

MIT Sloan
Management Review

**RESEARCH
REPORT**

**FINDINGS FROM THE 2017 DATA & ANALYTICS GLOBAL
EXECUTIVE STUDY AND RESEARCH PROJECT**

Analytics as a Source of Business Innovation

The increased ability to innovate is
producing a surge of benefits
across industries.

By Sam Ransbotham and David Kiron

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REPRINT NUMBER 58380

SPRING 2017

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The authors conducted the research and analysis for this report as part of an *MIT Sloan Management Review* research initiative sponsored by SAS.

To cite this report, please use:

S. Ransbotham, D. Kiron, "Analytics as a Source of Business Innovation," *MIT Sloan Management Review*, February 2017.

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Analytics as a Source of Business Innovation

Not long ago, Keith Moody was the only data analyst at Bridgestone Americas Inc. He was located in the credit division in Brook Park, Ohio, and saw analytics take off — in other companies. When Bridgestone Americas named a data-savvy executive, Gordon Knapp, as chief operating officer in March 2014, Moody was given the opportunity to build a new analytics department for Bridgestone Retail Operations, the company's U.S. network of tire and auto repair stores. Today, Moody reports to the interim president, Damien Harmon, as director of analytics for Bridgestone Retail Operations, where he is making up for lost time.

Moody's team is influencing management practice in virtually every part of the organization. Working with the real estate department, the analytics team pinpoints the best locations for new stores. Working with operations, it automates provision of inventory to 2,200 stores.¹ Working with human resources, it determines the best allocation of 22,000 employees so that Bridgestone retail locations have the right people on-site to deal with peak demand — and don't have workers sitting around with time on their hands. What's more, Moody's team is looking for ways to use driver data, such as odometer readings and other telematics data, to encourage car owners to come in for new tires or a tune-up before they hear a rattle under the hood and have to look for the nearest repair shop. This new reliance on analytics to inform executive decision making and to develop new services reflects a cultural shift for Bridgestone's operations in the United States.

What's happening at Bridgestone provides a window into the state of analytics across industry. After years of enthusiasm and frequent disappointment, a growing number of companies are developing the tools and, increasingly, the skills to move beyond frustration. They are progressively able to ac-

cess large pools of data and use analytics to inform decision making, improve day-to-day operations, and support the kinds of innovation that lead to strategic advantage and growth.

MIT Sloan Management Review's seventh annual data and analytics survey, conducted during 2016, reveals a sharp rise in the number of companies reporting that their use of analytics helps them beat the competition. These survey results include responses from 2,602 managers, executives, and data professionals from companies around the globe. (See "About the Research.") The findings reverse a three-year trend in our survey data (2013-2015), in which fewer companies year over year reported a competitive advantage from their use of analytics.

So, why the reversal? What changed? Our findings offer clear signals that companies are increasing their use of data and analytical insights for strategic purposes and are using data and analytics to

innovate business functions as well as entire business models. Indeed, analysis of our survey results and interviews with more than a dozen executives and scholars indicates that the ability to innovate with analytics is driving the resurgence of strategic benefits from analytics across industries. In this report, we delve into the enablers of innovation with analytics and find that data governance capabilities, especially around data sharing and data security, form the foundation for these innovation processes.

The four key findings from our research are:

- **More companies report competitive advantage from their use of data and analytics, reversing a three-year trend.** According to several indicators in our 2013, 2014, and 2015 surveys, fewer companies were deriving competitive advantage and other important benefits from their investments in analytics than in previous years. According to this latest survey, however, that trend seems to have reversed, and more companies are now seeing gains. This is due to several factors, including wider dispersion of analytics within companies and better knowledge of what analytics can do, as well as a stronger focus on specialized, innovative applications that have strategic benefits.
- **Innovation from analytics is surging.** The share of companies reporting that they use data and analytics to innovate rose significantly from last year's survey. Organizations with strong analytics capabilities use those abilities to innovate not only existing operations but also new processes, products, services, and entire business models.
- **Data governance fosters innovation.** Companies that share data internally get more value from their analytics. And the companies that are the most innovative with analytics are more likely to share data beyond their company boundaries. Survey results show that strong data governance practices enable data sharing, which then enables innovation. To be most effective, data governance needs to be embedded in an organization's culture. Tactics are not the

ABOUT THE RESEARCH

This is the seventh *MIT Sloan Management Review* research study of business executives, managers, and analytics professionals. This year's 2,602 survey respondents were drawn from a number of sources, including *MIT Sloan Management Review* subscribers. They represent organizations around the world and from a wide range of industries.

The research also includes interviews from experts from a number of industries and disciplines. Their insights into the evolving uses of analytics have enriched our understanding of the survey data. In addition, we incorporate case examples that document how analytics are being used.

In this report, we use the term "analytics" to refer to the use of data and related business insights developed through applied analytical methods — using statistical, contextual, and predictive models, for example — to drive fact-based planning, decisions, execution, management, and learning.

same as cultural norms. Data governance needs to be more than a system of tactics to derive business value — it must actually influence organizational behavior.

- **Smart machines create opportunity for innovative thinking.** Smart machines that draw inferences from data on their own and learn by using algorithms to discern patterns in masses of data are no longer confined to research labs and limited applications such as speech recognition. The most analytically mature companies use artificial intelligence to augment human skills and to take on time-consuming tasks, freeing managers to spend more time on strategic issues.

