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2016

TDWI BENCHMARK GUIDE

A Guide to Achieving Big Data Analytics Maturity

By Fern Halper and David Stodder

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A Guide to Achieving Big Data Analytics Maturity

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Foreword from the Authors

Today, many organizations are collecting increasing amounts of disparate data. In fact, many are collecting more than they can manage or analyze, yet they realize that big data and data analysis can provide an important strategic competitive advantage. According to TDWI research, interest is growing for big data solutions. In late 2013, TDWI created a big data maturity model to help organizations understand how their big data and analytics deployments compared with those of their peers and how they could develop a road map for advancing with analytics. Approximately 600 organizations have participated in the TDWI assessment, which objectively measures the maturity of a big data program across various dimensions key to deriving value from big data and big data analytics.

The Big Data Maturity Model assessment has approximately 50 questions across the five categories—organization, infrastructure, data management, analytics, and governance—that form the dimensions of the model:

- **Organization:** To what extent does the organizational strategy, culture, leadership, and funding support a successful big data analytics program? What value does the company place on analytics? Additionally, is the company organized for success with data, big data, and analytics?
- **Infrastructure:** How advanced and coherent is the architecture in support of a big data initiative? To what extent does the infrastructure support all parts of the company and potential users? How effective is the data management approach? What technologies are in place to support this kind of initiative and how are they integrated into the existing environment?
- **Data management:** How extensive are the variety, volume, and velocity of data used for analytics and how does the company manage its big data in support of analytics? This includes data quality and processing as well as data integration and storage issues.
- **Analytics:** How advanced is the company in its use of analytics? This includes the kinds of analytics utilized and how the analytics are delivered in the organization. It also includes the skills required to make analytics happen.
- **Governance:** How coherent is the company's data governance strategy in support of its big data analytics program?

The maturity model itself consists of five stages of progression toward higher maturity—nascent, pre-adoption, early adoption, corporate adoption, and mature/visionary—with significant differences between each stage. As organizations move through these stages, we've seen them gaining more value from their analytics investments.

This guide builds on the model to discuss how organizations move through their big data analytics journey. It describes the stages of analytics maturity and what we've seen so far in the results of the assessment.

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Big Data Analytics Maturity: Where Are They Now?

Big data analytics requires the ability to collect, manage, and analyze potentially *large volumes of disparate* data at the right speed within the right time frame while providing the right time analysis to the end consumer. Big data includes structured data in traditional databases and warehouses, unstructured data from various internal and external sources, streaming data, machine and sensor data, and geospatial data. TDWI research indicates growing interest in these kinds of data for analytics. Organizations are using big data to analyze customer behavior to adjust marketing campaigns and offers, to improve operational efficiencies, and for fraud detection and improving situation awareness. The use cases are wide and varied.

Of course, reaching big data analytics maturity is a process that involves organizational change such as gaining executive support for big data and building a culture that values analytics. It includes data management and data integration that may require modernizing the warehouse environment. It also necessitates building expertise in different kinds of analytics methods.

Many companies are still at the beginning of their big data journey. As mentioned above, TDWI has collected approximately 600 responses from our Big Data Maturity Model assessment. The average scores across all dimensions put the majority of respondents in the late pre-adoption/early adoption phase at the time they took the assessment. Figure 1 illustrates the percent of respondents in each stage of maturity. Half (50%) are in the pre-adoption phase and 36% are in the early adoption phase. Approximately 8% have moved past the chasm that separates early adoption from corporate adoption.

