VENTANA RESEARCH

Next-Generation Predictive Analytics

Using Forward-Looking Insights to Gain Competitive Advantage

White Paper

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June 2015

Ventana Research performed this research to determine attitudes toward and utilization of predictive analytics. This document is based on our research and analysis of information provided by organizations that we deemed qualified to participate in this benchmark research.

This research was designed to investigate predictive analytics practices and needs and potential benefits. It is not intended for use outside of this context and does not imply that organizations are guaranteed success by relying on these results to improve the results of analytics. Moreover, gaining the most benefit from predictive analytics requires an assessment of your organization's unique needs to identify gaps and priorities for improvement.

The full report with detailed analysis is available for purchase. We can provide detailed insights on this benchmark research and advice on its relevance through the Ventana On-Demand research and advisory service. Assessment Services based on this benchmark research also are available.

We certify that Ventana Research wrote and edited this report independently, that the analysis contained herein is a faithful representation of our evaluation based on our experience with and knowledge of predictive analytics, and that the analysis and conclusions are entirely our own.

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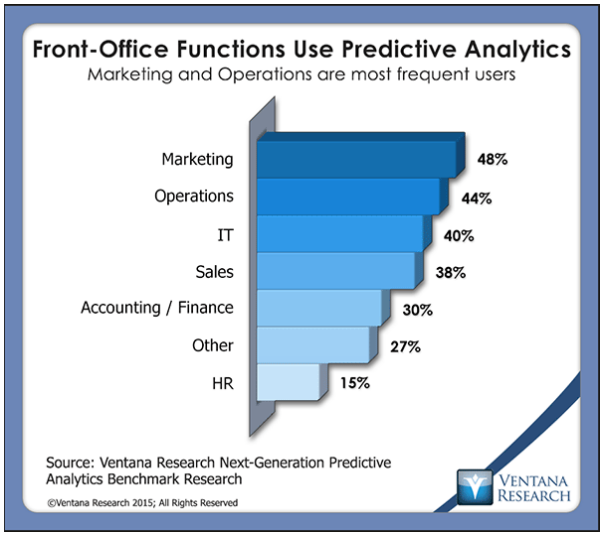
Executive Summary

Our benchmark research consistently shows that business analytics is the most significant technology trend in business today. It also finds that using effective predictive analytics is organizations' top priority in this category. In our benchmark research on big data analytics, for example, organizations ranked predictive analytics as the most important analytics category for working with big data. Yet a majority also indicated that they do not have enough experience in applying analytics to business problems and lack training on using the tools. Organizations will need to make decisions about investment priorities to have the skills and technology needed to apply predictive analytics effectively to their business.

Ventana Research defines predictive analytics as the application of mathematical computation and models to generate forward-looking insights that can be used to optimize business and IT processes and decisions. Predictive analytics improves the organization's ability to understand potential future outcomes; its results enable decision-makers in key areas of the business to choose the best courses of action.

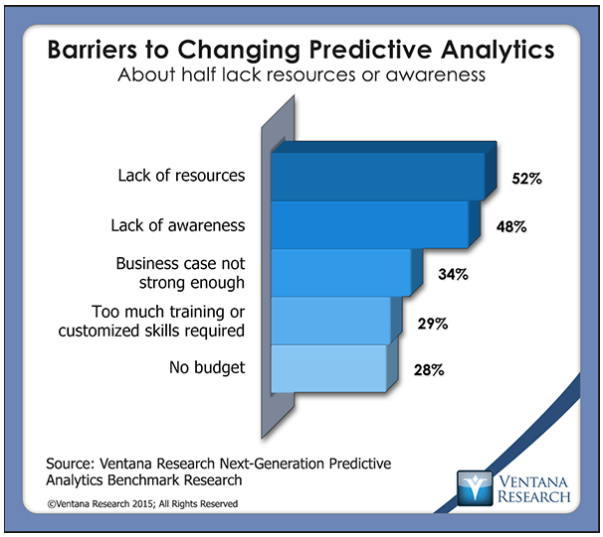
Ventana Research undertook this benchmark research to determine the attitudes, requirements and future plans of those who use predictive analytics and to identify the best practices of organizations that are most proficient in it. We set out to examine both the commonalities and the qualities specific to major industry sectors and across sizes of organizations. We considered how organizations perform predictive analytics, what they use if for, issues they encounter in the process and the information technology they use.



The research shows that the business units that most often apply predictive analytics are marketing (48%) and operations (44%). Organizations most commonly apply predictive analytics to customer (50%) and marketing (44%) information, followed by product (43%), financial

(40%) and sales (36%) information. The findings of predictive analytics are most commonly used for forecasting (currently used by 56%), marketing analysis (46%), customer service (41%) and product recommendations or offers (35%). Thus, the research finds, predictive analytics is being used in areas critical to revenue and profitability. More than seven out of 10 participating organizations already use predictive analytics, and the remaining 28 percent plan to.

However, the research also finds persistent barriers to making changes in the use of predictive analytics. More than half (52%) of organizations lack the resources they'd need to do so, and nearly as many (48%) lack awareness of the need for changes. One-third said that the business case is not strong enough, and 29 percent said too much training is required. These issues contribute to a perceived difficulty in gaining support for predictive analytics systems and underscore the importance of building a strong business case for investment.