Several factors contribute to the resurgence in companies gaining a competitive advantage from data and analytics: success applying data-driven insights to strategic issues; application of analytics to a wide range of business issues; technology advances, such as cloud computing and distributed storage; and data-driven innovations that make a material contribution to the company’s competitiveness.

Channeling the data deluge

Our survey first tracked managers’ access to useful data in 2012. In each of the five surveys since then,

Resurgence in Competitive Advantage from Analytics

From 2013 to 2015, our annual surveys showed a steady ebb in the percent of companies reporting a competitive advantage from their use of data and analytics. As analytics became more widespread, and therefore a more common path to value, it became more difficult for companies to gain or maintain a competitive edge with data. “Those big early adopters got an early benefit,” notes Kristina McElheran, assistant professor of strategy at the University of Toronto. She points out that in many cases, even early adopters hit a slow patch after their initial successes with analytics because they weren’t embedding analytics into the organization. “Until it becomes an engine for learning, until it transforms your cost structure or value to customers in a way that’s difficult for your competitors to imitate, then I don’t see analytics as a silver bullet that lets firms get in front of the pack and stay there,” she explains.

In 2016, managers in more companies said they are getting ahead of the pack. This is a marked reversal of the trend of the previous three years. The share of respondents who say that analytics provides competitive advantage rebounded to 57%, still off the 2012 peak of 67%, but well above the 51% of 2015. (See Figure 1.)

FIGURE 1: COMPETITIVE ADVANTAGE FROM ANALYTICS RESURGES From 2015 to 2016, the share of organizations reporting that analytics creates a competitive advantage rose 6 percentage points.

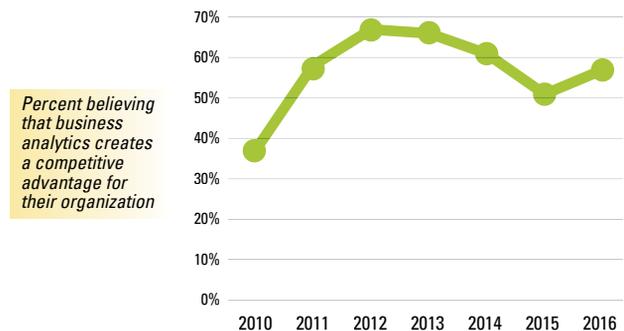
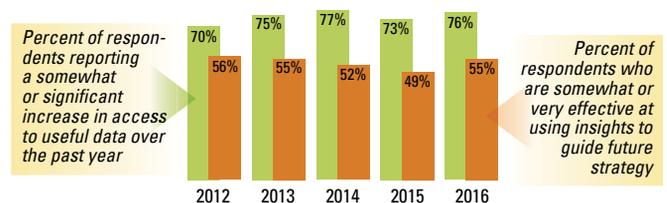


FIGURE 2: MORE ORGANIZATIONS TURN DATA INTO STRATEGIC INSIGHTS From 2015 to 2016, the share of organizations that report that they effectively use data for strategic insights rose 6 percentage points.



seven out of 10 managers reported a “somewhat” or “significant” increase in their access to useful data from the year before. Not surprisingly, over this same period, the share of respondents who said that they were “somewhat or very effective” in using insights from analytics to guide strategy steadily dropped, evidence that the flood of data hampered rather than enhanced managers’ ability to translate data to business value.

Our 2016 survey demonstrates a sharp reversal in this trend. While access to useful data continues to increase, 55% of companies said they were effective at using data to guide future strategy, up from 49% last year. (See Figure 2, page 5.)

Concentrating analytics on specific business issues

This improved ability to apply insights to strategy may reflect organizational changes in the way managers use data to improve decision making and enhance processes across the enterprise. As McElheran points out, identifying useful data and performing analyses is only part of the process. To implement data-driven approaches that generate measurable results, companies also need to make adjustments throughout the organization — in process design, in supply chain operations, in compensation and training, and in mindsets and behaviors across the board. Those adjustments, McElheran says, take time, which may help explain why fewer companies reported competitive advantage and strategic insight from 2012 to 2015.

Another reason for the improved ability to apply insights to strategy is management’s application of analytics to address specialized business issues, such as understanding individual customer behavior, that yield high-value results. More organizations are translating knowledge of their own customers into specialized models that lead to unique insights, rather than depending on external data providers for more generic insights into their customers’ behavior. Wayfair Inc., a Boston-based online home goods retailer, is an example of how analytics use is evolving from the general-

purpose to more specific, customized applications. For years, the company used an outside vendor to analyze data and optimize display-advertising purchases. David Drollette, senior director of analytics at Wayfair, brought the function in-house because he believed that Wayfair would do better with analytics that were customized for its operation. “We took a small team of data scientists, paired them with business analysts, and created a display-advertising functionality that beat our vendor, which is a multi-hundred-person company, where that’s the only thing they focus on,” he says. “So we were able to take those costs off our books, take that ability in-house, and really optimize a pretty important channel for us.” General Mills Inc. and Entravision Communications Corp., the California-based Spanish-language media company, are two other companies wresting control from data vendors over how they understand customers.²

More generally, as managers in various departments and functions become more adept at analytics themselves, they are developing specialized approaches, uniquely optimized to their situation, that answer specific questions and solve problems. “We are clearly seeing a specialization story playing out with some of our repeat clients who are slowly but surely realizing the vast potential of business analytics,” says Ravi Bapna, who runs the Carlson Analytics Lab at the University of Minnesota’s Carlson School of Management. “A client that started three years ago with an exploratory, unsupervised machine-learning project to optimize aspects of a nationwide product mix has now evolved into using individual-level predictive modeling to tackle idiosyncratic employee churn.” McElheran further observes that “specialization is going to come rapidly on the heels of a broad-based diffusion.”