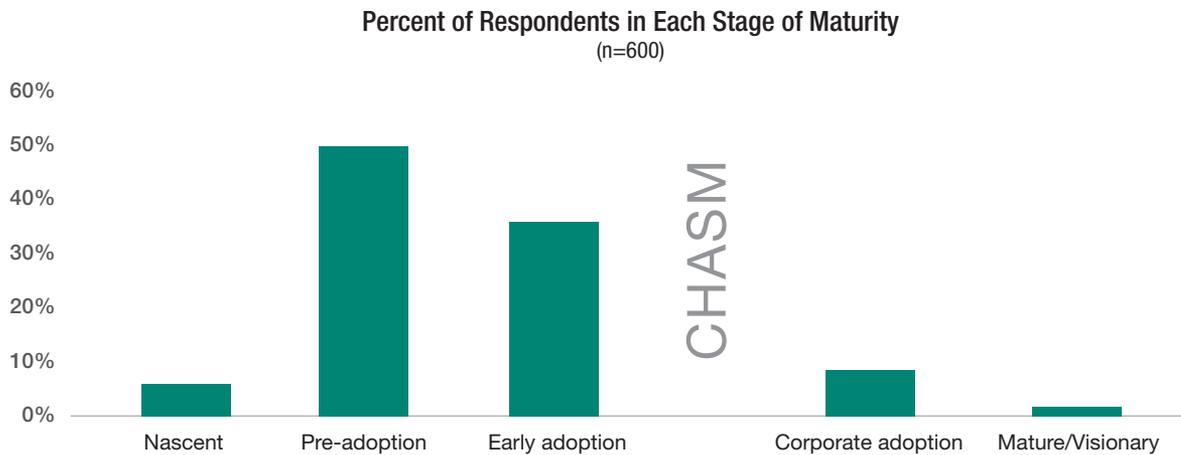


Figure 1. Percent of respondents in each stage of big data maturity (n=600), from the TDWI Big Data Maturity Model, online at www.tdwi.org/bdmm.

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The profile of these respondents includes:

- Many respondents received high scores for some of the softer features around organization. For instance, they felt that their organizations valued innovation or had a creative culture. However, they fell short in tangible metrics such as actually having a road map in place for data and big data or a big data strategy. Many had fragmented funding as well and were still trying to identify the right problems to solve using big data and analytics. Only a small percentage (less than 25% in these assessments) were organized to execute on big data initiatives.
- Many of the respondents were still collecting structured data that they stored in their data warehouse. Although some respondents are capturing large amounts of data (typically in the terabyte range), this is typically structured data that they manage using their traditional data warehouse. Less than half of the respondents (40%) had some sort of infrastructure in place to support big data other than a data warehouse or some other kind of database or flat file. This 40% are using Hadoop, appliances, or some sort of combination of legacy systems along with newer technology, either on premises or in the cloud.
- More than half of the respondents (55%) were either experimenting with big data or were just starting to look at it. The rest either had proof of concepts (POCs) or multiple POCs in production. Of course, a POC is a good starting point for a big data project because it can illustrate the value and get people excited about big data. A small percentage had companywide big data projects in production.
- The majority of respondents did not have analytics teams in place to address big data analytics. Many were in the process of hiring analytics talent. They are using a combination of approaches, including cross-training and hiring from the outside. This is typical as organizations try to cross the chasm that separates them from becoming corporate adopters. These organizations need to build the skills in both technology and analytics. TDWI typically sees organizations using multiple methods to build a skilled workforce.
- Most of the respondents collected more data than they analyzed. In terms of analytics, about half of the respondents claimed not to use advanced analytics. Another 44% said that there were pockets of advanced analytics usage in the company. This could be in finance, operations, or another business unit. Less than 10% said that advanced analytics were used throughout the company. About a third of the respondents were currently analyzing disparate kinds of data (such as text data, geospatial data, stream data, etc.).
- Many respondents felt that their data security was in good shape. We've seen this before in other surveys—organizations tend to think they are further along in security than they may actually be. However, it wasn't clear that there was a strong governance process in place for big data; many organizations had no data steward or even policies in place to address big data.

In summary, although there were more advanced organizations taking the big data assessment, the majority of respondents were positioned early in their big data analytics journey. For many, the definition of big data analytics is analyzing structured data found in their data warehouses, sometimes moving past dashboards and reporting to more advanced analytics such as predictive analytics over this structured data. This analysis was often occurring in pockets in the organization and governance is not advanced; many, however, felt that they had a handle on their data security.

Of course, organizations can attain value doing this kind of analysis—at the pre- and early-adoption stages of maturity—and they do. However, big data analytics can include so much more than this. It can make use of disparate kinds of data to provide lift to models. By its very nature, big data analytics can include an order of magnitude more attributes to analyze. Big data technologies can handle iterative analysis, using these attributes, to get answers and insight to important business questions in the right time frame. Using advanced technologies, such as machine learning, with a big data infrastructure means this analysis can become data driven, programmatic, and real time. The possibilities are numerous.