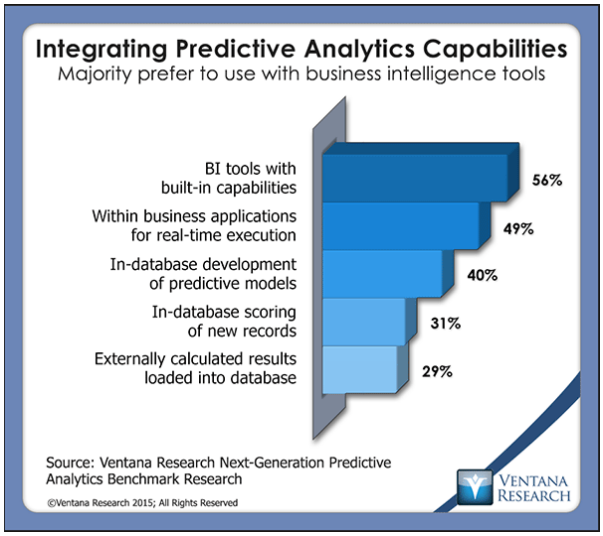


Analysis of the research findings shows that issues of expertise and training are critical considerations in adopting and using predictive analytics effectively. Those most often primarily responsible for designing and deploying predictive analytics are data scientists (in 31% of organizations), followed by the business intelligence and data warehouse team (27%). Yet in only about half (52%) of organizations are the people who design and deploy predictive analytics the ones who utilize the output of the predictive analytics processes. The most common reasons that users don't design analyses themselves are that they don't have enough skill training (79%) and don't understand the mathematics involved (66%).

Those nontechnical executives, managers and users involved with predictive analytics must know something about the mathematical algorithms used to build statistical models and transform data into predicted outcomes. To make an informed purchase decision for predictive analytics tools it is necessary to understand the impact of

algorithmic techniques available and to identify those best suited to developing the kinds of insights an organization hopes to achieve. In working with predictive analytics, training pays off: While only half of those who said they received adequate training in applying predictive analytics to business problems also said they are very satisfied with their predictive analytics, fewer than one in 12 of those who viewed their training as somewhat adequate or inadequate said that. These findings make clear that organizations must acknowledge the technical nature of predictive analytics and invest in hiring and training people to have the skills that ensure success in using it.

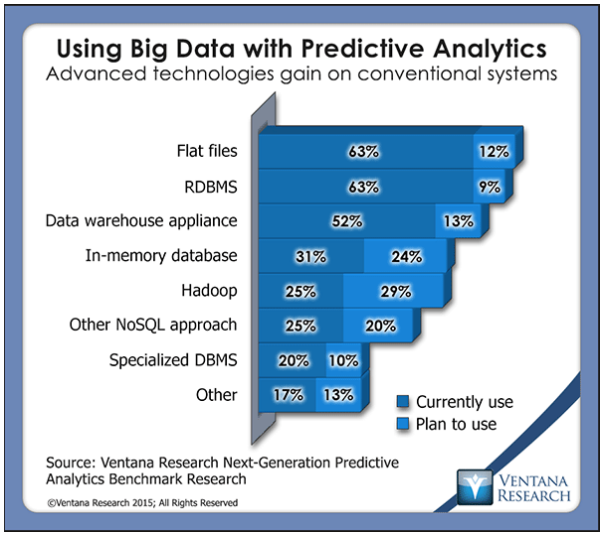
The good news is that organizations need not be overcome by complexity. Almost half (48%) of those participating in the research said they can address all of their business issues with 10 or fewer algorithms. Very large companies, however, most often said they need 20 or more algorithms, likely because they apply predictive analytics in more ways, but they also are more likely to have enough resources to deal with the complexity. The most commonly used types of mathematical algorithms use regression techniques, specifically decision trees and linear regression, pivot tables, logistic regression and generalized linear models, all used by at least 70 percent of participants.



As for simplifying use, the research uncovers a trend to blend predictive analytics with more established tools, a choice that can bring the technology closer to mainstream use and help businesses respond faster to challenges and opportunities. Participants most often said they would like predictive analytics integrated with business intelligence (56%) and within business applications (49%), and a majority of these want it embedded in both. The research also finds demand for integration with databases. In-database capabilities allow combining of predictive analytics at the source so advanced users can both build and deploy models in one system.

Integrating data is essential for predictive analytics, but the research shows that preparing data for analysis (40%) and accessing data

(22%) are the parts of the predictive analysis process that create the most challenges. To allow more time for actual analysis, organizations must reduce the time spent in these tasks. The reasons most often cited for moving storage of data from on-premises to cloud-based systems are to improve accessing data (49%) and preparing data for analysis (43%). Organizations are using another innovative technology, big data, to manage access to and processing of the ever larger volumes of incoming data. The research shows that while the conventional tools of flat files and relational databases on standard hardware are still the most commonly used for predictive analytics with big data, more than half (52%) now use data warehouse appliances and 31 percent use in-memory databases. Within a year another 19 percent plan to use in-memory databases and the use of Hadoop, the open source big data technology, will nearly double, from 25 to 49 percent. Hadoop also is the technology being evaluated by the most organizations. We expect use of the combination of big data and predictive analytics to expand rapidly.



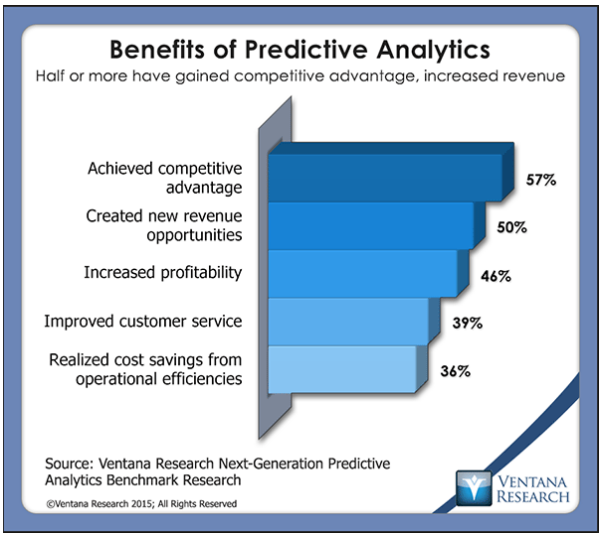
As noted, use of predictive analytics is moving into the lines of business to provide insights that help decision-makers achieve the organization's business goals. In our view, therefore, predictive analytics should be viewed as a business investment rather than an IT investment. The research confirms this by finding a shift in funding sources for these technology purchases. Since our previous research on this topic in 2012, funding authority has shifted from general business budgets (from 44% to 29% now) to line of business IT budgets (from 19% to 27% now).

