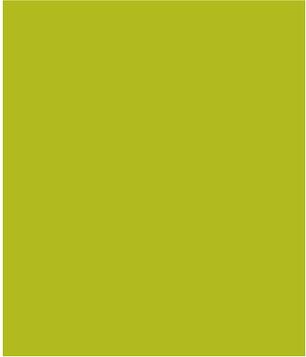


McKinsey Center for Business Technology

Perspectives on Digital Business





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January 2012

Digital Business

Technology, and its impact on business strategy continues to rise in importance on CEO agendas. “Digital business” has become the mantra of many top teams as they seek competitive advantages in a world of fast moving technological change.

At the beginning of 2011, McKinsey launched the McKinsey Center for Business Technology to research the most critical issues that leading corporations face in as they become more digital. Over the course of the past year, the Center, in conjunction with MGI and other practices, has focused on the following issues:

- How can CEOs set their organization’s Digital Business agenda?
- What is Big Data, and how can CEOs capture the upside?
- What are the right questions for CEOs to be asking about tech-driven change, and what can we learn from the experiences of successful leaders?
- How are social technologies impacting the organization?
- How should executives think about the cybersecurity risks that this move to digital business might entail?

This Compendium contains a set of articles and whitepapers published in 2011 that speak to these questions. We hope they spur spirited conversations with clients on how to capture the value of technology in a fast moving world.

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Capturing the upside of technology-driven threats

How CEOs can shift the focus on technology from a backroom cost to a business model enabler

Brad Brown
Seth Schuler
Johnson Sikes



Capturing the upside of technology-driven threats

As the technology line-item has grown in size over the past two decades, management teams have had to consider critical technology issues, including managing costs, aligning investment priorities and measuring ROI. While these are important issues, most members of the C-suite, CEOs in particular, have had little visibility into what technology actually does. More critically, they often feel that they are unable to shape or change their company's use of technology.

Today, technology has become more of a game changer that can spur top-line growth, and create new business models. As a result, it's critical that CEOs and management teams develop a new approach that involves delegating technology management issues to others, and instead focusing their time on a single strategic question: "How can technology change or threaten my business and how can we turn this to our advantage?" Rather than engage in a tactical debate over the management of IT, CEOs should stake out the high ground by focusing on strategic threats and opportunities driven by technology.

In this paper we'll review evidence of just how game-changing technology can be. The second section puts forward our recent research on this and a framework for CEOs to think about these changes and shape their own response. Lastly, we will lay out a set of simple, powerful questions that CEOs can use to corral the technology agenda and set it on a more meaningful course.

For CEOs and other C-suite leaders, future success depends on their ability to shift the focus on technology from a backroom cost to a business model enabler.

Rather than engage in a tactical debate over the management of IT, CEOs should stake out the high ground by focusing on strategic threats and opportunities driven by technology.

The debate is over: technology transforms markets and businesses

Over the past 20 years, we have heard frequent declarations that technology and information will transform the way businesses compete, but until now, these predictions have never fully come true. However, reality is finally catching up as years of promised technology benefits take root and the pace of technology change accelerates.

The stakes are high, and not just in terms of potential benefits realized – since 1980, technology spend has almost doubled its share of U.S. capital investment, from 25% to 47%. (Exhibit 1) Fully half of all investments made by a typical corporation are now going to technology. And this is occurring in a business environment marked by productivity gains and downsizing .

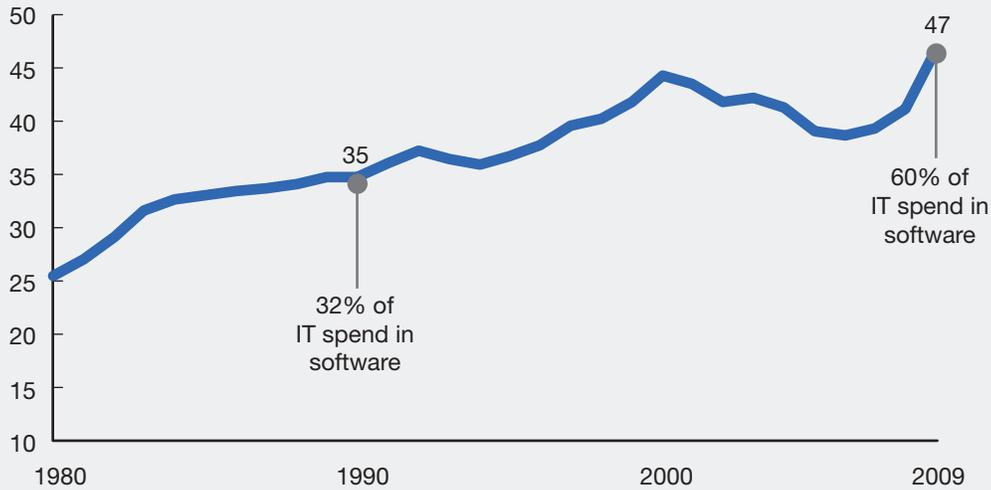
What is all this technology investment chasing? For many companies, where IT is still seen only as a business enabler, it is spent on lights-on costs. But at others, where IT is recognized for its businessdriving potential, technology is driving innovation and improved performance.

EXHIBIT 1

IT spend increasingly dominates corporate investment spend

Growing IT intensity of U.S. business

IT spend as percent of U.S. capital investment (%)



SOURCE: Bureau of Economic Analysis, McKinsey Analysis

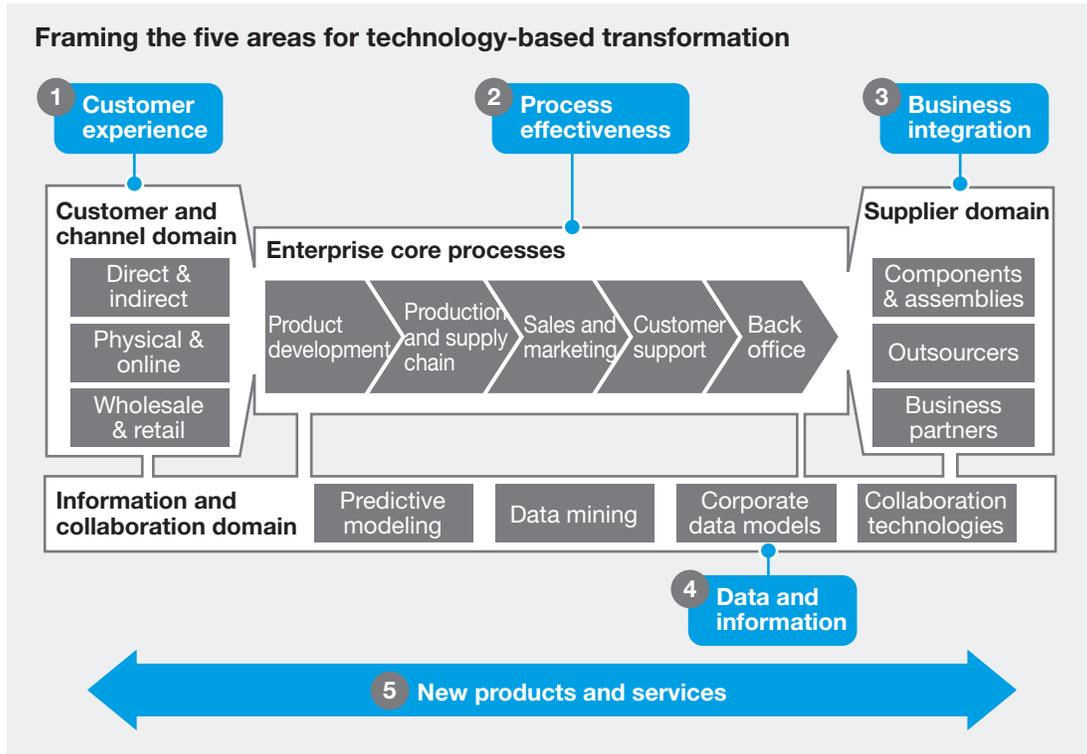
Consider two global companies from different eras that proved themselves ahead of their time, companies in which the management team focused on technology as a core value creator, and laid the groundwork for sustainably outperforming competitors for years or even decades.

In the 1980s Wal-Mart disrupted the retail industry by aggregating and mining data from their Point of Sales (POS) systems. This provided the retailer with a more complete picture of customer buying behavior than focus groups, which were the traditional proxies, could. Concurrently, Wal-Mart began to use inventory and purchasing data to link directly with their suppliers to drive increased inventory pullthrough, speed inventory turns and substantially lower holding costs. Wal-Mart has posted double-digit revenue growth in 14 of the past 20 years.

More recently, the Spanish fashion retailer Zara depends on an extremely well-integrated supply chain to underpin a business model based on customized fast retailing. Leveraging small product runs and product suggestions from employees at each store, they are able to deliver newly designed products to stores in a matter of weeks, rather than the months that is a more typical turnaround time for clothing retailers. This allows Zara to stay on top of fashion trends and remain highly responsive to local conditions while maintaining lean inventories.

In the cases above, Wal-Mart and Zara captured the upside (Exhibit 2). Their competitors were blindsided by a new model. What did the winning companies do to get ahead? What should the others have been doing to reduce their own risks?

EXHIBIT 3



2. Process Effectiveness: Step-change improvement in core functions

Many companies are creating more efficient and effective internal processes by focusing on speeding up their decision making and execution. To do this, they have focused on the most important valuable internal processes, and built on the prior technology investments to create more efficient and nimble systems and processes.

A multinational property and casualty insurer undertook a program to radically automate and standardize core claims processes and to codify the knowledge of its best claims adjustors. The claims and technology staff collaborated to create a robust set of business rules and logic for handling different types of claims. These drove changes to the business processes and systems, enabling “straight-through processing” for many more claims. This reduced their claims-handling workload by a third on average, and halved the time required to process simple claims. Customers saw substantial improvements through faster claims payouts and greater consistency in the way their claims were handled, leading to improved customer satisfaction and retention.

Another example can be found in product development processes for automotive and airline manufacturers. They are building on decades of experience and new capabilities in integrated supply chains to automate and digitize even more of the product design process with advanced CAD/CAM systems integrated with their manufacturing processes. Leaders are also experimenting with integrating collaboration tools directly into their design systems to improve communication and leverage skills across teams of designers in far-flung geographies.

3. Business Integration: Creating the open organization

New technology investments can ease data sharing throughout the partner ecosystem, and take advantage of new data created by mobile devices and embedded sensors like RFID or FedEx’s SenseAware technology, which monitors a package’s environment, including location, temperature and light exposure during transit.

Our research revealed a number of companies that have used technology to rethink their supplier interaction model, forcing a redesign of their logistics and inventory management functions. A new set of integrated business processes often leverages capabilities in their ERP systems, allowing expanded automation and standardization to enable real-time transparency across their entire logistics chain.

Companies are also beginning to open their value chains to take advantage of multiple, often competing, suppliers or networks of suppliers. Some are using increasingly complex systems to segment their manufacturing into separate supply chains based on product volume, complexity or geography. One manufacturer that adopted these practices reduced its cost of goods by 15% while drastically shortening delivery lead times. Others are taking advantage of new supplier markets and exchanges, allowing increasingly flexible on-demand supplier networks enabled by companies like Alibaba, a leading Chinese business-to-business marketplace that connects manufacturers with global customers and serves as an intermediary for payments and other transactions.

4. Data and Information: Creating a new corporate asset from information

Organizations are creating data at rates never seen before—recent MGI¹ research shows the amount of data generated worldwide is doubling every 18 months—collected from customer and supplier interactions, gathered from Web communities and generated by newly deployed smart objects. The payoff can be substantial—recent research indicates that companies using data to drive decisionmaking have seen overall productivity improve by 5-6%². Yet, at the same time, 45% of executives in a recent McKinsey Quarterly Survey³ said that a “lack of data” was one of the top reasons they couldn’t increase their use of analytics to improve decision making. The challenge is to turn tons of data into useful information, in a timely and cost-effective way.

The high-tech industry is rushing into this space, sensing opportunity. This is evident in the number and value of acquisitions by leading high-tech companies, which have been buying analytics-focused companies including Cognos, Hyperion and SPSS.

Many of the companies in our research are investing to consolidate, standardize and actively manage disparate pockets of data to create a single, consistent data store that can serve as a “single source of the truth.” This store can then be combined with additional data, either public information or purchased data and then mined with business intelligence, real-time analytics and predictive modeling tools to create unique information assets.

A large bank recently developed a customer data strategy with the goal of building a foundation for a number of business-driven efforts to increase sales effectiveness, streamline and automate process, and enable advanced risk management. In addition to technical improvements to data architecture and management, the bank synchronized the definition of a “customer” across multiple business units and created a common set of processes and systems to manage and track customer interactions. While the potential impact on sales is substantial (worth almost \$1 billion annually), this newly consolidated data asset will also allow the bank to manage its exposures more closely, limiting downside risks.

The retailing industry has been at the forefront in developing large data sets and predictive models to help its product managers make optimal commercial decisions that involve a myriad of factors: shelf price,

1 See the McKinsey Global Institute report: *Big Data: The next frontier for innovation, competition and productivity* (http://www.mckinsey.com/mgi/publications/big_data/index.asp). Also see “Are you ready for the era of ‘big data?’” on page 27, and “Seizing the potential of big data” on page 47.

2 Research from Erik Brynjolfsson, Lorin Hitt and Heekyung Kim, April 2011 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1819486)

3 The McKinsey Quarterly Survey on information and technology strategy was conducted in October 2010, and had respondents from 864 companies, representing a range of geographies, industries and corporate functions.

price discounts, advertising, couponing. In one case, a large retailer achieved a 12% profit increase in the first year after implementing a commercial support system for a subset of its products, simply from improved managerial decisions.

Companies are also increasing their use of lightweight applications like wikis, blogs and knowledge sharing tools, to help share information and increase collaboration. Increasing the ease of sharing information and advertising their own expertise allows company staff, for example, to quickly find solutions to problems, easily find experts in a particular area, or work collaboratively on documents. This yields productivity dividends via reduction of rework and waiting time. Over time, these new applications help break down functional silos, improving utilization of scarce resources and encouraging innovation.

5. New Products and Services: Using technology to find new profit pools

As corporations apply technology to their core business, some are finding opportunities to tap new profit pools and create new revenue streams. Chief among these examples are:

- The creation of new businesses or products from “exhaust data” or existing internal systems. For example, MasterCard has combined proprietary transaction data with analytic skills to create MasterCard Advisors, which provides performance benchmarks at the store and company level, complemented with additional analytic services for merchants.
- “Unbundling the enterprise” to create new end-to-end managed services that leverage core business activities, underpinned by technology capabilities. Amazon.com is a leading example of this, as they launched Amazon Web Services – essentially unbundled computing, payment and logistics services offered to businesses, developers and consumers. In fact, Netflix runs much of its rental and streaming platform using Amazon’s services. This goes far beyond high-tech – companies as diverse as healthcare providers and cable TV operators are also developing strategies for creating managed service offerings from their core business processes.
- Embedding technology into products (e.g., bridges that monitor themselves for icing or corrosion) or fundamentally shifting cost/feature set for new and emerging markets, as GE has done with a \$1,000 electrocardiogram machine designed to meet cost and reliability hurdles for markets in rural India. Ironically, many of these products are also “blowing back” to find markets in developed countries, given their low prices and acceptable performance.

Four questions that CEOs should ask of their organizations

Getting a handle on where to focus, and how much to invest against opportunities and threats is an increasingly frequent item on the agendas of senior business executives. The challenge is often how to start.

By asking some basic questions, CEOs can bring the focus up out of the tactical details

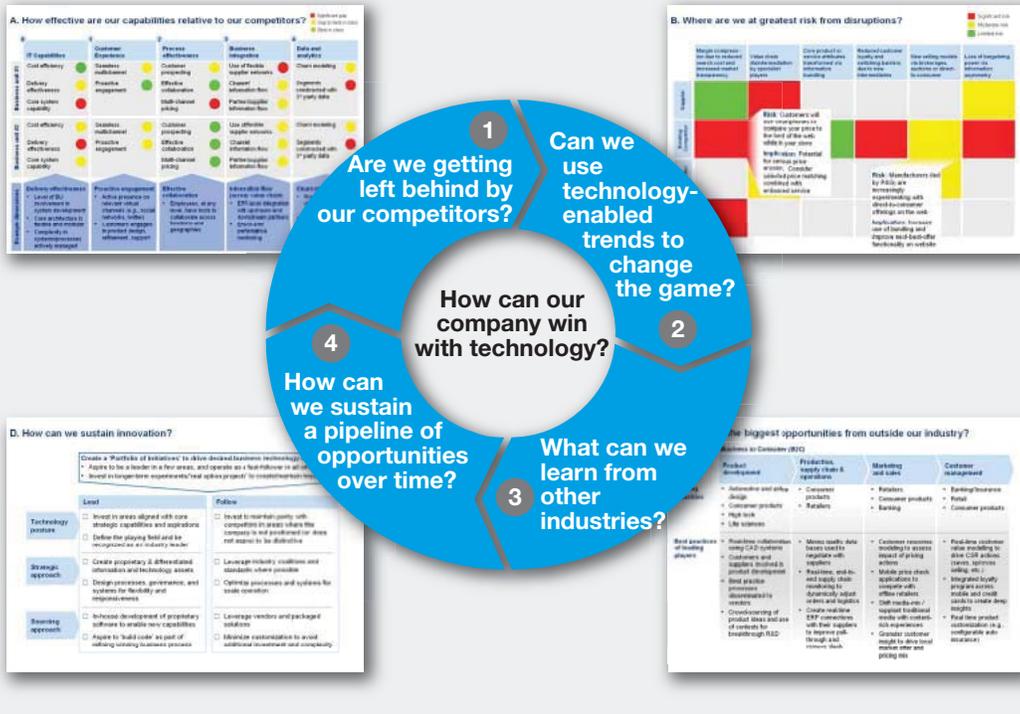
In our experience, CEOs need to wade into the technology discussion and shape the debate. By asking some basic questions, CEOs can bring the focus up out of the tactical details and onto increased performance and driving innovation. We have found the following four questions to be effective at shifting the technology discussion from “necessary cost” to “business enabler” (Exhibit 4):

1. Are we getting left behind?

In our experience, few leadership teams have clear visibility into how a company’s business technology capabilities—the combination of business processes and their supporting systems—stack up against

EXHIBIT 4

Four questions for building a winning technology position



those of competitors. Instead, top teams often rely on anecdotes and suppositions about perceived weaknesses or strengths as seen by business unit executives. These views can be erroneous or incomplete, and the murkiness often envelopes cutting-edge technologies and more traditional ones alike.

