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2014 Number 1

Shaping the future of manufacturing

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This Quarter

When *McKinsey Quarterly* published its first issue, in 1964, manufacturing's share of global GDP was roughly 50 percent larger than it is today. More Harvard Business School graduates entered manufacturing than any other field.

Fifty years on, manufacturing doesn't seem so sexy. In conversations about growth engines of the future, it's often an afterthought—something countries move *from* as their economic maturation shifts employment and GDP from manufacturing to services and beyond.

Yet a major transformation is under way. Emerging markets' consumption of manufactured goods is surging and becoming more sophisticated. Simultaneously, we're experiencing a range of technological changes, including advanced robotics, large-scale factory digitization, and 3-D printing, not to mention a host of energy innovations. In many sectors, these shifts are weakening the economic rationale for manufacturing strategies built on long supply chains and cheap labor in low-cost countries. Proximity to demand—whether in developed or emerging markets—and proximity to innovative supply ecosystems will become increasingly important determinants of competitiveness. We describe this phenomenon as "next-shoring" and lay out the implications for leaders in any geography.

Shorter supply chains would remove one of the major obstacles to the achievement of what our colleagues Hanh Nguyen, Martin Stuchtey, and Markus Zils call "the circular economy," which restores rather than throws out the material, energy, and labor

inputs used in manufacturing goods. It's not a pipe dream. Real companies, including Philips, whose efforts are described by CEO Frans van Houten in a related commentary, are working to reduce and recover materials they use in manufacturing and to redesign products so their components are easier to reuse. Geographic dispersion, materials complexity, and inertia have slowed progress, though, suggesting a need for coordinated action in areas such as standards-setting for materials used in a range of products.

The digitization of manufacturing is just one part of the broader data-analytics revolution that's sweeping across the economy. Stay on the cutting edge by reviewing the insights of data-analytics practitioners, from a range of industries, who got together late last year to trade thoughts on their biggest challenges. And don't miss the latest McKinsey Global Institute research on open data or IMD professor Phil Rosenzweig's assessment of the areas where data-driven decision models are (and aren't) effective. A thread of data also runs through fresh thinking on the management and mining of information distilled from social media, the value consumers derive from free (to them, at any rate) services available on the web, and the identification of hidden influencers, who are often key to organizational change. It's striking how all-encompassing and interrelated the impact of the digital revolution has become. We hope this issue of the *Quarterly* helps you connect the dots.

Katy George
Director, New Jersey office

Detlef Kayser
Director, Hamburg office

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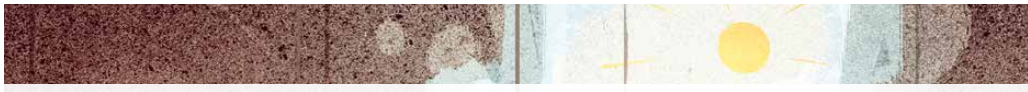

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The mobile Internet's consumer dividend

Jacques Bughin and James Manyika

New research suggests that user benefits have nearly doubled thanks to the growth of the wireless web.

When consumers tweet, exchange photos, or search for information on the web, they've come to expect that it will be free. In economic terms, this panoply of services by web providers amounts to a vast consumer surplus. Three years ago, we took the measure of these consumer benefits in the United States and Europe.[1] Using survey data and statistical analysis, we estimated how much consumers would be willing to pay for each of a range of services and then aggregated the benefits,[2] which we found totaled €130 billion.

A 2013 update suggests that the consumer surplus has nearly doubled, to €250 billion (exhibit). Three-fourths of the incremental surplus results from the explosion in consumer use of the wireless web through smartphones and tablets—propelled by the migration of web services, communications channels, social media, and entertainment to these wireless devices. Broadband usage also has grown in the countries analyzed, rising to 65 percent of all households, from a little more than 50 percent.