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The capability to analyze big data provides unique opportunities for your organization to gain value from the data it has today and the data it wants to collect and utilize. To get there requires a certain amount of maturity and involves the evolution of an organization to integrate, manage, and leverage internal and external data sources into key decision points. This evolution often involves the stages of maturity described below and illustrated in Figure 2.

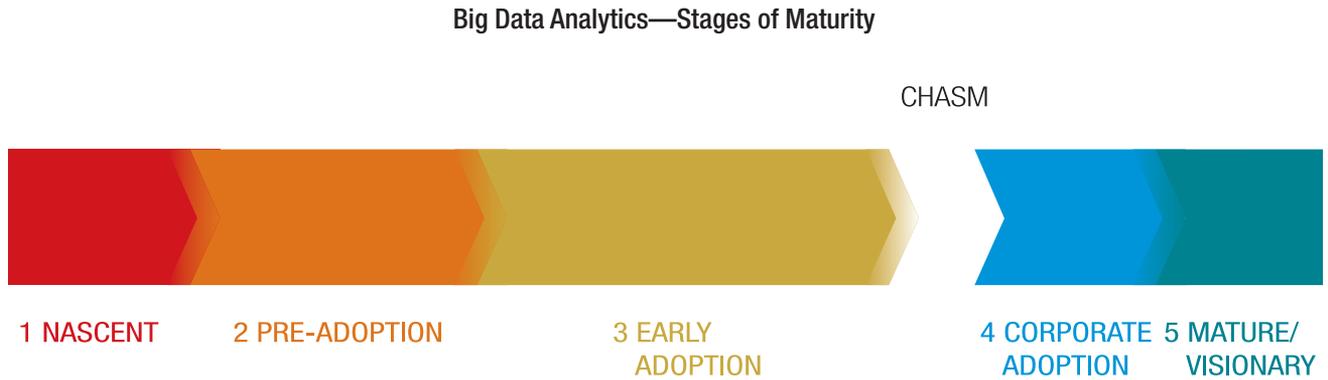


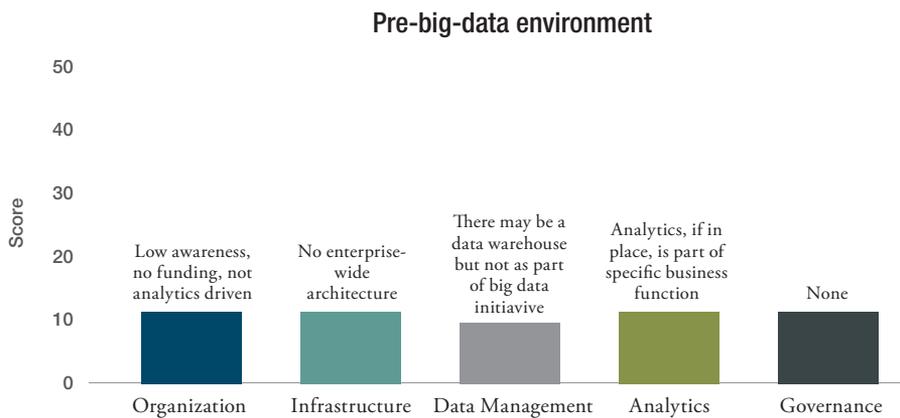
Figure 2: The five stages of big data analytics maturity.

Stages of Big Data Analytics Maturity

Big data analytics maturity is not simply about having some technology in place; it involves technologies, data management, analytics, governance, and organizational components.

The TDWI Big Data Maturity Model consists of five stages: nascent, pre-adoption, early adoption, corporate adoption, and mature/visionary. As organizations move through these stages, they should be gaining more value from their investments.

