact at the right time, the greater their satisfaction with BI, analytics, and supporting data infrastructure investments.

For this report, we asked research participants about their organization's overall level of satisfaction with the contribution of BI and analytics to business initiatives. In Figure 5, we can see that organizations are most satisfied with the role of BI and analytics in identifying and managing performance metrics; 21% of participants are very satisfied and 43% are somewhat satisfied. Almost two-thirds (63%) are satisfied with BI and analytics for evaluating business decisions and strategies, which is a critical use of timely data to make ongoing adjustments. Only 11% said they are very satisfied, however, and 20% are somewhat unsatisfied.

Overall, how satisfied is your organization with the contribution of BI and analytics to the following types of business initiatives in your organization?

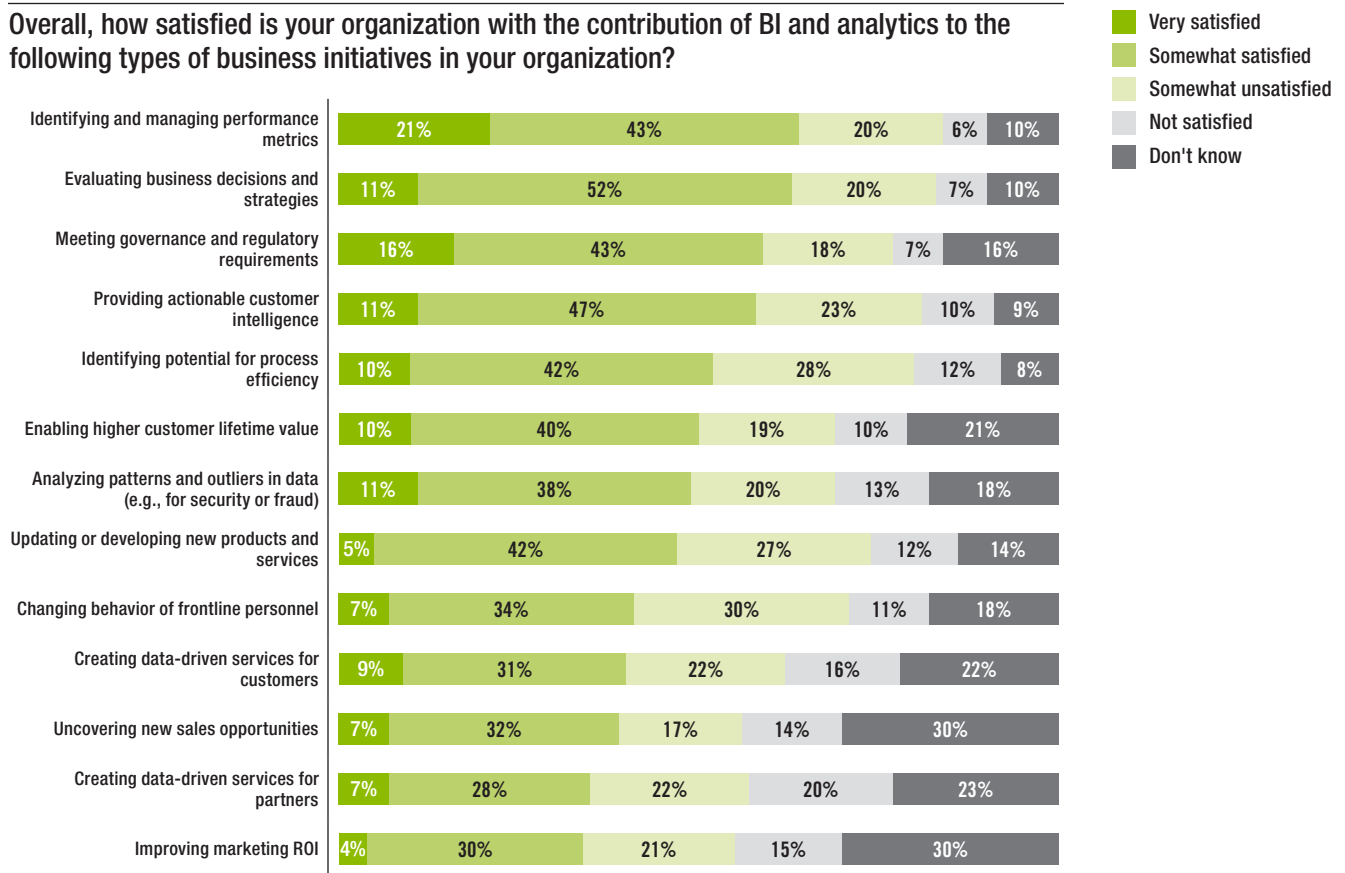


Figure 5. Based on answers from 174 respondents. Ordered by highest combined "very satisfied" and "somewhat satisfied" responses.

Only 11% of respondents are “very satisfied” with BI and analytics for actionable customer intelligence; 47% are somewhat satisfied.

Organizations still seek higher satisfaction for BI/analytics with customer-related objectives. Although just 11% of research participants said their organizations are “very satisfied” with BI and analytics for providing actionable customer intelligence, 47% are somewhat satisfied with its use for this purpose. Looking at satisfaction for related goals in Figure 5, there is room for improvement in using BI and analytics for customer-related objectives. Half (50%) of research participants are satisfied with BI and analytics for enabling higher customer lifetime value, with 10% very satisfied. Organizations are somewhat less satisfied with BI and analytics for creating data-driven services for customers; 9% are very satisfied and 31% are somewhat satisfied.

Overall, using BI and analytics to monetize data appears to be an area where organizations are still looking for improvement. Only 7% are very satisfied with BI and analytics for creating data-driven services for partners; 28% are somewhat satisfied; 22% are somewhat unsatisfied; and 20% are not very satisfied, which was the highest level of dissatisfaction recorded for this question.

Return on Investment

ROI is an important principle in assessing the value of any technology investment relative to its costs. Organizations will often use some form of ROI calculation to understand the potential gain from investment in BI and analytics technologies and solutions. The calculations can be helpful in comparing the potential ROI from BI and analytics with ROI calculations for other types of technology investments, such as ERP or CRM applications.

With BI and analytics, however, ROI is often imprecise because there can be many variables involving different types of users and different ways in which they might employ the technologies to support decision making. In fact, we interviewed users who said their organization’s metric for whether BI and analytics are delivering value is simply whether people are using the tools, because how they are being used could be quite diverse.

TDWI finds that just 12% of organizations surveyed quantify the value or ROI of all or nearly all of their projects.

TDWI finds that just 12% of organizations surveyed quantify the value or ROI of nearly all of their BI and analytics projects, while 15% do not quantify the value or ROI for any projects (no figure shown). The largest percentage (37%) assess the intended value as part of the business case but do not formally track ROI. In our interview research for this report, we found this to be what most organizations are doing. A significant percentage of respondents would prefer to be doing more defined ROI calculations; just over a quarter (28%) indicated that their organizations want to quantify the value but lack the tools or metrics to do so.

Determining the Downstream Impact

One of the biggest challenges in assessing the value or ROI of BI and analytics is that much of the impact occurs downstream in decisions and actions taken as part of business processes or in the pursuit of strategic objectives. We asked research participants whether their organizations measure or otherwise recognize downstream contributions to business objectives made possible by the achievements of successful BI and analytics projects. Most said they do so for some projects. Here are survey results for some specific types of contributions offered in our survey question (no figure shown for the research results in this section):

Giving the right users the right information at the right time. This is the essence of what a BI and data warehousing system can deliver to organizations as they pursue business objectives. About a quarter (26%) of participants said they do measure or otherwise recognize this contribution in nearly all of their projects and 46% did so for some projects.

Tangible metrics that organizations find effective for measuring “rightness” success range from whether reports or dashboards are being used by multiple people (and whether that number is increasing) to their contribution to specific goals, such as metrics tracking the percentage improvement in customer conversion rates.

Reducing the time it takes to complete business projects. When users do not have to spend most of their time looking for relevant data, massaging it to improve quality, or manually creating visualizations to present it in an understandable form, they can accelerate progress toward completion of business projects. Although only 16% of research participants said they measure or recognize this contribution of BI and analytics for all projects, almost half (49%) do so for some projects.

Just 16% of organizations surveyed measure or recognize the contribution of BI and analytics to reducing time to completion of business projects.

Providing data insights that increase customer, partner, or other stakeholder value. Sharing and collaboration on data insights can enrich relationships and build higher stakeholder value. An increasing number of organizations are using data insights to create fully monetized offerings. In our research, just over a quarter (27%) of survey participants measure or otherwise recognize the contributions of BI and analytics projects to these types of initiatives, and 44% do so for some of them.