Nonetheless, IT, technical and data experts are still indispensable for the evaluation and use of predictive analytics. In fact, data scientists or the head of data management are most often involved in recommending (52%) and evaluating (56%) predictive analytics technologies. Reflecting the need to deploy predictive analytics to

business units, analysts and IT staff are the next-most influential roles for evaluating and recommending.

The key point is that the business units and IT should work together with the common goal of making predictive analytics deliver value to the enterprise, and the research finds evidence of this happening. For example, they agree about how best to deploy the tools. Within two percentage points, both expressed a greater preference to deploy on-premises (business 53%, IT 55%) and were even closer among those who prefer to do it on demand through cloud computing (business 22%, IT 23%). More than 90 percent on both sides said the organization plans to deploy more predictive analytics, and they also were in close agreement (business 32%, IT 33%) that doing so would have a transformational impact, enabling the organization to do things it couldn't do before.

Some distinctions remain. For example, those on the business side said that predictive analytics is very important to the organization more often (52%) than did those in IT (38%). This finding further underscores the involvement of business participants in this technology, although IT (40%) ranks third among functions currently using it. Business users also more often said that the organization has achieved competitive advantage (60% vs. 50% of IT) and created new revenue opportunities (55% vs. 41%), which were the two benefits most often cited overall. On the other hand, IT professionals more often reported the benefits of increased upselling and cross-selling (53% vs. 32%), reduced risk (26% vs. 21%) and better compliance (26% vs. 19%); the last two reflect key responsibilities of the IT group.



Our Performance Index analysis of the research produced a snapshot of the findings overall. In the four dimensions (People, Process, Information and Technology) into which we segment performance, participating organizations perform best in Technology dimension,

where 38 percent reach the top Innovative level of our four-stage hierarchy. Interestingly, when participating organizations were asked to identify barriers to improvement, technology that is not suitable was mentioned least often (by only 16%). In the Performance Index only about one in 10 reach the Innovative level in the People and Process dimensions; the general findings repeatedly show lack of skills, training, resources and awareness as impediments to using predictive analytics effectively. It is clear that nearly all organizations have work to do to train people in predictive analytics and improve their processes to benefit fully from this difference-making technology.

Key Insights

This benchmark research yielded the following important general findings and key insights regarding predictive analytics as well as identifying trends based on our previous research on the topic. (We discuss performance levels in the Performance Index portion of the full research report; the actual questions asked in our survey are in an appendix to the research report. Specifics of organization sizes are in the appendix "About This Benchmark Research.")

Effective use of predictive analytics requires a blend of skills.

Our Performance Index analysis of predictive analytics practices placed almost equal numbers of organizations at each of the four levels of our performance hierarchy, with only slightly more than half (52%) at the two highest levels. Thus, our research shows that one in four organizations, those reaching the highest Innovative level, can use predictive analytics at a level that potentially enables them to innovate and to compete effectively against others that use this technology less well. But overall, organizations' ability to use predictive analytics has improved over the last three years; comparison with our previous research shows that now 10 percent fewer organizations rank at the lowest Tactical level of performance. It's worth noting, though, that how well they perform is not an indication of organizations' interest in predictive analytics: 72 percent currently use it, and the remainder (28%) plan to.

> One in four organizations can use predictive analytics at a level that potentially enables them to innovate and to compete effectively against others that use this technology less well.

One indicator of success found in the research is the level of the skills that are used to design and deploy predictive analytics. Three out of four participants in this research are technically sophisticated. More than one-third (35%) are data scientists, who have a deep understanding not only of predictive analytics and its use but also of data-related technology; one-fourth are data analysts, who understand the organization's data and systems but have limited knowledge of predictive analytics; and 16 percent described themselves as predictive analytics experts who have a deep

understanding of this topic but not of technology in general. The research finds that those most often primarily responsible for designing and deploying predictive analytics are data scientists (in 31% of organizations), followed by the business intelligence and data warehouse team (27%). The research thus makes clear that organizations must pay attention to investing in their people and their skills to ensure their success in predictive analytics.

Performance in predictive analytics lags most in training.

We additionally analyze performance individually in four dimensions (People, Process, Information and Technology), and in this instance the analysis indicates where an improved focus would be beneficial. In the case of predictive analytics we find that organizations perform best in the Technology dimension, where 38 percent reach the top Innovative level. This is a pattern we often see in the case of new technologies. In contrast, only 10 percent reach the Innovative level in the People dimension and only 11 percent in Process. Reinforcing this analysis are two research findings: that one of the two most-often cited reasons an organization's not being fully satisfied with its use of predictive analytics is that there are not enough skilled resources (62%), and that 29 percent said that too much training or customized skills being required is a barrier to changing their predictive analytics technology.

> Half of those who said they received adequate training in applying predictive analytics to business problems also said they are very satisfied with their predictive analytics.

However, in only about half (52%) of organizations are the people who design and deploy predictive analytics the same people who utilize the output of the predictive analytics processes. The most common reasons that users of predictive analytics don't produce their own analyses are that they don't have enough skill training (79%) and don't understand the mathematics involved (66%). The research also finds evidence that training pays off: Fully half of those who said they received adequate training in applying predictive analytics to business problems also said they are very satisfied with their predictive analytics; percentages dropped precipitously for those who said the training was somewhat adequate (8%) and inadequate (6%). It is clear that trained professionals are

necessary for an organization to successfully understand, deploy and use predictive analytics.