A tide of innovation

Specialization, in turn, can direct analytics toward innovations that deliver or contribute to competitive advantage. In 2016, 68% of respondents “somewhat agreed” or “strongly agreed” that analytics has helped their organizations innovate, up from 52% in 2015.

This finding suggests that the poster children for data-driven innovation, such as General Electric, Google, IBM, Airbnb, and Uber, are not lone stars. Bridgestone and Nedbank Group Ltd., discussed below, are two examples of traditional companies now using data and analytics to improve their existing operations and create new business.

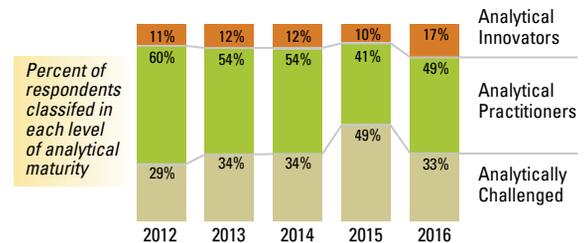
At Bridgestone, analytics allows the company to innovate new processes in key areas, such as site selection and staffing. A new staffing program, using predictive analytics, determines the appropriate allocation of 22,000 workers across 2,200 stores — putting enough workers in stores for peak demand while avoiding unneeded labor costs when business is slower. “The headcount model we built is based on standard industry practice, but it’s groundbreaking here at Bridgestone,” says Moody. The payoff will be millions of dollars per year in efficiency gains and increased sales, he says. The key advantage for Bridgestone is applying those industry standard practices in ways that capitalize on Bridgestone’s unique capabilities.

At Nedbank, the fourth-largest bank in South Africa, analytics targets bank marketing efforts more precisely. The bank tracked customer profitability by product for many years, but when it combined several sets of product and customer data, branch managers could then identify the most profitable customers and offer special discounts and other incentives to increase patronage. At Nedbank, analytics goes beyond just improving existing processes; the bank also developed an entirely new service line for commercial customers based on its growing expertise in analytics. Market Edge is a web-based service that lets Nedbank’s merchant customers identify their own best customers, based on the bank’s analysis of transactional credit- and debit-card data.

Analytical Innovators at a High-Water Mark

For the past five years, we have assessed an organization’s analytical maturity in terms of its ability to

FIGURE 3: THE NUMBER OF ANALYTICAL INNOVATORS JUMPED FOR THE FIRST TIME The share of organizations that qualify as Analytical Innovators rose from 10% to 17%.



THREE LEVELS OF ANALYTICS MATURITY

In our research, we categorize companies based on their level of sophistication in analytics and their success in using data to innovate and to build competitive advantage.

Analytical Innovators

These companies have an analytics culture, make data driven decisions, and rely on analytics for strategic insights and innovative ideas.

Analytical Practitioners

Analytical Practitioners have adequate access to data and are working to become more data driven. They use analytics primarily to effect operational improvements.

Analytically Challenged

The least advanced companies still rely more on management intuition than data for decision making. They struggle with data access and quality and lack data management skills.

innovate with data and to gain a competitive advantage from analytics. With the surge in organizations reporting data use along both of these dimensions, analytics maturity within the corporate landscape has shifted. Figure 3, on page 7, illustrates this shift.

FIGURE 4: ANALYTICS FOSTERS MANY WAYS TO INNOVATE Innovation with data is becoming common practice in a wide variety of ways.

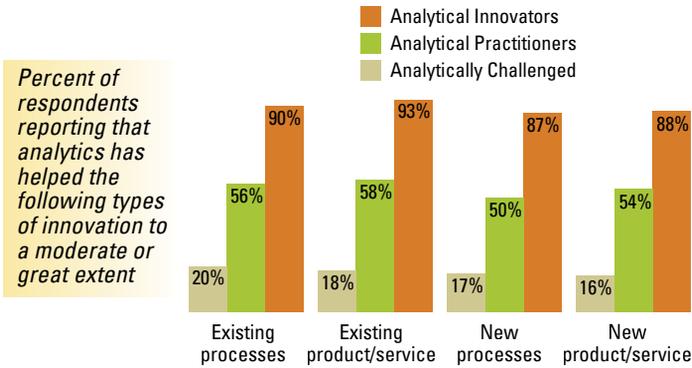


Figure 3 depicts the sharp rise in the number of Analytical Innovators — those organizations that use data and analytics to innovate and obtain a competitive advantage to a moderate or great extent. This is the first time that the share of respondents in this category has exceeded 10%-12% of survey respondents. (The sidebar, “Three Levels of Analytics Maturity,” describes the characteristics of companies in each category.)

The level of Analytically Challenged companies, the least-advanced category, fell to 33% in 2016, down from its 2015 high of 49%. Meanwhile, the share of Analytical Practitioners — companies that are working to become data driven and are adopting some complex approaches to analytics — rose to 49% in 2016 after having dropped to a five-year low of 41% in 2015.

