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From Value to Vision:
Reimagining the Possible with Data Analytics

What makes companies that are great at analytics different from everyone else

By *MIT Sloan Management Review* and SAS Institute

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INTRODUCTION

How organizations capture, create and use data is changing the way we work and live. This big idea, which is gaining currency among executives, academics and business analysts, reflects a growing belief that we are on the cusp of an analytics revolution that may well transform how organizations are managed, and also transform the economies and societies in which they operate.

Among companies, this revolution has several dimensions. First, companies have more data to use than ever before, at a volume and with a variety that are unparalleled in human history. Second, by using internal and external data, companies are beginning to understand patterns of consumer activity that had once been impossible to perceive or act upon. And third, companies are using new analytic tools and services to understand their own operations and behavior at a much finer level of detail, enabling new questions to be asked and answered.

At the vanguard of this revolution are companies that are using analytics to compete and to innovate. Understanding these companies gives insight into both the direction and the pace of the analytics revolution. Lessons about what hurdles these companies face and how they are addressing them suggest a path forward for many other companies.

As part of a multiyear research initiative, *MIT Sloan Management Review* is partnering with SAS Institute Inc. to better understand companies that are shaping (and are being shaped by) this analytics revolution. In 2012, we conducted a survey of more than 2,500 respondents in two dozen industries. Fifty-five percent of the respondents were executives at the vice president/director level or above. The survey included over 30 detailed questions about how organizations are using data to advance their business objectives. We also interviewed 29 academics and senior information technology executives at a diverse group of companies, including eBay, Inc., Kaiser Permanente, LinkedIn Corporation, Neiman Marcus, Inc., PayPal, Inc., PepsiCo, and Southern California Edison Company.

Fully 67% of survey respondents report that their companies are gaining a competitive edge from their use of analytics. Among this group, we identified a set of companies that are relying on analytics both to gain a competitive advantage and to innovate. These Analytical Innovators constitute leaders of the analytics revolution. They exist across industries, vary in size and employ a variety of business models. They also share a distinctive orientation toward data and analytics that includes three key characteristics:

1. A widely shared belief that data is a core asset that can be used to enhance operations, customer service, marketing and strategy
2. More effective use of more data for faster results
3. Support for analytics by senior managers who embrace new ideas and are willing to shift power and resources to those who make data-driven decisions

This report provides an in-depth look at Analytical Innovators, including their beliefs, practices and outcomes. Our profile of this group provides insights into what success factors are currently required to excel in today's analytics revolution. In addition, we offer a framework that shows how other companies — regardless of their analytical sophistication — can become more like Analytical Innovators.

From Value to Vision:
Reimagining the Possible with Data Analytics

Signs of an Analytics Revolution

Increasingly, top thinkers in academia and business believe that analytics, especially analytics connected with big data, is going to be a driving force in our economy and society in the next 10 to 20 years. This belief is being matched with action in the public and private sectors.

In February 2013, MIT Sloan launched a digital economy initiative to explore how digital technologies are influencing both productivity and employment, declaring, "The digitization of the economy is one of the most critical issues of our time."[1] The broad use of analytics is an important factor in the development of the emergent digital economy.

This view is supported by General Electric Company executives Peter Evans and Marco Annunziata, who argue that the "industrial Internet" — a system of machine-to-machine sensors — will add $10 trillion to $15 trillion in economic benefit to the global gross domestic product through 2030.[2] GE is putting its money where its mouth is, investing $1 billion in developing the talent, software and analytic tools to better identify when machines need fixing or replacement.[3]

A recent study of senior executives at Fortune 500 companies found that 85% of those organizations had launched big data initiatives.[4] Intel announced a five-year, $12.5 million partnership with MIT to create a research center that will focus on big data. The state of Massachusetts, host to more than 100 companies that employ more than 12,000 people in big data-related businesses, has launched a public-private Big Data Consortium to grow its innovation economy.[5] In 2011, big data companies received more than $350 million in venture capital.[6]

Alex "Sandy" Pentland, director of the Human Dynamics group at the MIT Media Lab, argues that as we move into a society driven by big data, "most of the ways that we think about the world change in a rather dramatic way":

This is the first time in human history that we have the ability to see enough about ourselves that we can hope to actually build social systems that work qualitatively better than the systems we've always had. …

We can potentially design companies, organizations, and societies that are more fair, stable and efficient as we get to really understand human physics at this fine-grain scale. This new computational social science offers incredible possibilities.[7]

While much of the promise of data and analytics is couched in terms of "big data," some suggest that today's big data will likely become just tomorrow's data.[8] If we are to achieve anything close to the promise of big data (or data), it will need to become, as one research report says, "a key basis of competition, underpinning new waves of productivity growth, innovation, and consumer surplus."[9]

And this is precisely what our research team and others are beginning to see in the market. Companies that are leading the analytics revolution are already making data and analytics a source of competitive differentiation. In 2012, the MIT Center for Digital Business, along with research sponsor Capgemini Consulting, completed a two-year study with more than 400 companies to determine which companies were achieving a "digital advantage" over industry peers through their use of analytics, social media, mobile and embedded devices. The study found that companies that do more with digital technologies — and support their digital investments with leadership and governance capabilities — are 26% more profitable than their industry peers, and outperform average industry performance by 6% to 9%.[10]

Companies that many of us deal with every day are already making use of data to advance a variety of business goals and to help consumers:

▶ Kaiser Permanente collects petabytes of health information on its 8-million-plus members, a fantastic amount. Some of this data was used in an FDA-sponsored study to identify risks with Vioxx, Merck's pain medication, which was pulled shortly after the research identified a greater risk of heart attack in a subset of the patient population.

▶ Southern California Edison is collecting hourly (rather than monthly) data on customer usage from new digital smart meters in millions of residences. It will soon be monitoring and giving frequent feedback to customers about their energy use, a significant benefit for energy grid management and customer service.

▶ Pepsi has an ordering algorithm that lowers the rate of inventory out-of-stocks. The company shares information from this application with partners and retailers, improving its relationships with key stakeholders.
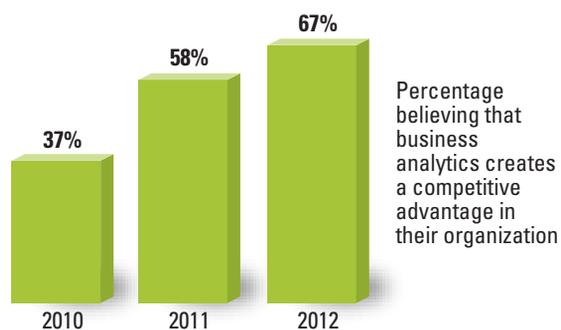
Three Ways to Compete with Analytics

You don't have to lead the analytics revolution to create value from analytics. This past year, two-thirds of our survey respondents said they are gaining a competitive advantage from their use of analytics. (See Figure 1: Finding Competitive Advantage with Analytics.) This represents a significant jump from our 2011 Global Executive Survey (58%) and an even larger jump from the 2010 survey (37%). Other research supports this trend.[11]

Companies that gain a competitive edge with analytics can be found at all levels of technological sophistication. At one end are traditional companies like Illinois-based Oberweis Dairy, which have older technologies but add new analytics talent. (See case study on next page.) At the other end are companies like LinkedIn, which include analytics as part of their corporate DNA but still find new ways to capitalize on analytic insights.