Predictive analytics is used most often used for areas involving customers, marketing and operations.

The research shows that the functions within the organization that most often apply predictive analytics are marketing (48%) and operations (44%). The categories of information to which organizations most commonly apply predictive analytics are customer (50%) and marketing (44%) information, followed by product (43%), financial (40%) and sales (36%) information. Thus predictive analytics is being used in areas critical to revenue and profitability. Size matters, though: In each of these categories except product, greater percentages of very large companies (as measured by number of employees) use such information than do large, midsize or small companies. Conversely, small and midsize companies most often focus on product information.

The categories of information to which organizations most commonly apply predictive analytics are customer (50%), marketing (44%), product (43%), financial (40%) and sales (36%).

The most common uses for the findings of predictive analytics are forecasting (currently used by 56%) and marketing analysis (46%), followed by customer service (41%) and product recommendations or offers (35%). Substantial percentages of organizations will focus on these same areas in future deployments, but interestingly the areas most often planned for future deployments differ, suggesting an interesting shift in business focus; they are social network analysis (by 54%) and predicting product development life cycles (46%). But organizations have a broad view of the utility of predictive analytics; at least 30 percent plan to use predictive analytics for 11 of the 14 options we suggested. The research thus finds that predictive analytics provides value across a wide array of business areas and especially in those areas involving customers and products.

Business and technical obstacles still impede deployment of predictive analytics.

Despite evidence of growth and increasing use, the research also finds persistent barriers to making changes in the use of predictive analytics. More than half (52%) of organizations lack the resources that would be needed, and nearly as many (48%) lack awareness of the need for changes. One-third (34%) said that the business case is not strong enough, and 29 percent said too much training is required. The lack of suitable technology was cited least often as a barrier, by only 16 percent of participants. These findings reinforce our Performance Index analysis that identifies people issues as those most in need of improvement and technology as the least. Executives most often expressed concern about lack of awareness (58%), while lack of resources was identified as a barrier most often by managers (71%) and users (55%), who require those resources. IT participants are more concerned than business users about both lack of resources (64% vs. 50%) and lack of awareness (58% vs. 43%). Taken together, these issues highlight perceived difficulty in gaining priority for predictive analytics systems and underscore the importance of building a strong business case for investment.

> More than half (52%) of organizations lack resources to make changes in the use of predictive analytics, and nearly as many (48%) lack awareness of the need for changes.

From a more technical perspective, the most common deployment challenge by far is difficulty in integrating predictive analytics into the information architecture, cited by fully half of participants. Accessing necessary source data (30%), inappropriate algorithms (26%) and results not accurate enough (21%) also impede use. Only 17 percent said they haven't encountered any technical challenges. Difficulty integrating into information architecture is of particular concern for managers (55%) and users (50%) but not as much for executives (20%), who would not deal directly with this. Very large companies (as measured by number of employees) most often have issues with integration into the information architecture (63% vs. 50% overall); only 22 percent of small companies said this is an issue. Larger organizations likely have more complex infrastructures than in smaller

ones, and so the challenge of integrating predictive analytics into them is more difficult.

Competence in using statistics and algorithms is necessary for predictive analytics.

Mathematical algorithms and related analytic methods are at the heart of predictive analytics; they provide the basis for building statistical models and transforming data from inputs into predicted outcomes. Almost half (48%) of organizations participating in the research said they can address all of their business issues with 10 or fewer algorithms. Very large companies, however, most often said they need 20 or more algorithms, likely because they apply predictive analytics in more ways. In any case it is necessary to understand the different techniques available and identify those best suited to developing the kinds of insights an organization hopes to achieve; this assessment should include plans for training on how to use those selected.

> Almost half (48%) of organizations participating in the research said they can address all of their business issues with 10 or fewer algorithms for predictive analytics.

The mathematical algorithms used most often now are the same as in our earlier research, with regression techniques leading the way. Specifically, more than four out of five participants use decision trees and linear regression, 76 percent use pivot tables, 71 percent use logistic regression, and 70 percent use generalized linear models. Regression is the most common type of statistical technique used for prediction and forecasting. However, many algorithms have become more popular over the last three years, including several associated with the trend toward analysis based on machine learning: regression trees (from 69% to 82%), associative rules (49% to 61%), clustering (36% to 68%), neural networks (30% to 49%), Naïve Bayes (21% to 43%) and support vector machine (20% to 37%).

In machine learning analysis inputs help construct the model. The emergence of machine learning has coincided with the rapidly accelerating use of big data – the availability of large data sets and the computing power to process it. The research finds that knowledge and

use of mathematical and statistical models are prevalent among organizations that embrace predictive analytics.

Organizations use an array of tools to implement predictive analytics.

Establishing predictive analytics requires use of programming or statistical languages to process the mathematical algorithms and correlate to statistical models. Some packaged software masks the complexities of the languages and algorithms from the user to reduce the degree of skill required. Whatever the approach, though, individuals employ interfaces to apply predictive analytics. The interfaces most often used are spreadsheet modeling tools (48%), graphical workflow tools (44%), integrated development environments (37%) and menu-driven modeling tools (35%). It is not surprising that spreadsheet tools are the most common since they are a widely used personal productivity tool. Similarly, graphical workflow tools allow users to drag and drop various statistical operators to create a visual workflow of how the data is processed; this can make it easier to build and troubleshoot complex models. We note that usability is the top software evaluation criterion for predictive analytics systems; these most common interface design tools are often considered more approachable than command-line interfaces and integrated development environments.

> The interfaces most often used to apply predictive analytics are spreadsheet modeling tools, graphical workflow tools, integrated development environments and menu-driven modeling tools.