Vocal business unit leaders at a North American insurance company, for example, insisted that sluggish times to market for new products were an important factor behind its eroding market share. They also believed that poor IT systems—specifically, the software that supported pricing and helped adapt insurance products to local regulatory requirements—were responsible for the lagging product development performance.

To get a reality check on these views, the insurer’s CEO and a business unit president tasked a team of business and IT managers to undertake a more rigorous benchmarking of the company’s business technology performance relative to competitors. The results were eye opening. The insurer learned that the initial concerns about its product-development capabilities were misplaced and that its performance in product introductions was on par with that of competitors.

In fact, the loudest voices at the table had distracted the leadership from the most important technology challenges the company actually faced: a lagging ability to handle straight-through underwriting and policy administration in the online channel. These systems were siloed by line of business, whereas top-performing competitors had redesigned their IT architecture and business processes to facilitate more standardized pricing across business lines. The competitors’ systems did just about everything— from assessing risk to running online channels—more quickly and cheaply than the company’s systems could. Worse, the CEO learned that his investment budget was being consumed by ongoing maintenance and enhancements to sustain the status quo rather than by efforts to support new functionality.

Armed with this knowledge, the business unit president started a debate among his colleagues in the top team. The discussions ultimately forced a critical series of trade-offs among the competing demands for the company's technology-investment budget. In the end, he brought his team, the CEO, and eventually the board of directors together to support a major investment in renewing the company's core IT platform and processes.

The lessons for the business leaders were clear: while they didn't need to know the ground-level details of the company's IT practices, a "hands off" policy had led to a poor view of the risks accumulating across the business units and thus to serious competitive blind spots. Going forward, the insurer established an IT capability review as part of its annual business strategy sessions. The review includes operational basics, market intelligence on competitors' use of technology, and an analysis of the competitive gaps that might affect the company's market share and financial performance.

2. Can we use technology-enabled trends to change the game?

Even if your company's technology position is solid today, a tech-enabled competitor or new entrant with a disruptive agenda may be preparing to strike. So executives need to know where technology threats are emerging and what it will take to respond – or, better yet, get ahead of them.

These disruptions come from a variety of sources, ranging from new channels to engage customers, especially through smartphones and mobile devices; new levels of automation enabled through "the Internet of Things" and embedded sensors; highly agile and scalable business models driven by cloud computing; or from the vast stores of data arising from transactions, Internet interactions, new mobile devices and the increasing digitization of process of all stripes.

This last area—"Can we use data to change the game?"—is a growing focus for many companies. Increasingly, this new data is standardized and can be broadly shared. This evolving data environment can change the terrain for companies whose business models are based on information asymmetry – creating a competitive advantage from proprietary information.

The CEO and top team of one pharmaceutical industry player recently realized their information advantage was eroding. Traditionally, data on drug efficacy across patient populations has been the exclusive domain of pharma companies like this one, as a result of their major investments in clinical trials. Lately, however, insurers have been building up massive databases on how patients respond to drugs and how fast they recover, gleaned from their own transaction records and electronic medical records kept by health care providers. As information about how drugs are used, how they are priced, and their overall efficacy is more widely disseminated across the value chain, insurers "sometimes have a better view of patient responses and outcomes than we do," said one executive at this pharma company.

The competitive implications were significant: in pricing and distribution negotiations, the insurers were able to create their own data-driven assessments of drug efficacy. Based on this information they were demanding lower payments for drugs they considered less effective, while limiting patient access to others. This combination of commoditization and curtailed volumes was hurting the pharma company's revenues and margins.

Based on their early experiences in negotiations involving payers armed with better data, executives at the pharmaceutical company were concerned that the new information at payers' disposal put the company at a competitive disadvantage in negotiations for drug coverage and reimbursements. To combat this, they needed to create a more robust information asset of their own, one that combined clinical trials data as well as a fuller portrait of efficacy from hospital records, public health data and more.

It was a “bet the company” undertaking in the words of the CEO, requiring not only major investments in new technology capabilities and business partnerships to capture and analyze this new data, but also significant changes to the organization and processes across sales and R&D to ensure that the resulting insights were “baked in” to the way the company did business. To test the approach, executives launched a pilot to assess the insights they could create for two high-value drugs.

The results were striking. In the next set of negotiations with payers, the pharma team was able to demonstrate that the two drugs had benefits beyond those cited by payers – they reduced hospital stays and limited the need for additional drug therapies. Rather than move the two drugs into a commodity classification, the insurance payers kept them in a higher value category, avoiding a revenue loss of tens, if not hundreds, of millions of dollars.

The company has since extended the new data asset to other products, and is rolling it out globally. The more disciplined and expansive approach to gathering and analyzing data has brought additional benefits. The top team now has a more complete set of information when deciding on new or incremental research investments. Identifying new benefits from their products also has helped reshape marketing efforts and refined procedures for clinical trials.

3. What can we learn from other industries?

Looking beyond your industry to proven technology leaders is a good way to shake up your thinking. This seems simple, yet in our experience few leaders consistently look beyond their own industries for new technological insights and opportunities; instead, many cite time constraints or a lack of reliable processes for developing such intelligence.

A European grocery chain’s CEO was eager to discover a way to break through his industry’s revenue growth and margin boundaries. Grocers traditionally use a combination of traditional market research and gut instinct to shape their commercial strategies: the set of coordinated decisions—made around prices, promotion, communication, and product assortments—that drive revenues and sales volumes. When properly calibrated, these factors can swing margins by 1 to 2 percent, a huge amount given the industry’s slim margins.

The CEO had long watched retail and grocery industry pioneers that used data to better understand consumer behavior. Now he wanted to go further, spurred by the example of digital-media companies, airlines, and financial-services companies that change promotions and prices in real time based on factors such as customer demand, supply constraints, and seasonal or regional factors, among others. The CEO’s goal was to go even further and develop the ability to anticipate competitive reactions to various commercial strategies. He began by having managers, and even board members, visit and observe players in other industries to understand the current state of the art.

To emulate these practices, the company would need to start from scratch. While some vendors offered targeted research aids to help retailers position certain products, there were no software systems or standard approaches for creating the broad-based tools the CEO envisioned. The new tools would require an experimental approach to commercial strategy—one that allowed the grocer to model the way a range of variables (such as pricing, shelf displays, and advertising) affected performance in the past and then to see how useful those models would have been at predicting the future. The project would demand substantial IT investments and close support from the company’s marketers, sales operations professionals, and store managers.

The company started with 100 variables and back-tested them to select the 12 most important, which eventually formed the backbone of the new strategy-setting tool. So far, this approach has helped the grocer boost sales by 2 percent—increasing its market share without sacrificing profitability. What’s more,

the “test and learn” methodology has allowed the company to decentralize some of its decision making, so that regional executives and managers, who tend to have the clearest view of fast-changing market conditions, are now empowered to make commercial decisions.

4. How can we sustain a pipeline of opportunities over time?

While the answer to this question will differ according to a company’s culture, management and competitive situation, many companies have focused on funding a set of focused initiatives, much like a venture capitalist does, and wrapping senior business accountability around them. (See “Technology-enabled innovation” on page 53 for additional perspectives)

We’ve seen several CEOs create this mindset shift by including technology strategy as a core element in the annual business reviews of their divisions. By refusing to allow company presidents to delegate leadership of technology priorities to their CIOs, CEOs can force their business units to “wake up” and take ownership of their technology agendas.

Other companies have taken more structured approaches to embed innovation and new thinking even further into the organization. For example, GE uses a common process (called CECOR, for Calibrate, Explore, Create, Organize and Realize) to drive investments in innovation in its businesses. Top management aligns itself to a focused set of product innovations, large and small, that are systematically developed, tested and measured, leading to a “survival of the fittest” result.



The swift and radical changes taking place today in the technology landscape are creating opportunities that extend far beyond IT’s ‘traditional’ impact. As a result, CEOs need to tackle technology today more than ever. To move far out in front of competitors and change the game entirely, chief executives must elevate the IT debate to a focus on how their organizations’ core businesses can leverage the transformative capabilities that technology has at last realized.

Brad Brown is a director in McKinsey’s New York office, where Johnson Sikes is a consultant. Seth Schuler is an alumnus of McKinsey.



Internet matters: The Net's sweeping impact on growth, jobs, and prosperity

Matthieu Pélissié du Rausas
James Manyika
Eric Hazan
Jacques Bughin
Michael Chui
Rémi Said



2 billion

Internet users worldwide

Internet accounts for

3.4% of GDP in 13 countries we looked at, and

21% of GDP growth in the last 5 years in mature countries

10% increase in productivity for small and medium businesses from Internet usage

2.6 jobs created for 1 job lost

Small and medium businesses heavily using Web technologies grow and export **2x** as much as others

75% of Internet impact arises from traditional industries

Up to **€20** per Internet user per month of consumer surplus

Executive summary

Two billion people are connected to the Internet. Almost \$8 trillion exchange hands each year through e-commerce. In some developed markets, about two-thirds of all businesses have a Web presence of some kind, and one-third of small and medium-sized businesses extensively use Web technologies.¹ The Internet has transformed the way we live, the way we work, the way we socialize and meet, and the way our countries develop and grow. In two decades, the Internet has changed from a network for researchers and geeks to a day-to-day reality for billions of people. Our research sheds new light on this revolution and helps explain the direct link between the Internet and economic vitality.

Many have compared the dawn of the Internet to another communications game changer, the introduction of the Gutenberg press five centuries earlier. But a comparison with the development and commercialization of electric power may be more appropriate.² Among its many other consequences, electricity changed the landscape of cities around the world, allowing elevators that can travel great heights and heralding the dawn of massive skyscrapers. As with electricity, the Internet has changed the global landscape. The Internet bridges vast distances and has made the world flatter by allowing instant access to an almost endless stream of information that can be immediately brought into play. Its impact on economic wealth reaches well beyond pure players in the industry. Indeed, the brunt of its economic contribution derives from established industries that, in the shadow of the Internet, have become more

¹ The sources for these statistics are the World Bank, 2009; Gartner, 2010; Eurostat, 2010; and a McKinsey & Company Internet survey of more than 4,800 small and medium-sized enterprises.

² Nicholas Carr, *The big switch: Rewiring the world, from Edison to Google*, New York: W.W. Norton & Company, 2009.

productive, have created more jobs, have increased standards of living, and have contributed more to real growth. Our research shows that more than 75 percent of the value added created by the Internet is in traditional industries.

Also, as with electricity, the Internet has influenced every corner of the world, not just those countries that pushed its original development or were instrumental in its growth. As Internet usage spreads to even the most remote communities—where gas-powered generators and satellite links make the connection—its observable positive effects grow. As evidence, the United Nations in its Millennium Development Goals lists Internet penetration as a key metric in efforts to reduce poverty and encourage rational development.

Yet despite its ubiquity, little is known about how much value the Internet contributes to national economies. To help fill this gap, McKinsey has conducted extensive research on the contribution of the Internet to GDP and economic growth in the G8 economies and five other key countries at various levels of development: Brazil, China, India, South Korea, and Sweden.

The study, drawn from public sources and targeted surveys, examines the Internet ecosystem, how it is being framed, and who is doing the framing. For the first time, we believe, this work offers a quantitative assessment of the impact of the Internet on GDP and growth while also considering the most relevant tools governments and businesses can use to get the most benefit from the Internet.

The Internet Is Contributing Strongly To Wealth

The Internet embraces all of us: businesses, individuals, governments, and entrepreneurs. The Web has made possible new waves of business models and entrepreneurship but has also led to radical innovations for accessing, using, and delivering goods and services for everyone. It has transformed industries and governments through innovative approaches and changed how users engage the world.

The Internet is already a significant contributor to the economies of the 13 countries we studied—economies that account for more than 70 percent of global GDP—exerting a strong influence on economic growth rates particularly in mature economies.

To measure the Internet's impact on a country's economy and to understand how the Internet is framed worldwide, we structured the analysis around its two primary components: consumption and expenditure on one hand, and supply on the other.

Internet consumption and expenditure contributes significantly to the economy

Looking at Internet-related usage through expenditure and consumption first, we see:

- **The Internet is big and continues to grow and reach everywhere.** The Internet is now used in every country, in every sector, in most companies, and by more than 2bn people and it is still growing. Internet-related consumption and expenditure is now bigger than agriculture or energy, and our research shows that the Internet accounts for, on average, 3.4 percent of GDP in the 13 countries we studied. If Internet consumption and expenditure were a sector, its weight in GDP would be bigger than energy, agriculture, or several other critical industries. The Internet's total contribution to the GDP is bigger than the GDP of Spain or Canada, and it is growing faster than Brazil.
- **The Internet is still in its infancy, and the weight of the Internet in GDP varies drastically, even among countries at the same stage of development.** While the Internet accounts for around 6 percent of GDP in advanced countries such as Sweden and the United Kingdom, in 9 out of the 13 countries its contribution is below 4 percent, leaving tremendous room for further Internet development.

- **The Internet is a critical element of growth.** Both our macroeconomic approach and our statistical approach show that, in the mature countries we studied, the Internet accounted for 10 percent of GDP growth over the past 15 years. And its influence is expanding. Over the past five years, the Internet’s contribution to GDP growth in these countries doubled to 21 percent. If we look at all 13 countries in our analysis, the Internet contributed 7 percent of growth over the past 15 years and 11 percent over the past five. This is a reflection of small and medium-sized enterprises (SMEs) receiving a performance boost from the Internet. As part of our research, we surveyed more than 4,800 SMEs in the countries we studied.³ We found that those with a strong Web presence grew more than twice as quickly as those that had minimal or no presence, an outcome that holds across sectors. In addition, SMEs that took advantage of the Internet reported the share of total revenues that they earned from exports was more than twice as large as that reported by others. They also created more than twice the number of jobs as others.
- **The maturity of the Internet correlates with rising living standards.** Leveraging endogenous economic growth theory, we have been able to show that Internet maturity correlates with growth in per capita GDP. Using the results of the correlation, a simulation shows that an increase in Internet maturity similar to the one experienced in mature countries over the past 15 years creates an increase in real GDP per capita of \$500 on average during this period. It took the Industrial Revolution of the 19th century 50 years to achieve same results.⁴ This shows both the magnitude of the positive impact of the Web at all levels of society and the speed at which it delivers benefits.
- **The Internet is a powerful catalyst for job creation.** Some jobs have been destroyed by the emergence of the Internet. However, a detailed analysis of the French economy showed that while the Internet has destroyed 500,000 jobs over the past 15 years, it has created 1.2 million others, a net addition of 700,000 jobs or 2.4 jobs created for every job destroyed. This conclusion is supported by McKinsey’s global SME survey, which found 2.6 jobs were created for every one destroyed.
- **The Internet drives economic modernization.** The Internet’s main impact is through the modernization of traditional activities. Although the Internet has resulted in significant value shifts between sectors in the global economy, our research demonstrates that all industries have benefited from the Web. Indeed, in McKinsey’s global SME survey, we found that 75 percent of the economic impact of the Internet arises from traditional companies that don’t define themselves as pure Internet players. The businesses that have seen the greatest value creation have benefits from innovation leading to higher productivity triggered by the Internet.
- **The impact of the Internet goes beyond GDP, generating astonishing consumer surplus.** Beyond its impact on GDP, the Internet creates substantial value for users, ranging from €13 (\$18) a month per user in Germany to €20 (\$28) in the United Kingdom.⁵ In total, the consumer surplus generated by the Internet in 2009 ranged from €7 billion (\$10 billion) in France to €46 billion (\$64 billion) in the United States.

The rapidly shifting supply side offers some contrasts

Looking at the “supply” of the Internet globally, we find that countries with a strong Internet ecosystem also have a high Internet contribution to GDP. However, the global Internet landscape is shifting rapidly and offers some interesting contrasts:

- **The United States leads the global Internet supply ecosystem.** The United States captures more than 30 percent of global Internet revenues and more than 40 percent of net income. Using a

³ Excluding Brazil.

⁴ See Angus Maddison, *The World Economy: Historical Statistics*, Paris: OECD, 2003.

⁵ Internet Advertising Board, *Assessing the consumer benefits of online advertising*, July 2010.

proprietary model, the McKinsey Internet Supply Leadership Index, we show that the United States remains the largest player in the Internet supply ecosystem. It is the country with the most diverse structure within the global ecosystem among the 13 we analyzed in this research, garnering relatively equal contributions from hardware, software and services, and telecommunications.

- **The United Kingdom and Sweden are changing the game.** These two countries have leveraged very strong Internet usage across the board to gain greater importance within the global Internet ecosystem. This move is helped by the strength and strong performance of their telecom operators.
- **India and China are strengthening their position** in the global Internet ecosystem rapidly. Both countries show growth rates of more than 20 percent.
- **France, Canada, and Germany have strong Internet usage.** All three could leverage this usage to increase their presence in the global supply ecosystem.
- **South Korea is rapidly accelerating** its influence on the Internet economy at a faster rate than Japan.
- **Brazil, Russia, and Italy are in the early stages of Internet supply.** They all have strong potential for growth.

Only strong Internet ecosystems can capture maximum value. We find that to build a strong ecosystem, the best performers focus their efforts on four critical areas:

- **Promote human capital.** The United States in particular has used its vast talent pool effectively compared to other countries. Its relative attractiveness to talent with the right skills has been critical in the creation of a strong Internet ecosystem, and this human capital has been nurtured in universities, corporate research and development centers, startups and elsewhere. However, the US will increasingly compete for such talent with other countries.
- **Ease access to financial capital.** The United States, Israel, and South Korea have all ensured sufficient financial capital is available and the mechanism for capital formation in place to nurture innovation and support entrepreneurial resolve.
- **Develop infrastructure.** Infrastructure, the backbone of the entire Internet ecosystem, is an irreplaceable prerequisite. It creates the platforms upon which users, and organizations experience the Internet, and upon which entrepreneurs and businesses innovate.
- **Create an attractive business environment.** The context in which business operates is critical to the growth of the Internet ecosystem and will hold back its growth if the environment does not encourage expansion of usage, encouragement of innovation, and business investment and participation. To ensure such an attractive environment requires ongoing assessment of the frameworks that govern access, usage, protection of various rights, and considerations of security.