Increasing the success of transactions and reducing the number of complaints. Many, if not most, transactions today are more than just discrete, onetime events. They are frequently part of a customer relationship life cycle that combines services and products to increase loyalty. Transactions tie into cross-channel marketing campaigns. Organizations want to make sure that fulfillment processes are in order so that customers are satisfied and metrics for complaint reduction are met. In addition, transactions themselves might be multinational, involving globally distributed manufacturing, supply, and demand chain subsidiaries and partners. Such transactions could raise a variety of tax, governance, and regulatory issues.

BI and analytics are important to managing the complexity of modern transactions by providing easier access to the data of record and for visualization of data relationships, trends, and dependencies for easier analysis. A significant percentage (40%) of research participants’ organizations are measuring or otherwise recognizing the contributions of BI and analytics for some projects and 16% are doing so for all projects. Success in this area often results from measures organizations are taking to improve data quality and speed of delivery of the most relevant data. Thus, organizations could monitor delivery of quality, relevant data for managing transactions and whether complaints are being reduced.

Reducing business risk and exposure. BI and analytics can play a valuable role in giving decision makers an informed understanding of exposure to different types of risk that affect operations, financial management, credit, supply chains, regulatory compliance, and more. Yet about a quarter (27%) of participants said their organizations rarely measure or otherwise recognize the contribution of BI and analytics for achieving this objective, and 11% never do. About a third (34%) do so for some projects and 17% do so for all projects (10% did not know).

About half (51%) of organizations surveyed measure or otherwise recognize the contribution of BI and analytics to reducing business risk.

Delays due to poor data quality or errors in analytical models can have a negative impact on risk management. Organizations should consider establishing metrics that track risk areas such as the overhead costs of doing business with certain partners and what is the exposure to vendor lock-in, including switching costs.

Providing a single version of the truth. Data chaos due to user inability to bridge numerous disparate data stores is often the main problem organizations are seeking to solve by deploying enterprise BI and data warehousing. The mission of these systems has long been to provide users with access to a complete, consistent, nonredundant, and often centrally consolidated version

of all relevant data (i.e., “the truth”). In our research here, we find that about two-thirds (67%) of research participants measure or otherwise recognize the contribution of BI and analytics to achieving this objective for some or all of their projects, with 22% doing so for all of them.

With data ever more varied, it is becoming harder to establish a single version of the truth. Organizations are likely to always have different versions and sources of data; for many use cases, the focus is shifting to using software techniques such as machine learning to gain knowledge about the data and then define levels of trust in the sources so that users understand what they are accessing and analyzing. Thus, organizations should be careful about assigning metrics broadly for establishing a single version of the truth because the requirements for it and the difficulty of obtaining it will change depending on the use case. A goal to which metrics could be applied is completeness of the data for reporting, including financial or business performance reporting.

Reaching the above objectives as well as others with BI and analytics rarely, if ever, happens overnight. This is one reason for the popularity of agile development methods that orient organizations toward delivery of smaller pieces of projects, which users can test for the meeting of requirements and then use to gain incremental value while work continues on the full application. Organizations are wise to track their progress toward these and other objectives and recognize when they have realized value. This can build confidence in BI and analytics and accelerate project momentum, which will be needed as projects grow in size and complexity.

USER STORY HAVAS STREAMLINES DATA PREPARATION TO ENHANCE CLIENT SATISFACTION

According to Sylvain Le Borgne, executive vice president of data platforms for Havas Media, “We’ve been working with data very intensely for over 15 years.

“Fifteen years ago, we were receiving very structured data. Now, with our media pool diversifying, we have to make sure we can integrate a lot of different sources and match them with each other. Digital media keeps growing; we need to integrate online and offline advertising data so clients can understand how to improve execution across channels. That’s a very important use case for us.” Le Borgne said the company is using Unifi’s software to enable data integration and preparation of the sources.

“One of the big changes in the past two years is that our clients want to evaluate their own data on top of the data we have, and they want instant results. We want to be sure to give them access to something where we prepare and process the data for them, rather than have to interface their IT with our IT. Clients want more than just access. We want to give them a recommendation or show them where they may need someone with training—that’s why we’re in business.

“Having the one tool, Unifi, that provides a single point of entry and as many automations as possible is key. We are a marketing company, not a technology company, so we need to empower users as best we can. A big competitive advantage for Havas is that we can provide a dedicated instance [of their data] to the client—an instance of our platform that they will own. However, we need to make it easy to prepare data so that data scientists did not waste time doing it.

“Now, we are trying to grow our integrated stack and add some data discovery features. A big step for us is to find that missing piece.”

Taking Action to Accelerate Time to Value

Once an organization determines that accelerating time to value is a priority, it must then develop a strategy for making it happen. A good first step is to measure how long it is currently taking for BI, analytics, and data warehousing projects to move through development, testing, and deployment cycles. We asked research participants how long are these cycles before users can apply BI and analytics products, services, or applications to their business use cases.

The range of responses proved to be quite wide, with responses distributed across a spectrum from two days or less (2%) to more than 12 months (also 2%; no figure shown). On the faster end, 15% of respondents can begin providing value to the business in two weeks or less, with an additional 17% delivering value in under a month. Toward the middle of the range, 15% take between one and two months, 16% require from two to three months, and 11% can deliver in less than four months. At the upper end of the range, users at 12% of responding companies must wait from four to six months, 5% for up to a year, and 2% for more than a year.

On the faster end, 15% of respondents said their organizations can begin providing value with BI and analytics in two weeks or less.

Of course, not all BI and analytics projects are the same. Data infrastructure demands alone can slow down projects. Some might require integration of data from multiple sources, which typically requires intensive data profiling, data quality improvement, more complex ETL, and other data preparation steps. As data sources become diverse, the lack of a common metadata repository or catalog can become a stumbling block for developers and users. Diversity in data types from semistructured and unstructured to structured data can stretch the limits of what a data warehouse can handle, leading to the need to develop a data lake. This step could require the organization to bring in new technologies along with personnel skilled in creating data lakes on Hadoop clusters.

The front-end solution requirements of users can also be complicated. Users who are primarily data consumers will have different requirements from those interested in deeper analytical discovery, including the ability to compose ad hoc queries. Data analysts, business analysts, and power users who have experience with OLAP may seek similar functionality from easier-to-use visual analytics solutions, whereas data consumers may simply desire good visualization that can present actionable information in dashboards.

Organizations should examine the range of projects underway and look at where challenges related to technology, development methods, or implementation practices are slowing time to value. In some cases, technically skilled personnel in IT are not slowing projects; rather, users are having trouble articulating their requirements due to inexperience in analyzing and visualizing data. Users may need better education and guidance in working with data to move past simple data consumption to support their decision making.

Strategies for Reducing Time to Value

In our research, TDWI examined what organizations are currently doing to increase project speed and reduce time to value. We asked research participants how often they are taking what TDWI regards as helpful steps and strategies for accelerating BI and analytics projects and realizing value sooner. In Figure 6, we can see that the most prevalent strategy was a pre-project planning approach of defining and following a project strategy to ensure alignment with corporate objectives. This is used very often or somewhat often by 75% of organizations. Other responses from this category relevant to project strategy included identifying quantifiable objectives and ways to measure value (59%), learning what business decisions will be based on the BI or analytics system (58%), and scheduling clear-cut deliverables in order from easiest to most difficult (54%).

Pre-project planning to ensure alignment with corporate objectives is the most prevalent strategy for accelerating projects.



Figure 6. Based on answers from 170 respondents. Ordered by highest combined "very often" and "somewhat often" responses.

In the category of development approaches, research participants reported that they most often use a phased deployment strategy, used by 74% of companies, followed by encouraging the reuse of analytics artifacts such as queries, models, and workflows (64%). Over half (56%) choose to speed development by simplifying the user experience.

Among the project management methodology strategies, agile principles of iterative development (60%) and ongoing user testing (56%) are common. Less common is the use of dedicated multidisciplinary agile workshops to explore solutions to business problems using data; 31% do not often take this step and 31% almost never take it.

Finally, just over half of respondents (52%) simply grant access to a set of governed data and self-service analysis tools to business analysts and let them run their own projects.

One or several of these steps or strategies could potentially be appropriate depending on user requirements and the organization's culture, including its governance needs. Developers, analysts, and business users should meet, possibly as part of a CoE or BICC, to discuss these steps and strategies to determine which ones fit best.