From a technical perspective, the two most common languages and libraries used to achieve the goal of algorithmic implementation are SQL (67%) and Microsoft Excel (64%). This is not surprising given the ubiquity of skills in these approaches and their relative ease of use compared to more advanced languages and libraries. The next three most commonly used are the open source language R (by 58% of organizations), Java (42%) and Python (36%). Unlike the first two, these languages must be implemented by programmers and require much more training. Overall, many languages are in use: Three out of five organizations use four or more of them. In addition, 18 languages and libraries were each mentioned by 5 percent or more of

participants, and 17 percent mentioned a unique language or library that was not included on our list. In addition, vendor-specific languages such as those from SAS (34%) and IBM SPSS (21%) are used, perhaps in parallel with others. We conclude that many languages and libraries are likely to remain in use in enterprise environments in the near future. While this diversity reflects the predictive analytics skill sets available in organizations, it creates significant challenges if the predictive analytics tools are stand-alone products. These findings are another indicator of the complexity that organizations face today.

Blending predictive analytics with other technology is widely desired.

The research reveals that fewer (29%) organizations prefer to purchase predictive analytics as stand-alone technology today than in the previous research (44%). This trend indicates a growing demand for predictive analytics tools that can be integrated with operational environments such as business intelligence or transaction applications. Being able to do so helps businesses be more responsive to market opportunities and competitive threats. More than half now prefer predictive analytics to be embedded in other technologies; the most common choice (23%) is within a business intelligence product. Fewer prefer to purchase it as part of an application (12%) or embedded in middleware (9%) or a database (9%). We attribute the somewhat increased interest from three years ago (2%) in purchasing predictive analytics embedded in middleware applications to more use of predictive analytics for operational intelligence. In particular, emerging areas such as the Internet of Things dictate that more predictive analytics be embedded in a distributed fashion.

> More than half of organizations now prefer predictive analytics to be embedded in other technologies; the most common choice (23%) is within a business intelligence product.

Asked specifically how they would like predictive analytics integrated with other tools, participants most often said with business intelligence (56%) and within business applications (49%). These two options are not mutually exclusive: A majority of those who want predictive

analytics embedded in business intelligence tools also want it embedded in business applications. Organizations want to deliver capabilities to end users; thus, the research shows less but still significant demand for integration with databases as well. In-database capabilities allow the predictive analytics to be combined at the source so users can both build and deploy models in one system. In this regard participants would like in-database development of predictive models (40%) and in-database scoring of new records (31%). The preference to purchase predictive analytics integrated with business user tools reflects a trend to bring predictive analytics into the mainstream of the organization.

Predictive analytics requires timely updates to statistical models.

In predictive analytics, statistical models provide the mechanism for transforming data inputs into likely outcomes. Inevitably, models get stale and produce inaccurate results as business circumstances change and new data sources emerge. Yet the research shows that about half (51%) of organizations update their models only monthly or less frequently. Only one in five update models daily or more often, and this group is most often satisfied with its use of predictive analytics, with more than half indicating they are very satisfied, compared to 23 percent overall.

> Only one in five update their statistical models daily or more often, and more than half of this group is very satisfied with its use of predictive analytics, compared to 23 percent overall.

Updating models automatically, which fewer than one-third of organizations do today, can provide advantages as well. Those organizations that said they update their models constantly more often than others also said more often that they have achieved significant improvement in their processes (71% vs. 43% overall) and competitive advantage (86% vs. 60%). Very large companies as measured by number of employees most often update their models on an automatic basis (42%) whereas only about one-quarter (27%) of small companies do automatic updates of their models. While frequent updates generally are beneficial, we do not recommend a one-size-fits-all approach to updating. For instance, the capital-intensive portions of

these businesses may not require very frequent updates, but commercial aspects that can change in a moment need timelier predictions. As a general rule, however, more frequent updating of models can produce more accurate predictions.

Data preparation and big data are key ingredients for predictive analytics.

Integrating data is essential for predictive analytics. The research finds that preparing data for analysis (40%) and accessing data (22%) are the parts of the predictive analysis process that create the most challenges for organizations. Preparing data is a challenge for nearly half of those in IT (48%). To allow more time for actual analysis, organizations must work to improve their data-related processes. Some are considering moving from on-premises storage to cloud-based deployments to improve accessing data (49%) and preparing data for analysis (43%), the top areas most often cited for moving.

Big data technologies also are becoming popular for working with predictive analytics. Today flat files and relational databases on standard hardware, each cited by almost two-thirds (63%) of participants, are most commonly used. However, more than half (52%) now use data warehouse appliances for predictive analytics, and 31 percent use in-memory databases, which the second highest percentage (24%) plan to adopt in the next 12 to 24 months. Hadoop and NoSQL technologies lag in adoption, currently used by one in four organizations, but in the next 12 to 24 months an additional 29 percent intend to use Hadoop and 20 percent will use other NoSQL approaches. Furthermore, more than one-quarter (26%) of organizations are evaluating Hadoop for use in predictive analytics, which is the most of any technology. As organizations accumulate more data and need to apply predictive analytics in a scalable and reliable manner, access to and use of big data with them will be increasingly important.

> More than half (52%) now use data warehouse appliances for predictive analytics; 31 percent use in-memory databases, and 24 percent plan to adopt them in the next 12 to 24 months.

Business and IT should coordinate to optimize predictive analytics.

To impact business success, predictive analytics should be viewed as a business investment rather than an IT investment, and most participants recognize this. Two-thirds of organizations fund these projects from business budgets: 29 percent from general business budgets and 27 percent from a line of business's IT budget. Since the previous research, funding has shifted from general business budgets (previously 44%) to line of business IT budgets (previously 19%).

This is not to say that IT, technical and data experts aren't needed. By role, data scientists or the head of data management are most often involved in recommending (52%) and evaluating (56%) predictive analytics technologies. Reflecting the need to deploy predictive analytics to lines of business through technology systems, analysts and IT staff are the next-most influential roles for evaluating and recommending. Due to the need for specialized expertise, consultants are also active participants (31%) in recommending purchases. IT roles also are integral for designing and deploying predictive analytics; the BI and data warehouse team (27%), general IT resources (16%) and outsourced IT resources (2%) comprise almost half of those responsible for them.