Leveraging The Internet To Revive The Engine Of Growth

Armed with a better understanding of how—and how much—the Internet contributes to national economies, policy makers and business executives can focus their efforts more acutely and effectively to promote and strengthen their domestic Internet ecosystems. In particular, they should consider the following immediate practical steps:

- **Public decision makers should act as catalysts to unleash the Internet's growth potential.** Governments could leverage Internet public spending as a catalyst for innovation. Indeed, countries with the highest public investment in the Internet are also those with the largest nonpublic Internet

contribution to GDP. Governments' own use of the Internet encourages citizens to use it. Government e-transformation creates large-scale, complex demand that stimulates the supply ecosystem. In addition, governments must promote Internet usage by informing and training businesses and individuals.

- **All business leaders, not just e-CEOs, should put the Internet at the top of their strategic agenda.** Business leaders must optimize the benefits gleaned from the Internet through innovation and change. It is no longer a choice, given that many businesses face competitors who capitalize on the power of the Internet to innovate business models. Business leaders should play a significant role in the spread of the Internet and systematically review how the Internet allows them to innovate more aggressively and even reinvent their business models to boost growth, performance, and productivity. In particular, businesses should constantly try to identify up-and-coming Internet trends that have the potential to increase the impact of their efforts—e.g., by applying statistical analyses to the mass of data available from the Internet or using IT-enabled services to improve production capabilities.
- **All stakeholders should take part in a fact-based, public-private dialogue** to assure optimal conditions for the development of the Internet ecosystem within each country, as well as internationally. Open discussions between government and business leaders should work toward creating a nurturing environment in which the benefits of the Internet can be better understood and the Internet ecosystem can grow. Issues such as standards for digital identities and intellectual property protection must be addressed as countries strive to stimulate usage, while topics relevant to improving the supply ecosystem include net neutrality, the availability of talent, and the overall business environment.

Monitoring The Progress Of The Internet Using Four Critical Indicators

Behind our analysis and recommendations are four indicators to measure the impact and evolution of the Internet in individual countries. Two, the “e3” index and the “iGDP,” focus on Internet expenditures and consumption. The other two, the McKinsey Internet Supply Leadership Index and the i4F indicator, track supply trends. Our aim is to improve and track them yearly and to review the global economy’s progress toward reaping optimal economic benefits from the Internet. Also, as we know that our indicators are still imperfect, we encourage “open-source” improvements to our methodology. We’ve made public the details and welcome any suggestions for refining our approach.

The full McKinsey Global Institute Report, *Internet matters: the net’s sweeping impact on growth, jobs and prosperity*, is available at mckinsey.com/mgi



The top marketing executive at a sizable US retailer recently found herself perplexed by the sales reports she was getting. A major competitor was steadily gaining market share across a range of profitable segments. Despite a counterpunch that combined online promotions with merchandizing improvements, her company kept losing ground.

When the executive convened a group of senior leaders to dig into the competitor's practices, they found that the challenge ran deeper than they had imagined. The competitor had made massive investments in its ability to collect, integrate, and analyze data from each store and every sales unit and had used this ability to run myriad real-world experiments. At the same time, it had linked this information to suppliers' databases, making it possible to adjust prices in real time, to reorder hot-selling items automatically, and to shift items from store to store easily. By constantly testing, bundling, synthesizing, and making information instantly available across the organization— from the store floor to the CFO's office—the rival company had become a different, far nimbler type of business.

What this executive team had witnessed first hand was the gamechanging effects of big data. Of course, data characterized the information age from the start. It underpins processes that manage employees; it helps to track purchases and sales; and it offers clues about how customers will behave.

But over the last few years, the volume of data has exploded. In 15 of the US economy's 17 sectors, companies with more than 1,000 employees store, on average, over 235 terabytes of data—more data than is contained in the US Library of Congress. Reams of data still flow from financial transactions and customer interactions but also cascade in at unparalleled rates from new devices and multiple points along the value chain. Just think about what could be happening at your own company right now: sensors embedded in process machinery may be collecting operations data, while marketers scan social media or use location data from smartphones to understand teens' buying quirks. Data exchanges may be networking your supply chain partners, and employees could be swapping best practices on corporate wikis.

All of this new information is laden with implications for leaders and their enterprises.¹ Emerging academic research suggests that companies that use data and business analytics to guide decision making are more productive and experience higher returns on equity than competitors that don't.² That's consistent with research we've conducted showing that "networked organizations" can gain an edge by opening information conduits internally and by engaging customers and suppliers strategically through Web-based exchanges of information.³

Over time, we believe big data may well become a new type of corporate asset that will cut across business units and function much as a powerful brand does, representing a key basis for competition. If that's right, companies need to start thinking in earnest about whether they are organized to exploit big data's potential and to manage the threats it can pose. Success will demand not only new skills but also new perspectives on how the era of big data could evolve—the widening circle of management practices it may affect and the foundation it represents for new, potentially disruptive business models.

1 For more, see the McKinsey Global Institute report *Big data: The next frontier for innovation, competition, and productivity*, available free of charge online at mckinsey.com/mgi.

2 See Erik Brynjolfsson, Lorin M. Hitt, and Heekyung Hellen Kim, "Strength in numbers: How does data-driven decisionmaking affect firm performance?" Social Science Research Network (SSRN), April 2011. In this study, the authors found that effective use of data and analytics correlated with a 5 to 6 percent improvement in productivity, as well as higher profitability and market value. For more, see the forthcoming e-book by Brynjolfsson and coauthor Andrew McAfee, *Race Against the Machine: How the digital revolution accelerates innovation, drives productivity, and irreversibly transforms employment and the economy* (Harvard Business Review Press, October 2011).

3 See Jacques Bughin and Michael Chui, "The rise of the networked enterprise: Web 2.0 finds its payday," mckinseyquarterly.com, December 2010.

Five big questions about big data

In the remainder of this article, we outline important ways big data could change competition: by transforming processes, altering corporate ecosystems, and facilitating innovation. We've organized the discussion around five questions we think all senior executives should be asking themselves today.

At the outset, we'll acknowledge that these are still early days for big data, which is evolving as a business concept in tandem with the underlying technologies. Nonetheless, we can identify big data's key elements. First, companies can now collect data across business units and, increasingly, even from partners and customers (some of this is truly big, some more granular and complex). Second, a flexible infrastructure can integrate information and scale up effectively to meet the surge. Finally, experiments, algorithms, and analytics can make sense of all this information. We also can identify organizations that are making data a core element of strategy. In the discussion that follows and elsewhere in this issue, we have assembled case studies of early movers in the big data realm (see "Seizing the potential of 'big data,'" on page 47, and the accompanying sidebar, "AstraZeneca's 'big data' partnership," on page 49).

In addition, we'd suggest that executives look to history for clues about what's coming next. Earlier waves of technology adoption, for example, show that productivity surges not only because companies adopt new technologies but also, more critically, because they can adapt their management practices and change their organizations to maximize the potential. We examined the possible impact of big data across a number of industries and found that while it will be important in every sector and function, some industries will realize benefits sooner because they are more ready to capitalize on data or have strong market incentives to do so (see sidebar, "Parsing the benefits: Not all industries are created equal").

The era of big data also could yield new management principles. In the early days of professionalized corporate management, leaders discovered that minimum efficient scale was a key determinant of competitive success. Likewise, future competitive benefits may accrue to companies that can not only capture more and better data but also use that data effectively at scale. We hope that by reflecting on such issues and the five questions that follow, executives will be better able to recognize how big data could upend assumptions behind their strategies, as well as the speed and scope of the change that's now under way.

1. What happens in a world of radical transparency, with data widely available?

As information becomes more readily accessible across sectors, it can threaten companies that have relied on proprietary data as a competitive asset. The real-estate industry, for example, trades on information asymmetries such as privileged access to transaction data and tightly held knowledge of the bid and ask behavior of buyers. Both require significant expense and effort to acquire. In recent years, however, online specialists in real-estate data and analytics have started to bypass agents, permitting buyers and sellers to exchange perspectives on the value of properties and creating parallel sources for real estate data.

Beyond real estate, cost and pricing data are becoming more accessible across a spectrum of industries. Another swipe at proprietary information is the assembly by some companies of readily available satellite imagery that, when processed and analyzed, contains clues about competitors' physical facilities. These satellite sleuths glean insights into expansion plans or business constraints as revealed by facility capacity, shipping movements, and the like.

One big challenge is the fact that the mountains of data many companies are amassing often lurk in departmental "silos," such as R&D, engineering, manufacturing, or service operations—impeding timely exploitation. Information hoarding within business units also can be a problem: many financial institutions, for example, suffer from their own failure to share data among diverse lines of business, such

as financial markets, money management, and lending. Often, that prevents these companies from forming a coherent view of individual customers or understanding links among financial markets.

Some manufacturers are attempting to pry open these departmental enclaves: they are integrating data from multiple systems, inviting collaboration among formerly walled-off functional units, and even seeking information from external suppliers and customers to cocreate products. In advanced-manufacturing sectors such as automotive, for example, suppliers from around the world make thousands of components. More integrated data platforms now allow companies and their supply chain partners to collaborate during the design phase—a crucial determinant of final manufacturing costs.

2. If you could test all of your decisions, how would that change the way you compete?

Big data ushers in the possibility of a fundamentally different type of decision making. Using controlled experiments, companies can test hypotheses and analyze results to guide investment decisions and operational changes. In effect, experimentation can help managers distinguish causation from mere correlation, thus reducing the variability of outcomes while improving financial and product performance.

Robust experimentation can take many forms. Leading online companies, for example, are continuous testers. In some cases, they allocate a set portion of their Web page views to conduct experiments that reveal what factors drive higher user engagement or promote sales. Companies selling physical goods also use experiments to aid decisions, but big data can push this approach to a new level. McDonald's, for example, has equipped some stores with devices that gather operational data as they track customer interactions, traffic in stores, and ordering patterns. Researchers can model the impact of variations in menus, restaurant designs, and training, among other things, on productivity and sales.

A next-generation retailer will be able to track the behavior of individual customers from Internet click streams, update their preferences, and model their likely behavior in real time.

Where such controlled experiments aren't feasible, companies can use "natural" experiments to identify the sources of variability in performance. One government organization, for instance, collected data on multiple groups of employees doing similar work at different sites. Simply making the data available spurred lagging workers to improve their performance.

Leading retailers, meanwhile, are monitoring the in-store movements of customers, as well as how they interact with products. These retailers combine such rich data feeds with transaction records and conduct experiments to guide choices about which products to carry, where to place them, and how and when to adjust prices. Methods such as these helped one leading retailer to reduce the number of items it stocked by 17 percent, while raising the mix of higher-margin private-label goods—with no loss of market share.

3. How would your business change if you used big data for widespread, real-time customization?

Customer-facing companies have long used data to segment and target customers. Big data permits a major step beyond what until recently was considered state of the art, by making real-time personalization possible. A next-generation retailer will be able to track the behavior of individual customers from Internet click streams, update their preferences, and model their likely behavior in real time. They will then be able to recognize when customers are nearing a purchase decision and nudge the transaction to completion by bundling preferred products, offered with reward program savings.

This real-time targeting, which would also leverage data from the retailer's multitier membership rewards program, will increase purchases of higher-margin products by its most valuable customers.

Retailing is an obvious place for data-driven customization because the volume and quality of data available from Internet purchases, social-network conversations, and, more recently, location-specific smartphone interactions have mushroomed. But other sectors, too, can benefit from new applications of data, along with the growing sophistication of analytical tools for dividing customers into more revealing microsegments.

One personal-line insurer, for example, tailors insurance policies for each customer, using fine-grained, constantly updated profiles of customer risk, changes in wealth, home asset value, and other data inputs. Utilities that harvest and analyze data on customer segments can markedly change patterns of power usage. Finally, HR departments that more finely segment employees by task and performance are beginning to change work conditions and implement incentives that improve both satisfaction and productivity.⁴

4. How can big data augment or even replace management?

Big data expands the operational space for algorithms and machinemediated analysis. At some manufacturers, for example, algorithms analyze sensor data from production lines, creating self-regulating processes that cut waste, avoid costly (and sometimes dangerous) human interventions, and ultimately lift output. In advanced, "digital" oil fields, instruments constantly read data on wellhead conditions, pipelines, and mechanical systems. That information is analyzed by clusters of computers, which feed their results to real-time operations centers that adjust oil flows to optimize production and minimize downtimes. One major oil company has cut operating and staffing costs by 10 to 25 percent while increasing production by 5 percent.

Products ranging from copiers to jet engines can now generate data streams that track their usage. Manufacturers can analyze the incoming data and, in some cases, automatically remedy software glitches or dispatch service representatives for repairs. Some enterprise computer hardware vendors are gathering and analyzing such data to schedule preemptive repairs before failures disrupt customers' operations. The data can also be used to implement product changes that prevent future problems or to provide customer use inputs that inform nextgeneration offerings.

Some retailers are also at the forefront of using automated big data analysis: they use "sentiment analysis" techniques to mine the huge streams of data now generated by consumers using various types of social media, gauge responses to new marketing campaigns in real time, and adjust strategies accordingly. Sometimes these methods cut weeks from the normal feedback and modification cycle.

But retailers aren't alone. One global beverage company integrates daily weather forecast data from an outside partner into its demand and inventory-planning processes. By analyzing three data points—temperatures, rainfall levels, and the number of hours of sunshine on a given day—the company cut its inventory levels while improving its forecasting accuracy by about 5 percent in a key European market.

The bottom line is improved performance, better risk management, and the ability to unearth insights that would otherwise remain hidden. As the price of sensors, communications devices, and analytic software continues to fall, more and more companies will be joining this managerial revolution.

4 See Nora Gardner, Devin McGranahan, and William Wolf, "Question for your HR chief: Are we using our 'people data' to create value?" mckinseyquarterly.com, March 2011.

Parsing the benefits: Not all industries are created equal

Even as big data changes the game for virtually every sector, it also tilts the playing field, favoring some companies and industries, particularly in the early stages of adoption. To understand those dynamics, we examined 20 sectors in the US economy, sized their contributions to GDP, and developed two indexes that estimate each sector's potential for value creation using big data, as well as the ease of capturing that value.¹

As the accompanying sector map shows (exhibit), financial players get the highest marks for value creation opportunities. Many of these companies have invested deeply in IT and have large data pools to exploit. Information industries, not surprisingly, are also in this league. They are data intensive by nature, and they use that data innovatively to compete by adopting sophisticated analytic techniques.

The public sector is the most fertile terrain for change. Governments collect huge amounts of data, transact business with millions of citizens, and, more often than not, suffer from highly variable performance. While potential benefits are large, governments face steep barriers to making use of this trove: few managers are pushed to exploit the data they have, and government departments often keep data in siloes.

Fragmented industry structures complicate the value creation potential of sectors such as health care, manufacturing, and retailing. The average company in them is relatively small and can access only limited amounts of data. Larger players, however, usually swim in bigger pools of data, which they can more readily use to create value.

The US health care sector, for example, is dotted by many small companies and individual physicians' practices. Large hospital chains, national insurers, and drug manufacturers, by contrast, stand to gain substantially through the pooling and more effective analysis of data. We expect this trend to intensify with changing regulatory and market conditions. In manufacturing, too, larger companies with access to much internal and market data will be able to mine new reservoirs of value. Smaller players are likely to benefit only if they discover innovative ways to share data or grow through industry consolidation. The same goes for retailing, where—despite a healthy strata of data-rich chains and big-box stores on the cutting edge of big data—most players are smaller, local businesses with a limited ability to gather and analyze information.

A final note: this analysis is a snapshot in time for one large country. As companies and organizations sharpen their data skills, even low-ranking sectors (by our gauges of value potential and data capture), such as construction and education, could see their fortunes change.

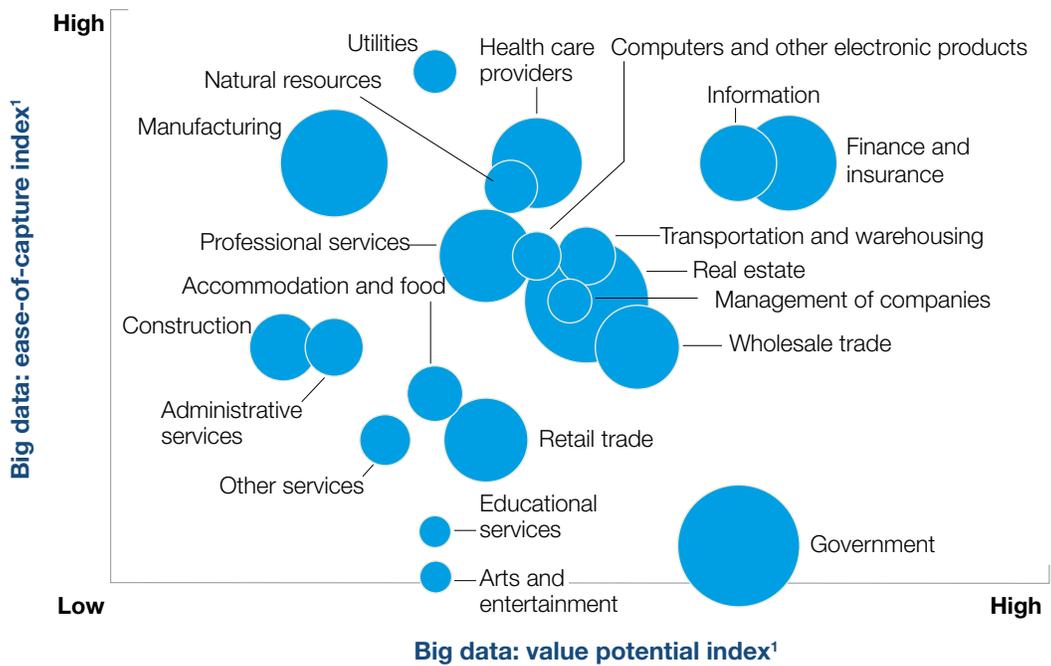
¹ The big data value potential index takes into account a sector's competitive conditions, such as market turbulence and performance variability; structural factors, such as transaction intensity and the number of potential customers and business partners; and the quantity of data available. The ease-of-capture index takes stock of the number of employees with deep analytical talent in an industry, baseline investments in IT, the accessibility of data sources, and the degree to which managers make data-driven decisions.