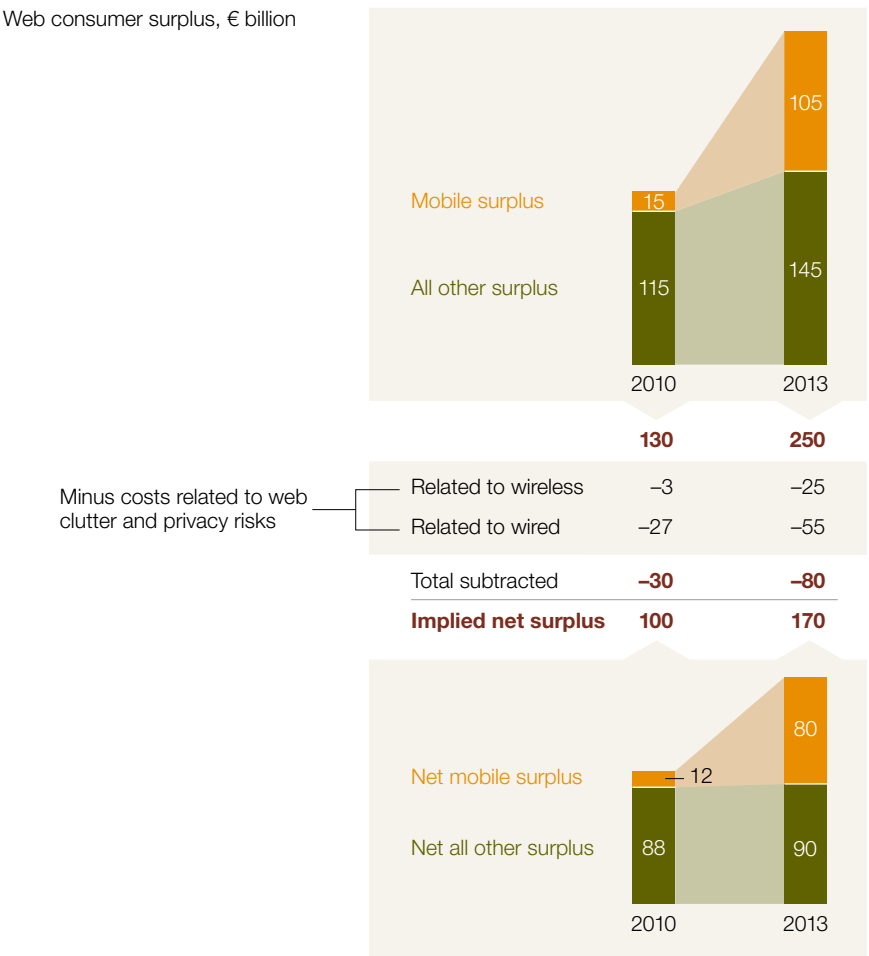
While web services are free to consumers, many companies providing them generate income from their extensive platforms and user networks, through advertising

or access charges for valuable information about consumers and their preferences. In our analysis, we identify those two activities as a cost to users and set a price we think they would pay to avoid disruption of their web experiences or to limit the risks associated with sharing personal information.

Since 2010, these costs have risen to €80 billion, from €30 billion, reflecting growing consumer sensitivity to web clutter and privacy issues. While that's a sizable increase, it's less than the rise in the web's total surplus for consumers, suggesting that the net effect on them remains strongly positive. Interestingly, in

Exhibit

The web's consumer surplus has nearly doubled in the past three years, primarily because of the explosion in consumer use of wireless access.



a sign of maturing usage, the net surplus for the wired web has remained close to flat since 2010, as a large increase in privacy and clutter risk balances the increased surplus. Mobile usage drives almost the entire increase in the overall net consumer surplus.

As an extension of our core surplus analysis, we estimated the value of the trust users have in the web brands they use to interact with others, seek information, and consume entertainment. This trust generates a €50 billion surplus across both wired and wireless use. Leading web-service providers such as Google (including YouTube), Facebook, Microsoft, Yahoo!, and Twitter capture nearly half of the trust surplus. This concentration in a few marquee brands, many of which actively generate revenues from their web services, suggests that these revenues can coexist with acceptable privacy and web-experience quality levels. Indeed, they must do so, given the fragility of that trust and the ease of undermining it when companies mismanage user expectations. Companies with strategies that meet or exceed them while increasing the range and reliability of their web offerings—particularly mobile services—should be well positioned to enjoy a virtuous cycle in which the creation of a consumer surplus expands the scope of opportunities to generate revenue and value.