Stage 1: Nascent



The nascent stage represents a pre-big-data analytics environment. In the nascent stage, most companies have a low awareness of big data or its value across much of the business. There is no real executive support for the effort, although there are pockets

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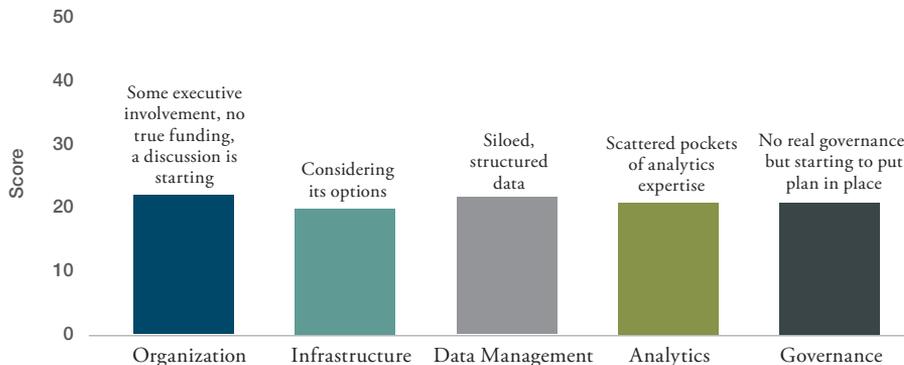
of people spread throughout the enterprise who may be interested in the potential value of big data. Often, the organization has bought into the concept of analytics and it may have a data warehouse, for instance, but it has not yet started to explore advanced analytics or begun its big data journey. This may also mean that its governance strategy is more IT-centric than business- and IT-centric.

Generally, in the nascent stage, the culture is not analytical. In other words, the culture is not data driven. However, in many nascent organizations, employees want analytics tools so they can answer important business questions that might involve big data. Here, there may be pockets of people who are trying to get educated about big data analytics because they know the old way won't help them remain competitive. If the company has an analytics group in place, it is generally within a department or line of business and targeted at a specific function. Typically, if the organization is utilizing advanced analytics, such as predictive analytics, it is working with structured data only.

The nascent organization does not have much in the way of an end-state data architecture, although it may have a data warehouse. Its data strategy and data life cycle management strategy are not strong and are often more about immediate results and silos of information than an overall plan.

Stage 2: Pre-adoption

Big data discussion begins, value not fully understood



As a company moves out of the nascent stage and into pre-adoption, it is starting to do its homework regarding data and analytics. Staff may be reading up on big data and attending conferences. The organization may have invested in some new technology (such as Hadoop) to support big data. It knows that it will be implementing big data analytics in the near term, although the effort is usually departmental in scope.

In many companies, typically one executive sponsor is on board, but companywide support for big data can be spotty. The mindset is generally around experimentation. The team realizes that identifying the right business problem is critical for success. The team may also have started to identify and collect some big data sources (mostly internal) as part of the experimentation process. Additionally, in this stage of maturity the company may be trying out Hadoop or some other big data technologies as part of the experimentation phase leading to a POC.

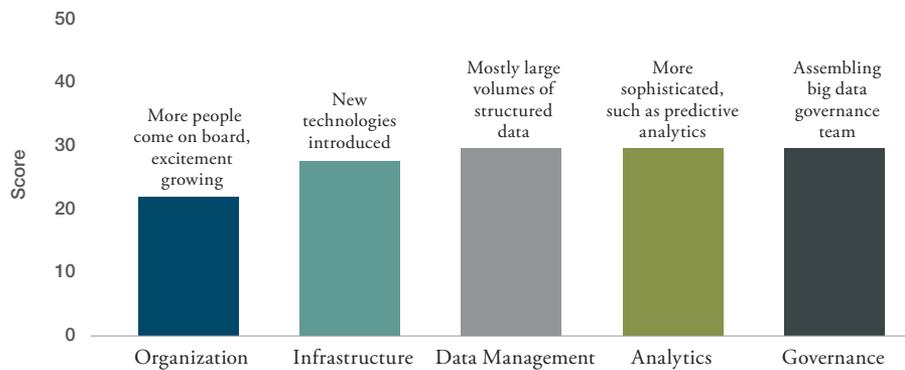
Analytics is occurring but in silos. There may be some groups of individuals adept at visual analytics or predictive modeling—usually with structured data only—but these people may be aligned at the department or line-of-business level. These statisticians or business analysts may be part of the overall voice of the organization that sees the need for a big data implementation and its value.