In 2006, LinkedIn had 8 million users, but something wasn't clicking: Users weren't seeking connections, a key component of success, at the expected rate. Reid Hoffman, the company's cofounder (and current executive chairman), brought in Jonathan Goldman, who has a background in physics, to

FIGURE 1:
FINDING COMPETITIVE ADVANTAGE WITH ANALYTICS
The percentage of companies that create a competitive advantage with analytics is trending upwards.

67%
58%
37%

Percentage believing that business analytics creates a competitive advantage in their organization

2010   2011   2012

CASE STUDY: Oberweis Dairy

Milkmen, glass bottles, door-to-door service.

In some ways, not much has changed at Oberweis Dairy, Inc. from its founding at the turn of the last century. Milk is still procured from local dairy farms. Dairy products are additive-free. Milk is delivered in glass bottles to customers' doorsteps, although nowadays Oberweis uses refrigerated trucks rather than horse-drawn milk carts.

In other ways, everything is changing at the nearly 100-year-old company.

What started as an Illinois farmer selling his surplus milk to neighbors in 1915 is now an analytics-savvy company with revenues approaching $100 million. Oberweis Dairy has three distribution channels: home delivery, with thousands of customers; retail, with 47 corporate and franchise stores; and wholesale, to regional and national grocery chains like Target. In 2012, the company began looking to expand from its Midwestern roots to the Eastern Seaboard.

At Oberweis, the usual approach to regional expansion was to bring together operations executives to figure out the best configuration for these resources. This time was different.

This time, CEO Joe Oberweis brought to the strategy table an executive with just three years' experience at the company, Bruce Bedford, vice president of marketing analytics and consumer insights. He had been brought on board in 2009 to inject some analytical thinking into the family-run company. However, he was a relatively unknown figure to the operations executives. According to Bedford, on the day of the strategy meeting:

> The CEO invited a large number of operational decision makers — literally, people who manage the company's drivers and transfer centers. When I got to the meeting I said, "Hey, there are some things I'd like you to consider beyond just operations. I'd like you to think about our customers, particularly the customers that we currently have, who are great candidates for our service. And then let's also evaluate customers that we've spent a lot of money to acquire in the past, that didn't ultimately turn out to be great customers."

Bedford took the team through his analysis of Oberweis's target customer segments using data sets based on community-level demographic information. Contrary to the company's conventional wisdom, he had discovered that the so-called Beamer and Birkenstock group — liberal, high-income, established couples living leisurely lifestyles — weren't a good fit for Oberweis's high-end retail dairy products. Analytics essentially shattered the company's preconceived notions about its target market.

Once Bedford demonstrated the possibilities of utilizing data analytics to segment the customer market, the meeting shifted from tactical, focusing on operations — how many trucks and transfer centers would be required and where they should be located — to strategic, stepping back to define the target market. "From a marketer's point of view, this seems to make perfect sense," said Bedford. "But it didn't necessarily make sense initially to people in that room. Because that's not how they think."

Oberweis's expansion plans are now being driven by analytics. More importantly, Bedford says, the company's decision makers are thinking about using data analytics within their own areas of expertise:

> I've started to see people now say, "Wait a second, you know what, this analytic stuff, there's some power here, and maybe I should take the time to learn a little bit more about what Bruce is doing that maybe I could do." They're saying, "I'm not sure what I should be asking about, but let me at least ask if there's something that I should ask about."
>
> It comes down to having a number of people who don't ordinarily use analytics stop and see the light bulb go off. The change is cultural, and to a point now where people want to acquire a better understanding of analytics tools because they can see that there is real benefit.

The Oberweis story calls attention to how analytics can transform even the most traditional of companies. Indeed, the dairy company lacks modern ERP systems (although it is planning a state-of-the-art ERP implementation) and continues to process much of its inventory by hand. Yet when its CEO gave analytics a seat at the strategy table and operations executives subsequently began using analytics to make business decisions, the company did not merely move on from its geographical roots — Oberweis reinvented how it would compete.

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test different ways to encourage members to link to one another. Goldman came up with the algorithm that would become the "People You May Know" function on LinkedIn's homepage — arguably one of the site's key user benefits today.[12]

Because the product team initially did not see value in the algorithm, Hoffman suggested Goldman run a test on LinkedIn pages in the form of an advertisement: "Find out what happened to your former colleagues or classmates." The result was a staggering 30% click-through rate in an industry that views click-through rates of 1% to 3% as a success. LinkedIn raced ahead of its competitors.

Some of the more traditional companies struggling in mature industries are increasingly turning to analytics for insights that provide an edge. A case in point is in the pharmaceutical sector, where companies have found themselves challenged by their payers, the largest managed-care customers or governments.

For example, AstraZeneca Group found that its payers were combining data from the pharmaceutical giant's clinical trials with proprietary data to conduct comparative-effectiveness studies. Payers, in effect, knew more about AstraZeneca's drug performance data in some situations than AstraZeneca itself did. This gave them a distinct advantage in negotiating payments. It also made it difficult for AstraZeneca to get its drugs represented on national and country formularies, the all important drug approval lists from which physicians prescribe medications. How did AstraZeneca respond to this competitive disadvantage? It built up its own analytics program, partnering with IMS Health in Europe and U.S.-based HealthCore, a clinical outcomes research subsidiary of health insurer WellPoint Inc. The partnerships have become a crucial tool in AstraZeneca's negotiations with payers.

CASE STUDY: Caesars Entertainment

Another dimension of the analytics revolution is balancing intuition with analytical insights. Decision-makers, especially in the context of strategic judgment, often need to strike the right balance between a course of action suggested by data and a different course of action indicated by intuition. On one hand, there is a clear sense in which the distinction between intuition and data is false: Many judgments must be made about which data to use and how to interpret it in order for data to become insights in the first place. But on the other hand, as analytical insights grow in number and influence within an organization, the need to put these insights into a broader context will become even more important.

Caesars Entertainment Corporation is a case in point. Led by chairman and CEO Gary Loveman — a former Harvard Business School professor with a doctorate in economics from MIT — Caesars was offered the chance to bid on a gambling concession in Macau, China, in 2006. The asking price of the concession was $900 million. Loveman, who had established a reputation for himself by profitably using analytics to fine-tune customer segments and build effective loyalty programs, ran the numbers but couldn't produce a valuation anywhere near $900 million. He declined to bid. The global financial crisis hit the next year — but not in Macau, which enjoyed a growth explosion. Caesars bought a golf property in Macau in 2007 for close to $600 million in the hopes of turning it into a gaming property. Unfortunately for Caesars, no more gambling concessions have been (or are likely to be) issued to foreign investors. One of Caesars' competitors is now profiting more from its properties in Macau than from its properties in Las Vegas.