> Data scientists or the head of data management are most often involved in recommending and evaluating predictive analytics technologies; analysts and IT staff are the next-most influential roles.

The research finds general agreement on predictive analytics between the business units and IT. For example, they agree about how best to deploy the tools. Within two percentage points, both expressed a greater preference to deploy on-premises (business 53%, IT 55%) and were even closer among those who prefer to do it on demand through cloud computing (business 22%, IT 23%). More than 90 percent on both sides said the organization plans to deploy more predictive analytics, and they also were in close agreement (business 32%, IT 33%) that doing so would have a transformational impact, enabling the organization to do things it couldn't do before.

Some distinctions remain. For example, those on the business side said that predictive analytics is very important to the organization more often (52%) than did those in IT (38%). This finding further underscores the involvement of business participants in this technology, although IT (40%) ranks third among functions currently using it. Business users also more often said that the organization has achieved competitive advantage (60% vs. 50% of IT) and created new revenue opportunities (55% vs. 41%), which were the two benefits most often cited overall. On the other hand, IT professionals more often reported the benefits of increased upselling and cross-selling (53% vs. 32%), reduced risk (26% vs. 21%) and better compliance (26% vs. 19%); the last two reflect key responsibilities of the IT group.

Organizations that have deployed predictive analytics most often said they have gained competitive advantage, created new revenue opportunities and increased profitability.

Benefits of predictive analytics include competitive advantage and growing profitability.

One-third (32%) of participants said that being able to perform additional predictive analyses would have a transformational impact on the organization, enabling it to do things it couldn't do before, while half (49%) said it would have a significant positive impact by improving current work processes. Asked about benefits attained, organizations that have deployed predictive analytics most often said they have gained competitive advantage (57%). As well, half have used it to create new revenue opportunities and nearly as many (46%) to increase profitability. Small companies (as measured by the number of employees) most often asserted that they have gained competitive advantage and created new revenue opportunities (each 62%). Services companies more often said they have benefitted than did other industry sectors in all three of the top categories.

IT professionals cited somewhat different benefits than those in business functions. They more often reported increased upselling and cross-selling (53% vs. 32%), reduced risk (26% vs. 21%), better compliance (26% vs. 19%) and a reduced load on IT (32% vs. 17%). These differences suggest that IT is using predictive analytics to deal

with risk, compliance and its own operations while business users deal more with top-line metrics.

Further analysis reveals commonalities among organizations that have benefitted from having a competitive advantage. They more often support the deployment of predictive analytics in business processes (66% vs. 57% overall), use business intelligence and data warehouse teams to design and deploy predictive analytics (71% vs. 58%), and fund predictive analytics as a shared service (73% vs. 58%). Our research suggests that benefits likely will be realized in any predictive analytics project, but applying this technology tool to an area of business areas will yield the most value.

10 Best Practice Recommendations

This benchmark research reveals significant new insights into the evolving nature and use of predictive analytics processes and systems. For organizations considering how they can enhance their business planning and decision-making, we offer the following recommendations.

1. Realize that predictive analytics requires technical skills.

Three out of four participants in this research are technically sophisticated data scientists, data analysts or predictive analytics experts. Data scientists and the business intelligence and data warehouse team are primarily responsible for designing and deploying predictive analytics in 58 percent of organizations. Do not underestimate the need for such talent in making analytics useful, and make sure that skilled people are on board when you begin an initiative.

2. Include training in plans for adopting tools.

In only about half of organizations are the people who design and deploy predictive analytics the same people who utilize the output of the predictive analytics processes. Users most often don't produce their own analyses because they don't have enough skill training (79%). The research finds that half of participants who said they received adequate training in applying predictive analytics to business problems also said they are very satisfied with their predictive analytics, compared to fewer than one in 12 who said their training was somewhat adequate or inadequate. Training, too, is a necessary part of preparing to benefit from analytics.

3. Determine which aspects of business most need predictive analytics.

The research shows that the functions to which predictive analytics is applied most often are marketing and operations and that the most widely used categories of information are customer and marketing, all used in 44 to 50 percent of organizations. Similarly, forecasting and marketing analysis are the most common uses for the findings of

predictive analytics. Assess the uses that can best benefit your business, keeping in mind that many organizations use it in areas critical to revenue and profitability.

4. Identify the most important benefits for your organization.

Asked about benefits attained, 57 percent of organizations that have deployed predictive analytics said they have gained competitive advantage, half have used it to create new revenue opportunities, and 46 percent increased profitability. IT professionals cited somewhat different benefits than those in business functions. They more often reported increased upselling and cross-selling (53% vs. 32%), reduced risk (26% vs. 21%), better compliance (26% vs. 19%) and a reduced load on IT (32% vs. 17%). Of course the benefits you seek should be tied to the areas in which you will use predictive analytics.

5. Prepare to overcome business and technical obstacles to deployment.

The research finds that despite increased familiarity, persistent barriers remain to implementing changes in predictive analytics. About half of organizations lack resources and awareness of the need for it. Therefore on the business side build a strong business case to gain priority for investing in systems. Regarding technical challenges only 17 percent of participants said they haven't encountered any; the most widespread have to do with integrating predictive analytics into the information architecture. Make sure that technical expertise is available to handle these kinds of issues also.

6. Take time to understand the role of statistics and algorithms.

Mathematical algorithms and related analytic methods provide the basis for building statistical models and transforming data into predicted outcomes. Regression analysis is the most common type of statistical technique used for prediction and forecasting, both in general and in this research. It is necessary to understand the different techniques available and identify those best suited to developing the kinds of insights your organization hopes to achieve;

this assessment should include plans for training on how to use those selected.