Navigating Data-Driven Innovation

Analytical Innovators use data and analytics both to innovate incrementally in existing products, services, and processes and to create all-new products, services, and business models. (See Figure 4.) Analytical Innovators are more than 60% more likely than Analytical Practitioners to use analytics for in-

novations that lead to new products, services, and processes or improve existing ones.

While conceptually distinct, the edge between incremental innovation and the kind of innovation that enables a new business model may not be clear in practice. At the University of Pennsylvania’s Wharton School, professor Peter Fader and the team at his predictive analytics startup, Zodiac, developed a system to crunch various types of data to determine which customers are most valuable — that is, most likely to use a company’s products and services again and most likely to buy a new product. Based on this analysis, the system predicts a total lifetime value for each individual customer. Marketers can then prioritize them accordingly.

That may seem like an incremental improvement on customer segmentation, but that’s not how Alvin Glay, head of digital marketing for Wahoo Fitness, sees it. Wahoo Fitness, based in Atlanta, Georgia, makes sports and fitness products, including workout apps and smartphone-connected fitness devices, such as heart rate monitors, indoor smart-bike trainers, and GPS bike computers. When he learned about Fader’s approach, he saw a new business opportunity. “We sent them detailed, non-personally identifiable information [non-PII] transactional data. We also sent them geography information and the category that customers purchase in,” says Glay. “They came back and said, on a customer-by-customer basis, these are the customers that essentially have a high value. We said, let’s take the top 20% of cyclists in terms of customer lifetime value and run digital campaigns for our new bike computer product targeting those customers, instead of everyone who purchased a bike computer in our database. The results we saw with this approach were amazing, and we are looking forward to exploring this further.”

Beyond incremental improvement

Well over 80% of Analytical Innovators and half of Analytical Practitioners use analytics to innovate new products, services, and processes. What kinds of innovations are they pursuing? At Bridgestone, Moody describes an idea that would radically alter

his company’s business model. If the company could gain access to telematics information about how many miles a car has been driven — a big “if” at this point — it could create a new way of selling. Instead of waiting for a car owner to drive in for replacement tires, for example, the company could tell the customer when the car is due for new tires and craft a custom offer to encourage drivers to come into the nearest Firestone Complete Auto Care store. This approach, which depends on data navigating its way between automobiles and Bridgestone, could be used to offer preventive maintenance, encouraging drivers to bring their vehicles in for service before they hear an ominous knocking under the hood or the brakes start to fade. “This predictive analytics approach changes entirely the way that we look at our role in the business,” says Moody. “We’re trying to get in front of the event rather than behind it.”

Like Bridgestone, some companies that are re-vamping their business models with data-driven innovations are discovering new levels of customer engagement with analytics and new opportunities to engage with organizations in their business value chain. In the Bridgestone example, for instance, the tire manufacturer could offer a new service to customers but only if it first works with automakers or software providers to make the requisite data sharing possible. Furthermore, what Bridgestone then learns about automobile performance and customer behavior might have value on its own that then could be the source of unknown new revenue opportunities. Indeed, a growing number of organizations have begun monetizing analytical capabilities that they have produced in the course of developing data-driven innovations, including companies as diverse as Entravision, GE, and the pharmaceutical distributor McKesson Corp.³

Functional areas that excel with data

Within companies, innovation with data varies across departments and functions; for example, departments may emphasize incremental innovation or more radical innovation. In Figure 5, a score of 50 indicates an even mix; the higher the score, the more

FIGURE 5: INNOVATION EMPHASIS VARIES BY DEPARTMENT Departments mix their use of analytics between incremental and radical innovation.

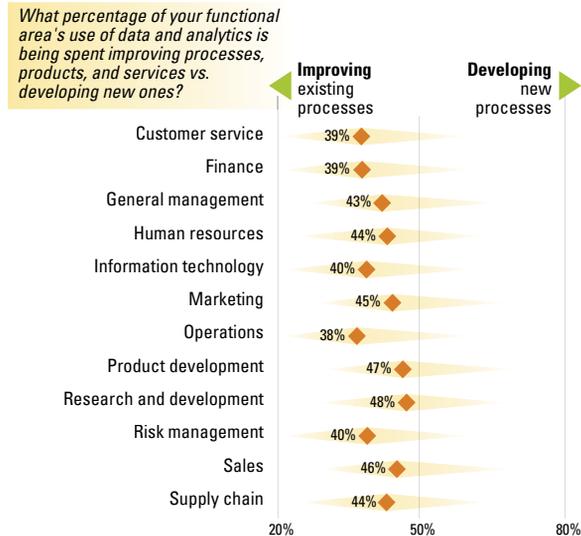
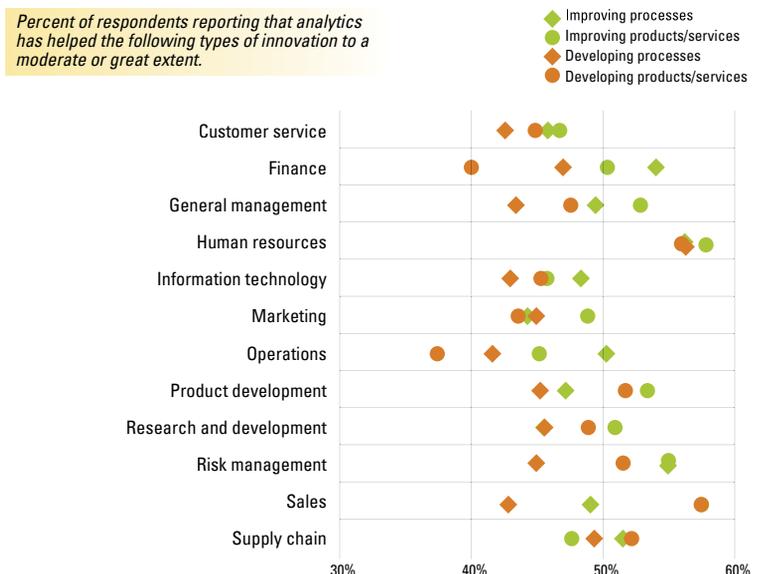