Loveman has been open about his missteps in Macau. "You had to have a kind of intuitive courage, and I am not well-suited to those kinds of decisions," he said in 2010.[i] "Big mistake. I was wrong, I was really wrong."

In some markets, once a company finds a unique way to use data to gain an advantage, competitors quickly jump on the bandwagon and level the playing field. Simply obtaining an advantage from analytics is not enough in these cases; insights must be revitalized again and again to sustain a competitive edge.

The story of the Oakland Athletics offers a telling example. In 2002, despite being handicapped with the most significant salary constraint in Major League Baseball, Oakland A's general manager Billy Beane built a winning team through an innovative use of analytics. He bucked conventional wisdom and began looking at previously ignored player statistics. This story — popularized in Michael Lewis's book *Moneyball: The Art of Winning an Unfair Game* and the movie starring Brad Pitt — ends on a happy note, with the A's winning their division and going to the playoffs.[13]

But over time, other teams copied Beane's methods, and the A's lost the competitive edge they had initially gained with analytics. It was only after team management created new analytical metrics that the A's returned to the playoffs in 2012, after a five-year hiatus.[14] The moral: Organizations need to find new ways to apply analytics to refashion the advantage they gain from data.

Analytics is not just about generating insights and getting those insights to the right people. To sustain the long-term success of data-driven innovation, it is necessary to continually revise one's analytical approach in order to generate insights that lead to new innovation and competitive advantage.

The Analytical Innovators

While many companies are beginning to cultivate benefits from their use of analytics, organizations that are getting the most value have a distinct approach. In this section, we introduce the Analytical Innovators, contrast their behaviors with other companies and discuss how these differences matter to organizational performance.

The concept of Analytical Innovators emerged when we combined responses to two of our survey questions, one about creating a competitive advantage with analytics and one about using analytics to innovate.[15] We then

grouped respondents into three distinct levels of analytics sophistication according to how they responded to both questions. (See Figure 2: Analytical Innovators — A Small Group of Analytics Leaders.)

Analytical Innovators are those respondents who strongly agree that analytics has helped improve their organizations' ability to innovate and say that analytics has helped create a competitive advantage to a great extent. Analytics Practitioners are utilizing data, mostly to address tactical and operational issues, but are not innovating with analytics at the same level as Analytical Innovators. And Analytically Challenged organizations are struggling to use data beyond basic reporting and marketing applications.

Analytical Innovators are distinguished by several key characteristics: their mindset and culture, their actions and their outcomes.

Mindset and Culture

More than other companies, Analytical Innovators have developed an analytical mindset that supports the use of data and analytics across a wide range of corporate activities. They tend to view data as a core asset; they challenge the status quo; they believe in the possible; and they are open to new ways of thinking.

Data as a Core Asset: It's Cultural Several executives in our interview series described data as a core asset — in their companies, analytical insights are part of the culture of the organization and are utilized in strategic decisions, both large and small. Analytics determines products and services, project success or failure, and the allocation of resources. Employees, whether data-oriented or not, utilize these insights in their decision-making processes.

Neel Sundaresan, senior director and head of eBay Research Labs, describes the role of analytic insights at eBay:

Everybody in the organization — whether you are a technical person, a researcher or an engineer, a product manager, a businessperson, or an analyst — has to be data-driven. Now, not everybody has to look at data, but everybody has to understand data at some level. A lot of data is coming from the behavior of millions of

people on our site. So, being able to understand and get your head around that data is really important. You can think of it as an attitude change in all grades of people."

Michael Johnson, director of the utility for care data analysis at Kaiser Permanente, describes how analytics permeates healthcare delivery:

With our electronic medical record system, we've become much more data driven and analytics oriented. Pretty much every actor in the care delivery system is using the same record and entering information in the same place. That allows us to do some remarkable things with regard to thinking about where and how members should receive care, and how to improve the flow of information, while at the same time lowering costs.

New Ways of Thinking Sixty percent of Analytical Innovators "strongly agree" that they are open to new ideas that challenge the status quo, a view that is weakly represented among other companies. (See Figure 3: Open to New Ideas.)

A perfect example of an Analytical Innovator company with this mindset is online dating service Match.com. The evolution of analytics has changed how the company thinks about everything it does, according to its CEO, Mandy Ginsberg:

Everything that we do is driven by analytics. We literally test every page, every new feature — there's nothing that we do where we don't understand the impact of what we've done.

Match.com has become much smarter in the past four years. We've grown the data and analytics team considerably compared to some of the other areas of our business. We realized

that we needed to double down in this area, and we started getting smarter and smarter about decisions.

Match.com has been around for 18 years, and that is both a benefit and a curse because we had old infrastructure and old ways of doing things, and had to adapt, versus a company like Zynga who is so fresh and new and everything they do is as a data driven company. In fact, I would say a company like Zynga is a data company that happens to do games. We're a dating company that happens to be good at analytics, but it went in that reverse order. It's shocking how far we've come.

Analytical Innovators use different language than other types of companies to talk about analytics. In response to an open-ended survey question, Analytically Challenged managers often referred to their analytics capabilities in terms of "we can't" or "we don't." Analytics Practitioners frequently described their analytics capabilities in practical terms, such as solving problems or increasing efficiencies. In stark contrast, Analytics Innovators describe their analytics capabilities in terms of "reimagining" or "rethinking."

Key Actions

Compared to the other groups, Analytical Innovators report that they use more of their data, use it to obtain more timely answers, collaborate more with analytics and are more effective throughout the information value chain. In short, Analytical Innovators use data and analytics much differently than everyone else.

Getting Real-Time Answers and Developing Products More Quickly We asked respondents to rank the top three uses of analytics in their organizations and found that the groups diverged on several key applications. For Analytical Innovators, the No. 1 use of analytics is to make real-time decisions. For other groups, the top answer was reducing costs. The next top use of analytics among Analytical Innovators is increasing customer understanding, followed by accelerating the development of new products. (See Figure 4: Analytical Innovators Use Analytics Differently Than Other Companies.)

Sam Hamilton, vice president of data at PayPal, describes how analytics has influenced that company's real-time decision making:

We have gone from report creation that takes weeks or months to deliver, to self-service, real-time data analysis. And we have gone from data analysis done by a small group of analysts to data-driven decisions throughout PayPal, done by most of the staff. All of this has progressively shrunk the latency of time to value of data.

In our interviews, we asked executives from companies that had many of the earmarks of Analytical Innovators how analytics was influencing their product development life cycle. The comments of eBay's Neel Sundaresan were typical:

Increasingly (Internet-based) products are getting improved and improvised as they get used. As these products get used at scale, they generate a lot of user behavioral data. This provides the opportunity to enhance these products as users use them and create analytics-driven learning products.

Think about the product life cycles now and those from a few years ago. Before you would probably have a product release every year, every two years, and you're waiting for the next revision to be released with enhancements, whereas now it's just happening all the time. Releases? There is no well-defined product release.