EXHIBIT

The ease of capturing big data's value, and the magnitude of its potential, vary across sectors.

Example: US economy

Size of bubble indicates relative contribution to GDP



¹ For detailed explication of metrics, see appendix in McKinsey Global Institute full report *Big data: The next frontier for innovation, competition, and productivity*, available free of charge online at mckinsey.com/mgi.
 SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

5. Could you create a new business model based on data?

Big data is spawning new categories of companies that embrace information-driven business models. Many of these businesses play intermediary roles in value chains where they find themselves generating valuable “exhaust data” produced by business transactions. One transport company, for example, recognized that in the course of doing business, it was collecting vast amounts of information on global product shipments. Sensing opportunity, it created a unit that sells the data to supplement business and economic forecasts.

Another global company learned so much from analyzing its own data as part of a manufacturing turnaround that it decided to create a business to do similar work for other firms. Now the company aggregates shop floor and supply chain data for a number of manufacturing customers and sells software tools to improve their performance. This service business now outperforms the company's manufacturing one.

Big data also is turbocharging the ranks of data aggregators, which combine and analyze information from multiple sources to generate insights for clients. In health care, for example, a number of new entrants are integrating clinical, payment, public-health, and behavioral data to develop more robust illness profiles that help clients manage costs and improve treatments.

And with pricing data proliferating on the Web and elsewhere, entrepreneurs are offering price comparison services that automatically compile information across millions of products. Such comparisons can be a disruptive force from a retailer's perspective but have created substantial value for consumers. Studies show that those who use the services save an average of 10 percent—a sizable shift in value.

Confronting complications

Up to this point, we have emphasized the strategic opportunities big data presents, but leaders must also consider a set of complications. Talent is one of them. In the United States alone, our research shows, the demand for people with the deep analytical skills in big data (including machine learning and advanced statistical analysis) could outstrip current projections of supply by 50 to 60 percent. By 2018, as many as 140,000 to 190,000 additional specialists may be required.

Also needed: an additional 1.5 million managers and analysts with a sharp understanding of how big data can be applied. Companies must step up their recruitment and retention programs, while making substantial investments in the education and training of key data personnel.

The greater access to personal information that big data often demands will place a spotlight on another tension, between privacy and convenience. Our research, for example, shows that consumers capture a large part of the economic surplus that big data generates: lower prices, a better alignment of products with consumer needs, and lifestyle improvements that range from better health to more fluid social interactions.⁵ As a larger amount of data on the buying preferences, health, and finances of individuals is collected, however, privacy concerns will grow.

That's true for data security as well. The trends we've described often go hand in hand with more open access to information, new devices for gathering it, and cloud computing to support big data's weighty storage and analytical needs. The implication is that IT architectures will become more integrated and outward facing and will pose greater risks to data security and intellectual property.

⁵ See Jacques Bughin, “The Web's €100 billion surplus,” *mckinseyquarterly.com*, January 2011.



Although corporate leaders will focus most of their attention on big data's implications for their own organizations, the mosaic of company-level opportunities we have surveyed also has broader economic implications. In health care, government services, retailing, and manufacturing, our research suggests, big data could improve productivity by 0.5 to 1 percent annually. In these sectors globally, it could produce hundreds of billions of dollars and euros in new value.

In fact, big data may ultimately be a key factor in how nations, not just companies, compete and prosper. Certainly, these techniques offer glimmers of hope to a global economy struggling to find a path toward more rapid growth. Through investments and forward-looking policies, company leaders and their counterparts in government can capitalize on big data instead of being blindsided by it.

Brad Brown is a director in McKinsey's New York Office; Michael Chui is a senior fellow with the McKinsey Global Institute (MGI) and is based in the San Francisco office; James Manyika is a director of MGI and a director in the San Francisco office.



Competing through data: Three experts offer their game plans

Erik Brynjolfsson,
*Massachusetts Institute of
Technology's Sloan School*

Jeff Hammerbacher,
Cloudera

Brad Stevens,
Butler University



As big data creates new opportunities

and threats, it also demands new mind-sets from senior executives about the role of information in business and even the nature of competitive advantage. The perspectives that follow may help shake up your thinking and forge that new frame of mind.

Massachusetts Institute of Technology (MIT) professor Erik Brynjolfsson explores the implications of intriguing new research about the relationship among data, analytics, productivity, and profitability. Jeff Hammerbacher, cofounder of the data-oriented start-up Cloudera, provides a view from the front lines about what it takes to harness the flood of data now at companies' collective fingertips. Finally, basketball coach Brad Stevens describes how, on a tight budget, he uses data that's powerful (even if not extraordinarily "big") to help his Butler University squad punch above its weight. Presented here are edited versions of interviews with each, conducted by McKinsey's Michael Chui and Frank Comes.

The data advantage

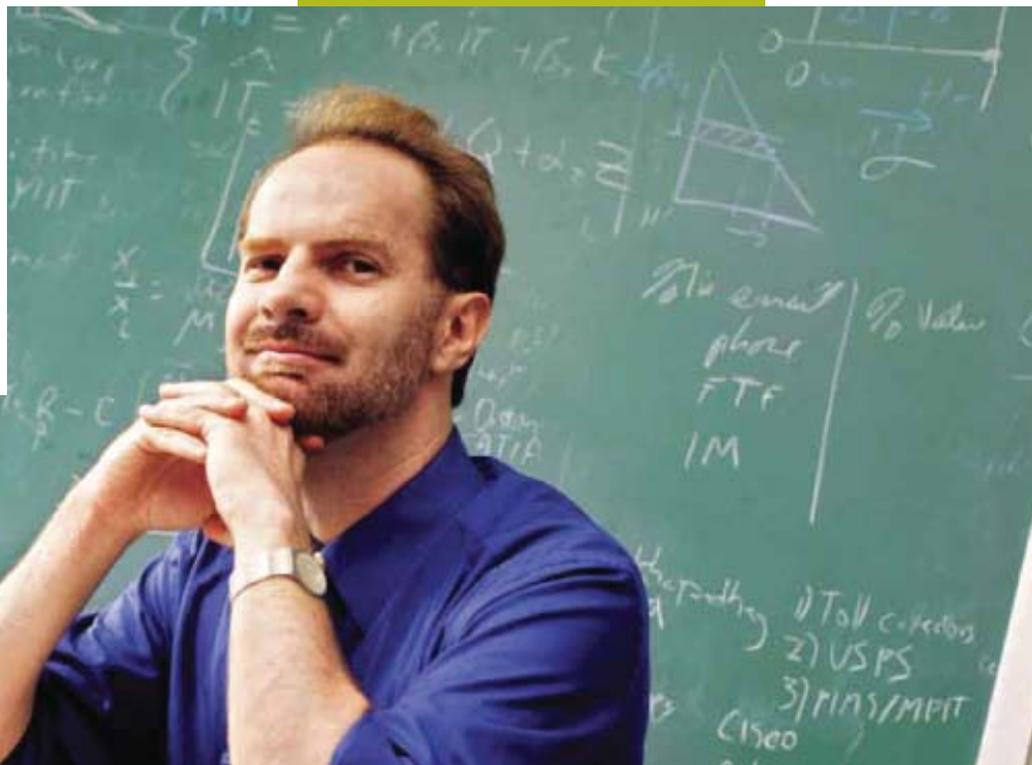
Most great revolutions in science are preceded by revolutions in measurement. We have had a revolution in measurement, over the past few years, that has allowed businesses to understand in much more detail what their customers are doing, what their processes are doing, what their employees are doing. That tremendous improvement in measurement is creating new opportunities to manage things differently.

Our research has found a shift from using intuition toward using data and analytics in making decisions. This change has been accompanied by measurable improvement in productivity and other performance measures. Specifically, a one-standard-deviation increase toward data and analytics was correlated with about a 5 to 6 percent improvement in productivity and a slightly larger increase in profitability in those same firms. The implication for companies is that by changing the way they make decisions, they're likely to be able to outperform competitors.

"Too many managers are not opening their eyes to this opportunity and understanding what big data can do to change the way they compete."

The professor **Erik Brynjolfsson**

Erik Brynjolfsson is the Schussel Family Professor of Management Science at the Massachusetts Institute of Technology's Sloan School of Management, director of the MIT Center for Digital Business, and one of the world's leading researchers on how IT affects productivity.



Becoming data driven

The prerequisite, of course, is the technological infrastructure: the ability to measure things in more detail than you could before. The harder thing is to get the set of skills. That includes not just some analytical skills but also a set of attitudes and an understanding of the business. Then the third thing, which is the subtlest but perhaps the most important, is cultural change about how to use data. A lot of companies think they're using data, and you often see bar charts and pie charts and numbers in management presentations. But, historically, that kind of data was used more to confirm and support decisions that had already been made, rather than to learn new things and to discover the right answer. The cultural change is for managers to be willing to say, "You know, that's an interesting problem, an interesting question. Let's set up an experiment to discover the answer."

Too many managers are not opening their eyes to this opportunity and understanding what big data can do to change the way they compete. They have to be ready to show some vulnerability and say, "Look, we're open to the data" and not go in there saying, "Hey, I'm gonna manage from the gut. I have years of experience and I know the answers to this going in." I think, historically, a lot of managers have been implicitly or explicitly rewarded for that kind of confidence. You have to have a different kind of confidence to be willing to let the data speak.

One CEO told me that when he pushed this attitude, he had to change over 50 percent of his senior-management team because they just didn't get it. Obviously, that was a painful thing to have to do. But the results have been very successful. And they require that level of aggressiveness by top management, if it really wants to end up in that group of leaders as opposed to the laggards.

"I think this revolution in measurement, starting with the switch from analog to digital data, is as profound as, say, the development of the microscope and what it did for biology and medicine."

Required skills

Having enough data to get a statistically significant result is not a problem. There's plenty of data. So the skills often have more to do with sampling methodologies, designing experiments, and working these very, very large data sets without becoming overwhelmed. If you look inside companies, you also see a transformation in the functions that are using data. CIOs are discovering that, more and more, it's the marketing people and the people working with customers—customer relationship management—who have the biggest data needs. These are the people CIOs are working with most closely. This is part of a broader revolution as we move from just financial numerical data toward all sorts of nonfinancial metrics.

Often, the nonfinancial metrics give a quicker and more accurate measure of what's happening in the business. I was talking to Gary Loveman—the CEO of Caesar's Entertainment, formerly Harrah's, and a PhD graduate of MIT. He's used some of these techniques to revolutionize what's happening in that industry. But, interestingly, increasingly what he measures is customer satisfaction and a lot of other intermediate metrics. He said that customer satisfaction metrics were much quicker and more precise metrics of what was happening in response to some of the policy changes that he put in place.

Think of it this way. If customers end up satisfied or dissatisfied, that will affect the probability of their coming back next year. Now, next year's financial results will be affected as a result. And you could, in principle, try to match up the experience the customer had this year with future years' return rates. But a much quicker way of getting feedback on which processes are working is to look at customer satisfaction when you put process changes in place.

The new landscape

I think this revolution in measurement, starting with the switch from analog to digital data, is as profound as, say, the development of the microscope and what it did for biology and medicine. It's not just big data in the sense that we have lots of data. You can also think of it as "nano" data, in the sense that we have very, very fine-grained data—an ability to measure things much more precisely than in the past. You can learn about the preferences of an individual customer and personalize your offerings for that particular customer.

One of the biggest revolutions has involved enterprise information systems, like ERP, enterprise resource planning; CRM, customer relationship management; or SCM, supply chain management—those large enterprise systems that companies have spent hundreds of millions of dollars on. You can use the data from them not just to manage operations but to gain business intelligence and learn how they could be managed differently. A common pattern that we're seeing is that three to five years after installing one of these big enterprise systems, companies start saying, "Hey, we need some business intelligence tools to take advantage of all this data." It's up to managers now to seize that opportunity and take advantage of this very fine-grained data that just didn't exist previously.

The path ahead

There's some good news and there's some not-so-good news. The good news is that technology's not slowing down, and the pie is getting bigger. Productivity is accelerating. And that should make us all better off. However, it's not making us all better off. Over the past 20 years or so, median wages in the United States have stagnated because a lot of people don't have the skills to take full advantage of this technology. And, unfortunately, I don't see that changing any time soon unless we have a much bigger effort to change the kinds of skills that are available in the workforce and have a set of technologies that people can tap into more readily.

This flood of data and analytical opportunities creates more value for people who can be creative in seeing patterns and for people who can be entrepreneurial in creating new business opportunities that take advantage of these patterns. My hope is that the technology will create a platform that people can tap into to create new entrepreneurial ventures—some of them, perhaps, huge hits like Facebook or Zynga or Google. But also, perhaps equally important for the economy, hundreds of thousands or millions of small entrepreneurial ventures, eBay based or app based, would mean millions of ordinary people can be creative in using technology and their entrepreneurial energies to create value. That would be an economy where not only does the pie get bigger but each part of the pie—each of the individuals—benefits as well.



The data entrepreneur **Jeff Hammerbacher**

Before cofounding Silicon Valley software start-up Cloudera in 2009, at the age of 26, Jeff Hammerbacher was a quantitative analyst on Wall Street and one of Facebook's first employees.

“If you can understand consumer behavior and get your hands around as much behavioral data as possible to better guide product decision making, then every penny you can eke out is increasing your margins and allowing you to invest more.”

The open-source advantage

I was Facebook's first research scientist. The initial goal for that position was to understand how changes to the site were impacting user behavior. We had built our own infrastructure to allow us to do some terabyte analytics, but we were going to have to scale it to up to petabytes.¹ We realized that instead of continuing to invest in infrastructure, we could build a more powerful shared resource to facilitate business analysis by working with the open-source community.

In founding Cloudera, I saw a path to a complete infrastructure for doing analytical data management. It would be made up of existing open-source projects as well as open-source versions of a lot of the technologies that we had built out internally at Facebook. Cloudera

would be a corporate entity for pursuing those goals and ensuring that it wasn't just Facebook that would be able to use this technology but, really, any enterprise.

Data leaders

When we started Cloudera, we didn't have a core thesis around where the technology would be adopted or what the market was going to look like. Early adopters were clearly in the Web and digital-media spaces. But in terms of traditional industries, the federal government surprised me. They really are the leaders in multimedia data analysis—working with text, images, video. In the intelligence agencies, I've seen more sophistication than in commercial domains.

I was also surprised to see the retail space. Retailers had very large volumes of data, and because many were branching out into e-commerce, they had a lot of Web logs and Web data as well. There is an arms race going on right now in retail. If you can understand consumer behavior and get your hands around as much behavioral data as possible to better guide product decision making, then every penny you can eke out is increasing your margins and allowing you to invest more.

¹ Under the International System of Units, a terabyte equals one trillion bytes, or 1,000 gigabytes. A petabyte is equal to 1,000 terabytes.

Financial services was one sector that I had hoped would be an early adopter, but these companies tend not to look at their businesses as a whole in the same way that retail does. Data management is thought of as project specific, even to the point where individual trading desks could have their own chief technology officers. Our technology tends to work best as a shared infrastructure for multiple lines of business.

Where this is headed is learning how to point this new infrastructure for storing and analyzing data at real business problems, as well as growing the imagination of businesspeople about what they can do when a variety of experts analyze the data. If you can digitize reality, then you can move your world faster than before.

Building a big data function

You need to make a commitment to conceiving of data as a competitive advantage. The next step is to build out a low-cost, reliable infrastructure for data collection and storage for whichever line of business you perceive to be most critical to your company. If you don't have that digital asset, then you're not even going to be able to play the game. And then you can start layering on the complex analytics. Most companies go wrong when they start with the complex analytics.

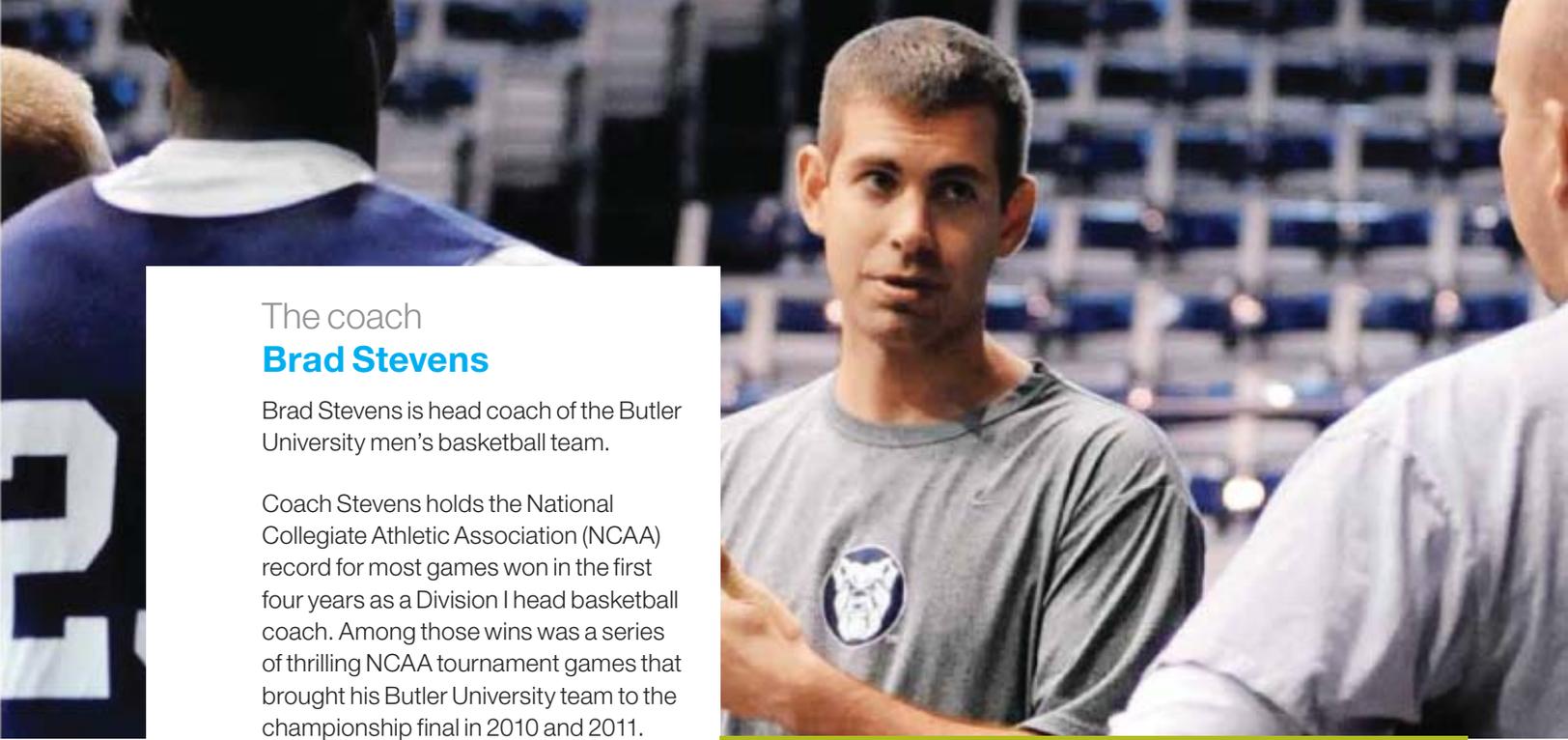
When deciding how to incorporate analytics expertise into an organization, you have to be honest about what your organization looks like—your capacity to hire and your long-term vision for what that organization is going to be. There isn't one right answer. Yahoo! built a centralized group called Strategic Data Solutions to run the entire gamut. Rather than just building a small group of people primarily focused on marketing analytics, the company took an end-to-end view, extending from data storage to the actual P&L. In our group at Facebook, because we were a very fast-moving organization, we were much more of a platform—a service organization for the rest of the company.