Updating Organizational and Governance Processes

As interest in data-driven decision making grows, it can put pressure not only on an organization's technology infrastructure but also on its culture, management, and governance. Attending to these areas is as equally vital as technology innovation for accelerating the path to

BI and analytics democratization is changing IT's role from control to collaboration, guidance, and facilitation.

value with BI and analytics. IT has traditionally played a dominant role in BI, data warehousing, and data management. However, with BI and analytics democratization, the traditional culture is changing and IT is evolving away from control toward a posture of collaboration, guidance, and facilitation.

More reliant than ever on data access and analytics for decision making, users will continue to seek access to a variety of data sources and take greater control over how they analyze, present, and share data. Even so, as users gain more control, they must share responsibility with IT to set policies for ensuring the data's quality, provenance for analytics, and governance. Collaboration between users and IT on setting BI and analytics priorities should be a key part of an organization's healthy analytical culture.

Enhancing the Role of Business Stakeholders

TDWI asked research participants what role business stakeholders (i.e., executives, managers, business analysts, and other business users) have in BI and analytics projects. We find that their involvement in project life cycles varies from development to deployment of BI and analytics applications, products, or services (no figure shown). About two-thirds of research participants (65%) said their business stakeholders allocate funding and approve budgets, which is evidence that the business side is driving the majority of BI and analytics projects. However, a smaller percentage (38%) said stakeholders are involved in mapping out project starting points and intended deliverables.

Not surprisingly, business stakeholders play a strong role in defining the questions to be explored in the BI and analytics projects; 61% of research participants indicated that stakeholders are involved in this process. A smaller percentage (41%) said business stakeholders define shared concepts for analysis, such as net profitability, which is important to ensuring access to the right data for specific metrics and that various stakeholders can understand and apply visualizations and analysis to their objectives. Slightly more research participants (44%) said business stakeholders are involved in determining business definitions and provide advice about metadata. Although data analysts and administrators are often in charge of these tasks, user input can improve the accuracy of definitions and metadata. A smaller percentage (29%) said business stakeholders help determine steps to improve data quality.

Agile methods influence development. Business stakeholders are participating more frequently in development phases, especially where organizations are implementing agile (or “agile-like”) development methods. Agile methods specify setting up product teams that include business users and developers. Business-side “product owners” define what the business needs. Teams aim at producing pieces of software that users can evaluate along the way rather than having to wait until the end of a complete “waterfall” cycle for a final product release or prototype. Agile methods work with shorter, incremental cycles of development. Use of agile or similar methods can help organizations respond to the need for business agility—that is, to dynamic business environments that make it necessary to change project requirements.

The majority of research participants (58%) said business stakeholders test product phases and iterations and provide feedback. However, only 23% said their organization's stakeholders serve on agile product teams, including as leaders. The caveat to this lower percentage is that not all organizations are using agile methods.

Research indicates that business stakeholders' most common role in projects is to define the questions to be explored.

Research finds that business stakeholders test product phases and iterations and provide feedback; only 23% said stakeholders serve on agile teams.

Encouraging Guidance from BI Teams

Self-service BI and visual analytics solutions are making it easier for business users to access, analyze, and interact with data on their own. Nevertheless, users still need guidance in selecting and working with data sources, understanding the data’s completeness and quality, and developing analytical insights. In some organizations, this is regarded as a data stewardship role performed either by data stewards or members of the BI team acting in that capacity.

TDWI finds, however, that it is not routine for IT BI teams and development experts to provide guidance to users of self-service BI and analytics technologies. Just 29% of research participants said BI teams and development experts play this role in their organizations very often (see Figure 7). A quarter (25%) said this happens on a project-by-project basis as requested, and 18% said BI teams and development experts provide guidance only when users work with IT-managed data sources, such as the enterprise data warehouse. Anecdotally, TDWI finds that users are often on their own when not working with corporate data sources. A small number of users receive guidance from power users inside departments rather than IT BI teams (12%); 15% said no one provides users with regular guidance.

Do your organization’s IT BI teams and development experts provide guidance to users of self-service BI and analytics technologies? (Please select the description that best fits your organization.)

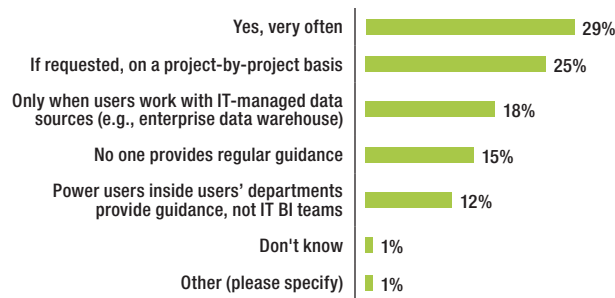


Figure 7. Based on answers from 171 respondents.

Expert guidance and stewardship can help users avoid frustration and delays caused by rework.

Expert guidance and stewardship can help users avoid frustration and the need for rework so they can realize value sooner. As a best practice, organizations should encourage and facilitate mentoring and guidance, either formally through CoE and BICC groups or informally (e.g., “lunch and learn” sessions).

Helping Business Users Interpret Analytics

Analytics, by its nature, is open to interpretation. Various users may draw different conclusions from the same data. Further, if the analysis differs from what users expected, confusion can result. Leadership may conclude that the analytics is not valuable—that something went wrong in the analysis and it should be discarded. Even more challenging is turning analytical insights that people interpret differently into shared, actionable business insights that can be applied to operational decisions.

We asked research participants how their organization copes with results that are difficult to interpret as a concrete business action (see Figure 8; respondents could select all answers that apply). The largest percentage of research participants (56%) said their organization brings in experts from within the business to potentially illuminate the result. It is wise to gain the

insights of subject matter experts (SMEs) who have the depth of knowledge to understand the data in context. About half as many research participants (26%) said their organizations will reach outside the business to experts who can shed light on the results.

Analytics results are often statistical in nature. How does your organization cope with results that are difficult to interpret as a concrete business action? (Please select all that apply.)



Figure 8. Based on answers from 170 respondents. Respondents could select all answers that apply.

A number of organizations would try to get a better look at the data or run some tests. About a quarter of research participants (26%) said their organization would wait for more data in hopes of a clearer result. A quarter (25%) said they would set up small-scale business experiments to test the results. These standard analytics practices demonstrate the difference with BI in terms of data demands; for analytics, users may need to run models and algorithms through the data, or different data, multiple times to learn from each result and fine-tune the analysis. Experienced analysts and data scientists could be helpful in guiding business users through such processes to avoid frustration.

Some organizations are fearless in using trial and error in the real world to eventually arrive at valuable results. A significant percentage of participants (26%) related that their organizations accept that some analytics results are risky; they execute on the results and, if unprofitable, reject the results. Only 9% indicated agreement with our somewhat tongue-in-cheek assertion, “We never have difficulty in analyzing our data, what are you talking about?”

About a quarter (26%) of organizations accept that some analytics results are risky; they execute on results and, if unprofitable, reject the results.

USER STORY GOVERNANCE AND METADATA CREATE FOUNDATION FOR VALUE

“We’re an agency that’s very data rich but very information poor,” says a system project analyst at a major state government agency in the U.S. “We have roughly 6,500 employees across the state. We’ve got everything from IBM DB2 on a mainframe to Oracle, Microsoft SQL Server, Access, and even Excel worksheets, if they hold data that’s not being held elsewhere. However, if we don’t know what we’ve got, we don’t know where to go to improve.

“We are now very early in the process of developing a data governance structure on an enterprisewide level. We’ve hit some barriers, though. When hiring a consultant to help us along, it seems politics got in the way. There was also no clear communication or definitions.

“When we were asking for people to develop the structure and the process, managers just assigned people without thinking about the skill sets that are needed to help. For example, a lot of the data stewards don’t know what metadata is. Adding those people early on, they hear ‘BI tool’ and start

asking ‘when do we get to play with the tool?’ Well, it’s not a tool—it’s a culture change. It’s an initiative.

“We’ve just selected a vendor to help us with the BI/DW tool, and with that we’ve pared down to just focus on metadata management. We’ve created a temporary data store where we’ve identified as many applications as we can—and we’ve identified over 1,200 in our organization—and tried to gather some of the metadata. With us narrowing our scope, it doesn’t seem that we’re foundering as much. We now have a better idea how to get where we need to be.”