Use More of Their Own Data Analytical Innovators use more of their data than other companies. They are nearly three times more likely to say they use a great deal or all of their data than Analytically Challenged organizations do, which are the least ef-

FIGURE 3:
OPEN TO NEW IDEAS
Most Analytical Innovators strongly agree with the statement: My organization is open to new ideas that challenge the status quo.
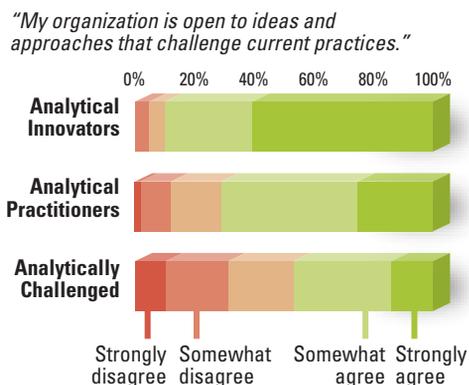
"My organization is open to ideas and approaches that challenge current practices."

	Strongly disagree	Somewhat disagree		Somewhat agree	Strongly agree
Analytical Innovators					
Analytical Practitioners					
Analytically Challenged					

0% 20% 40% 60% 80% 100%

**Making real-time decisions is the No. 1 use of analytics
among Analytical Innovators, compared to cost reduc-
tion for other groups.**

Percentage indicating this activity as a main use of analytics

■ Analytical Innovators
■ Analytical Practitioners
■ Analytically Challenged

fective at using analytics for competitive advantage
and innovation. More generally, we saw a strong
correlation between how much a given company
uses analytics to create competitive advantage and
advance innovation, and how much of their data
that company uses. (See Figure 5: Analytical Inno-
vators Use More of the Data They Collect.)

LinkedIn is among the few companies that uti-
lizes virtually all of its data. Every web request the
company gets generates a transaction, and every
transaction has some information and value associ-
ated with it, according to Deepak Agarwal,
LinkedIn's director of relevance science:

*While carefully respecting the privacy of our
LinkedIn members' data, every single bit of
information is eventually used. The raw data
gets transformed in very complex ways, allow-
ing for members' data to remain private and
anonymized. There are many different ana-
lysts and data scientists who analyze this data,
create different groupings of the data, create
different aggregates of the data, look at differ-
ent kinds of numbers on different user
subpopulations and then glean insights
from them. That's what ultimately goes into
improving the relevance of our products.*

**More Effective Throughout the Information
Value Chain** Analytical Innovators are also more
effective than other companies at each step of the
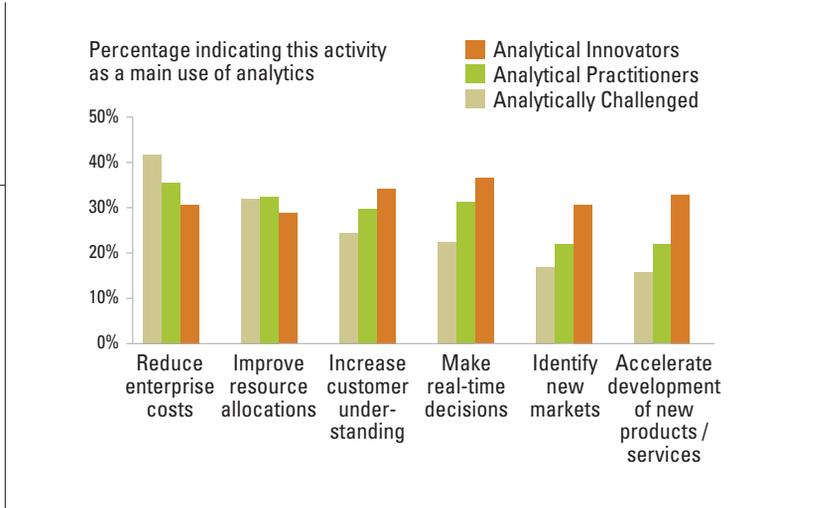
information value chain. (See Figure 6: Effective-
ness Across the Information Value Chain.)
Compared to Analytically Challenged organiza-
tions, Analytical Innovators are more than twice as
effective capturing information, nearly three times
as effective at analyzing information and three
times as effective at using insights to guide strategy.

Beyond the basics of capturing and analyzing
information, Analytical Innovators are much more
likely to support their analytics activities with an in-
tegrated approach to information management that
disseminates insights to customer-facing employees
and to partners and suppliers. Analytical Innova-
tors bolster their efforts to share knowledge and
insights through champions who promote best
practices. And they are much more likely than other
groups to have these key supports in place. (See Fig-
ure 7: Analytical Innovators Have More Supports
for Analytics.)

Outcomes: Power Shifts
to Those with Insight

One distinguishing characteristic of Analytical Inno-
vators is also a compelling theme that emerged during
our research: Analytical Innovators report a power
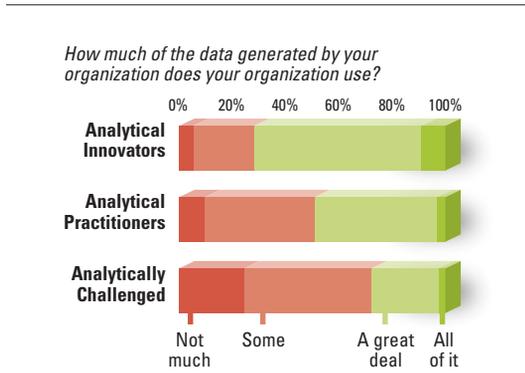shift in their organization because of their use of

How much of the data generated by your
organization does your organization use?

Analytical Innovators

Analytical Practitioners

Analytically Challenged

Not much   Some   A great deal   All of it

**Analytical Innovators tend to know why they
are collecting data and how to use it.**

Percentage indicating that their organization is "very effective" at each activity

- Analytical Innovators
- Analytical Practitioners
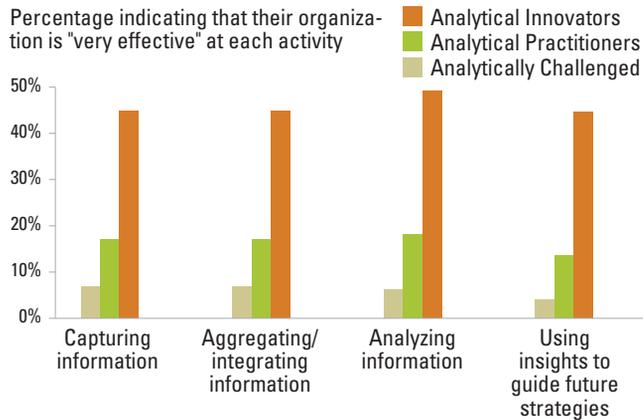- Analytically Challenged

FIGURE 6:
EFFECTIVENESS ACROSS THE INFORMATION VALUE CHAIN
Analytical Innovators are more effective at capturing and analyzing data, and utilizing insights from that data than their Analytically Challenged or Analytical Practitioner counterparts.

analytics. This is a significant finding, in that power shifts can be disruptive. They often call into question experience and intuition that managers and employees have built up over years. We found that the more an organization uses analytics to build competitive advantage and to innovate, the more likely it is to say analytics has shifted its power dynamics.