The rise of the 'data scientist'

I tried to articulate this title of data scientist in a book I put together with O'Reilly Media.² I now actually see people describing themselves as data scientists in their job titles on LinkedIn and scientists talking about themselves as data scientists. So it's evolving. People realize that there is a gap between the current role of statistician or data analyst or business analyst and what they actually want. They are grappling with the set of tools and the set of skills that they need. Across the whole research cycle, it's a combination of skills that social scientists understand, plus additional programming skills, plus the ability to do aggressive prioritization. And, of course, a good grounding in statistics and machine learning.³ That collection of skills is difficult to find.

² Jeff Hammerbacher and Toby Segaran, eds., *Beautiful Data: The Stories Behind Elegant Data Solutions*, Sebastopol, CA: O'Reilly, 2009.

³ Machine learning is a form of artificial intelligence in which algorithms allow computers to make decisions based on data streams.



The coach
Brad Stevens

Brad Stevens is head coach of the Butler University men's basketball team.

Coach Stevens holds the National Collegiate Athletic Association (NCAA) record for most games won in the first four years as a Division I head basketball coach. Among those wins was a series of thrilling NCAA tournament games that brought his Butler University team to the championship final in 2010 and 2011.

Before joining Butler, which is located in Indianapolis, Indiana, and has just 4,500 students, he was a marketing associate at the global pharmaceutical group Eli Lilly. In the following interview, Stevens explains how focusing on the numbers has helped improve his team's game.

“I can have all the data I want to have— but I still have to communicate it to our players. It has to get into their minds. And they have to utilize it.”

The Quarterly: *How have things changed in basketball with regard to the use of data and analytics?*

Brad Stevens: You know, I'm a bad person to ask about that because I'm 34. The data's always been an important part of my job. I've always looked at it through that lens, even when I was a young assistant. This is how I work best. For me, it's incredibly interesting. There are complexities that you can really study using numbers. We don't have access to the highest end—we're not sitting here with NBA⁴ money to invest in a numbers-and-research department. But I think you can speak to your team with numbers and give your players pretty clear-cut and defined examples of what they need to do to get better.

The Quarterly: *If you had an infinite budget, what sorts of things would you do?*

Brad Stevens: The first thing is that I'd have one of the positions on our staff, or maybe a whole group on our staff, working on statistics. They would look at game planning and how players are most effective: what they're doing when they're most effective, where they are on the court—really show players the exact way that they are most effective in different areas of the game. That's an incredibly useful teaching tool.

The Quarterly: *In the absence of those resources, that staff, what do you do?*

Brad Stevens: I first break down all of the statistics that I can on opponents to try to get my mind wrapped around what their trends are. I'll look for how many three-point attempts per field goal attempt⁵—that tells you what kind of team they are right away. You can look at offensive-rebound percentages. Defensive- and offensive-turnover percentages. How teams shoot against them. What they defend well. What they try to defend well.

Then there's the ability to cut film on computers and to do so quickly. We can watch all of somebody's moves off of a ball screen. All of a person's moves going left. All of the post moves, going to the middle or going to the baseline. Whatever the case may be. And we can really determine their effectiveness from that. We obviously hope that the film validates the statistics and we can figure out what's unique about what players do.

“As we get to the latter part of the season, I'll spend a lot more time asking, ‘What's happened in the past five games? What are they doing differently from a statistical standpoint? What have they improved on? What have they regressed in?’”

One thing that you have to be careful of is not getting caught up in just season statistics. Teams change. And as we get to the latter part of the season, I'll spend a lot more time asking, “What's happened in the past five games? What are they doing differently from a statistical standpoint? What have they improved on? What have they regressed in?”

Of course, I can have all the data I want to have—but I still have to communicate it to our players. It has to get into their minds. And they have to utilize it. So you can't inundate them. You can't take three seconds to make a decision in basketball. It's a game that moves too quickly for that. There's no huddle in between plays; there's not a moment in between every pitch. You've got to have thoughts in your mind about what the people that you're playing against like to do, and what you do best, and at the same time you can't be inundated with those thoughts or it'll affect the way you play. That makes communicating data and simplifying it for the players incredibly important.

The Quarterly: *Can you say more about how you simplify data, how you engage your players?*

Brad Stevens: You've got to figure out how they react, how they best comprehend, how they best learn in a team setting, how they best learn in an individual setting, and go from there. Each team's different, each player's different. And, you know, it may mean bringing in a guy who has a mind for numbers and saying, “The bottom line is that, right now, you're shooting 43 percent. You're a better shooter than that. If you make one more shot a game, you're probably at 48 or 49 percent. How can we make it so you're one more shot effective for a game?”

5 For an explanation of basketball terminology, visit www.fiba.com/pages/eng/fc/baskBasi/glos.asp.

The Quarterly: *Was there one game or a couple of games where this really played out and made a difference?*

Brad Stevens: Every game we play in. There's not a game when this wouldn't have played a major role. We're not the most talented, so we have to be good in these little areas. Sometimes, you know, the numbers hurt you. You believe one thing, and then the other team has a night that's unique. But more times than not, the score takes care of itself, as Bill Walsh⁶ says.

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⁶ Bill Walsh coached the US National Football League's San Francisco 49ers to three Super Bowl titles (1982, 1985, and 1989). His book *The Score Takes Care of Itself: My Philosophy of Leadership* (Portfolio, August 2009), published two years after his death, was coauthored with his son, Craig, and with Steve Jamison.



Seizing the potential of 'big data'

Companies are learning to use large-scale data gathering and analytics to shape strategy. Their experiences highlight the principles—and potential—of big data.

Jacques Bughin
John Livingston
Sam Marwaha



Large-scale data gathering and analytics are quickly becoming a new frontier of competitive differentiation. While the moves of companies such as Amazon.com, Google, and Netflix grab the headlines in this space, other companies are quietly making progress.

In fact, companies in industries ranging from pharmaceuticals to retailing to telecommunications to insurance have begun moving forward with big data strategies in recent months. Together, the activities of those companies illustrate novel strategic approaches to big data and shed light on the challenges CEOs and other senior executives face as they work to shatter the organizational inertia that can prevent big data initiatives from taking root. From these experiences, we have distilled four principles that we hope will help CEOs and other corporate leaders as they try to seize the potential of big data.

1. Size the opportunities and threats

Many big data strategies arise when executives feel an urgent need to respond to a threat or see a chance to attack and disrupt an industry's value pools. At AstraZeneca, for example, executives recognized the power that real-world data (such as medical claims) gave the pharmaceutical company's customers in evaluating the cost effectiveness of its products (for more, see sidebar, "AstraZeneca's 'big data' partnership," on page 49).

In the case of a retailer we studied, big data was part of a difficult battle for market share. The company's strategy had long been predicated on matching the moves of an efficient big-box rival, yet now a different online player was draining the retailer's revenues and denting its margins. At the heart of the threat was the competitor's ability to gather and analyze consumer sentiment and generate recommendations across millions of customers—a capability that was neutralizing the retailer's sales force. Meanwhile, the competitor was becoming a platform where vendors could sell excess inventory by using publicly available price data aggregated across the industry to help pinpoint the size of discounts the vendors could offer to customers. The retailer's board asked whether it could leverage its own information resources to counter these challenges.

Data-related threats and opportunities can also be more subtle. After using an innovative product bundling approach to improve market share, for example, a European telecom company saw large-scale data analysis as a way to boost momentum. The company's executives believed it could press its newfound advantage by pinpointing exactly where its sales approach could make further gains and by studying the behavior of customers to see what factors motivated them to choose one brand or product over another. Doing so would require interpreting two massive and growing volumes of information: online search data and real-time information—shared by consumers across social networks and other Web-based channels—about the company's products and services.

2. Identify big data resources . . . and gaps

Framing the basics of a big data strategy naturally leads to discussions about the kinds of information and capabilities required. At this point, executives should conduct a thorough review of all relevant internal and external data. The audit should also consider access to analytical talent as well as potential partnerships that might help fill gaps. Such an audit will not only create a more realistic view of a company's capabilities and needs but can also spark "aha" moments—for example, as executives identify "data gems" cloistered inside their business units or recognize the value of creating the right kind of partnership.

The retailer's audit focused on internal data the company gathered but wasn't using to potential. This information—about product returns, warranties, and customer complaints—together contained a wealth of information on consumer habits and preferences. The audit also revealed an obstacle: none of the information was integrated with customer identification data or sufficiently standardized to share within or outside the company. Therefore, the information was rarely analyzed for marketing insights and couldn't be marshaled to assist sales reps in customer interactions or supply chain executives in serving

vendors. Happily, the audit also helped identify a team that could help solve these problems: in-house data analysts whose siloed efforts were underused.

For the European telco, the discussions centered around how it might tap into the rising tide of online conversations about individual companies and their products—the millions of relevant microblog posts, social-media conversations, search term keywords, head-to-head brand comparisons, and customer feedback postings that were now available on the Web. Recognizing the importance of the effort—and the company’s relative lack of econometric and analytical skills to manage it—the telco’s CEO helped recruit an outside analyst with the necessary stature to lead a new “collective insights” team.

3. Align on strategic choices

Once companies identify an opportunity and the resources needed to capitalize on it, many rush immediately into action-planning mode. This is a mistake. Data strategies are likely to be deeply intertwined with overall strategy and therefore require thoughtful planning when a company decides how its resources should be concentrated to achieve the desired results.

In some cases, that could mean putting powerful data analysis tools in the hands of frontline workers. In others, it might mean amassing data and ramping up analytical talent to create a first-mover advantage.



AstraZeneca’s ‘big data’ partnership

Mark Lelinski, an executive at the global drugmaker, explains how the company is using data to build customer relationships that focus on the total cost of care.

Mark Lelinski
is vice president of managed markets at the pharmaceuticals manufacturer AstraZeneca.

We have always designed and manufactured our products with the mind-set of “make it effective, make it safe, and make sure it meets regulatory approval.” Historically, at the early prelaunch stage, we were not thinking about the willingness of payers to pay for it—whether that’s a patient, health plan, pharmacy benefit manager, employer, or the government. We weren’t asking, “How do customers perceive our products relative to alternatives?”

But willingness to pay has obviously become extremely important in recent years—to the extent that more and more of our customers began complementing our clinical-trials data with their own proprietary data to conduct comparative-effectiveness studies. They were asking, “In a realworld setting, product X performs at this level and costs me this much. And product Y performs at this level and costs me this much. How do they compare?” Eventually, this practice created an imbalance in our payer conversations, as the dialogue became more transactional—more

about unit cost and more about the data that our customers were bringing to the table. And from our perspective, few of the comparative studies that payers were conducting focused on health outcomes. So we decided that we needed to get beyond our single focus on the controlled environment of the randomized clinical trial and see the business from the other side as well.

The focus, we realized, needed to be on the total cost of care. Don’t just talk about the unit cost of a drug, but learn about the total cost that it takes to manage, say, a diabetic patient—including the diagnostics, the outpatient visits, the emergency room visits. This led to an “aha” moment: if we could combine medical-claims data with clinical data collected in an electronic-medical-record system for a defined patient population, we might actually discover ways to improve health outcomes and manage the total cost of care at the same time. And why not collaborate with customers? Prescription drugs represent about 11 percent of total health care spending in the United States. For the other 89 percent, our interests are completely aligned. By working together, we all get access to a broader, richer data environment, and we can work together on creating state-of-the-art access tools and real-world methodologies.

So we took this idea to potential partners. From the beginning, this was about true collaboration and strategic fit, not an “I’m gonna win more than you win” mentality. When we presented our vision to

It's also important to view big data in the context of competing strategic priorities. When one CEO looked closely at what it would take to boost the data orientation of his company's sales and marketing function, he discovered that it would be necessary to acquire some key data vendors, replace a strategy leader, and invest heavily in analytical talent. In the end, deciding not to pull the trigger, he said, "I can see how this has moved to our industry's backyard, but until I consolidate five acquisitions and deal with major revenue shortfalls from products coming off patent, we'll need to think small." While backing off was the right answer for this company at that time, it clearly carried risk. Before demoting big data on your strategic priority list, ask whether you've thought hard enough about its long-term strategic potential and about what your competitors may be doing while you wait.

As for the retailer, its executives determined that the goal was to create an information grid that would provide for a range of data-sharing and -analysis activities across the company. However, the leaders decided against a company-wide initiative, since the retailer's culture generally favored innovation at the business unit level. Therefore, the retailer tapped an executive with technology and entrepreneurial experience to launch a study across key business units—an effort that ultimately surfaced 80 potential big data projects. Each was then ranked by its net present value and mapped against the company's strategic objectives.

The first project the retailer pursued was a revamp of its fragmented customer-relationship-management (CRM) system and the creation of a single data pool that company executives plan to use in multiple

HealthCore¹ and its parent company, WellPoint, we quickly realized that their views on all of these things were so similar to ours that everyone's jaws kind of dropped. It was a quick connect. We announced our collaboration in February 2011.

Certainly, there was some internal resistance at first. In some cases, we were asking our people to think in dramatically different ways than they had for the bulk of their careers. This is especially true in R&D, where we're now bringing in the voice of the payer much earlier in the development process so we can "lose the losers" quickly and not take products to market that won't be valued by the people paying for them. And of course we still negotiate with WellPoint on individual drugs, so the increased transparency acts as a double-edged sword: if the collaboration helps us get new evidence that supports a price point we set, that's extremely valuable. But sometimes it goes against us too.

The key to turning around the resistance and getting to where we are today has been the senior-level involvement and support we've received from the start. Our leaders recognized that this approach is a long-term play: there may be quick wins and short-term gains for the company, but to really have a broad impact on the company and the industry, we have to manage the complexity

and growing pains. One example was the way we brought together top-notch biostatisticians, epidemiologists, health economists, and programmers working throughout the company and created a new group focused on real-world evidence. Without the support of engaged and interested leadership, making that happen would have been like pushing a rock uphill.

While this partnership is still in the early stages, HealthCore and AstraZeneca personnel are operationally aligned and set up, and working together very well. We have a number of joint studies under way and are in the throes of completing the first one, which will be ready for discussion with payers soon. Still, both sides see this as the first phase of a broader, industrywide collaboration. Eventually, we expect this will include other health insurers, pharmacy benefit managers, providers, employers, other pharmaceutical manufacturers, and even federal and state governments. It won't be just about pharmaceuticals but about much more: Which diagnostics make sense and which don't? Which medical devices? What leads to errors or high readmission rates in hospital settings? What key health issues need to be addressed in a given local community? Through big data, we can learn things about health care that we could never get at before. And that's really what we're setting out to do.

1 A research subsidiary of US-based health insurance company WellPoint.

This commentary is adapted from an interview with Sam Marwaha, a director in McKinsey's New York office.

ways. One pilot project, for example, is exploring the use of tablet devices by salespeople, in hopes that easier access to inventory data, customer profiles, and product information will help them close more sales. A second initiative enlisted online developers to create virtual storefronts for third-party Web sites. By using algorithms, survey market prices, and predetermined discounts to link the storefronts to the inventory systems of the retailer and its vendors, the initiative is helping it counter its competitor's third-party sales strategy—while also improving the commissions of its sales force and vendors.

In the case of the telecom provider, a cross-functional executive committee was created to oversee the analytics team and ensure that its efforts were aligned with the company's strategy. The committee focused the team's efforts on answering two questions: "How competitive are our brands in the minds of users when they make purchase decisions?" and "What key buying factors matter for users, and how well positioned are we to communicate with customers about these factors?"

The team then created targeted data "mash ups"¹ of customer data that it could analyze quickly to gain actionable insights—for instance, sports and other premium TV programming was a key differentiator in purchasing decisions, and customers would be more inclined to purchase a "triple play" service offering (television, high-speed Internet, and voice telephony) if the company deemphasized voice telephony in its marketing messages. This was the *opposite* of what consumers indicated in traditional market research interviews. What's more, the analysis underscored, and helped quantify for executives, the importance of a bigger strategic imperative: the need to add mobile telephony as a fourth service to complete a "quadruple play."

4. Understand the organizational implications

Finally, it's important to note that the threats and opportunities associated with big data often have organizational implications that only concerted senior-executive attention can address. To be useful, data must cut across internal boundaries, yet this often goes against the grain of an organization and creates friction.

At one insurer, for example, a senior leader observed that crunching the numbers on highly detailed aspects of customer behavior would allow the company to price risk more finely and probably help to increase market share. But that knowledge also represented a threat—an internal one—that impeded action: sales agents worried that their bonuses, which were tied to profitability, would suffer if the market share increases came at the expense of margins.