FIGURE 6: FEW DEPARTMENTS USE ANALYTICS HEAVILY FOR ALL TYPES OF INNOVATION

Beyond relative differences in emphasis, departments also vary in their absolute amounts of innovation through analytics.



radical innovation in products, services, and processes is taking place in the department on average.

Figure 5, on page 9, shows a detailed breakdown of innovation activity by department. It shows that the departments that use data to innovate new products are sales (58%) and human resources (56%) — ahead of product development (52%) and R&D (49%). Surprisingly, human resources also leads in innovation of new processes, followed by supply chain and finance. One possible explanation for this finding is that it may be easier for some departments to innovate new processes when use of analytics is still relatively new; the differences we observe between organizations in analytics adoption is also true within organizations.

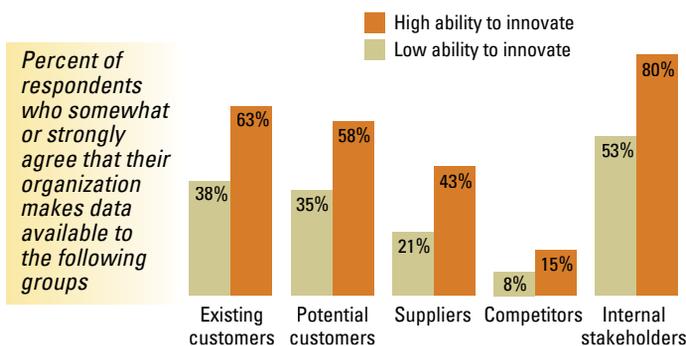
Figure 6, on page 9, also shows that only a few departments use analytics for innovation across the board; most focus on either new products, services, and processes or improving existing processes — but not on both. An exception is human resources. Finance departments, which are known for their embrace of analytics, reported relatively limited use of analytics for new products, services, and processes.

Sharing Data Accelerates Innovation

The ability to innovate with data is clearly tied to having effective data-sharing practices (though to a lesser extent in some — but not all! — heavily regulated industries). (See Figure 7.) Organizations with a high ability to innovate (those that somewhat or strongly agree that analytics helps them innovate) share data both internally and beyond company borders at much higher levels than other organizations: 80% of these organizations report sharing data internally, compared with 53% of other organizations.

Yet, in many organizations, data remains stuck in functional silos or within departments. Nearly half of respondents say that their companies are secretive or somewhat secretive about sharing data (internally and externally). Less than 10% describe their companies as open about sharing data. “It’s a fun topic within our company, because each division has its own data silos,” says Bridgestone’s Moody. “We’re slowly starting to break down those walls and trying to build out an enterprise analytics sandbox, where we can get all the data together so we can do a lot of the more advanced analytics modeling.” Technical barriers to sharing are diminishing with increased reliance on infrastructure such as cloud computing, but organizational barriers are still common impediments to dissolving data silos and creating broad-based access to useful information.⁴

FIGURE 7: SHARING DATA HELPS ORGANIZATIONS INNOVATE Organizations with a high ability to innovate share data the most.



At W.L. Gore & Associates Inc., systems architect Chris Chen is keenly aware of the need to unlock siloed data to enable innovation. Gore, a manufacturer of advanced materials based in Newark, Delaware, is a research-driven company that is famous for its Gore-Tex waterproof fabric. “We have been running experiments for almost 60 years, but we should be able to do more with the data,” Chen says. “If we could look at all the experiments collectively, would we see that we completely missed some white space in the search? It is hard to answer that if each experiment is a one-off dataset sitting on individual computers.” Sharing is particularly important

for catching errors of omission. Without effective data-sharing practices, it's difficult for an organization to know whether some analysis has been tried before, with or without success. Processes need to be established to record both successful and unsuccessful results in order to avoid errors. Chen believes that by combining data from all those experiments, the company might “stumble upon” the next Gore-Tex, an innovation that nobody knew was needed but has become essential to outdoor enthusiasts and workers, as well as a huge success for the company. “More importantly, is there a more methodical way to stumble?” he adds. “That’s what data and analytics lets us do.”

Sharing data across silos is necessary, but by itself, data sharing is insufficient to generate valuable insights; companies often need employees with very different skill sets to collaborate in order to unite different views about what the data means. Arabesque Partners, a London-based asset management firm that invests in companies with good environmental, social, and governance (ESG) practices, needs analytics teams and subject-matter experts to work together to weight a variety of data inputs, from board composition information to green supply chains, in order to create the best algorithms. “Our firm is built on two pillars, sustainability research and the quant skill set, using artificial intelligence in order to maximize information out of that,” says CEO Omar Selim. “I look at the head of ESG and the head of quant, and think, ‘Thank goodness they are good friends, because they fight often with each other.’ But the friction is where we generate the value.”