Our survey revealed that Analytical Innovators "strongly agree" or "somewhat agree" four times more than Analytically Challenged organizations that analytics has shifted the power structure within their organizations. (See Figure 8: Analytics Shifts the Power Structure.)

That power shift can take a number of forms. A C-suite champion may give new analytics talent the power to innovate. Or analytics and analysis may start to influence investment decisions, shifting power from

one group or executive to another. For example, at Neiman Marcus, analytics was once consumed exclusively by midlevel managers. Now, with consistent project successes, analytics outcomes are regularly reported to the board and senior executives. According to Jeff Rosenfeld, vice president of customer insight and analytics at Neiman Marcus, this has created a shift in the all-important funding decision process:

Having a culture, which has evolved over the last couple of years, based more on data, has caused us to make smarter decisions. No question. There is a long list of examples of changes we've made to the website, or customer experience, or changes we've made to promotions that were based on rigorous analytics and tests to understand what's most profitable for the business. How we choose to allocate our marketing dollars has shifted by substantial dollar figures, based on analytics.

Those who have control over data, and the ability to analyze that data, move to the forefront in the organization — in fact, it is suddenly very cool to be the geek. (Researchers Tom Davenport and D. J. Patil peg data scientists as having, "The Sexiest Job of the 21st Century.")[16]

Chief marketing officers are among those who are benefitting from data analytics. In a 2012 survey of 100 CMOs,[17] over 89% say that social data has influenced their decisions. The authors of the study offered a particularly intriguing conclusion: CMOs are using social data to drive discussion in the C-suite and thereby elevate themselves "as owners of the brand-consumer relationship." This suggests that CMOs are using social data to enhance their influence and improve their personal brand within the organization. For CMOs, social data is not merely about insight; it is a new source of legitimacy in the C-suite.

Many executives focus on the question of how to get more value from their data. But for some companies — perhaps even many companies — this
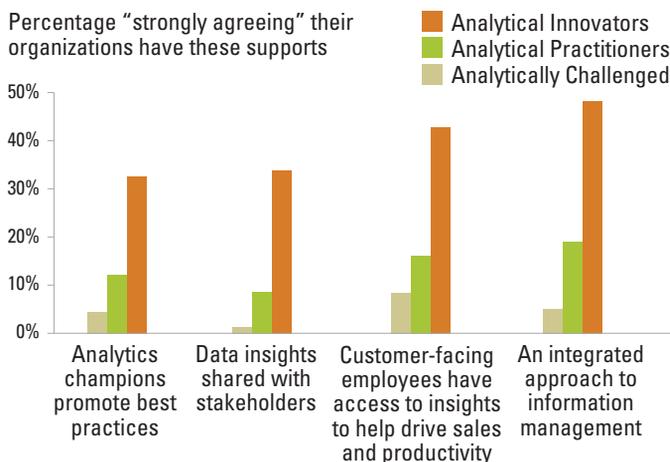
Percentage "strongly agreeing" their organizations have these supports

- Analytical Innovators
- Analytical Practitioners
- Analytically Challenged

FIGURE 7:
ANALYTICAL INNOVATORS HAVE MORE SUPPORTS FOR ANALYTICS
Analytical Innovators are much more likely to support analytics with more resources and processes.

approach emphasizes the wrong issue. It misses a key part of the relationship between data and value: the connection between how much data is valued and how much value data can deliver.
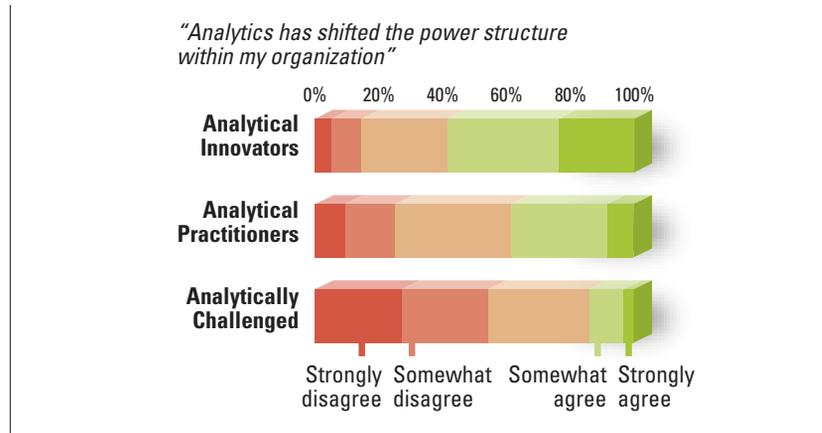
Indeed, the more data is valued by an organization, the more value it can usually deliver. This is not merely about making investments in analytics (which can go wrong), but about conferring power on analytics and creating a culture in which analytics is part of how decisions get made. At Wells Fargo Company, this means that the organization is relying more on analytics to make decisions, a significant shift, according to Pascal Hoffmann, former vice president of digital banking strategy:

When you look at the decision making process, it has become more quantitative and more scientific than it used to be a few years back. It's a slow transition triggered by smart people along the way, where you have existing processes and established thinking. Some people want to challenge the status quo and look harder at the evidence on how the decisions are made, and what decisions are made. They come up with evidence that shows that there is a better way to go about making decisions; that there is a better decision than the one that was made in the past. And because they have the evidence and they can build a case with hard science and data, they get paid attention to.

Senior management support is almost always critical to developing the kind of data-driven culture that embraces evidence-based ideas that run counter to the status quo. At casino giant Caesars Entertainment, for example, analytics is being driven through the organization by a team of analytics missionaries who are being integrated into senior management teams at the property level. This has been a difficult change in management process that has required support from corporate executives at headquarters.

Summing up the Analytical Innovators

Analytical Innovators exist across industries, vary in size and differ in how much data they collect. However, they share several important characteristics. Most share a belief that data is a core asset that can be used to

"Analytics has shifted the power structure within my organization"

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
Analytical Innovators				
Analytical Practitioners				
Analytically Challenged				

enhance operations, customer service, marketing and strategy. Across the information value chain, they are more effective with their analytics than other groups. They use this effectiveness to act more quickly: to deliver faster results, to make real-time decisions and to accelerate the development of products or services. They also tend to have strong management support for analytics-based decision making, which undoubtedly supports (or reflects) a greater willingness to accept data-driven ideas that challenge the status quo. In turn, this creates more opportunity for managers with valuable ideas to advocate for their organization's success — and to enhance their own career prospects.

On Becoming an Analytical Innovator

In the previous section, we examined the flagship characteristics of the Analytical Innovators. In this section we examine the remaining companies — the Analytically Challenged and the Analytical Practitioners — and what these organizations can do to become more like Analytical Innovators.

The Analytically Challenged

The Analytically Challenged, 29% of our survey respondents, are less mature in their use of analytics and have not been able to derive as much value from them as the other groups.[18] Few have achieved a competitive advantage with analytics, and even fewer have benefitted in the area of innovation. This is a stark difference compared to all other survey respondents, most of whom are deriving some

FIGURE 8:
ANALYTICS CAN SHIFT THE POWER STRUCTURE
Analytical Innovators report a power shift in their organizations at a much higher rate than other groups.

competitive advantage and are using data to innovate. (See Figure 9: Analytically Challenged Report Fewer Benefits from Analytics.)