Similarly, the European telecom's collective-insights team learned that two things led to the most rapid dissemination of negative word of mouth about the company on social-media and microblogging sites: network outages and any perception by customers that the company had made false advertising claims about its products or network. Yet the marketing and network organizations, rather than cooperate, initially blamed one another for the findings. Only when senior executives forced the two sides to work more closely together and build trust could the company capitalize on the information, by tailoring marketing messages to better explain new-product rollouts and network upgrades.



Too few leaders fully understand big data's potential in their businesses, the data assets and liabilities of those businesses, or the strategic choices they must make to start exploiting big data. By focusing on these issues, senior executives can help their organizations build a data-driven competitive edge.

Jacques Bughin is a director in McKinsey's Brussels office, John Livingston is a director in the Chicago office, and Sam Marwaha is a director in the New York office.

1 A mash up is a Web application that combines multiple sources of data into a single tool.



How a grocery giant puts technology at the center of innovation



In an interview, Massimo Bongiovanni explains IT's role in the future of retailing.

Brad Brown
Lorenzo Forina
Johnson Sikes



An interview with Coop Centrale's CEO Massimo Bongiovanni



Cooperative Consumers Coop, better known as Coop, was Italy's first retailer to embrace hypermarkets, in the 1980s, and then began opening even bigger superstore venues while expanding its offerings to include insurance and banking services, electricity, and prescription drugs. Throughout this expansion, Coop sought innovative ways to support its strategy with technology. Massimo Bongiovanni has strongly helped the company realize that goal as president of Coop Centrale, which manages purchasing and distribution for the retailer's cooperative network of stores, as well as the IT and services that support marketing, pricing, and other elements of Coop's commercial policies.

Earlier this year, McKinsey's Brad Brown, Lorenzo Forina, and Johnson Sikes spoke with Massimo Bongiovanni about technology's role in fostering growth and innovation.

McKinsey: *How do you manage technology within Coop's networked corporate structure?*

Massimo Bongiovanni: First of all, Centrale is a service company. We manage the purchasing and distribution for the network of cooperatives, as well as the information technology and services that support marketing, pricing, and other elements of Coop's commercial policies. The P&L and strategic decisions are the responsibility of the cooperatives. Since different cooperatives have different commercial policies, you can imagine the challenges involved in harmonizing the technology requirements for pricing, promotion, and other merchandising levers—all at the same time. For example, Centrale manages more than 100 price lines for a single product, as well as all promotional activities for it. That level of complexity has put a premium on developing sophisticated technology and IT tools.

McKinsey: *What business imperatives drive the adoption of technology at Coop?*

Massimo Bongiovanni: Traditional customer categories are now blurring across hypermarkets, discount stores, and superstores. We see the same customers shopping across all our store formats—something that did not happen in the past. So our business processes, formats, and technology need to become more customer-centric.

This has meant developing a single view of the customer across all our store formats and brands. We also need a business model that allows us to show customers new prices and products very frequently, on a weekly or even a daily basis. So as the cost of technology decreases, we are evaluating, for example, electronic labeling, which will support the rapid change of prices at the store level. It will also enable us to customize the information we provide to customers—improving the display and accessibility of products.

McKinsey: *Where do you take this next?*

Massimo Bongiovanni: Another stream of innovation I foresee is the adoption of multimedia technology at the point of sale, to make the shopping experience more interactive and more dynamic for customers. We imagine the new point of sale as a theater. While some areas will be more stable, others will frequently change. For example, we envision the ability to display multiple offers and events at each point of sale during the course of a single day. We also want to massively enhance our ability to do customer profiling. We could combine profiling with new technologies, such as iPhones, apps, and other mobile devices. All of this would allow us to engage in new interactions with customers at the point of sale, creating a dialogue about new products, pricing, offers, et cetera. Customers will have new reasons for coming to our stores. Of course, we need to do all this while respecting the privacy of the customer.

McKinsey: *How will this change affect your IT and processes?*

Massimo Bongiovanni: The underlying challenge is to execute quickly and flexibly on both the business and technology fronts. Our current commercial and management processes must be able to change things on a weekly or daily basis rather than a quarterly basis.

McKinsey: *Tell us how you keep the momentum going behind this agenda.*

Massimo Bongiovanni: As chief executive, I need to have a vision to inform, guide, and excite the organization. Since there is always resistance to change, we are constantly looking for ways to bring the vision to life in tangible ways. We therefore do a great deal of piloting and prototyping, which helps in several ways. We are able to quickly test new tools and ensure that they are easy for our staff and employees to use—and not just for the software engineers who designed them. We can also prove the new tools' bottomline value by comparing the results with those at other stores or functions before we roll out the changes more broadly, reducing the risk to our customers and stakeholders. The challenge isn't really the technology itself but its application to business. Can people across the organization—and particularly our customers—use the technology? So the key is transforming technology into a business enabler.

McKinsey: *Can you give us an example of how this approach works?*

Massimo Bongiovanni: Eight or nine years ago, we launched the first pilot of a self-scanning checkout at selected points of sale. The real challenge wasn't the cost of the technology, but the interaction between it and the business. How user friendly was this technology in the eyes of the consumer? Was it well received? We continually asked these questions and adjusted the technology and training for our employees, as well as the messaging to our customers. Eight years ago, only 1 customer out of 100 was scanning her own purchases. Nowadays, around 50 percent of our customers use self-scanning. It was a really gradual process to get there.

McKinsey: *At Coop, where does technological innovation start—at the top or at a lower level of the organization?*

Massimo Bongiovanni: There is an initial phase where the approach is top down. But this really depends on the profile of the top executives. If they are innovators, innovation happens; but if they are conservative and more focused on the way things have always been done, it doesn't. The style and attitudes of top management strongly influence attitudes at all levels of the organization toward innovation.

After this initial top-down phase creates the groundwork for innovation, executives need to focus on creating a process and a path forward for the organization. Then the strategic vision has to be digested, developed, and modified by middle managers. The involvement and commitment of middle management is absolutely key in translating the strategic vision into an operational vision or a process.

McKinsey: *As a CEO, how do you stay on top of technology options?*

Massimo Bongiovanni: That starts with putting yourself in the shoes of the customer. You also need to be curious and open minded, always on the lookout for new ideas. There's an element of dreaming in this, too. While many dreams or wild ideas go nowhere, one that becomes reality could dramatically change the way we do business.

McKinsey: *How do you build on this approach across the organization?*

Massimo Bongiovanni: I encourage managers to travel and observe what others are doing, looking at our own industry and especially at other industries, both in Italy and in other countries. And this happens at both the management level and at the board level. We study restaurants, bookstores, and electronics stores—all places where consumers look not just for products but also for entertainment and emotional engagement. Of course, not everything that we observe in the United States or in the UK is easily adaptable or replicable in Italy. But trips there typically give us ideas we can test to see what may be applicable to Coop.

McKinsey: *Looking forward, what role will technology play in transforming the retailing industry?*

Massimo Bongiovanni: In the retail landscape, I think we are very close to a set of discontinuities where technology can play a critical role. The first area is food safety—the growing need and demand for safe and traceable food, from the farmer through production to store shelves. The solution here might be electronic labels or optical bars that can provide customers with a more complete accounting of the history of specific items.

We also need technology to deal with the saturation of our market. Most European markets already are saturated or will be soon. There's no room for growth, so companies will need to reduce costs and improve efficiency to remain competitive on prices. This involves all aspects of cost, from labor to indirect costs, and IT will be a great tool here.

Finally, there's the evolving and changing consumer behavior. Consumers are much less loyal to retailers and more selective about what they want. So technology will play a role in how we attract customers and maintain their loyalty.

This future will be very different from how we have operated in the past. We cannot—and we should not—transform stores into something out of Star Trek: Enterprise. But we need to work on an approach that is friendly to employees, actively engages our existing customers, and allows us to provide compelling experiences and offers that will draw in more customers over time.

Brad Brown is a director in McKinsey's New York office, where Johnson Sikes is a consultant; Lorenzo Forina is a principal in the Milan office.

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Robert McDonald
*is the president and
 CEO of P&G.*

CEO Robert McDonald wants to make the consumer goods giant the world's most technologically enabled company. Here's how.

Robert McDonald is a CEO on a mission: to make Procter & Gamble the most technologically enabled business in the world. To get there, the 31-year company veteran and former US Army captain is overseeing the large-scale application of digital technology and advanced analytics across every aspect of P&G's operations and activities—from the way the consumer goods giant creates molecules in its R&D labs to how it maintains relationships with retailers, manufactures products, builds brands, and interacts with customers. The prize: better innovation, higher productivity, lower costs, and the promise of faster growth.

McKinsey's Michael Chui and Thomas Fleming recently sat down with McDonald at P&G's Cincinnati headquarters to talk about the nature and progress of the company's digitization initiative, as well as its implications for P&G's people and culture. An edited summary of the interview follows.

Real-time insights

Our purpose at P&G is to touch and improve lives; everything we do is in that context. With digital technology, it's now possible to have a one-on-one relationship with every consumer in the world. The more intimate the relationship, the more indispensable it becomes. We want to be the company that creates those indispensable relationships with our brands, and digital technology enables this.

One way is through consumer feedback. In 1984, when I was the Tide brand manager, I would get a cassette tape of consumer comments from the 1-800 line and listen to them in the car on the way home. Then, back at the office, I'd read and react to the letters we'd received. Today that's obviously not sufficient—you've got blogs, tweets, all kinds of things.

And so we've developed something called "consumer pulse," which uses Bayesian analysis to scan the universe of comments, categorize them by individual brand, and then put them on the screen of the relevant individual. I personally see the comments about the P&G brand. This allows for real-time reaction to what's going on in the marketplace, because we know that if something happens in a blog and you don't react immediately—or, worse, you don't know about it—it could spin out of control by the time you get involved. The technology also lets us improve things that *are* working. For example, we're rolling out a product called Downy Unstopables, a fragrance addition you can add to your wash, and the real-time comments from consumers about the product's characteristics are helping us figure out how best to join in the discussion through our marketing efforts.

From factory to shelf

From an operational standpoint, we also believe that to be successful we've got to continue to improve productivity, and being digitally enabled allows for that as well. So we're digitizing our operations everywhere—from our manufacturing plants to the stores where consumers purchase our products. We believe digitization represents a source of competitive advantage.

In our manufacturing plants, for example, we have systems that allow people to use iPads to download data off the production line in real time and communicate that to a place where we roll the data up.

We're not there yet, but we envision a system where I could literally see, on my laptop, any product at any moment as it goes through the manufacturing line of any one of our plants. And what I'd love to be able to do is see the costs of that product at the same time. It's challenging because accounting systems aren't designed today for operations—they tend to look backward—but we're working on integrating our operational system with the financial system to move in that direction.

In transport and logistics, we created a digitally enhanced operational program we call Control Tower that lets us see all the transportation we're doing: inbound, outbound, raw materials, finished product. We're probably the second- or third-largest user of trucks in the United States, and through this technology we've been able to reduce "deadhead" movement¹ by about 15 percent. This reduces costs and carbon monoxide. In circumstances where we use distributors, a similar interface, called Distributor Connect, lets us link directly with them and help them run their business. This benefits all of us by improving service and reducing inventory across the supply chain.

We want to be digitally connected to retailers too. For example, we use and support GDSN,² which is basically a standardized data warehouse that allows us to do commerce with our retail partners in a totally automated way, with no human intervention. The industry association GS1 did a study a few years ago that found that 70 percent of orders between retailers and suppliers had errors. But if everyone used a common data warehouse like GDSN—where the data are kept dynamically correct—that number goes down to virtually zero, and it saves millions of dollars in doing commerce together.

Another thing we do is to use our scale to bring state-of-the-art technology to retailers that otherwise can't afford it. Imagine a small store in the Philippines, for example—a country where I used to live. We can provide sophisticated ordering applications to help people there run their businesses better than they would be able to otherwise. We have mobile-phone applications that allow retailers to order from us wirelessly or, if they don't have a wireless capability, to order when they go back to their office and set the phone in a base. It's very easy to use.

We also have performance standards that retailers in developing markets can visualize on their phones. For example, we believe you should arrange your store in a certain way to maximize consumer sales. If you have a store that partners with P&G on this, you can call up the performance standards on your phone, hold it up, look around your store, and compare it with what you see. Eventually, I want to be able to take a picture of the shelf, have it digitally compared, and then automatically send action steps back to the retailer to help rearrange the shelf for maximum consumer sales. That's where we're going.

In fact, some applications like these will probably come back to the developed world as improvements because they'll be simpler—there's no question that progress will be accelerated by the leapfrogging of technology. Inevitably, everything's got to be usable on the smallest, cheapest device possible because that's what's going to get the broadest distribution in a developing market.

Digitizing innovation

Data modeling, simulation, and other digital tools are reshaping how we innovate. The way we used to do innovation research required a lot of work and time setting up consumer panels—you need the right distribution

Virtual diapers: P&G uses modeling and simulation tools to speed up innovation and lower costs.

¹ When trucks are empty or not optimally loaded.

² Global Data Synchronisation Network.





P&G's 'virtual wall' uses multiple projectors to simulate store shelves for faster consumer testing.

of races, ages, and so forth to make them representative. Now, with the amount of data we have available, the “n” is so large that by definition we can immediately have a representative group.

When you design a disposable diaper the traditional way, for example, by the time you get to the point where you make a prototype, the prototype itself has cost thousands of dollars, if not more, and it was all made by hand. Now, using modeling and simulation, you can go through thousands of iterations in seconds. The key is that you've got to have the data. So the advantage for P&G is our scale. We have operations in around 80 countries, our products are

sold in almost every country, and we touch more than four billion consumers every day. Imagine all those data points. We can literally fit any virtual diaper to any baby anywhere in the world.

We're even digitizing the creation of molecules. For example, in the research and development for our new dishwashing liquid, we used modeling to predict how moisture would excite various fragrance molecules so that throughout the dishwashing process you get the right fragrance notes at the right time. We did that all virtually.

I think that digital technology will even help us identify new service components to our consumer products that wouldn't otherwise be immediately obvious. For example, say you're a consumer concerned about the environment. You go to one of our packages and photograph the QR³ code. We then could download for you all the ingredients in the product and their biodegradability—or tell you where the product was produced, the quality of the water, or how we've reduced carbon emissions in the plant. We can't do that today, but it's an aspiration.

Improve data at the source

P&G employees have a “cockpit” interface on their computers that they help design. It has certain tolerances for the metrics that are important to them. When we go outside those tolerances, either negatively or positively, an alarm goes off. Then we can click down and understand what's going on and react to it, because we feel that time compression—or operating in real time—is a competitive advantage.

Similarly, every Monday morning we have a meeting with our leadership team all over the world—physically and virtually—where we review the business for the previous week and click down on all this data. And everyone signs up for the principles behind this—it's real time and continuous; it gives us the ability to click down to find causality, make decisions, and then move on.

As we apply those principles each week, the challenge becomes the data source. I'll use the Philippines again as an example. If a company we buy syndicated data from goes into stores in the Philippines once every two months and does a handheld questionnaire audit, then it doesn't matter if we meet every Monday or not. Our data's not going to be very good. So we've been working with all our data partners to help them understand that our need is for real-time data. For us it's really constraint theory—understanding where the constraint in our data is and pushing it all the way to the data source. Then, change the data source.



For companies like ours that rely on external data partners, getting the data becomes part of the currency for the relationship. When we do joint business planning with retailers, for example, we have a scorecard, and the algorithm is all about value creation. Getting data becomes a big part of the value for us, and it's a big part of how we work together. We have analytic capabilities that many retailers don't have, so often we can use the data to help them decide how to merchandise or market their business in a positive way.

P&G's high-tech conference room (dubbed 'Business Sphere') allows company leaders to harness massive amounts of data to make real-time business decisions.

It would be heretical in this company to say that data are more valuable than a brand, but it's the data sources that help create the brand and keep it dynamic. So those data sources are incredibly important. Therefore, we go to the extreme to protect whatever consumer data we get. It's a board-level enterprise risk-management issue for us. We have very clear firewalls between one retailer and another and strict policies—for example, about how long a "cooling off" period you need to have when working on projects with different retailers. All of this comes with our strategy of being the most digitally enabled company in the world. We can't do that without being an industry leader on data security and privacy.

The digital workforce

When I started with P&G, in 1980, almost nothing was digital. Back then, our Management Systems Division—as we called it then—had mainframe computers, but our people did more work on phone systems than on computers. And whenever I would get together with them, I would ask, "How many of you have coded BCD?"⁴ or, "Have you ever done a Monte Carlo simulation?" Nobody would raise a hand. They didn't have those kinds of skills.

More than two decades later, as vice chairman of global operations, I and my colleague Filippo Passerini, who today is the CIO of P&G,⁵ began to put together some very clear strategies to hire people with different skills. We needed people with backgrounds in computer modeling and simulation. We wanted to find people who had true mastery in computer science, from the basics of coding to advanced

4 Binary-coded decimal, a digital-encoding method for decimal numbers. Each digit is represented by its own binary sequence.

5 See "From internal service provider to strategic partner: An interview with the head of Global Business Services at P&G," mckinseyquarterly.com, July 2008.

programming. When you've actually done a simulation, you truly realize the importance of the data; it's classic "garbage in, garbage out."

We've come a long way toward meeting our goals today, but we still have further to go. For example, we established a baseline digitalskills inventory that's tailored to every level of advancement in the organization. We have a training facility to make sure that if you're in a particular area, you're competent on the systems for that area. This goes for senior managers too; we have an area in the facility where we can pull the curtains, so to speak, and work with senior managers privately so we don't embarrass anyone. But we've got to have the standards for everyone because otherwise we'll dumb the organization down to the lowest common denominator.

Ultimately, though, P&G has been pretty good about hiring for analytical thinking. We hire very good people and then train them. I remember the day I joined the company and one of the managers a few levels up said, "Throw away your MBA textbooks and we'll teach you; we'll give you another MBA." And I think that's still practical and relevant today. Nonetheless, analytical-thinking skills have become even more important to this company. We need to come up with the ideas to innovate, and those innovations are always informed by data.

Michael Chui is a senior fellow of the McKinsey Global Institute and is based in McKinsey's San Francisco office; Tom Fleming is a member of McKinsey Publishing and is based in the Chicago office.