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At this stage of maturity, there is no organizational governance in place for big data (although there may be some governance for traditional structured data sources), meaning there is no stewardship or policies that address how to raise the quality of the data or analytics content. Some organizations may believe that they have data security under control—although typically they do not.

Stage 3: Early Adoption

Proof of concepts or early big data projects underway



In organizations we identify as in the early adoption stage, IT and business teams are working to determine the right big data business problems to solve and how to drive big data analytics into business decision making. This stage of maturity is typically characterized by one or two POCs that become more established and production ready. Oftentimes these are operational in nature and may be isolated projects. For instance, a utility company might implement a big data project involving smart meters, or a telecommunications company might implement a big data project for network analysis.

Typically, organizations are still using one kind of data in early adoption, although that may vary among organizations in this phase. For example, some companies in early adoption are utilizing large volumes (i.e., more than 10 TB) of structured data stored in an appliance. The company may be running one or more predictive models on this data. This is an established and production-ready implementation, but it still may be departmental (i.e., siloed) in scope and the organization may not have moved on to other forms of data. Some companies might be utilizing different kinds of data but not in an integrated fashion. For instance, some organizations may be primarily utilizing internal structured data for analysis but making use of unstructured social media data in another part of the company for competitive analysis.

In this stage, there may be pockets of BI, data discovery, or analytics tools spread around the organization. There may be some groups of individuals, especially at established companies with some history of performing data analysis, who are adept at more advanced analytics. There may also be outside consulting organizations helping to set the big data analytics strategy or that have personnel on site performing advanced analytics. Having personnel with the appropriate skill sets can be an issue here.

During the early adoption stage, a variety of big data technologies—an appliance, a Hadoop cluster, or a NoSQL database—might be used. The company may also be thinking about creating a unified architecture that can enable users to access multiple data sources and different types of data, including unstructured content and big data, although they are not yet there. Often, awareness of the need for a unified architecture is driven by an increase in the use of Hadoop for creating a data lake containing multiple types of big data needed (or expected to be needed) for analytics. These organizations are realizing that they need to unify this growing big data environment with their data warehouses into a more coherent architecture.

At this point, there is generally at least one executive sponsor involved. However, it is also at this stage that more executives might start to become interested in the program as companies show some wins in the POCs. As the organization gets excited about the prospects of big data, more people start to come on board. Some organizations might have a steering committee overseeing the program from a governance perspective—with representatives from departments providing reports on progress and compliance—but most do not.

Organizations tend to spend a long time in this stage, often because it is hard to cross the chasm that leads to companywide adoption of big data and big data analytics.

Crossing the Chasm

Most organizations trying to move from the early adoption stage to the corporate adoption stage want a more sustained, comprehensive use of analytics rather than one-off projects conducted by isolated individuals or departments. Leadership is interested in corporate adoption of big data and analytics and extending the value of analytics to more users and departments. Crossing this chasm generally involves a series of hurdles to reaching the organization's goal. Overcoming these hurdles is why companies often spend a large amount of time in the early adoption phase. There is the obvious challenge of obtaining the right skill set. There may also be political and budget obstacles holding back adoption of big data and analytics. Oftentimes analytics isn't available in a way that encourages such extensive adoption.

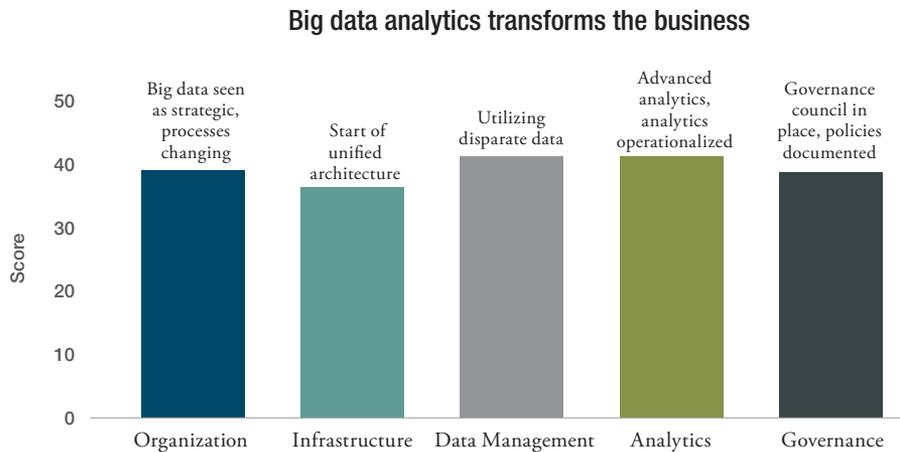
To successfully cross the chasm, organizations need to address the following challenges:

- **Funding:** Many early analytics projects are driven by a visionary executive champion. Of course, it is critical to establish wins with these early projects in order to secure future funding. However, the funding needs to be driven by both IT and the business. Business involvement is needed because big data analytics projects must have business value with tangible business outcomes. In fact, organizations report that prototypes in the early phases of analytics that show real results can help in getting buy-in and showing what is possible.
- **Data management and data governance:** To get to corporate adoption, an enterprise needs unified data management and a governance plan in place. At corporate adoption, data is typically shared, meaning that without being too heavy-handed, IT or the governance committee must put the right processes and checkpoints in place so users will have the rights to access and work with certain data, including big data. Typically, companies will need to build a more unified information architecture or companywide analytics platform—or at least have a less siloed and more coherent way to get at data and ensure its integrity for analytics.
- **Skill sets:** A big barrier for big data projects moving across the chasm is the difficulty of developing the skill set for new technologies (such as predictive analytics or stream analytics) or new big data stores (such as Hadoop or NoSQL databases). The skill issue is the barrier to moving forward with analytics that comes up most often in our research. If a company can afford it, it will hire skilled staff. Many companies are using a combination of approaches such as bringing in consultants, hiring data scientists from the outside, and training from within. Some organizations establish internal user groups to help build skill sets.
- **Cultural and political issues:** Often it is the cultural and political issues that can stop big data and analytics from becoming more pervasive throughout the organization. For example, a company might hit a roadblock when it is trying to operationalize analytics as part of a business process (important with big data) because people don't trust the analytics to drive the process. It takes time to build trust. If a company does not have a culture of thinking with data and making decisions with data, it can take time to get used to a new way of doing things.
- **Governance:** Moving to corporate adoption requires a big data analytics governance team. To get across the chasm, organizations should have program governance in place with guidance for the program and a steering committee that oversees how the program will be implemented in each division. The program should be executed as a budgeted and planned initiative from the division perspective and be treated on par with other data integration programs. This program will need to deal with issues such as the cloud for big data as well.

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To cross the chasm, companies need to ensure that the right governance, data architecture, data life cycle management, security strategies, and organizational structures are in place in a balanced and unobtrusive way so users are not thwarted or delayed unnecessarily in their pursuit of analytics. In our observations to date, we have seen many organizations spend extra time as they near the chasm and require additional staffing to cross it.

Stage 4: Corporate Adoption



Corporate adoption is the major crossover point in any organization's analytics journey. During corporate adoption, data and analytics transform how companies do business. For instance, users may change how decisions are made by operationalizing analytics in the organization. They will be using disparate kinds of big data that is semistructured or unstructured for their analytics efforts. They might be implementing some real-time analytics. Business and IT view themselves as a team and have experience working together successfully on analytics projects. There is often a center of excellence (COE) forming or other organizational models in place that support big data analytics. Data science teams are often in place.