Analytically Challenged organizations have four distinct characteristics that separate them from their more analytically advanced peers:

1. Data deficiency
2. Weak information value chain
3. Lack of collaboration
4. No burning platform

Data Deficiency Analytically Challenged companies are distinguished by the state of their data and what they are (or aren't) doing with it. Unlike other companies, this group has generally not capitalized on big data trends, and their data management abilities are lagging.

One survey respondent in the Analytically Challenged category noted:

Analytics are only meaningful if the quality of the underlying data is unassailable. Until there is sufficient attention paid to data governance and quality assurance, analytics will remain little more than a lofty goal.

Data issues are a nonstarter for the effective use of analytics. If the data the organization is using isn't at least reliable, accurate, timely and adequate, the results of analytics will be meaningless. And upstream, senior managers who prefer to drive decisions on their intuition will have cause to be skeptical.

Weak Information Value Chain Another defining characteristic of the Analytically Challenged is their

ineffectiveness at the analytics tasks that make up the information value chain, particularly compared to other organizations. Fewer than half (42%) of the respondents in this category report being effective at capturing information, and the capabilities in other areas are even weaker, with information dissemination at a markedly low 21%. According to one respondent:

We are collecting mass quantities of data. However, there is no specific plan in place to actively utilize the data and only a vague concept of why we need it. … In other words, no real plan. We are capturing data just in case.

Lack of Collaboration

If we do not improve on our collection, integration, analysis and productive use of information across data silos, we will destroy our business.
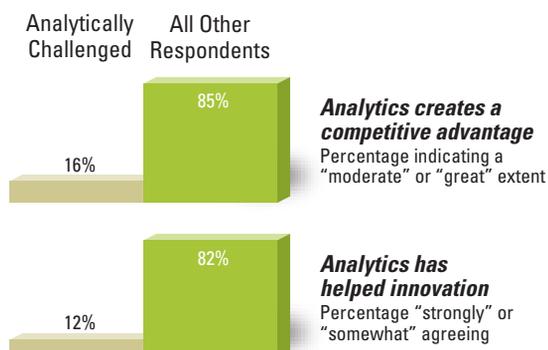
This quote from a survey respondent, an IT executive at a European bank, gets to the heart of another characteristic common among the Analytically Challenged: lack of collaboration across the organization. Silos have long been identified as a barrier to the use and management of information from both a data and a cultural standpoint. As companies have amassed more data from disparate sources, systems across organizations have emerged that are not always integrated. Different functional areas have built their own data stores, and IT departments have often been hamstrung in trying to keep up with it all. Another respondent said:

Too many nonintegrated silo systems is a huge problem for implementing better analysis and using the existing information as a competitive advantage.

Technology can improve, if not fix, the issue of data integration. However, more difficult to address are organizational silos spawned from a culture that lacks collaboration. One respondent in the Analytically Challenged group notably lays out sharp criticism of senior management:

I find the corporate political climate surrounding analytics to be one of smiling deception. Many EVP level managers … are threatened by analytics. I fear that self–interest … is the biggest hindrance. Organizational dynamics

**FIGURE 9:
ANALYTICALLY
CHALLENGED
REPORT FEWER
BENEFITS FROM
ANALYTICS**
Analytics is not on the executive agenda in Analytically Challenged organizations.

Analytically Challenged | All Other Respondents

85%
16%
Analytics creates a competitive advantage
Percentage indicating a "moderate" or "great" extent

82%
12%
Analytics has helped innovation
Percentage "strongly" or "somewhat" agreeing

are always at the core of enterprise solution adoption. … I fear it probable that many officers may be shackled and apprehensive, caught on the sucker's side of the Prisoner's Dilemma.[19]

No Burning Platform The fourth characteristic of Analytically Challenged companies is that they appear to have no key driver to use analytics — no real burning platform compelling them to make the foray into analytics, let alone to improve their data management. Without something threatening to spur them to action and leave the status quo, there will not likely be much change. As one Analytically Challenged survey respondent noted:

Everyone believes that if we've managed so far and so well without a robust strategic approach to data analytics, we can go on doing so in the future as well.

These companies are clearly change-resistant. A telling example: Only 13% of the Analytically Challenged strongly agree that their companies are open to approaches that challenge current practices, compared to 60% of Analytical Innovators who feel that way. Evidently, many Analytically Challenged organizations are feeling no pressure to do things differently. Another respondent from this group offered:

Unfortunately, the pain of declining profits and markets will have to take the lead before management will seriously look to analytics as a source of competitive advantage. No pain, no analytics seems to be the business model.

Supporting this notion is our finding that only 29% of the Analytically Challenged organizations indicate that analytics is a top-down mandate, compared to 55% of all other respondents. There is a case to be made that not only are these organizations analytically challenged but they are also analytically apathetic.

Moving Forward with Analytics

Analytics in the organization has a huge future. I'm very interested in where big data goes over the next few years. My organization doesn't get it at this point; there are some pock-

ets of the company where teams are pushing for increased analytics, but the C-suite doesn't yet see the value.

This survey response seems to capture the attitude of many respondents in the Analytically Challenged group, who expressed general frustration with their organization's view on data and analytics. The obstacles they face due to data deficiency, a weak information value chain, lack of collaboration and no burning platform are formidable.

Though it is unlikely that a company will progress from Analytically Challenged directly to being an Analytical Innovator, the data advocates in these organizations can help ignite change. The mission for the individual who wants to be an analytics catalyst: *Lead analytics change by showing value.*

We've identified three key issues stemming from the characteristics noted above that individuals can begin to address: technology latency, lack of collaboration and inertia.

Technology Latency. The Analytically Challenged are stymied in their progress by core data issues, from upstream at the capture, quality, integration and access phases to downstream, where data is analyzed and disseminated. To address these areas, companies must invest in improved infrastructure, processes and technology skills. Wholesale change of these competencies across the organization is impossible without executive commitment to data. Therefore, improvement must start at the localized level.

Action items for the analytics catalyst: Identify a small but important issue that will benefit from the use of analytics. Use the resources that can be found in the organization and highlight what needs to be brought in from the outside. Find the internal geeks — those who are hungry for analytical work — and take a seat at their lunch table. Gather credible, timely and accurate data. Make use of the available analytical technology, and focus on identifying solutions to your issue that have a clear and measurable impact.

Lack of Collaboration. The silos in the organization, whether built from data stores or management protectionism, are a major impediment to the effective use of information. Talk about breaking down

these silos is not new. But enterprise-wide change in this arena could require a substantial information infrastructure investment, not to mention a dramatic culture shift. However, collaboration can start to occur at the individual level.