Leading with values

Senior executives can benefit from codifying their beliefs and sharing them with colleagues, says P&G CEO Robert McDonald. In his document titled “What I believe in,” which he shares with managers at P&G and elsewhere, McDonald explains the ten principles that make up the values-based leadership model he says influences him most:

Living a life driven by purpose is more meaningful and rewarding than meandering through life without direction.

Companies must do well to do good and must do good to do well.

Everyone wants to succeed, and success is contagious.

Putting people in the right jobs is one of the most important jobs of the leader.

Character is the most important trait of a leader.

Diverse groups of people are more innovative than homogenous groups.

Ineffective systems and cultures are bigger barriers to achievement than the talents of people.

There will be some people in the organization who will not make it on the journey.

Organizations must renew themselves.

The true test of leaders is the performance of the organization when they are absent or after they depart.

That sense of empowerment is very important—and one reason I strongly encourage all managers at P&G to conduct the exercise themselves and share the results with their people. I want a culture where every person in the organization is prepared to make a difference, and sharing what you believe, and why, helps create that kind of culture.

This idea very much intersects with our strategy of digitization. As P&G gets bigger and bigger, the tendency is to become more hierarchical, more bureaucratic, more apt to only focus on the things that made us successful in the past. We don't want that, and digital technology enables us to flatten the organization and help avoid those problems. At the same time, we want a democracy of ideas where people raise their hands and take “ownership.” We may all be looking at the same data, but it's no one's job to tell anyone else what to think. I want people to challenge things and draw their own conclusions. It's the value of ownership.

‘My leadership philosophy’

Robert McDonald explains how lessons he learned in the Army have helped shape his business career.

The Quarterly: *You’re a graduate of the US Military Academy at West Point, and before coming to P&G you were a captain in the US Army Airborne Rangers, an elite infantry unit. How have those military experiences helped you in your business career?*

Robert McDonald: West Point is all about leadership—first learning to be a good follower and then learning how to lead. And when you graduate, you are responsible for the lives of soldiers, so you get a lot of experience at a very young age. During Arctic warfare training, for example, you’re trying to get soldiers from Point A to Point B, and it’s 60 degrees below zero. If they sit down, they’ll die. Experiencing that teaches you a lot about yourself and probably results in some additional self-confidence, an ability to deal with stress, and also experience in motivating and leading people.

The Quarterly: *Has your military background ever been a disadvantage in business?*

Robert McDonald: I’ve always said that George C. Scott’s portrayal in the movie Patton was the worst thing that could happen for military leadership. We’re not trained to stand up in front of the American flag and spew profanities or to slap soldiers who are in the hospital. So as I was coming through my career, now and then I had to overcome situations where people might apply a caricature or stereotype to me before they got to know me.

But that’s really changed, and I think business is realizing that there’s a lot to learn from the military. The military, for example, came up with the concept of VUCA—volatile, uncertain, complex, and ambiguous—and the whole idea of leadership agility in a VUCA world is something companies can learn from.

The Quarterly: *In what ways do you apply what you learned in the military to leadership development at P&G?*

Robert McDonald: One way is through sharing a set of personal beliefs—a list of principles based on my experiences in the military and business—that I use in leadership-training courses at P&G, as well as on college campuses.

The Quarterly: *When did you create your list and why?*

Robert McDonald: I probably started it 20 years ago or more, though I periodically review and refine it. I found that I was always telling stories, and those stories became an important aspect of leadership for me. And rather than repeating them all the time, I thought that it would be really worthwhile to write these down. Those stories eventually became my statement of beliefs.

I was also influenced by meeting a fellow West Point graduate, Ed Ruggero, who was working on a book about the importance of having a personal leadership philosophy.¹ It turned out the US Navy had started doing something similar to what I'd been doing—they ask new leaders to write down their beliefs and share them with their personnel.

The Quarterly: *What benefits have you seen as a result of the exercise?*

Robert McDonald: Over the years, I have found tremendous value in it. By writing down what you believe and sharing the results with the people you work with, everyone learns what's important to you—and that's what subordinates always crave. As a leader, it forces you to be much more deliberate about leadership. Also, if I do something contrary to my beliefs, people can call me on it, and I have to explain what I'm doing. This creates trust and empowers the people who work for me.

¹ Ed Ruggero and Dennis F. Haley, *The Leader's Compass: A Personal Leadership Philosophy Is Your Key to Success*, second edition, King of Prussia, PA: Academy Leadership Publishing, 2003.



How social technologies are extending the organization

Our fifth annual survey on the way organizations use social tools and technologies finds that they continue to seep into many organizations, transforming business processes and raising performance.

Jacques Bughin
Angela Hung Byers
Michael Chui



Companies are improving their mastery of social technologies, using them to enhance operations and exploit new market opportunities—key findings of our fifth annual survey on these tools and technologies, in which we asked more than 4,200 global executives how organizations deploy them and the benefits they confer.¹ When adopted at scale across an emerging type of networked enterprise and integrated into the work processes of employees, social technologies can boost a company’s financial performance and market share, respondents say, confirming last year’s survey results.

But this is a very dynamic environment, where the gains from using social technologies sometimes do not persist, perhaps because it takes so much effort to achieve them at scale. Some companies, respondents indicate, reaped fewer benefits and thus became less networked, while a smaller percentage learned how to deploy these technologies to become even more networked. Executives say that their companies are using them to increase their agility and to manage organizational complexity. Many believe that if organizational barriers to the use of social technologies diminish, they could form the core of entirely new business processes that may radically improve performance.

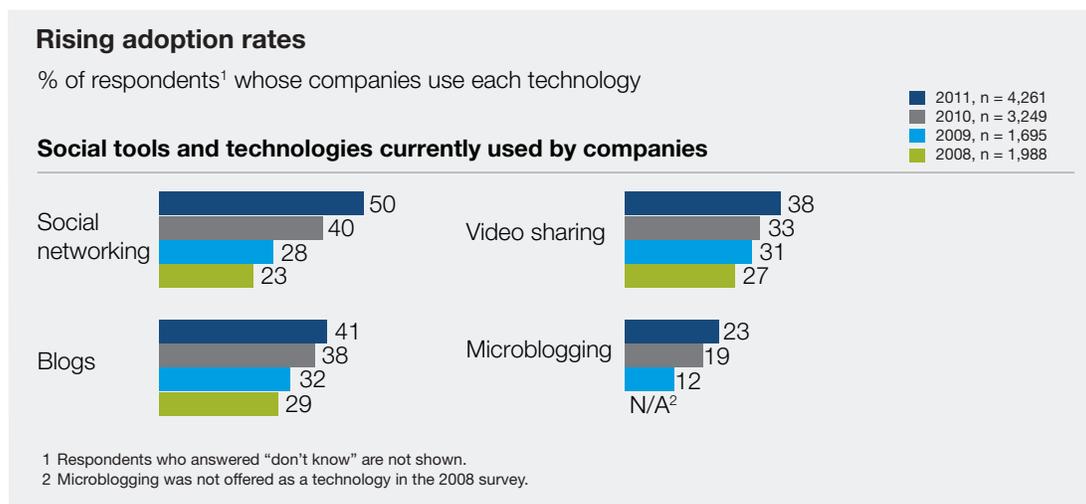
Usage at scale and continued benefits

Social technologies as a group have reached critical scale at the organizations represented in our survey. Seventy-two percent of the respondents report that their companies are deploying at least one technology, and more than 40 percent say that social networking and blogs are now in use (Exhibit 1). These technologies are being deployed across sectors, at the high level of 86 percent of the respondents’ companies in high tech and telecommunications, but at 62 percent of companies even in the energy industry (Exhibit 2). Levels of reported benefits not only remain high when respondents’ organizations use social tools for internal purposes but have also increased among those that use them for communicating with customers or for integration with partners and suppliers (Exhibit 3).

The performance edge of networked enterprises

Last year, we identified a small group of respondents who indicated that their companies had experienced superior performance from the use of social technologies across key stakeholder groups. We repeated the analysis this year, looking at the average level of improvements in business benefits

EXHIBIT 1



1 The online survey included 4,261 respondents across sectors, geographies, company sizes, tenures, and functional specialties. As with surveys in past years (when we referred to social technologies as “Web 2.0”) the survey covers the adoption and usage of technologies, their benefits, and corporate performance. This year, we also asked about how organizations are using social technologies and the types and magnitude of the organizational and process changes that could result.

EXHIBIT 2

Adoption of social technologies across industries

% of respondents (n = 4,261)

Companies using at least 1 social-technology tool

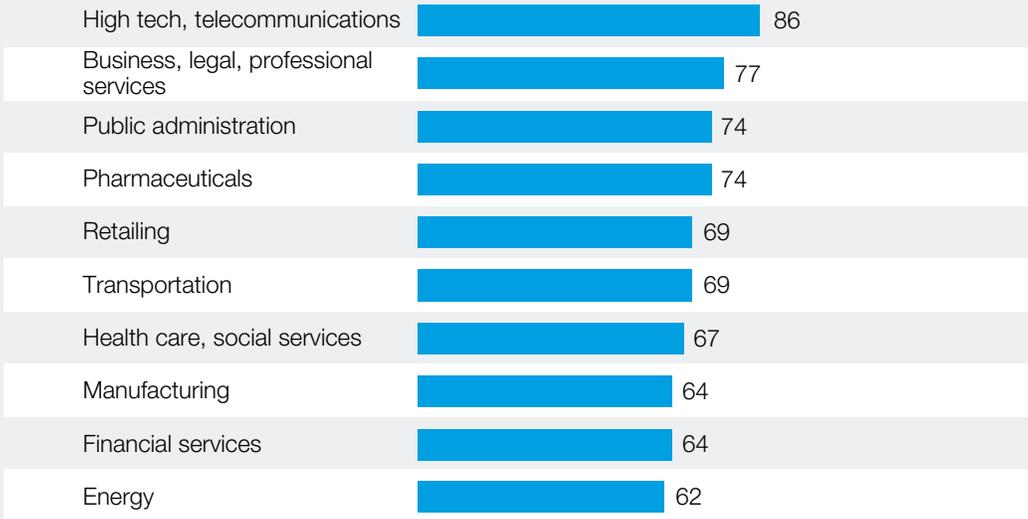


EXHIBIT 3

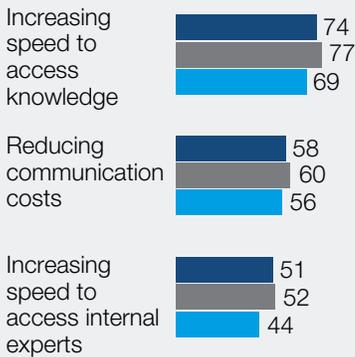
Benefits remain consistent over time

% of respondents reporting at least 1 measurable benefit at their companies

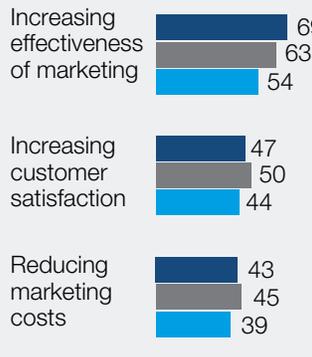
Top 3 measurable benefits of technology adoption, by use

■ 2011
 ■ 2010
 ■ 2009

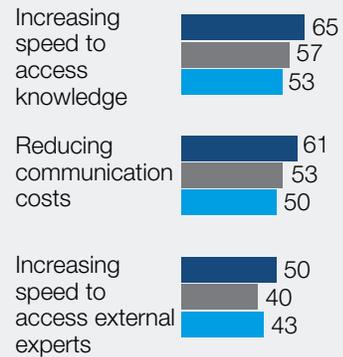
Internal purposes¹



Customer purposes²



Partners, suppliers, and external-expert purposes³



¹ In 2011, n = 1,949; in 2010, n = 1,598; in 2009, n = 1,008.

² In 2011, n = 2,227; in 2010, n = 1,708; in 2009, n = 956.

³ In 2011, n = 1,142; in 2010, n = 1,008; in 2009, n = 686.

EXHIBIT 4

Tracking the four types of organizations

Organizational type, based on social-technology benefits

		Developing, n = 2,413	Internally networked, n = 224	Externally networked, n = 365	Fully networked, n = 101
Improvement in benefits, mean %	Internal benefits	2	18	8	26
	Customer benefits	1	3	13	21
	Partner benefits	1	2	11	24
Extent of social- technology usage, % of respondents	% of employees	39	37	43	48
	% of Customers	26	37	54	51
	% of Partners	40	48	55	64
Integration, % of respondents	Very or extremely integrated into employees' day-to-day work	18	49	45	80

that executives reported. Four clusters emerge from our analysis. Executives at internally networked organizations note the highest improvement in benefits from interactions with employees; those at externally networked organizations, from interactions with customers, partners, and suppliers. Executives at fully networked organizations report greater benefits from both internal and external interactions. In the fourth and by far the largest group, developing organizations, respondents report lower-than-average improvements across all interactions at their organizations.²

As we found last year, the number of fully networked organizations is small. But the percentage of externally networked organizations is higher and that of internally networked ones lower (Exhibit 4),³ reflecting the fact that the gains from the use of social technologies are not static (see discussion below). We call the companies in the fully and externally networked groups extended enterprises, since their use of social technologies in customer and partner outreach blurs the boundaries of the organization.

We found statistically significant correlations between self-reported corporate performance metrics and certain business processes that networked enterprises use (Exhibit 5). The market share gains respondents report are correlated with two such processes. First, these organizations use social tools to scan external environments. Second, they use them to match employees to tasks: internal wikis and social networks help project leaders to identify employees with the most appropriate skills and to assign these employees to the projects for which they are best suited.

² As we did last year, we sorted the respondents into four clusters based on the average mean improvement reported across the different benefits when Web 2.0 is used in interacting with employees, customers, and external partners or any combination thereof. Fully networked enterprises are defined as those with an average improvement greater than 10 percent when Web 2.0 is used to interact with employees, customers, and external partners. Externally networked enterprises are those with a greater than 10 percent average improvement when Web 2.0 is used to interact with customers and external partners. Internally networked enterprises are those with an average improvement greater than 10 percent when Web 2.0 is used to interact with employees. The remainder of respondents work for what we classify as developing enterprises.

³ See Jacques Bughin and Michael Chui, "The rise of the networked enterprise: Web 2.0 finds its payday," mckinseyquarterly.com, December 2010.

Another key performance measure, self-reported operating-margin improvements, correlated positively with the reported percentage of employees whose use of social technologies was integrated into their day-to-day work. Among the companies of respondents who took the survey in previous years, these improvements also correlated positively with gains in the reported percentage of employees whose work is highly integrated with social media. Market share leadership in an industry, the final self-reported performance measure, correlated positively with the integration of social tools in employees' day-to-day work, as well. Consistent with last year's analysis, we found that market leadership correlates negatively with fully networked and externally networked organizations. While market leaders may use social technologies within the organization, they might be less inclined than market challengers to push for a full range of benefits.

Networked organizations: Not a steady state

We also analyzed the responses of executives who participated in both the 2010 and 2011 surveys for changes in our defined enterprise clusters. According to these responses, a surprising number of organizations made the transition from one type of enterprise to another. Roughly half of the internally

EXHIBIT 5

Correlations with corporate performance

	Processes that significantly correlate with self-reported corporate-performance metrics	Correlation coefficient (higher = greater correlation)	P-value (less than 0.05 = statistically significant)
1. Market share gains	Using social technologies to scan external environment	0.263	0.007
	Using social technologies to match employees to tasks	0.422	0.002
	Positive change in level of social-technology integration into day-to-day work (2010–11) ¹	0.254	0.001
2. Operating margin compared with those of competitors	Level of social-technology integration into day-to-day work	0.130	0.016
	Share of employees using intranet to conduct transactions	0.007	0
	Using social technologies to assess employee performance	-0.325	0.035
	Positive change in level of social-technology integration into day-to-day work (2010–11) ¹	0.276	0.007
3. Market leadership—ie, first in industry share	Fully networked	-0.616	0.019
	Externally networked	-0.444	0.001
	% of employees using social technologies	0.014	0
	Share of sales done online	0.004	0.044
	Level of social-technology integration into day-to-day work	0.135	0.005
	Share of employees using intranet to conduct transactions	0.003	0.021

¹ Reflects repeat respondents only.

EXHIBIT 6

Shifting network classifications

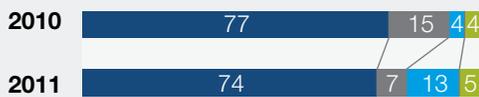
% of repeat respondents¹

Organizational type, based on social-technology benefits



Organizational type in 2010	2011				
	Remained the same, %	Shifted to new organizational type, %			
Developing, n = 500	83	N/A	5	10	2
Internally focused, n = 94	18	52	N/A	19	11
Externally focused, n = 24	38	46	4	N/A	13
Fully networked, n = 29	35	17	14	35	N/A

Distribution of organizational types, n = 647



¹ Figures may not sum to 100%, because of rounding.