Making Governance a Help, Not a Hindrance

Governance is important for overseeing sensitive data and monitoring how it flows through and outside the organization. Governance is about applying rules and policies so that only those who have rights to access the data can do so. Governance rules and policies should cover regulatory, data security, and privacy requirements and document how they are to be enforced. According to TDWI research, IT is most often in charge of governance; thus, many organizations are concerned that the spread of self-service BI and analytics with less IT oversight will open up governance problems. Organizations need to update procedures so they can manage self-service BI and analytics carefully and ensure that governance rules and policies remain effective.

Does governance make it harder for organizations to accelerate time to value? Fully 52% of research participants said their organization’s users consider governance a hindrance to improving time to value (no figure shown). The 21% who don’t think governance has any impact are almost a positive in comparison. A smaller percentage (12%) report that their users see governance as helpful to achieving time to value. Somewhat concerning, 10% of participants said their organizations do not have any governance rules or policies regarding data. A small percentage (5%) did not know whether governance is helpful or a hindrance.

The answer may be that it is both. Certainly, rules and policies can slow down user data access and analysis. However, necessary governance rules that are clearly applied early in project life cycles can help users in the long run by preventing work from having to be redone or projects abandoned if they are later found to violate governance rules and policies.

Most organizations surveyed view governance and data stewardship as enhancing their ability to realize value sooner.

We asked research participants whether the stewardship steps their organizations are taking to ensure users work with quality, governed, and appropriate data were enhancing their ability to realize value sooner (see Figure 9). Overall, participants view the role of governance and stewardship as important. Almost half (48%) said data security rules and policies are very important to realizing value sooner, and 34% view them as somewhat important. Only slightly less view implementation of regulatory policies (73%) and the monitoring of sensitive data, including applying masking and anonymization (71%), as important to their organizations’ ability to realize value sooner from BI and analytics.

At the other end of the response spectrum, 27% of participants view as somewhat unimportant the documentation of data provenance (recording what influences or changes the data over time), and 23% view this as not very important. Our anecdotal research suggests that many organizations are not yet documenting data provenance. However, nearly two-thirds (64%) said it is important to realizing value sooner to track and monitor data lineage—that is, where the data came from, where it moves, and what happens to it over time. Access to data lineage is important to users to support analytical conclusions and address questions about how users formulated them.

How important is it to your organization's ability to realize value sooner from BI and analytics to take the following governance and data stewardship steps to ensure that users are working with quality, governed, and appropriate data?

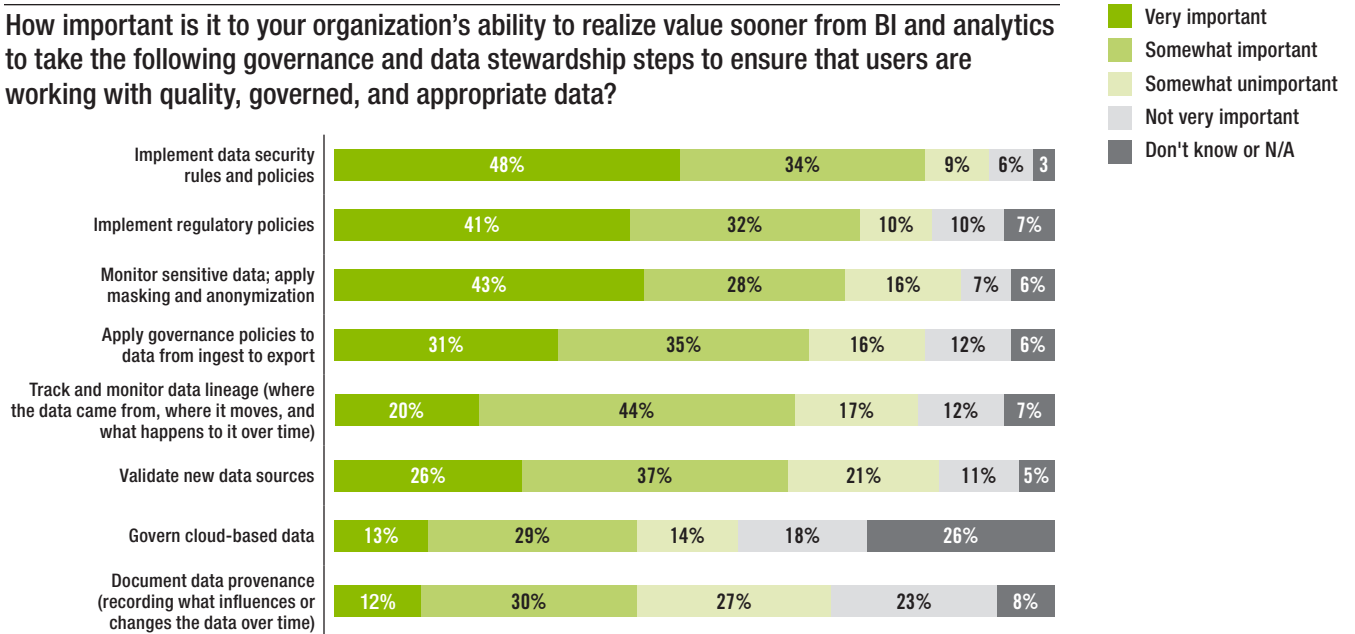


Figure 9. Based on answers from 170 respondents. Ordered by highest combined "very important" and "somewhat important" responses.

Technology Priorities for Accelerating Value

One of the driving reasons behind investment in new technologies and solutions is that organizations need to realize value from data faster and more completely. In recent years, technologies up and down the entire stack devoted to BI, analytics, and data management have advanced, enabling organizations to work with more variety and volume of data than before. SaaS and cloud-based solutions are available for organizations that prefer these options over establishing on-premises systems. Each of these technologies and solutions can play an important role. Our focus in this report is on BI, analytics, data management, and data integration.

Looking first at BI and analytics technologies and solutions, we asked research participants which BI and analytics capabilities are most important in solutions to meet their goals for accelerating progress toward realizing business value from data (see Figure 10). Here is a review of key survey results:

Capabilities for gaining detailed and refined data views are the most important. Nearly two-thirds (60%) of research participants said drilling down and slicing and dicing data, signature features of OLAP and visual analytics technologies, are very important; 32% said these are somewhat important. It is clear that to derive value from data, most users need technology flexibility to examine data from different perspectives, ask what-if questions, filter data, and go deeper than simple data consumption and visual analytics.