Action items for the analytics catalyst: Reach across the hall to those who have data that is important to addressing your issue. Enlist their help as partners in increasing the value of their data in decision making. Build ongoing relationships by including them in the process moving forward. Facilitate discussions among peers in different departments on bringing data together to address specific challenges. Give to get — share information of value to other departments to encourage reciprocity.

Inertia. Unfortunately, Analytically Challenged organizations are constrained in their use of analytics by their executives' unwillingness to change the status quo. These executives see no need for large investments in the infrastructure, systems and talent necessary to drive decisions with analytics because they believe that what they have been doing is working just fine. They are suspicious of data, particularly if it contradicts their intuition. So far, there has been no life-threatening event to their organization that has spurred thinking beyond the status quo. Outside of creating a burning platform to ignite a need for changes in decision making, those advocating the use of analytics simply must prove its value, one small win at a time.

Action items for the analytics catalyst: Develop an executive communication strategy for your analytics use case. To increase the credibility of the effort, engage your cross-sectional team to participate. Translate the analytical results into business insights and recommended actions. Show a clear ROI in terms of cost reduction, improved operations or increased revenue. Focus discussions on improving the business issue rather than on the method.

The Analytics Practitioners

The second and largest segment we identified through the survey responses is the Analytics Practitioners, which represent 60% of respondents. These companies have made significant progress in their analytics journey, and many are reaping strong benefits. However, the key metric that separates them from the Analytical Innovators is outcome. Recall that the Analytical Innovator group consists of those respondents who indicated that the use of analytics has provided a competitive advantage to a great extent and strongly agreed that analytics has helped them innovate. The Analytics Practitioners have not achieved this high level of competitive advantage and innovation from analytics. But they have matured well beyond the Analytically Challenged on their path to being data-driven. (See Figure 10: Analytics Practitioners Use Analytics more to Compete than Innovate.)
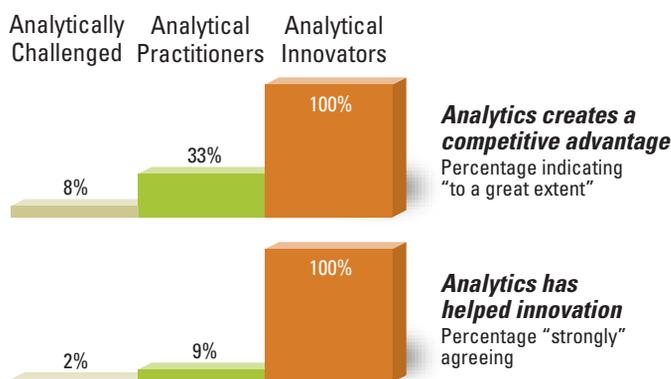
Underpinning the differences between this large group and Analytical Innovators are three characteristics:

1. Just-good-enough data
2. Operational focus on analytics
3. Fragmented analytics ecosystem

Just-Good-Enough Data Unlike the Analytically Challenged, Analytics Practitioners have made significant advances in the area of access to useful data this past year, with a corresponding increase in their confidence about the data, likely stemming from improved accuracy and timeliness. As survey respondents noted:

Analytics are only as the good as the data. Best practices for data management, integration and governance are necessary for analytics to succeed. Otherwise, the adage "garbage in, garbage out" applies. Then analytics gets a bad name and decision making is done via man-

FIGURE 10: ANALYTICS PRACTITIONERS USE ANALYTICS MORE TO COMPETE THAN INNOVATE
Analytics Practitioners have matured beyond the Analytically Challenged but are not yet close to Analytical Innovators.

Analytically Challenged / Analytical Practitioners / Analytical Innovators

Analytics creates a competitive advantage
Percentage indicating "to a great extent"
8% / 33% / 100%

Analytics has helped innovation
Percentage "strongly" agreeing
2% / 9% / 100%

agement intuition rather than based on facts originating in the data.

We operate in extremely complex markets that are very difficult to model, so the reliability of the data, analysis or insights is often challenged by the decision makers. We still have a way to go.

Let's be clear: This group still has room for improvement in terms of data proficiency. But Analytics Practitioners have achieved a level at which they are able to make use of their information to help run their businesses. In their own words:

Today, accessing data is not an issue, but the challenge lies in structuring the data, managing the data and making the data more usable, which will enable quicker decision making.

We have the data in pockets and currently manually piece a lot of it together, but have been making great progress in first aligning data so we speak the same language across the global operations, then connecting data, and finally creating dashboards and tools to provide the right data to the right people.

Operational Focus on Analytics

Analytics are mired in "automating the existing" rather than innovating a brighter performance future. It is a culture problem that will not be mitigated until a real leadership change occurs.

As this survey respondent points out, Analytics Practitioners tend to be focused more on day-to-day operational use of analytics, as opposed to using it to drive innovation and change the business. This is clearly supported by the survey results, which show that the top two uses of analytics among this group, similar to the Analytically Challenged, are *reduction of enterprise costs* and *improvement in resource allocations*. Compare these to the priority uses of the Analytical Innovators: making real-time decisions and *increasing customer understanding*. One Analytics Practitioner respondent noted:

We have to teach the enterprise to "behave" differently with data and move from a transactional to an insight mindset.

The balance of using analytics and intuition in key decisions is another example of the operational focus of Analytical Practitioners. In decisions in the areas of budget allocation, financial forecasts, supply chain management and allocating employees' time, Analytics Practitioners and Analytical Innovators use a similar balance of intuition and analytics. However, for more strategic insights such as identifying target customers, enhancing customer experience and establishing strategy for the organization, Analytical Innovators are much more reliant on analytics than the Practitioners.

Fragmented Analytics Ecosystem

Analytics are HUGE in my company. … Until recently, though, it was held in the hands of very few people. To the point where we worried about the proverbial "what if they get hit by a bus" scenario. The past 12 months have been focused on integrating and trying to give data access to more people.

As seen in this comment, the third key differentiator of the Analytics Practitioner and their more analytics-savvy counterpart is their fragmented approach to the execution and use of analytics in the organization. Additional fragmentation is evidenced by differences in where companies are in their integration of information management and business analytics. While fully 85% of the Analytical Innovators indicate that an integrated approach is a core part of their business strategy, only 59% of the Analytics Practitioners report the same. One respondent's view of the future of analytics emphasizes this point:

In the future, analytics will transition from simple information gatherers and maintainers to influential thought-leaders that are integrated parts of teams across the organization.

In the meantime, a pervasive issue still exists: ineffective dissemination of key insights to employees. We found that companies generally seem to struggle most with the dissemination of some components of the information value chain. This is quite definitely the weakest link for the Analytics Practitioners. One survey respondent from this group said:

The need internally is to have access to action-able insight with data at the right level of granularity — when it is needed.

What's more, only 14% of Analytics Practitio-ners report increasing by "a great deal" their delivery of actionable insights to frontline employees over the past year, as compared to 35% of Analytical Innovators. That, coupled with the 16% of Analytical Practitioner organizations that "strongly agree" that their customer-facing employees have access to insights, gives rise to a sort of insight fragmentation — analytics is being conducted to drive decisions, but the results are not being shared among those who might be in the best positions to drive change. In the words of one respondent:

A data-driven decision culture is at its beginning of being developed across the organization. It will be effective only if it is being embraced at all levels and everyone is empowered to access it.