EXHIBIT 7

Supporting a variety of processes

% of respondents¹ whose companies use at least 1 social technology in given process



How companies are using social technologies

	Total, n = 3,103	Social networking, n = 1,728	Blogs, n = 1,322	Video sharing, n = 769	RSS, n = 642	Wikis, n = 809	Podcasts, n = 502	Micro-blogging, n = 654
Scanning external environment	75	40	29	11	14	9	8	13
Finding new ideas	73	36	29	11	10	12	7	13
Managing projects	55	19	12	11	5	17	4	5
Developing strategic plan	43	16	11	8	4	8	4	5
Allocating resources	30	10	5	4	3	4	2	2
Matching employees to tasks	29	11	4	4	2	5	2	3
Assessing employee performance	26	7	4	3	2	3	1	2
Determining compensation	20	6	4	2	1	2	1	1

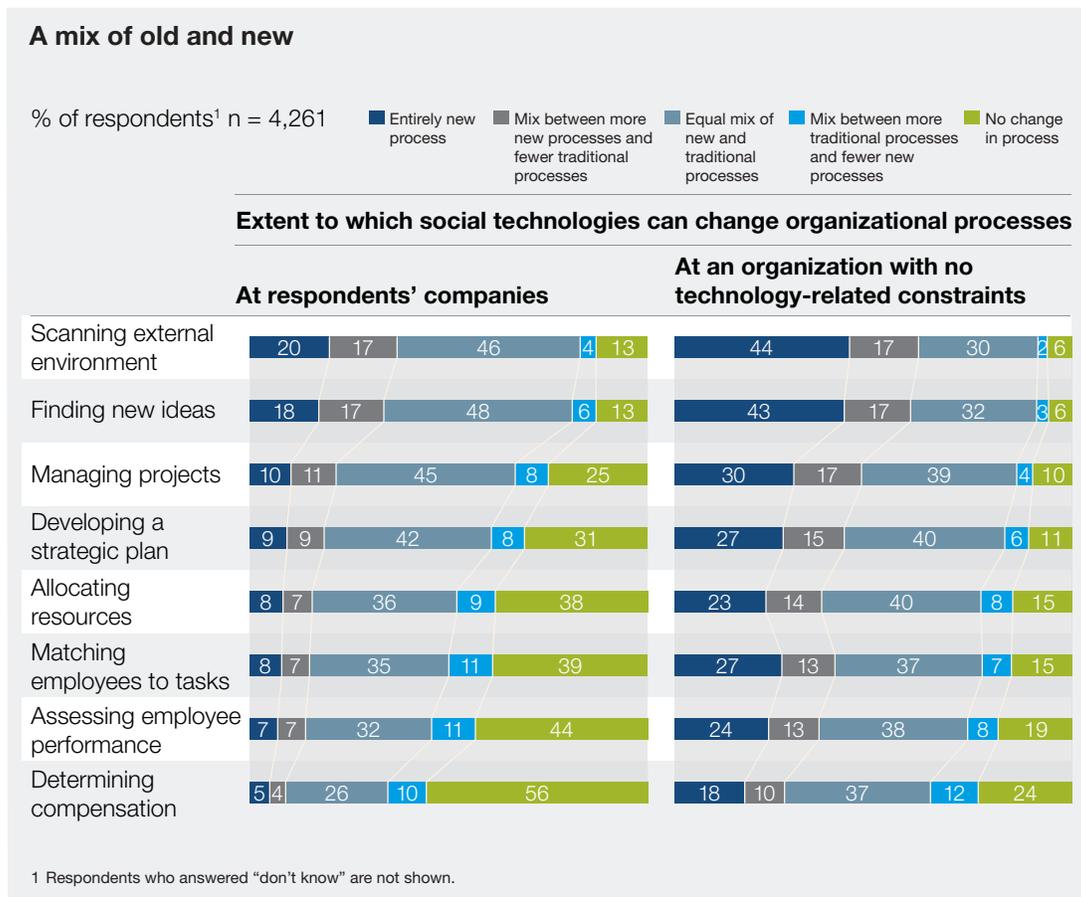
¹ Respondents who answered "other" are not shown; <10% of respondents use tagging, rating, mash-ups, and prediction markets for any of the tasks and are not shown.

and externally networked enterprises slid back into the category of developing organizations; that is, they did not maintain the benefits of using social technologies that they had achieved earlier. Less than 15 percent of the companies in any given category moved up to the next tier—in other words, from a developing to a networked enterprise or from an internally or externally networked enterprise to a fully networked one (Exhibit 6). It appears that it is easier to lose the benefits of social technologies than to become a more networked enterprise, which suggests that significant effort is required to achieve gains at scale. We also found initial indications that if the percentage of employees who integrated social technologies into their day-to-day work declined, their companies were more likely to backslide.

Changing processes

We asked respondents about current and future uses of social technologies for a range of business

EXHIBIT 8



processes and found that the greatest number say their companies use these tools to scan the external environment for new ideas. Respondents also report that different technologies are better suited to specific types of business processes, as the accompanying heat map shows (Exhibit 7). Social networking and blogs, in particular, are used most heavily in externally focused processes that gather competitive intelligence and support marketing efforts.

Respondents expect social technologies to modify many of their organizations' current processes. In addition, many believe that entirely new processes could arise if barriers to use—cultural obstacles, for example—fall (Exhibit 8). The respondents affiliated with fully networked organizations are the likeliest to believe that greater process change will occur in their own organizations. In larger numbers than respondents in other clusters, they think that social technologies will lead their companies to adopt

EXHIBIT 9

A blurring of boundaries

% of respondents¹ n = 4,261

Likeliest organizational changes in next 3–5 years, without constraints

The boundaries between employees, vendors, and customers will blur	35	Strategic priorities will be set from the bottom up	17
Teams will self-organize	32	Individual performance will be evaluated by peers rather than by managers	14
Decisions will be based primarily on the examination of data rather than reliance on opinion and experience	32	Employees will have much more discretion in choosing which tasks to work on	12
The organization's formal hierarchy will become much flatter or disappear altogether	27	Employees will play a much greater role in selecting leaders	10
Data used for decision making will mostly be collected through experiments	20	Large companies and/or business units will disaggregate	9
Financial transparency will increase dramatically	19	Compensation decisions will be made by peers rather than by managers	3
Internal markets or other voting mechanisms will be used to allocate resources (eg, talent, capital, ideas)	18		

¹ Respondents who answered "none of the above" or "don't know" are not shown.

entirely new processes under current conditions and to do so even more aggressively if all constraints were removed. This optimistic view may reflect the fact that these respondents are seeing the greatest level of benefits across the board.

Peering ahead three to five years, many respondents expect still more profound organizational changes (Exhibit 9). They say that with fewer constraints on social technologies at their companies, boundaries among employees, vendors, and customers will blur; that more employee teams will be able to organize themselves; and that datadriven decision making will rise in importance.

Looking ahead

- Our research shows that respondents affiliated with fully networked organizations say that they continue to realize competitive gains and performance improvements. Senior executives should think strategically about how social technologies can support business processes by helping organizations to navigate the external environment and to forge stronger links with customers and vendors. Integrating social technologies into the workflow and using them to optimize internal processes will, these results suggest, provide additional competitive benefits.
- Don't rest on your laurels: competition will increase as the adoption of social tools and technologies continues to rise and as progressive companies use them to improve their processes. Indeed, many companies we categorized as networked organizations last year slipped to a lower rung this year as the benefits their executives reported fell. Integrating Web technologies into the daily workflow, our results suggest, is the most effective way to maintain competitive position or become more networked.

- Companies should prepare for more substantial disruptions. Since many executives believe that significant changes will occur as (or if) constraints on social tools and technologies are lifted, companies that can create change themselves—instead of reacting to it—are likely to benefit the most.

Jacques Bughin is a director in the Brussels office; Michael Chui is a senior fellow of the McKinsey Global Institute and is based in the San Francisco office. Copyright © 2011 McKinsey & Company. All rights reserved.

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Meeting the Cybersecurity Challenge

Eliminating threats is impossible, so protecting against them without disrupting business innovation and growth is a top management issue.

James M. Kaplan
Shantnu Sharma
Allen Weinberg



Meeting the cybersecurity challenge

Cybersecurity—the protection of valuable intellectual property and business information in digital form against theft and misuse—is an increasingly critical management issue. The US government has identified cybersecurity as “one of the most serious economic and national security challenges we face as a nation.”¹

Companies must now fend off ever-present cyberattacks—the threat of cybercriminals or even disgruntled employees releasing sensitive information, taking intellectual property to competitors, or engaging in online fraud. While sophisticated companies have recently endured highly public breaches to their technology environments, many incidents go unreported. Indeed, businesses are not eager to advertise that they have had to “pay ransom” to cybercriminals or to describe the vulnerabilities that the attack exposed.

Given the increasing pace and complexity of the threats, corporations must adopt approaches to cybersecurity that will require much more engagement from the CEO and other senior executives to protect critical business information without constraining innovation and growth.

Why cybersecurity is a bigger issue now

Most large companies have dramatically strengthened their cybersecurity capabilities over the past five years. Formal processes have been implemented to identify and prioritize IT security risks and develop mitigation strategies, and hundreds of millions of dollars have been dedicated to execute these strategies. Desktop environments are far less “wide open” than they were even five years ago, as USB ports have been disabled and Web mail services blocked. Robust technologies and initiatives have been put in place to address attacks on the perimeter.

However, we recently conducted in-depth interviews and problem-solving sessions with information security leaders at 25 top global companies, and the results revealed widespread—and growing—concern. The combination of advances in enterprise technology and more effective malevolent actors is complicating the task of protecting business processes and information.

Our interviews reinforced that changes in how enterprises use technology have simultaneously made corporate environments harder to protect while increasing the importance of protecting them. Four common trends emerged:

- **Value continues to migrate online, and digital data have become more pervasive.** Why are some institutions experiencing more online attacks per hour than they did in a month just a few years ago? With apologies to Willie Sutton, because that’s where the money is. Quite simply, more online transactions create bigger incentives for cybercriminals. Moreover, corporations looking to mine data—for instance, transaction and customer information, results of product launches, and market information—create valuable intellectual property that is in itself an attractive target.
- **Corporations are expected to be more ‘open’ than ever before.** Increasingly, people working in business units are demanding access to corporate networks through the same mobile devices

¹ Barack Obama, “Remarks by the president on securing our nation’s cyber infrastructure,” The White House, Washington, DC, May 29, 2009.

that they use in their personal lives. While smartphones and tablets increase connectivity, they also present new types of security threats: when hackers “crack” a device, it creates an easy point of entry into corporate networks for malware.²

- **Supply chains are increasingly interconnected.** To strengthen ties to customers and optimize supply chains, companies are encouraging vendors and customers to join their networks. However, this engagement makes walling off a company’s technology environment all but impossible. Tighter integration with business partners, of course, can deliver clear benefits, but it also means that a company’s defense against attacks rests in part on the security policies of partners and customers. As one executive told us, “The whole network is now at risk from the weakest link.” One large company, for example, barred its employees from sharing sensitive company documents over Web networks using peer-to-peer software, only to discover that on-site contractors routinely used this software to review the same documents.
- **Malevolent actors are becoming more sophisticated.** Professional cybercrime organizations, political “hacktivists,” and state-sponsored groups have become more technologically advanced, in some cases outpacing the skills and resources of corporate security teams. Hackers provide “cybercrime as a service”—receiving payment for each end user device they infect with malware. As a result, the past five years have seen more complex, targeted attacks. Malware today is much more difficult to trace and often customized to steal data that can be used for financial gain. Some executives joke that organized crime seems to have better funding than their own security operations. National intelligence agencies appear to undertake some of the most advanced cyberattacks as part of industrial espionage efforts.³

The most challenging attacks exploit human vulnerabilities rather than technological ones, which are easier to remediate. Increasingly, cybercrime organizations use information gleaned from social-networking sites to craft highly targeted “phishing” attacks that entice senior executives or systems administrators to click on links that will install spyware on their laptop. Just as retailers seek to create a “multichannel” experience across e-commerce and in-person interactions, some cybercrime organizations combine on- and offline tactics. One institution was the target of a concerted effort to steal inadequately secured devices from senior executives to facilitate access to sensitive data through the corporate network.

Getting to a new business-driven cybersecurity model

Now more than ever, protecting a corporation’s technology assets from malicious damage and inappropriate use requires intelligent constraints on how employees, customers, and partners access corporate applications and data. Insufficient safeguards will result in the loss of critical data, but overly stringent controls can get in the way of doing business or have other adverse effects. At an investment bank, for instance, deathly slow security software caused its M&A specialists to abandon corporate laptops and e-mail services for personal devices and Web mail.

As a result, a business-driven cybersecurity model—one that can provide resiliency to increasingly flexible, open enterprises even in the face of highly capable and determined malevolent actors—is starting to emerge.

² Software, including viruses and spyware, that are created with the intent of damaging a computer or network, sometimes by taking partial control of applications.

³ In response to the threat of cyberattacks, the US government has signaled it would view a computer attack from a foreign nation as justification for military action. See Elisabeth Bumiller and David E. Sanger, “Pentagon to consider cyberattacks acts of war,” *New York Times*, May 31, 2011.

Cybersecurity must be addressed at the most senior levels

In many organizations, cybersecurity has been treated primarily as a technology issue. Most respondents believe that senior corporate leaders have too little understanding of the IT security risks and business implications to discuss the trade-offs for investment, risk, and user behavior.

A few institutions have started to make cybersecurity a key part of business strategy rather than technology governance. At one company, the CEO signaled the importance of cybersecurity by his direct involvement with senior security executives in making key decisions. Some organizations have placed divisional chief information security officers in business units, pairing them closely with senior executives there. Others report on cybersecurity issues to the board's risk committee rather than the technology committee.

Cybersecurity must be 'business back' rather than 'technology forward'

Increasingly, companies will have to reverse their thinking to address cyberrisks. Rather than starting with technological vulnerabilities (say, the insufficient patching of servers or routers), they should first protect the most critical business assets or processes (such as customer credit card information)—what we call a “business-back” approach. Already, many large institutions have implemented multiyear programs to classify corporate data so they can focus cybersecurity efforts and policies on their most critical information assets. Corporations have begun to evaluate their cyberrisk profile across the full value chain, clarifying expectations with vendors and enhancing collaboration with key business partners. Some institutions have made cybersecurity a core part of the customer value proposition, establishing an ongoing dialogue on the right balance between collecting enough data to verify identity without forcing customers to spend too much time setting up or signing on to their online accounts. For these companies, cybersecurity could represent a business opportunity, as they create end-to-end customer experiences that are both convenient and secure.

Move from protecting the perimeter to protecting data

Most organizations have approached cybersecurity by trying to put increasingly sophisticated defenses around their perimeter. The reality is that a motivated attacker will likely find a vulnerability—or an employee may inadvertently create an opening (for example, by accidentally e-mailing sensitive customer information).

Progressive corporations are reorienting security architectures from devices and locations to roles and data. Ultimately, plugging your laptop into the network at a corporate location may enable you to do no more than reach publicly available Web sites. Accessing corporate data or applications, however, would require authentication of your identity.

Security will soon become a fundamental design decision in underlying technology architectures. If customer credit card information resides in a single database, for example, a cybercriminal would only have to breach security once to engage in fraudulent transactions. Separating credit card numbers and expiration dates vastly complicates the task. Since a malicious systems or database administrator can be much more dangerous than even the most careless end user, some IT organizations have started to limit the number of people who can access production systems and data, preventing not only application developers but also infrastructure architects and engineers from touching “live machinery.”

Refresh cybersecurity strategies to address rapidly evolving business needs and threats

We heard many respondents say that CEOs and other senior executives inquire how to “solve” cybersecurity. Corporations need to acknowledge that it is an ongoing battle. New digital assets and mechanisms for accessing them simply mean new types of attacks.

Already, many corporations are conducting simulated cyberattacks to identify unexpected vulnerabilities and develop organizational muscles for managing breaches. Some have built sophisticated capabilities to aggregate and analyze massive amounts of operational data (such as e-mail headers and IP traffic) to uncover emerging threats. In addition, corporations must make cybersecurity, such as the information security measures that need to be implemented before entering new geographies, a key part of the business case for major initiatives or new-product introductions.

What should senior executives do to ensure that cybersecurity is sufficiently addressed?

At leading organizations, cybersecurity should be a constant item on the agendas of CEOs and boards. To stay ahead of the threats, executives must engage in an ongoing dialogue to ensure their strategy continually evolves and makes the appropriate trade-offs between business opportunity and risks. We believe this dialogue should start with a number of critical questions:

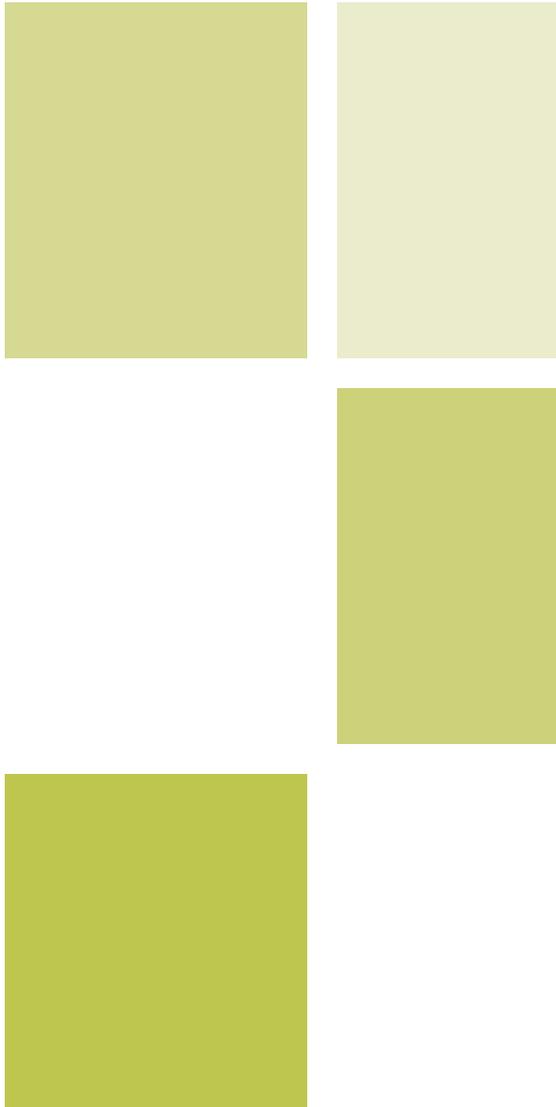
- Who is responsible for developing and maintaining our cross-functional approach to cybersecurity? To what extent are business leaders (as opposed to IT or risk executives) owning this issue?
- Which information assets are most critical, and what is the “value at stake” in the event of a breach? What promises—implicit or explicit—have we made to our customers and partners to protect their information?
- What roles do cybersecurity and trust play in our customer value proposition—and how do we take steps to keep data secure and support the end-to-end customer experience?
- How are we using technology, business processes, and other efforts to protect our critical information assets? How does our approach compare with that of our peers and best practices?
- Is our approach continuing to evolve, and are we changing our business processes accordingly?
- Are we managing our vendor and partner relationships to ensure the mutual protection of information?
- As an industry, are we working effectively together and with appropriate government entities to reduce cybersecurity threats?

As more value migrates online and corporations adopt more innovative ways of interacting with customers and other partners, the cybersecurity challenge will only increase.



Since the virulence and sophistication of assaults and complexity of IT environments have risen rapidly, addressing this challenge requires solutions that cut across strategy, operations, risk management, and legal and technology functions. Companies need to make this a broad management initiative with a mandate from senior leaders in order to protect critical information assets without placing constraints on business innovation and growth.

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