7. Build timely updates to statistical models into your plans for predictive analytics.

Statistical models provide the mechanism for transforming data inputs into likely outcomes, but models get stale and produce inaccurate results as conditions change. Therefore, develop a routine for updating them; the optimal schedule is daily or even more often. Only one in five organizations do so at this frequency, yet more than twice as many of them (57%) are very satisfied with their use of predictive analytics as are participants overall (23%). Consider ways to update models automatically, which the research shows can help produce significant improvement in analytic processes.

8. Consider combining predictive analytics with other tools.

The research reveals a growing demand for predictive analytics tools that can be integrated with other systems, particularly business intelligence (56%) and business applications (49%). Integration with databases, the third-most popular option, enables users to both build and deploy models in one system. These sorts of combinations can help bring predictive analytics into the mainstream of the organization and make it more widely useful; think of your use as a holistic rather than an isolated initiative.

9. Consider using big data with predictive analytics.

Preparing data for analysis and accessing data are the parts of the predictive analysis process in which research participants spend the most time. To maximize time for actual analysis, organizations must streamline their data-related processes. To deal with today's flood of incoming data, many are using big data technologies to work with predictive analytics. Investigate advanced tools such as data warehouse appliances (now used by 52%) and in-memory databases (31%); other organizations plan to adopt these and Hadoop and other NoSQL approaches. Don't try to handle the complexities of predictive analytics with outmoded tools.

10. Ensure that business and IT professionals work together.

To impact business success, view predictive analytics as a business investment rather than an IT investment. The research shows that two-thirds of organizations fund these projects from general business budgets and a line of business's IT budget. But ensure that IT, technical and data experts are involved in recommending and evaluating predictive analytics technologies, as more than half of those in the research do. Also make the choice of how to deploy the systems a joint decision: About half of business and IT roles prefer to keep it on-premises, but nearly one-fourth of both sides prefer on-demand cloud computing.

About Ventana Research

Ventana Research is the most authoritative and respected benchmark business technology research and advisory services firm. We provide insight and expert guidance on mainstream and disruptive technologies through a unique set of research-based offerings including benchmark research and technology evaluation assessments, education workshops and our research and advisory services, Ventana On-Demand. Our unparalleled understanding of the role of technology in optimizing business processes and performance and our best practices guidance are rooted in our rigorous research-based benchmarking of people, processes, information and technology across business and IT functions in every industry. This benchmark research plus our market coverage and in-depth knowledge of hundreds of technology providers means we can deliver education and expertise to our clients to increase the value they derive from technology investments while reducing time, cost and risk.

Ventana Research provides the most comprehensive analyst and research coverage in the industry; business and IT professionals worldwide are members of our community and benefit from Ventana Research 's insights, as do highly regarded media and association partners around the globe. Our views and analyses are distributed daily through blogs and social media channels including Twitter, Facebook, LinkedIn and Google+.

To learn how Ventana Research advances the maturity of organizations' use of information and technology through benchmark research, education and advisory services, visit www.ventanaresearch.com.

Appendix: About This Benchmark Research

Methodology

Ventana Research conducted this benchmark research on the Web from March through May 2015. We solicited survey participation via email, our website and social media invitations. Email invitations were also sent by our media partners and by vendor sponsors.

We presented this explanation of the topic to participants prior to their entry into the survey:

Predictive analytics improves an organization's ability to understand potential future outcomes and so to decide courses of action in key areas of the business. This research is designed to ascertain the state of and demand for predictive analytics. It will investigate how business units' request, produce and use predictive analytics and what roles they play in evaluating, purchasing and deploying predictive analytics tools. It also will examine best practices in the use of predictive analytics.

The following promotion incented participants to complete the survey:

What's In It For You? Upon completion of the research, all qualified participants will receive a report on the findings of this benchmark research to support their organization's efforts, along with a $5 Amazon.com gift certificate. In addition, all qualified participants will be entered into a drawing to win one of 25 benchmark research reports and a 30-minute consultation, a package valued at US$1,495 or €1,232. Thank you for your participation!

Qualification

We designed the research to assess the use of and plans for spreadsheets across organizations and industries. Qualification to participate was presented to participants as follows:

The survey for this benchmark research is designed for business analysts, data scientists, IT personnel and others involved with the purchasing of technology for this area. Solution providers, software

vendors, consultants, media and systems integrators may participate in the survey, but they are not eligible for incentives and their input will be used only if they meet the qualifications. Incentives are provided to qualified participants in the research and also are conditional on provision of accurate contact information including company name and company email address that can be used for fulfillment of incentives.

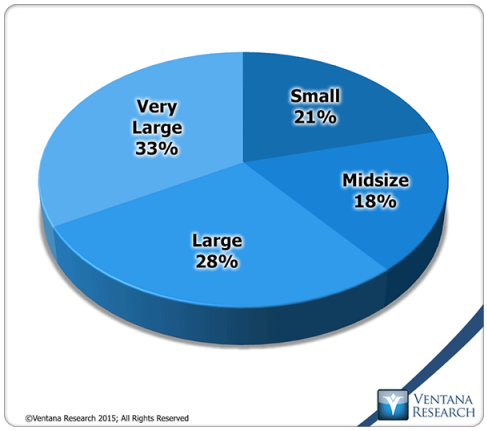
Further qualification evaluation of respondents was conducted as part of the research methodology and quality assurance processes. It entailed screening out responses from companies that are too small, questionnaires that were not materially complete, or those where the submission is from an inappropriate submitter or appears to be spurious.

Demographics

We designed the survey used for this research to be answered by executives and managers across a broad range of roles and titles working in organizations. We deemed 193 of those who clicked through to this survey to be qualified to have their answers analyzed in this research. In this report, the term "participants" refers to that group, and the charts in this section characterize various aspects of their demographics and qualifications.