It is possible, of course, for information sharing to undermine the innovation that leads to distinctive products. At Gap Inc., the company’s analytically oriented CEO Art Peck encourages product teams from The Gap and Old Navy to meet regularly to discuss fabric innovations and other issues. But some analysts believe that Old Navy cannibalized sales from The Gap, as the two brands now sell similar merchandise.⁵ Knowing when and how to share which information — and why — helps determine an effective data-sharing practice.

Creating passages between organizations

Sharing data beyond the bounds of the corporation is another way in which organizations that use data to innovate get the most out of analytics. Wahoo Fitness puts data at the core of its marketing initiatives to develop insights about its customers and how to market to them and find other individuals like them — such as identifying those that have the highest lifetime value — that the company could not generate with its own data alone. So, for example, it uses insights from social signals on Facebook and Strava (a fitness app for cyclists) that in turn provide Wahoo with information about the online behavior of those consumers, including ad impressions that they are exposed to. Combining multiple data sources, while difficult, provides insights that are not possible when they are used in isolation from one another.

German automakers BMW, Daimler, and Volkswagen take the practice of sharing data to a new level. In 2015, they formed an alliance and bought Berlin-based HERE, a digital mapping company, to create a crowdsourcing service that enables drivers to share detailed video views of traffic jams and other road conditions on a single platform. “You have competing brands which are putting their data together to create very unique services which were not possible before,” says Bruno Bourguet, HERE’s global head of sales.⁶ The new service, expected to go live in the first half of 2017, will also collect data from brakes, windshield wipers, headlights, locations systems, and other sensors from their respective car brands to deliver real-time alerts to driver dashboards. The sheer number of customers participating in this platform is expected to create a service that delivers more value to each car owner than a comparable effort from an automaker with fewer customers — a competitive advantage for the partnership.

Competitors’ willingness to share what they regard as proprietary information, even with guarantees that their data will be anonymized and protected, varies by industry. GE is still trying to convince oil and gas customers to share performance data for industry-wide benchmarking. The benefits could be enormous,

since even small improvements can be worth hundreds of millions of dollars for major oil companies. Oil and gas customers tell GE that they would like to have the benchmark data but are unwilling to contribute their own, so the data sharing is not occurring — nor is the innovation it might enable.⁷

Efforts to share data across industry lines — even when there is little risk that a competitor will gain advantage — are also fraught. As noted, Bridgestone sees an opportunity to create a new business model based on selling proactively, reminding customers when it's time to have their tires checked or perform preventive maintenance. But it does not yet have access to the telematics data gathered by onboard computers to make the model work. Auto dealers do have access to the data, at least when cars are under warranty. And some insurance companies also gather telematics data from drivers who permit them access in order to qualify for discounts based on what the data shows about their driving habits or for pay-as-you-go coverage.

Today, neither car manufacturers nor insurers share telematics data, but Moody is optimistic that they will. “I think data sharing, especially with another industry, is really going to start to open up, because

we are going to start competing so much with analytics and data that the more that we can partner with others to potentially share data or trade data between organizations, the better everyone's analytics will be,” he says. “I see a huge amount of new relationships forming to be able to do data sharing among companies to help improve decisions.”

As these examples make clear, ownership of useful data is altering power relationships within industries and even within companies. As organizations learn how to extract more and more value from data, incumbents that grew to prominence based on physical assets now face diminished importance of those assets due to the rising value of data. Amazon.com Inc.'s knowledge about what its more than 300 million customers are buying, for instance, gives it an enormous advantage over traditional retailers and provides market power in its dealings with suppliers.

Data governance liberates opportunity

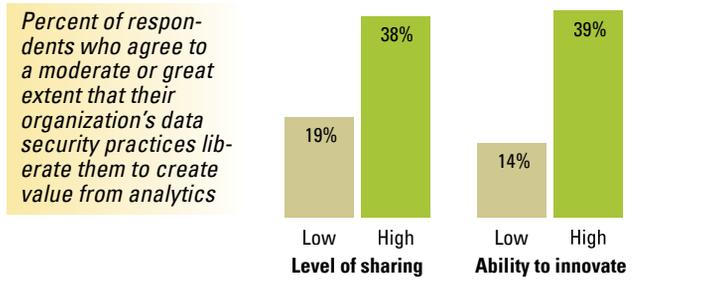
Opening the data floodgates between organizations and industries won't work without structure. Data governance encourages data sharing by controlling what can and cannot be shared. In health care, well-established regulations about how patient data can and cannot be shared can actually encourage sharing rather than restrict it. In our survey, 25% of respondents from health care industries said they are likely to share data with competitors, compared with 19% of respondents from other industries. (See Figure 8.) Nearly 40% of companies that have both high innovation capabilities and are high-sharing (an overlapping set) agree that good governance is liberating, while only 14% of companies with low innovation capabilities see governance as a positive.

Good governance can improve both the effectiveness and speed with which shared data and analytics improve innovations:

- When using shared data, organizations are further removed from the original source of the data and may miss important information about the data. “Effective use requires both stewardship

FIGURE 8: GOVERNANCE CAN LIBERATE

Organizations that share data and innovate say governance helps.



and protocols,” says Peter Levin, a senior research scientist at Intel Corp. “Stewardship defines both data and algorithm access, limits, and exchange rules. Protocols describe the metadata needed to provide the context.” Good governance practices promote effective use of data.