Moving Forward with Analytics

The current operational and tactical use of analytics by Analytics Practitioners is not unexpected for com-panies getting their feet wet in the use of analytics technology. Many companies have only recently made the foray into data-driven decisions and are still experiencing growing pains. It's clear that, unlike some in the Analytically Challenged segment, these organizations do see value in information, and they are earnest in trying to use it to their advantage.

One Analytics Practitioner respondent noted: *Analytics are the essential tool in the toolbox. The analytics are not THE answer, but the an-alytics should inform us to reach or formulate the answer. A growing trend for our company is the ability to capture information from a wide range of sources, use standard metrics and an-alytics to glean some knowledge and then ensure that this knowledge is appropriately disseminated. This is a trend and a need within our company ... it is a work in progress.*

This optimism about the use of analytics was strong among the Analytical Practitioner group. Unlike the general feeling of "we can't" among the Analytically Challenged, this group showed a defi-

nite sentiment of "we'll try." The mission for analytics evangelists who want to step up their orga-nization's use of analytics: *Expand analytics reliance by demonstrating strategic possibilities.*

In order to develop the ability to "reimagine the possible" with game-changing insights, at least three issues must be addressed: due data diligence, dashboard dependence and denial of access.

Due Data Diligence. A key differentiator between these organizations and those taking analytics to the next level is the data itself. It's a matter of data qual-ity, access and management. Analytical Innovators are leading the charge in tapping new sources of data. Analytics Practitioners should take note and learn from them.

Action items for the analytics evangelist: Con-duct a data audit. Do a quality check on the data you are using to drive decisions. How long have you been using the same data sources? Identify gaps in what you have and what you need, and consider how data from unconventional sources (e.g., social media) might provide a new perspective on your business.

Dashboard Dependence. Business intelligence technologies brought the ability to watch day-to-day operations on bright and shiny dashboards and monitor actual results against KPIs. But what's hot now is the ability to predict what's going to happen and to find patterns in data that lead to not-so-obvi-ous conclusions. Analytics Practitioners who want to step beyond the tactical and operational uses of their data need to sharpen their analytical skills and cast a net for analytics talent. If you are going to make the move to Innovator, be prepared to invest.

Action items for the analytics evangelist: Take stock of your own analytical prowess. Do you or your staff have the right skills to employ sophisti-cated analytical techniques? Search for talent that combines an understanding of your business with a passion for data exploration and technical skills.

Denial of Access. To help drive innovation, Analytics Practitioners must do a better job at disseminating key insights to the right people at the right time. Ana-lytics should be approachable — easy to access, simple and intuitive – in order to spur innovation

from all levels in the organization. As one respondent said, "Analytics must be in the DNA of every empowered employee."

Action items for the analytics evangelist: Take stock of your organization's information access and distribution. Are employees stifled in their jobs because they don't have the appropriate information to make decisions? Connect with peers about information dissemination, and developing strategies that help empower workers with insight.

Conclusion

The analytics revolution is still at an early point in its development. Many companies are still struggling to figure out how, where and when to use analytics. Despite their analytical prowess, less than half of Analytical Innovators report that they are "very effective" at capturing data, analyzing and integrating it, and using analytical insights to guide strategy. Similarly, less than half of Analytical Innovators strongly agree that they share data with key stakeholders and have an integrated approach to information management.

Even so, Analytical Innovators are much more likely to be able create a competitive advantage from analytics than their counterparts in the other two groups. In part, this is a matter of definition. Analytical Innovators are those respondents who say their companies are using analytics (to a great extent) to compete and innovate. However, the key lessons that we have identified from studying this group is that:

(a) their orientation to data and analytics is much different than other groups. How Analytical Innovators think about analytics, how they support the development and dissemination of analytical insights, and what they do with analytics are very different compared to the approaches taken by the Analytically Challenged and Analytics Practitioner groups

(b) We have boiled down these differences into three characteristics:

i. A widely shared belief that data is a core asset that can be used to enhance operations, customer service, marketing and strategy

ii. More effective use of more data for faster results

iii. Support for analytics by senior managers who embrace new ideas and are willing to shift power and resources to those who make data-driven decisions

These are the main characteristics of companies that are, today, leading the analytics revolution.

We hope that a better understanding of the Analytical Innovators will yield benefits for companies that are looking not only to create business value from analytics, but also for a more innovative way to compete in their markets.

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(a) To what extent does information and business

analytics create a competitive advantage for your organization within its industry or markets?

(b) To what extent do you agree with the following statement? Analytics has helped improve my organization's ability to innovate.

Managers that checked "great extent" for both questions were placed in the Analytical Innovators category.

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18. Respondents in Analytically Challenged companies differ demographically in subtle but important ways from other survey participants. They tend to be in less senior management positions and have a slightly higher likelihood than other survey participants to work in operational functions. These demographic differences might be a contributing factor to their evaluations of their organizations as less analytically mature.

19. The prisoner's dilemma refers to a non-zero-sum game that shows why two people may choose to betray each other even if cooperation is in their best interest. It's based on the premise that two isolated prisoners involved in the same crime have the independent opportunity to either collaborate with each other by remaining silent or sell the other prisoner out. Each combination of possibilities results in a different outcome, with the best for both stemming from cooperation. The sucker's side is the prisoner who remains silent but is betrayed by the other prisoner.

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ABOUT THE RESEARCH

To deepen our understanding of the challenges and opportunities associated with the use of business analytics, MIT Sloan Management Review, in partnership with SAS Institute Inc., has conducted its third annual survey, to which more than 2,500 business executives, managers and analysts responded from organizations located around the world. Our analysis includes individuals in 121 countries and more than 30 industries. Participating organizations also ranged widely in size, from those organizations reporting under $250 million in revenues to those with $20 billion and over in revenues. Respondents included MIT alumni and MIT Sloan Management Review subscribers, SAS clients and other interested parties.

In addition to these survey results, we interviewed academic experts and subject matter experts from a number of industries and disciplines to understand the practical issues facing organizations today in their use of analytics. Our interviewees' insights contributed to a richer understanding of the data and the development of recommendations that respond to strategic and tactical questions senior executives address as they implement analytics within their organizations. We also drew upon a number of case studies to further illustrate how organizations are using business analytics as a competitive asset.

In this report, the term "analytics" refers to the use of data and related business insights developed through applied analytical disciplines (e.g., statistical, contextual, quantitative, predictive, cognitive and other models) to drive fact-based planning, decisions, execution, management, measurement and learning.

DEFINITIONS

ANALYTICS The use of data and related insights developed through applied analytics disciplines (for example, statistical, contextual, quantitative, predictive, cognitive and other models) to drive fact-based planning, decisions, execution, management, measurement and learning. Analytics may be descriptive, predictive or prescriptive.

DATA-ORIENTED CULTURE A pattern of behaviors and practices by a group of people who share a belief that having, understanding and using certain kinds of data and information plays a critical role in the success of their organization.

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