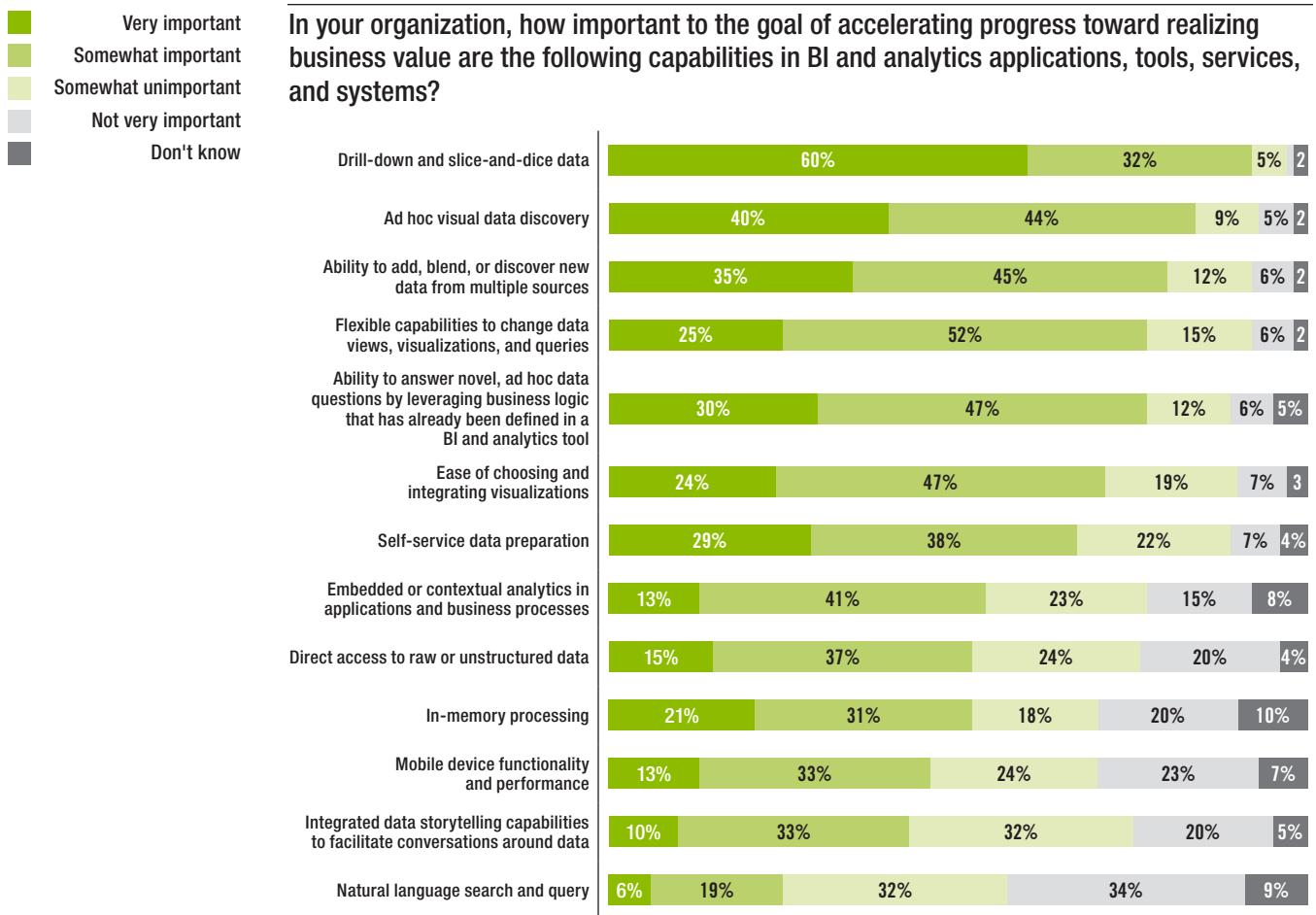


Figure 10. Based on answers from 170 respondents. Ordered by highest combined "very important" and "somewhat important" responses.

Ad hoc visual data discovery, including with predefined business logic, is in demand. TDWI finds that research participants need technology that lets users ask unexpected questions of the data and explore for new insights. Participants overwhelmingly regard ad hoc visual data discovery as vital; 40% said it was very important and 44% said it was somewhat important. Research participants also favored the ability to answer novel, ad hoc data questions by leveraging business logic that has already been defined in a BI and analytics tool; 30% said this is a very important capability and 47% said it is somewhat important.

Users need to add, combine, or discover new data from multiple sources—direct access to raw data less so. Research participants indicated that their organizations put a high priority on enabling users to combine (or "blend") and integrate data sources as needed for analytics; 35% said it was very important and 45% said it was somewhat important. Enabling users to engage in these activities on their own, without waiting for IT help, can speed time to value. In line with these findings, 67% of participants view self-service data preparation as important. Interestingly, gaining direct access to raw or unstructured data is not regarded as essential; just 15% of participants said it is very important, although 37% said it is somewhat important.

Flexibility to choose, change, and integrate data views is important. Survey responses highlighted the need for visual data interaction that is integrated with querying capabilities. More than two-thirds (71%) of research participants regard ease of choosing and integrating visualizations as important, with 24% noting that it is very important. The research finds even stronger interest in flexible capabilities to change data views, visualizations, and queries; 25% said this is very important and 52% said it is somewhat important.

Confidence in As-Needed Data Access

As users become more sophisticated with visual data discovery and analytics and seek to use data for decision making, the ultimate capability would be to have access to any data at any time.

This is particularly important where operations are depending on data access and analytics to determine next steps. If data preparation for access and analytics takes too long, users and automated applications have to wait. The latency between insight and action can slow down business processes to an unacceptable level.

Our research finds that user confidence in the completeness and timeliness of the data they are accessing is not as strong as it ought to be (no figure shown). Only 9% of research participants said their users are “very confident” in their ability to access the data they need when they need it; by contrast, nearly twice as many participants (19%) said they are “not very confident at all” in their data access. Most participants (41%) are “somewhat confident,” with 29% reporting that users are “not too confident” (2% don’t know).

Our research finds that user confidence in the completeness and timeliness of data is not strong.

Big Data Access and Interaction

“Big data” has become a catchall term for the tremendous volume and variety of data that is being generated from sources such as online customer behavior, social media networks, sensors, and mobile devices. Organizations are implementing data lakes developed on distributed Hadoop clusters, cloud-based storage, dedicated appliances, and traditional platforms to hold and manage big data.

Across industries, many organizations are investing in technologies for big data analytics so they can discover patterns, trends, and predictive insights. Big data analytics can include AI techniques such as neural networks and machine learning. Real-time streaming data is also part of the big data ecosystem. Organizations in financial services, energy, intelligence, telecommunications, and other fields are performing real-time analytics on streaming data to sense and respond to situations.

Interest in big data analytics is spurring innovation in a range of technologies. TDWI asked research participants which technologies or techniques their organizations are currently enabling or planning to enable to facilitate access to, interaction with, and analysis of big data (see Figure 11). Here are some highlights from the survey results:

Most organizations are using data connectors such as ODBC and JDBC to access big data. Nearly two-thirds (61%) of participants are currently using connectors and drivers that implement these standards. This is not surprising because most BI and analytics solutions support access and querying using these standards.

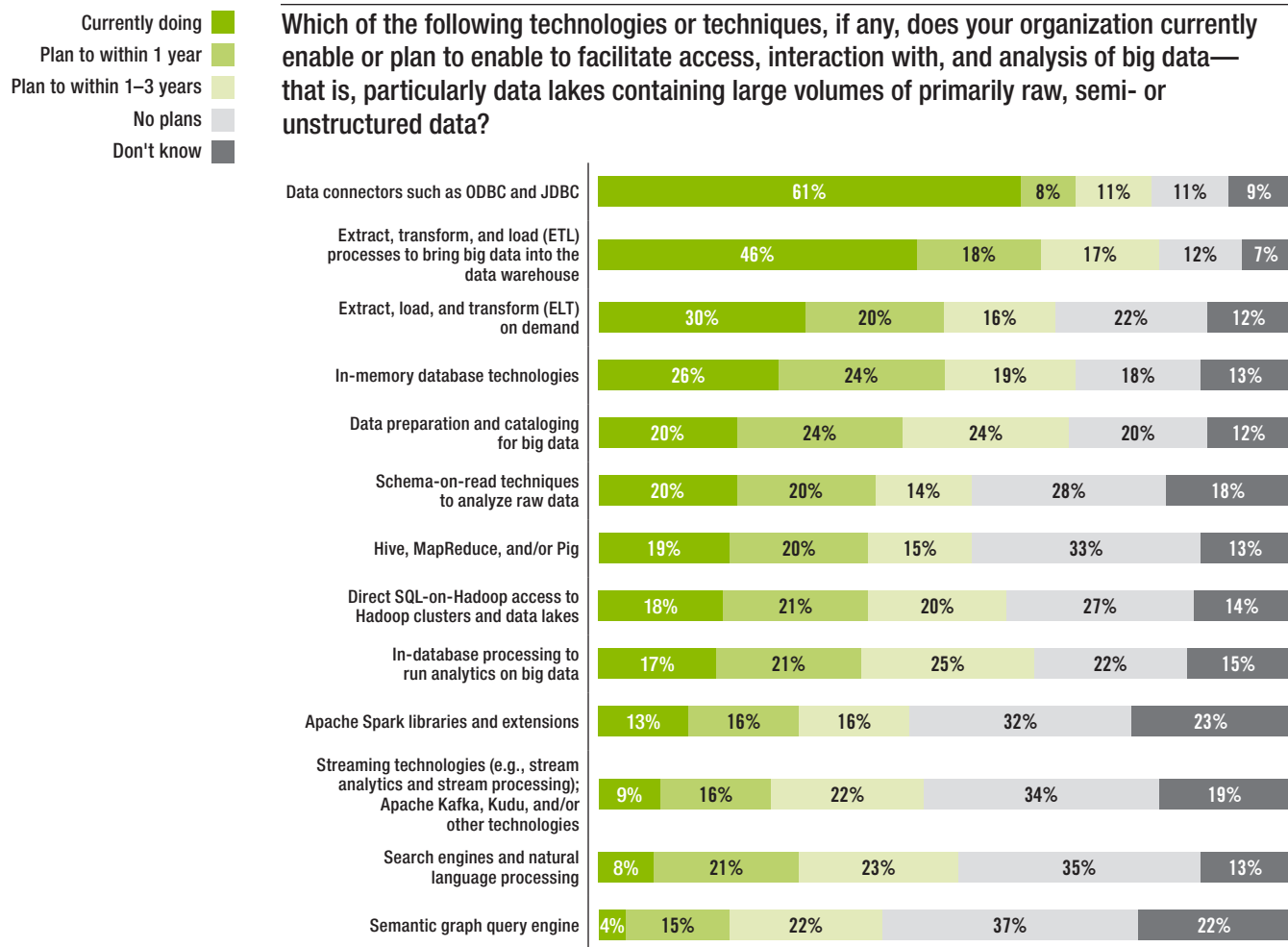


Figure 11. Based on answers from 171 respondents. Ordered by highest "currently doing" responses.