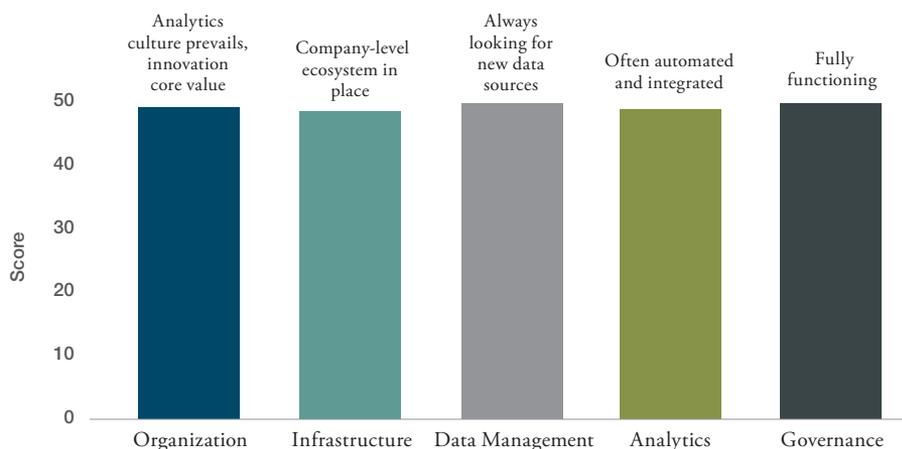
An analytically mature company often uses a range of technologies to support a range of analytics, including predictive analytics. Such a company uses big data—whether structured or unstructured—in novel ways. For instance, companies may be deploying text analytics or social media analytics. They may be using geospatial data or even streaming data to understand, for example, social networks and their impact on customer behavior, fraud, and the popularity of healthcare treatments. They may be implementing an Internet of Things (IoT) project, such as predictive maintenance that utilizes various kinds of data that must be dealt with in real time.

Underpinning the analytics are technologies such as enterprise NoSQL databases, Hadoop, and appliances or data warehouses, and use of the cloud may be growing. In-memory analytics are used. The information architecture is unified in a way that supports the analytics; it is not a hodgepodge of multiple tools and platforms.

Importantly, an analytically mature company is concerned with answering questions such as: Whose data was it? Whose data is it? Where is it going? How long will it last? At this stage of maturity, organizations will have program governance in place, with project management office guidance for the program and a steering committee that oversees the program from a companywide perspective. For data governance, a similar effort will be in place with a well-defined data strategy and management and a steering committee overseeing the progress of data. The overall executive sponsor is involved in monthly updates. The program is executed as a budgeted and planned enterprise initiative and treated on par with other data integration programs.

Stage 5: Mature/Visionary

Analytics seen as a competitive weapon



Only a few companies can currently be considered mature/visionary in terms of big data and analytics. Some of these companies are Internet based—companies such as LinkedIn, Facebook, and Amazon. These companies are dealing with massive amounts of big data and employ many data scientists to create new and exciting ways to analyze and act on their data. However, there are other non-Internet companies that are also visionary. For instance, some financial companies have built advanced big data ecosystems utilizing sophisticated analytics not just to determine fraud, but also to provide real-time customer messaging based on browsing behavior using real-time scoring. Some retail companies are using advanced clickstream analytics together with self-service analytics for their teams. They are deploying IoT in the form of beacon technologies that will capture information about customers as they move through their stores and present offers in real time.

At the visionary stage, organizations are executing big data analytics programs smoothly using a highly tuned infrastructure with well-established program and data governance strategies. Well-governed but flexible data access is available for users so they can explore data in a self-service fashion and are not completely dependent on IT. Many programs are executed as budgeted and planned initiatives from the company perspective. In the mature/visionary stage, there is excitement and energy about data, big data, and analytics, and a healthy and agile analytics culture enables nontraditional users at middle management and even frontline positions to benefit.

In this stage, enterprises often see analytics as a competitive weapon and its mindset is creative. Analytics is not simply used to drive strategy or insight. Instead, the business is always looking for opportunities to use analytics in new ways—for example, to monetize analytics by creating new products and services. Analytics can be sophisticated and are often embedded into business processes that utilize big data and are accessed from multiple devices. There are COEs in place and teams are working to deliver new and exciting forms of analytics. Some visionary organizations build an innovation team consisting of business, data scientists, and IT that innovates on the technologies, brings them back to the business, and takes them into production.

The infrastructure uses what has worked in the past, including a data warehouse, and is not reticent about leveraging newer big data technology such as commercial Hadoop and enterprise NoSQL databases. The cloud is also typically used by more mature organizations for many reasons, and it is typically used in a hybrid fashion (although often starting in a private cloud). Governance is well established and self-service options are deployed with oversight from a well-managed data access strategy.

Analytics is a way of daily life within these organizations; they are continuously consuming analytics and developing it to resolve business questions or gain insights for generating new customer products or services.