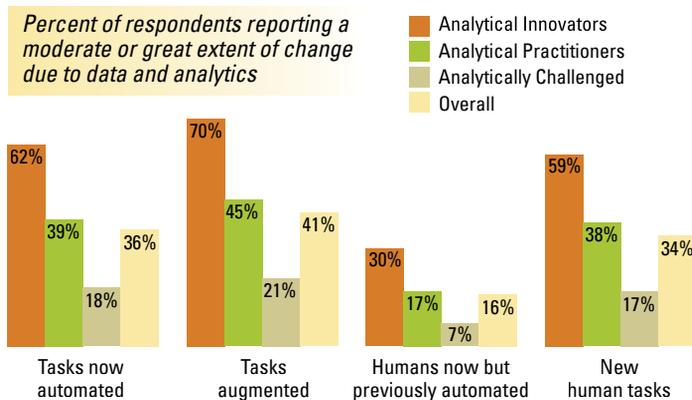
- Integrating data from multiple sources can slow down the data flow, as each step can add delay. At the Federal Bureau of Investigation, maintaining security — a form of preventive maintenance in the public sector — often depends on many different groups sharing data with one another in a timely manner. “Security events may be connected even though initially they may appear isolated,” says Kevin Swindon, an FBI special agent and supervisor of the Boston Division CYBER Program. “Analytics now lets us uncover patterns, and these patterns may provide investigative clues. However, speed is critical. As we have better defined our processes around data sharing, we’re able to focus on these types of incidents quickly, rather than spending time figuring out the mechanics around the data.” Good governance practices can also improve the speed of innovative use of data.

Smart machines create more time for innovative thinking

Smart machines that can take on tasks that traditionally required a human have captured the popular imagination. But the immediate benefits from smarter machines are not in human replacement. As Tom Davenport, the President’s Distinguished Professor of Information Technology and Management at Babson College, has written, “Of course, automation technologies bring fears of job loss. I believe that when an organization adopts these tools, it’s a bad idea to put the primary focus on eliminating human jobs.”⁸ Instead of elimination, liberation and augmentation more aptly describe the implications of automation for some segments of the labor market. For example, machine-learning techniques applied to dull, repetitive, data-cleaning work allow computers to learn from patterns they discern in large datasets, enabling companies to

FIGURE 9: ANALYTICS ENABLES TASK AUTOMATION AND AUGMENTATION

Organizations increasingly automate and augment, but new tasks for people may be the result.



automate some analytical tasks and freeing up data experts to work on higher-value-added tasks. Data experts are just one of many pools of workers that automated work flows may affect in ways that are not yet known.⁹

For several years, the more advanced corporate users of analytics in our surveys have told us they are using analytics to automate processes in their companies. This year, 63% of our Analytical Innovators say they are somewhat or very likely to turn analytical insights into automated processes. (See Figure 9.) This compares with 14% of respondents in the Analytically Challenged category. More than 60% of all companies surveyed say that some organizational tasks once done by humans in their companies have been automated, at least to some extent, because of analytics.

More than 40% of companies surveyed say that they use analytics to augment human tasks, and 70% of Analytical Innovators say their companies are doing so. Fewer companies overall and fewer Analytical Innovators say that tasks are being fully automated. So, at least for now, rather than always replacing human skills and jobs, companies use analytics to help humans work better or complete tasks that they could

FIGURE 10: CONTROLLING DATA IS A SOURCE OF ORGANIZATIONAL INFLUENCE Departments across organizations agree that knowledge and information affect influence.



not have done themselves, such as scanning millions of customer records to find patterns.

At Wayfair, Drollette talks about the importance of automating certain types of work. “I think real time is incredibly important, but to put a real-time data feed in front of a person is kind of a recipe to have them clicking their refresh button a little compulsively,” he says. “Instead of having a human try to watch it and make sense of it, let’s put some complex event-processing or some other algorithm in front of it to decide what’s really useful in real time, curate that, and maybe send an email when there’s something interesting, when there’s an exception that needs to be looked into.” Machine intelligence in this context lets Wayfair business processes use massive data at scale, matching machines and humans to their strengths.

Bridgestone found that workers were more than happy to get assistance from a smart algorithm. For years, the company used an essentially manual process to allocate inventory across the United States. Detailed segmentation through analytics led to many specialized and targeted products, but after a while, some stores had no room left to store ad-

ditional inventory. Physical constraints kept each location from being able to keep a volume of every product on hand. So employees then had the new task of allocation to each individual location based on its idiosyncratic customer characteristics. Moody and his team offered to embed the current human processes into dynamic algorithms that would use sales data to allocate store inventory. The team that had been struggling with the inventory process welcomed the new system. “They said, ‘Please help us do this,’” Moody recalls. Now, instead of spending their days trying to set the stock levels across the entire country, the team is occupied with more strategic questions and happy to let the model do the grunt work.

Similarly, at video game producer Electronic Arts Inc., based in Redwood City, California, the designers who dream up new games are embracing an analytics system that tells them what characteristics will make a game attractive to EA’s best customers. They don’t regard it as a loss of creativity, says the Wharton School’s Fader, but as a way to succeed. “The chief analytics guy told me it’s every bit as much a creative business as it was before, maybe more so, because instead of trying to come up with a game for everybody, they are designing for these really valuable customers, and it may be even more of a creative challenge,” he says.