Almost half (46%) are currently using ETL processes with big data. To support BI and visual analytics, organizations' IT programmers will often use extract, transform, and load (ETL) processes to bring data from a data lake into a data warehouse, where users can then access and interact with it. Participants indicate that this fairly traditional approach will continue in the future; beyond those who are already doing this, 35% plan to do so. ETL development is often a slow, laborious bottleneck that slows time to value, which has driven many organizations to look for alternatives, including use of data lakes. TDWI finds that somewhat fewer (30%) are using the variation of extract, load, and transform (ELT) on demand, which enables greater agility to speed loading of large data sets and target transformation only as needed; 36% plan to use ELT but 22% have no plans to use it.

In-database and in-memory processing will grow. TDWI research finds that a significant percentage of organizations surveyed will be implementing these technologies with big data. Currently, 17% of participants are using in-database processing, which is an approach that uses the processing power of database platforms for analytics rather than loading the data to a separate system. Nearly half (46%) plan to use in-database processing. Slightly more (26%) are currently using in-memory database technologies, which can help BI and visual analytics

performance by avoiding I/O to disk and making use of advances in expanding server memory. Nearly as many research participants (43%) are planning to use this approach as are planning to use in-database processing.

Search engine and natural language processing use will expand. Only a small portion (8%) of research participants are currently employing these technologies, but 21% are planning to use them within one year and 23% are planning to within three years. However, 35% have no plans to use them.

More than a third (37%) plan to use semantic graph query engines. Although just a small percentage (4%) of research participants said their firms are using these technologies to analyze big data, 15% said their organizations are planning to within one year and 22% are planning to within three years. The technologies can help organizations query based on semantic knowledge and discover data relationships and associations faster.

Graph-based approaches in general appear to be becoming a more mainstream part of the BI and analytics landscape. In a related research question (no figure shown), TDWI finds that 38% of organizations surveyed are currently using graph-based approaches; 13% plan to within one year and 14% plan to within three years (20% have no plans to use graph-based approaches and 15% did not know).

Within three years, 44% of respondents are planning to use search engines and NLP; 37% plan to use semantic graph query engines.

Capitalizing on Data Platform Trends for Analytics

Despite industry attention on new options such as cloud-based storage for data lakes and data warehousing and open-source-based technologies in the Hadoop/Spark ecosystem, most organizations in our research survey are currently using database software on premises for analytics projects (78%; no figure is shown for research results in this section). This is not surprising because most organizations have these systems already installed and therefore are more likely to use them first. TDWI finds that significant percentages are using database software in a public (20%) or private (25%) cloud, with 15% and 16%, respectively, planning to use these approaches within one year.

Cloud-based systems are likely to become more prevalent as organizations seek to avoid long on-premises deployment cycles that make it difficult to respond to immediate business needs for analytics. TDWI expects that many organizations will seek to expand their architectures into “hybrids” consisting of cloud-based and on-premises systems. Indeed, in our survey for this report, we find that 26% of research participants’ organizations are already implementing hybrid architectures and 35% plan to do so within three years.

Relatively small percentages are currently using Hadoop or Spark systems on premises (16%) or in the public cloud (9%). Nevertheless, more plan to implement these technologies in the future; 27% plan to implement Hadoop or Spark on premises and 26% plan to implement these technologies in the public cloud within three years. TDWI expects to see technologies for accessing and analyzing data in Hadoop or Spark systems mature and become easier to use in coming years, which could increase the percentage of organizations implementing these systems.

More than a quarter of organizations surveyed are currently implementing hybrid cloud/on-premises architectures; 35% plan to within three years.

Importance of Data, Metadata, and Semantic Integration

BI and analytics thrive when users can bring together different pieces of data to gain perspective and context. This makes the collection, management, and availability of metadata—data (or information) about the data—one of the most important aspects of any diverse data ecosystem. BI and analytics struggle to function without good metadata.

Almost all data sources, including business applications, databases, and text content, have metadata that enables users or automated programs to learn the structure of the source’s specific cache of data, find relevant information, and discover characteristics about the data. BI tools themselves have metadata and often manage their own metadata repositories. Unfortunately, where self-service BI and visual analytics have succeeded most—outside of IT in business units and departments—metadata is often not well managed or even collected, making it difficult, if not impossible, to share.

As the enterprise BI and data warehousing paradigm changes, how organizations collect and manage metadata needs to change as well so that collecting and sharing metadata is easier in environments where nontechnical users are directing BI, not IT. Data catalogs and metadata repositories can play an important role in enabling diverse, self-service users to access descriptive information about data sets, including how they are defined, who created them, and where to find them. This information enables users to move faster in selecting and combining appropriate and trusted data for their projects. Organizations today can choose between developing and deploying data catalogs and metadata repositories on premises or using cloud-based data services. Some solution vendors are supplying natural language search and automation to make it easier and faster to develop and use catalogs and repositories.

New and evolving Semantic Web technologies are enabling organizations to move to the next level of abstraction above metadata to connect broader sources of information available on the Web with business objects and concepts using ontology. Many such technologies work with industry standards such as Web Ontology Language (OWL) and Resource Description Framework (RDF).

To learn the status of research participants’ implementation of data integration, metadata integration, and semantic integration technologies, TDWI asked which technologies they are currently or planning to enable for users to view or access diverse sources of data for BI and analytics (see Figure 12). The dominant choice is data integration technologies (72%), a broad category that can include ETL, ELT, and other tools for bringing data together, particularly into a data warehouse.

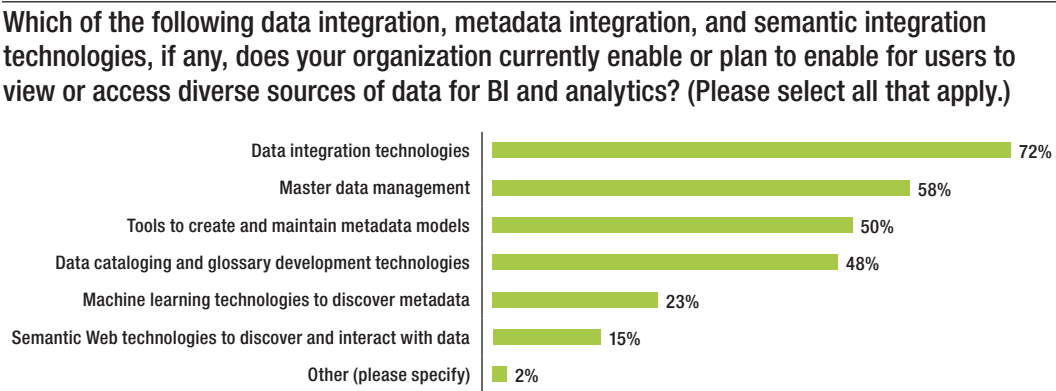


Figure 12. Based on answers from 159 respondents. Respondents could select all answers that apply.

More than half (58%) are implementing master data management to build a shared resource of “gold copy” master data or references to data. Half (50%) of those surveyed are using tools to create and maintain metadata models, and nearly as many (48%) are working with data cataloging and glossary development technologies. Machine learning is growing fast for discovering metadata; already 23% are using this technology. Finally, 15% are working with Semantic Web technologies to discover and interact with data.

More than half (58%) of organizations surveyed are implementing MDM; half are creating and maintaining metadata models.

Organizations need to continue to refine and update integration technologies to fit the evolving nature of what users need for BI and analytics. The saying “to a hammer, everything looks like a nail” is wise to keep in mind as a warning when it comes to data integration and data management. With use cases and workloads becoming more diverse, no single solution can handle every situation.

Data integration is often a source of latency. To ensure that data, metadata, and semantic integration do not become a bottlenecks that slow time to value, organizations should evaluate solutions that automate or bypass manual processes for integration and metadata collection. Organizations should examine solutions that enable self-service, so users can spend less time waiting for often overworked IT developers to program solutions and do more themselves. Users will then be able to shorten the path to using data effectively for decisions.

USER STORY FIRST TECH FEDERAL CREDIT UNION BUILDS FRONTLINE VALUE WITH ANALYTICS

First Tech Federal Credit Union’s senior manager of BI, digital analytics, and data governance, Hemanth Gangaram, knows exactly where the path to value starts. “It starts with the business, the challenges that the business is trying to solve. To that end, we do a quarterly business review with our business leaders and we try to understand how data and analytics can help them.