Getting from Here to There

In TDWI best practices research, we've seen a small leading-edge group of companies that have deployed predictive and more advanced analytics, have solid infrastructure and processes in place, and are using multistructured data for their analysis. They are using the cloud and other platforms for analytics, too, as part of a big data and analytics ecosystem. These companies are realizing top- and bottom-line impact from these efforts. In TDWI research, this group is a small percentage of respondents to our surveys (less than 20%). Not surprisingly, in the corporate adoption and mature/visionary stages of the big data maturity assessment, it is much less (about 10%). The point is that these companies have crossed the chasm and they are seeing real value from their analytics deployments.

How do organizations move from one stage to another? How do they make the best use of their data? How do they reach analytics maturity? Unfortunately, there is no silver bullet. It takes time, effort, and training. One technology alone will not get an organization to analytics maturity. Issues include lack of skilled personnel, understanding of technologies, and executive support; architecture; budget concerns; and cultural divides, to name just a few. People, processes, and technology are needed to reach analytics maturity.

There are, however, some common best practices that can help organizations get from one stage to the next. These include:

- **Commitment:** A “stick with it” philosophy is necessary to achieve big data and analytics maturity because it can take time. There may be fits and starts; analytics involves experimentation and not all experiments will be successful. Organizations should give users, analysts, and data scientists the resources to experiment so that they can “fail fast” and learn how to improve. Those in the top 10% are dedicated to analytics. Strong executive support helps here, but it is also important to have people on board with a passion for data and analytics. These people are less likely to give up on it.
- **Competency:** Changing the name of a data warehouse group to a big data group does not automatically create the skills needed for dealing with big data and analytics. In fact, the top 10% of the respondents to this assessment claim to still be building skills. Many have the data management skills in place, but they are still building analytics skills. It is a continual process. TDWI research indicates that organizations do this in a number of ways. They hire from the outside, build skills internally, and encourage sharing of best practices. They develop strategies and provide training programs, but people must want to be trained because they believe analytics provides value.
- **A culture that can manage change:** Change is difficult. Analytics often challenges company leadership to replace unquestioned assumptions with data-driven reasoning. As author Wayne Eckerson points out, those leaders who have successfully led their organizations to analytics maturity understand the principles of change management.* These include the people side of the equation and building trust. To move forward in maturity at every stage, organizational leadership needs to champion experimentation and the challenging of assumptions, as well as understand that they must address the people and process issues that come with change. In this way, they can begin to develop the trust that is critical to analytics success.

Is it worth the effort? Absolutely! Organizations that have achieved data and analytics maturity are more likely to improve their top or bottom lines (or both).

In many ways, it is a virtuous circle—a complex chain of events that reinforces itself through a feedback loop. In this case, it is a positive feedback loop about data and analytics. As organizations gain proficiency and are successful, they build on this to become even more successful. Success feeds success.

* See Wayne Eckerson, *Secrets of Analytical Leaders: Insights from Information Insiders* (New Jersey: Technics Publications, 2012).

What's Next?

Although there is no quick solution for becoming analytically mature with big data, numerous best practices can help organizations move from one stage of maturity to the next. We discuss these best practices in a four-part series of TDWI Checklist Reports:

- *Five Best Practices for Getting Started with Big Data Analytics* (Checklist No. 1)
- *Five Keys to Moving Your Big Data Analytics Program Forward* (Checklist No. 2)
- *Becoming an Analytically Mature Organization in a Big Data Age* (Checklist No. 3)
- *The Road to Becoming a Visionary Big Data Analytics Organization* (Checklist No. 4)

About the Authors



FERN HALPER is vice president and senior director of TDWI Research for advanced analytics, focusing on predictive analytics, social media analysis, text analytics, cloud computing, and other “big data” analytics approaches. She has more than 20 years of experience in data and business analysis, and she has published numerous articles on data mining and information technology. Halper is co-author of “Dummies” books on cloud computing, hybrid cloud, service-oriented architecture, service management, and big data. She has been a partner at industry analyst firm Hurwitz & Associates and a lead analyst for Bell Labs. Her Ph.D. is from Texas A&M University. You can reach her by email (fhalper@tdwi.org), on Twitter ([@fhalper](https://twitter.com/fhalper)), and on LinkedIn ([linkedin.com/pub/fern-halper/2/491/63](https://www.linkedin.com/pub/fern-halper/2/491/63)).



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