Conclusion

Many functional areas within organizations increasingly look to data and analytics as a source of knowledge and influence. Nearly 37% of respondents in our 2016 survey say that analytics has shifted the power structures in their organizations, and two-thirds expect that analytics skills and control of data will determine which departments and managers have influence in the future. Many functional areas report increases in influence within their respective organizations as a result of their use of analytics. (See Figure 10.) “IT will continue to play a critical role,” Moody observes, “but it may have less influence over how data is consumed across the company.”

As more companies draw on analytics for a competitive edge and more departments within a given organization explore the potential of analytics, several complementary trends are emerging around an organization's new emphasis on data (its own and others')

1. Businesses that take data seriously organize themselves around data as if it were a valuable organizational asset. The sources of data-driven innovation draw from strong data governance practices and a propensity and ability to share data. The growing ranks of analytically mature organizations, the Analytical Innovators, suggest that more organizations are developing these practices and propensities. This doesn't mean that an organization should rely exclusively on its own data; nor does it mean relying exclusively on others' data. Data from other organizations can augment organizational insights around customer behavior and market segmentation. Having strong governance practices that enable data sharing, both within the enterprise and across enterprises, may be critical to innovation that relies on integrated datasets. Executives need to carefully weigh the trade-offs that come with developing an in-house capability for integrating and analyzing datasets versus relying on external providers who can scale but may not be able to custom fit — for example, explain your company's customer behavior at a level that has genuine business value. In either case, creating processes that ensure confidence in the data is critical.
2. Data sharing requires many parts of an organization to work together, sometimes in tandem with other organizations. Awareness is critical — who else in your organization is working with data that may intersect with your own uses of data? Creating mechanisms for understanding how other business silos use data can deepen innovation opportunities within a given silo. Cultural norms that encourage managers to use these mechanisms are also necessary. Data sharing, and related practices, are not merely tactics for deriving business value. To be effective over time, they must be embedded in the

culture of the organization. Cultural norms for data sharing will vary depending on whether a company is in a more or less heavily regulated industry. But even in the most heavily regulated industries, such as health care and finance, a fair amount of data sharing occurs within and sometimes across the industry. Regulations and data governance remove uncertainty about what can be shared, how, and by whom.

3. Innovating with data also means ensuring that functional areas have the data and analytics capabilities to apply data to specific business problems. In some respects, this involves democratizing access to data. But that is surely not enough. One oft-cited goal of the chief information officer is “to get the right information to the right person at the right time.” But a critical flaw with this formulation is that creating business value from data drawn from different parts of an organization or from across organizations often depends on the right people having the right information — and these people may have different views about how to interpret or weight the information. Unhealthy organizational behavior about how to adjudicate or manage diverse interpretations may compromise the value produced from the data.
4. As organizations everywhere increase their use of analytics, differentiation will become increasingly important, and elusive. Our research indicates a rise in the number of organizations gaining advantage through analytics. But advantage for one organization in an area means disadvantage for another organization. As a result, organizations may decrease activities where they are not able to gain advantage in favor of activities where they can obtain advantage. The upshot: Analytics may help organizations narrow their strategic focus to where their advantage is strongest.

Reprint 58380.

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ACKNOWLEDGMENTS

- Ravi Bapna**, Carlson Chair in Business Analytics and Information Systems, University of Minnesota
- Ken Cartwright**, senior director of software development, Transaction Network Services
- Chris Chen**, core technology global engineering leader, W.L. Gore & Associates
- Peter Fader**, professor, University of Pennsylvania
- Nathan Falkenberg**, global cards and loans analytics leader, HSBC
- Alvin Glay**, head of digital marketing, Wahoo Fitness
- Sean Kent**, director, product management, Transaction Network Services
- Peter Levin**, senior research scientist, Intel
- Joe Malfesi**, vice president, Infrastructure Services, Transaction Network Services
- Kristina McElheran**, assistant professor of strategy, University of Toronto
- Keith Moody**, director of analytics, Bridgestone Retail Operations
- Omar Selim**, CEO, Arabesque Partners
- Kevin Swindon**, special agent, Federal Bureau of Investigation



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Analytics as a Source of Business Innovation

THERE IS NO *SINGLEWAY TO ACHIEVE INNOVATION*. It occurs in many small steps or one giant leap. No matter how it happens, innovation propels organizations forward and creates value. And today, it's hard to talk about innovation without mentioning analytics in the same breath.

This SAS-sponsored report is part of a multi-year data and analytics survey that MIT Sloan conducts. Taking a long-term view of analytics, this research uncovers key factors of business-driven innovation. While new technology is undoubtedly critical, the research reveals the enduring importance of process and culture in finding, cultivating and managing innovation through analytics.

One factor is the pivotal role of data governance, especially as operating environments and analytic processes have become more complex. Data demands have evolved to include internal and external sources, both structured and unstructured. And big data has exploded in size and complexity with data streams generated by the Internet of Things (IoT).

But as complexity has increased, so have the opportunities from machine learning and other forms of artificial intelligence (AI). A key finding in this research is that the most analytically mature companies use AI to augment human skills and automate previously time-consuming tasks, freeing managers to focus on strategic issues.

SAS customers apply analytics and machine learning technologies to countless business challenges, across dozens of industries. We help organizations create analytics-driven cultures that result in better customer experiences, improved fraud prevention, enhanced risk management and much more. But no matter the goal, it all begins with their data. •

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