“We’re sitting on mines of data and we’re trying to sift through all of it and bring value to our frontline employees. They’re the ones who are engaging the members, whether over the phone or in a branch. Working on that, we had a project that rolled out last year—a predictive model for what would be the next best offer. This is a tool that we built in-house. We actually hired a Ph.D. candidate as an intern to help us build it.

“Some of the conversations that we’re having with the business are to provide customized data sets for them to quickly track more in real time, more from the Consumer Lending & Special Assets Management teams, who are looking at delinquency and credit score monitoring. We’re asking, how can we best provide that information from the user-view data stores?

“From a data strategy perspective, we’re lucky to have an executive commitment on various data initiatives that we’re working on. That kind of alignment within the organization—from IT to project management to business engagement—that’s the foremost.”

Vendor Products

The firms that sponsored this report are among the leaders and innovators in BI, analytics, and data management. To get a sense of where the industry as a whole is headed, this section takes a 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.)

Cambridge Semantics, Inc.

Founded in 2007 and headquartered in Boston, Cambridge Semantics supplies software for enterprise analytics and data management. A key differentiator is the company's application of Semantic Web standards, including storing data in Resource Description Framework (RDF) format. Using Web Ontology Language (OWL) to supply a canonical modeling language, the company's software allows users to discover, link, and analyze semantic relationships across diverse data. In 2016, Cambridge Semantics acquired SPARQL City and its graph database intellectual property, which is now part of its Anzo Smart Data Lake (ASDL) Platform. Along with graph database and modeling, the platform offers an in-memory, massively parallel processing (MPP) engine to support graph queries across distributed big data sets to rapidly discover enormous numbers of interconnected facts and relationships. On demand, organizations can set up "graphmarts" for specific areas of interest and use model-driven, late-binding data preparation and integration functionality as an alternative to traditional ETL. ASDL also offers tools for automatic query generation for accessing diverse data, as well as visualization tools to build dashboards, exploratory charts, filters, and network views. Users can also work with their chosen BI and visual analytics tools on top of ASDL.

Looker

Founded in 2011 and headquartered in Santa Cruz, California, Looker offers a Web-based platform for enabling business users to go beyond standard reporting to find and explore data in a self-service fashion. It is frequently deployed in the cloud but can be implemented on premises. Working with a shared data model, Looker platform addresses data integration, transformation, and governance as well as self-service data exploration and visualization. A core component of Looker is LookML, an abstraction layer for user-friendly development of models and for producing enhanced SQL queries that have greater expression, perform better, and can be reused in parts or in their entirety. Looker can hide complexity from nontechnical users but does not aim to be a black box. Users can see the LookML and the SQL it produces to debug it, if necessary. Instead of requiring a separate, intermediate data store, Looker supports in-database processing, which enables transformations at query time and improves exploration agility. Looker speeds deployment by providing pre-built Blocks that sit on top of data systems. The Looker Blocks Directory provides a place where Looker and partners publish pre-written, reusable code that can be deployed immediately.

Modemetric, Inc.

Modemetric, founded in 2007, is a multinational company with offices in the U.S. and Pakistan. Modemetric's focus is on making it easier for nontechnical users to discover, interact with, and analyze quality data drawn from multiple sources. Lantern, the company's flagship product, is an integrated BI, analytics, and data integration solution that can be deployed as an appliance, VMware image, or in the cloud. It has a patented dynamic metadata architecture, which helps organizations move beyond static, hard-to-change metadata repositories to address changing environments. Lantern's functionality can modify metadata automatically, on the fly, allowing

organizations to devote less time and talent to addressing changes in a one-off fashion for each source. This makes it faster and easier for users to connect to a wide variety of sources for BI and analytics. The dynamic metadata architectures plus other Lantern functionality enable IT to manage data quality, security, and governance centrally. Lantern's front-end BI and analytics tools provide automatic generation of optimized SQL code and report layouts, with slice-and-dice, filtering, and other functionality within dashboards. Users can also develop and implement predictive and other analytical models.

SAP

Founded in 1972 and headquartered in Walldorf, Baden-Württemberg, Germany (U.S. headquarters in Newtown Square, Pennsylvania), SAP is a major provider of BI and analytics applications, with SAP BusinessObjects a common enterprise BI standard. Data preparation to support BI and analytics requirements are addressed with SAP Agile Data Preparation, part of SAP Enterprise Information Management. Users work through a visual interface to prepare data sets, choosing what sources they wish to combine, from CSV files to Hadoop data sets. SAP BusinessObjects Lumira provides self-service data visualization that enables nontechnical users to gain immediate value from their data; they can connect to different types of data sources, explore the data, and develop visualizations. Lumira users access trusted, governed data through integration of visualizations with the SAP BusinessObjects platform and can use the in-memory SAP HANA platform to improve the performance of visual analytics and queries. SAP's Analytics solutions, including SAP BusinessObjects Predictive Analytics, enable users to develop, manage, and score predictive models and use other techniques such as link analysis to uncover patterns and relationships. Analytics solutions also cover enterprise performance management, including strategy management and planning, budgeting, and forecasting.

SAS

SAS, founded in 1976, offers technology products and services that span analytics, data management, and business intelligence. In 2016, SAS introduced SAS Viya, a single, cloud-ready (but also can be on-premises) environment that serves a range of users and use cases. The new in-memory runtime, SAS Cloud Analytic Server (CAS), is at the heart of SAS Viya and serves as a high-performance engine for a variety of SAS products, including SAS Visual Analytics, SAS Visual Statistics, and SAS Visual Data Mining and Machine Learning. SAS Visual Analytics offers do-it-yourself capabilities for data preparation, interactive reporting, discovery, and self-service analytics in a governed environment. In 2017, SAS released an update to SAS Visual Analytics, which runs on SAS Viya, for business users and analysts. In addition to a redesigned and unified user experience, this latest release offers a new HTML5 interface, location analytics, and data preparation capabilities. With organizations facing a shortage of skills, SAS Visual Analytics helps firms understand and reveal vital insights by putting them in the hands of users who need them most. The goal is to empower users to be data savvy so they can take timely decisions and actions.

Tableau Software

Tableau, founded in 2003, is on a mission to “help people see and understand data.” At its core is a drag-and-drop interface that anyone can use to quickly self-serve their analytical needs. It reduces the complexity and delays associated with traditional BI platforms that require users to program in SQL. Tableau allows business users to immediately analyze data sources by connecting directly to databases or using high-performance extracts. Tableau also empowers large organizations to manage both their data and analytics with a central platform hosted on

premises, in the public cloud, or as a SaaS offering. Tableau recently announced the addition of subscription-based pricing alongside its existing perpetual licensing, aligning with its goal to simplify enterprisewide deployments by offering ELAs. Tableau supports an Amazon Athena connector allowing direct access to AWS S3 data, direct connect to PDF functionality, and table join recommendations powered by machine learning. Data-driven alerts can be configured to intelligently notify users when customized thresholds are reached in their dashboards. Tableau also continues to add features to its browser-based Web-authoring interface, with a goal to have full feature parity between desktop and browser early next year.

Unifi

Unifi, founded in 2013 and headquartered in San Mateo, California, has created a data-as-a-service platform that integrates data catalog and search capabilities with a comprehensive suite of data preparation tools, fronted by an intuitive, graphical interface designed for business users. Unifi has a policy engine for managing user access rights to the data with data governance that offers row- and column-level security. The tool also provides sophisticated data lineage functions that enable users to see data sources, fields, and attributes to track back the data's origin from visualizations to help users evaluate the legitimacy and quality of the data. Unifi's data preparation uses AI and machine learning (ML) to drive a recommendation engine that delivers automated data cleansing, enrichment, normalization, and filtering. When it connects to data sources, Unifi's intelligent crawling technology gathers information needed to build a metadata catalog. Users can also access the catalog and search for data. Business users search for and select data sources, and the software uses ML to formulate recommendations for other sources, accessing them via native connectors. Unifi can then perform joins and take other preparation steps automatically.

Zoomdata, Inc.