Company Size by Workforce

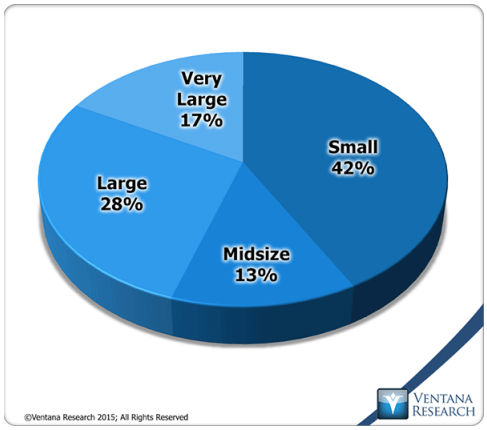
We require participants to indicate the size of their entire company. Our research repeatedly shows that size of organization, measured in this instance by employees, is a useful means of segmenting companies because it correlates with the complexity of processes, communications and organizational structure as well as the complexity of the IT infrastructure. In this research, participants represented a broad range of organization sizes in similar numbers, although skewing somewhat toward larger ones: the largest percentage, one-third, work in very large companies (having 10,000 or more employees), 28 percent work in large companies (with 1,000 to 9,999 employees), 18 percent work in midsize companies



(with 100 to 999 employees), and 21 percent work in small companies (with fewer than 100 employees). This distribution is consistent with prior benchmark research and our research objectives and provides a suitably large sample from each size category.

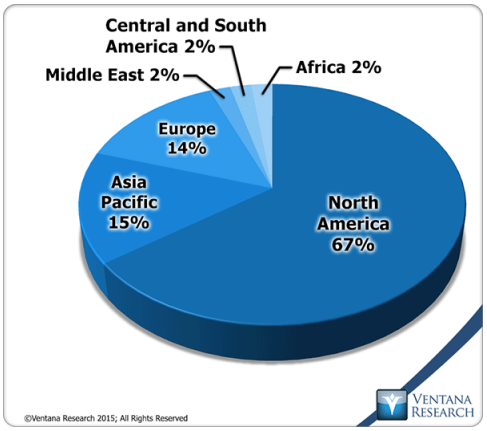
Company Size by Annual Revenue

When we measured size by annual revenue, the distribution of categories shifted downward; half as many companies are very large, and twice as many are small. By this measure, 16 percent fewer are very large companies (having revenue of more than US$10 billion), the same percentage are large companies (having revenue from US$500 million to US$10 billion), 5 percent fewer are midsize companies (having revenue from US$100 to US$500 million), and 21 percent more are small companies (with revenue of less than US$100 million). This sort of redistribution is typical in our research projects when we measure by revenue instead of head count.

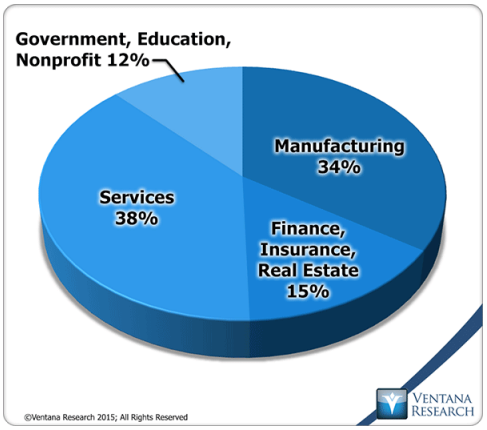


Geographic Distribution

Two-thirds of the participants were from companies located or headquartered in North America. Those based in Asia Pacific accounted for 15 percent, in Europe for 14 percent and in the rest of the world for 6 percent. This result was in keeping with our expectations at the start of this investigation, since organizations participating in our research most often are headquartered in North America. However, many of these are global organizations operating worldwide.



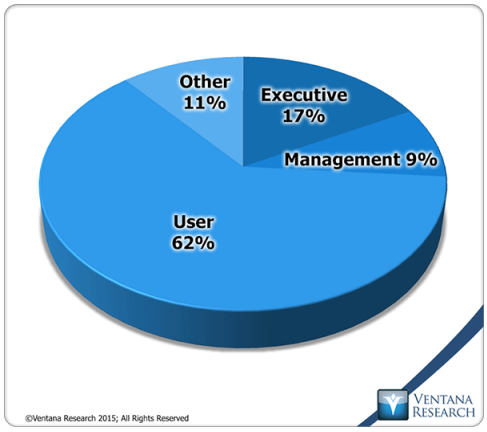
Industry



The companies of the participants in this benchmark research represented a broad range of industries, which we have categorized into four general categories as shown below. Companies that provide services (38%) and those in manufacturing (34%) accounted for more than seven out of 10 participants. Those in finance, insurance and real estate accounted for 15 percent. Government, education and nonprofits accounted for the remaining 12 percent.

Job Title

We asked participants to choose from among 15 titles the one that best describes theirs. We sorted these responses into four categories: executives, management, users and others. The majority identified themselves as having titles that we categorize as users, a grouping that includes director (12%), senior manager or manager (17%), analyst (27%) and staff (6%). Fewer than one in five are executives; about half of them (8%) are CIOs. Another 9 percent are management, by which we mean vice presidents. Others, in this case consultants, teachers and students, accounted for the balance. We concluded after analysis that this response set provided a meaningfully broad distribution of job titles.



Role by Functional Area

We asked participants to identify their functional area of responsibility as well. This enabled us to identify differences between participants who have differing roles in the organization. Given the rather technical nature of this topic, it is not surprising that the largest percentage identified themselves as being in IT; similarly the two next largest groups are research and development and consultants. The largest percentages from the lines of business are in operations and marketing. A total of 15 titles, none with more than 3 percent of the total, comprised the Other category.