Zoomdata, founded in 2012 and headquartered Reston, Virginia, and San Mateo, California, provides a visual analytics solution that enables business users to engage in fast, interactive exploration, visualization, and analysis of big and fast data. Streaming analytics is a strength, although Zoomdata can work with historical data sources as well. Zoomdata's solution can run on mobile devices, on premises, and in the cloud. Zoomdata implements industry standards such as HTML5 and JavaScript; it supports CSS and provides a REST API and SDK, enabling developers and OEMs to embed Zoomdata. It can connect natively with numerous modern and traditional data sources, including with Zoomdata Fusion for data federation. Zoomdata's data sharpening and microquery technologies, plus pushdown query processing and use of Apache Spark for in-memory analytics and data blending, drive the visual analytics. Users can "zoom" in from a broad perspective to sharpen the focus to a particular area of interest; users can also examine the data itself. Microqueries, executed as a stream, deliver intermediate results by performing calculations as the data is streaming in and as the visualization is sharpening. Rather than wait, all microqueries are processed for final results, so users can see intermediate results and continue with their analysis without waiting for the result to be fully sharpened.

Recommendations

Define project objectives and scope them carefully. In our research, we learned that poor definition of project objectives and scope was one of the chief obstacles to reducing time to value. Better definition will help stakeholders understand resource requirements; inadequate allocation of resources was another common obstacle found in our research. Make sure that projects begin with good planning and leadership to keep them focused on stated objectives. If objectives change, make sure everyone on the team understands the change in course.

Better project definition will help stakeholders understand resource requirements and keep leadership focused on objectives.

Match BI and analytics projects and workflows with user decision cycles. In both operations and at executive and managerial levels, there is increasing stress on decision makers to shorten the time it takes to make decisions and take action. In BI and analytics projects, team members should have a clear understanding of user decision cycles so that steps required for accessing and analyzing data fit the pace with which decisions will be made.

Evaluate agile methods to improve business/IT collaboration and produce value sooner. Agile methods have helped organizations deliver project benefits to users sooner. Agile teams bring business stakeholders and IT developers together to collaborate on goals. As opposed to traditional waterfall development methods, agile methods focus on incremental deliverables, which enable users to examine data, test functionality, and advise developers on what needs to be changed. Many organizations do not adopt agile methods strictly but use variations inspired by the agile methodology. Learn via online forums and conferences what others have done and see if the methods fit your organization.

Take steps to reduce time to value. One of the chief ways to increase the impact of BI and analytics is by ensuring that capabilities are in the hands of users at the right time to support decision making. Too often, organizations must wait for applications to the point where they are less valuable and relevant because the moment they were most needed has passed. TDWI research finds that there is room for improvement. Organizations should examine how to streamline development, align projects more closely with requirements (even as they change), and create a strategy to remove obstacles to completion and delivery.

Establish metrics for determining whether BI and analytics are delivering value and ROI. Most organizations do not have a formal way of determining whether, and to what extent, BI and analytics projects and applications deliver value, including whether they did so at the right time. It is not always easy to do so because the business impact is often most felt downstream. However, organizations should do assessments to track how BI and analytics contribute, including from a cost-benefit perspective. The assessments can both enable organizations to analyze where improvements could be made and also identify and publicize successes to justify the value of BI and analytics.

Although not always easy, organizations should do assessments to track the contributions of BI and analytics projects.

Aim for managed and governed self-service BI, analytics, and data preparation to avoid data chaos. Self-service BI and analytics, integrated with self-service data preparation, represents a major trend. TDWI research finds most organizations endorse the self-service trend but have concerns about the potential for governance, data quality, and analytics quality problems. Organizations should facilitate the use of self-service technologies because they help users become more productive in using data and can accelerate the path to value. However, organizations should upgrade data stewardship to help guide users in working with quality, relevant data. They should update governance policies to cover self-service environments and communicate rules and policies clearly.

“Operationalize” BI and analytics by strengthening the connection between insight and action.

TDWI research finds strong demand for making data and analytics actionable. Organizations should evaluate technologies and methods that help users interpret reports and analytics in the context of operational decisions and actions they need to take. Key performance metrics (KPIs) have long been a useful way of focusing BI and analytics on corporate objectives. Operationalizing BI and analytics also means closing the loop between analytics and processes. To do so, organizations need to streamline processes for data access, reporting, visualization, and analysis and define repeatable workflows to improve efficiency. Organizations should study their BI and analytics processes to address inefficiencies so there are fewer delays in applying insights to operational actions.

Organizations should investigate the potential of newer technologies that could help users get results faster.

Consider technology innovations that make visual data discovery faster and easier. TDWI research finds that the BI and analytics capabilities most desired by users are those that enable them to drill down, slice and dice, and engage in ad hoc data discovery. Many are using OLAP tools but could benefit from a newer generation of technologies and solutions that make OLAP-style analysis easier by incorporating search, advanced visualization, and semantic discovery—all of which can help users get results faster. Given the importance of deeper data analysis and discovery to users, organizations should investigate the potential of newer technology solutions.

Improve communication and interpretation of analytics by educating users about data storytelling. One of the best ways to shorten the path to value is to improve communication about analytics. TDWI research finds that organizations often struggle to interpret analytics and resort to extended trial-and-error in applying analytics, which takes time. Data visualization has brought dramatic improvements in how users can view and interpret the data and see patterns. The next step is “data storytelling,” or putting visualizations and other analysis together into a narrative describing how conclusions were reached and why they are relevant. Because most decisions are made collaboratively, data storytelling is important for communicating analysis to a diverse group of people. Good communication using data storytelling techniques can help decision makers understand analytical insights faster and act sooner, with more confidence, based on them.

Address deficiencies in number of skilled personnel. Research participants cited the lack of skilled personnel as a leading obstacle to realizing value with BI and analytics faster. More reports, analytics, and users are added to the team’s responsibilities, but skilled personnel resources stay the same. Adoption of self-service technologies can move some of the work to users, but many BI teams still have more work than they can handle. Consider options such as bringing in outside consultants and other experts to help teams move projects to completion faster.

Encourage guidance from internal BI teams and outside experts. TDWI research finds that IT BI teams and development experts do not routinely provide guidance to users of self-service BI and analytics technologies. In addition, only about a quarter of users in organizations will reach outside the organization if they do not have experts inside to help them interpret data insights and develop analytics and visualizations. Organizations should support mentoring, guidance, and interchange of expertise to ensure that users are working effectively with data and tools for visualization and analytics.



sas.com/tryva

SAS® Visual Analytics and SAS® Visual Statistics

SAS Visual Analytics is the flagship offering for self-service analytics and business intelligence (BI) with required governance. It allows business users, analysts, and citizen data scientists to visually prepare and explore data, create and share interactive reports, and apply self-service analytics for decision making.

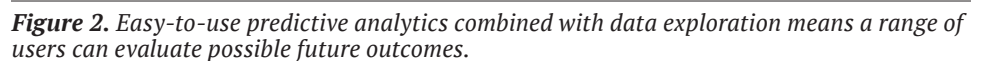
For data scientists and statisticians interested in predictive analytics, SAS Visual Statistics (an add-on to SAS Visual Analytics) can interactively explore data and build analytical models in tandem.



Figure 1. Quickly create dazzling interactive reports and dashboards, and share them for collaboration.

As recommended in this TDWI Best Practices Report, SAS helps to quickly realize value from BI and analytics by giving users the right set of capabilities. SAS Visual Analytics and SAS Visual Statistics offer a tightly integrated workflow of self-service data preparation and analytics capabilities in a governed environment to avoid data and content chaos. Besides technology, organizations also need to define clear objectives, establish metrics to evaluate whether they are delivering value, and bring IT and business stakeholders to improve collaboration.

(Continued on next page)



- Explore all relevant data quickly, easily identify key relationships, and make more decisions with trust. Self-service visual discovery and analytics put insights within reach of users in a governed, reusable manner.
- Quickly design precision-quality reports and dashboards that are attractive and meaningful, and then easily distribute them via Web, Microsoft applications, or mobile devices.
- Interact with reports, charts, and dashboards from your tablets and smartphones—anytime, anywhere.
- Build analytical models—add or change variables, remove outliers, etc.—for a variety of problems and instantly see how those changes affect outcomes with remarkable scale.
- Rightsize your BI, discovery, and analytics environment with options that fit your needs. Deploy on-premises, enterprise hosting, and private or public cloud infrastructure. The choice is yours.

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.

108981 G57469.0717



research

TDWI Research provides research and advice for data professionals worldwide. TDWI Research focuses exclusively on business intelligence, data warehousing, and analytics 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, data warehousing, and analytics 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.



**Transforming Data
With Intelligence™**

555 S. Renton Village Place, Ste. 700
Renton, WA 98057-3295

T 425.277.9126
F 425.687.2842
E info@tdwi.org

tdwi.org