[1] See Jacques Bughin, "The Web's €100 billion surplus," *McKinsey Quarterly*, January 2011, mckinsey.com.

[2] The original research was a 2010 survey created in partnership with the Interactive Advertising Bureau. It was updated in 2013 to include questions about services for multiple screens—mobile (both smartphones and nonsmartphones), PCs, and tablets. In the original survey, more than 4,500 respondents across France, Germany, Russia, Spain, the United Kingdom, and the United States were asked about their use of several broadband services. The 2013 survey focused only on four countries (France, Germany, the United Kingdom, and the United States), so estimates were scaled accordingly. The total sample size was 2,500 respondents. We used conjoint analysis to assess the value of each service by determining the respondents' willingness to pay. Consumer payments for wired and wireless broadband access are subtracted from the value of those services.

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Why the COO should lead social-media customer service

Gadi BenMark

Although social channels have become powerful and cost-effective tools for customer service, management may be in the wrong hands.

Social media offers a chance to redefine the delivery of service to customers, changing the way they think and talk about a company's brands while drastically lowering service costs. Seventy-one percent of consumers who've had a good social-media service experience with a brand are likely to recommend it to others,[1] and 70 percent of companies are trying out social customer care in some form.[2] But are they assigning the right organizational "owner" to those efforts?

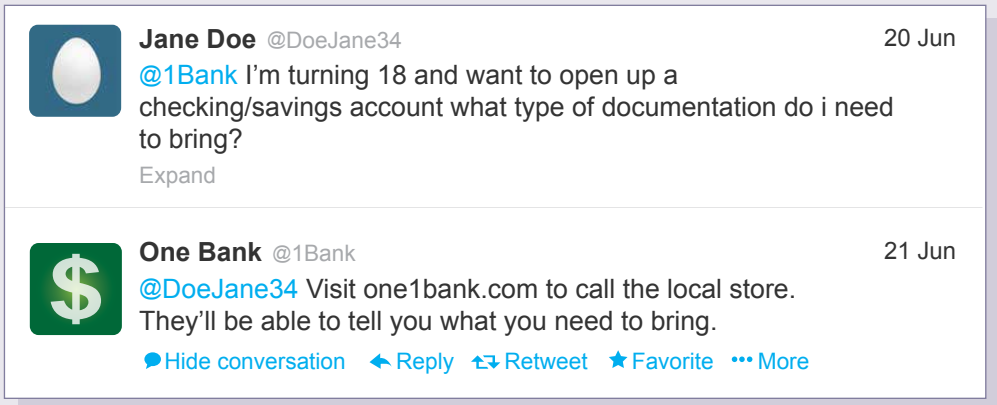
Beyond the call center

Often, it's the marketing or corporate-communications function—typically social media's internal pioneer—that takes ownership. That makes sense when social channels are used to build brands, drive loyalty, and boost sales. In the domain of customer service, however, marketing often lacks the resources, expertise, or institutional support to handle the issues, particularly in the face of a rapidly rising number of requests. Many managers feel that interactions with dissatisfied customers should be conducted out of the public eye and try to steer them to one-on-one call-center conversations even when they prefer real-time social media. Some executives worry that customer-service issues are "littering" marketing channels such as a company's Facebook page.

A powerful but underutilized alternative is to locate social customer care in the operations function, like other customer-service channels. Service operations, which have often emphasized costly call centers, are designed to deal with queries on a scale that has so far eluded social media, which at many companies handles 5 percent or less of service requests. Social-media channels can work just as well as call centers to upsell products or capture service-to-sales opportunities—with some added advantages. One is that social platforms make it easier to guide customers to relevant web pages or video content.

Missing a social opportunity?

Instead of answering this 18-year-old prospective customer's simple factual question on Twitter, the customer-service representative at "One Bank" is trying to end the social-media interaction as quickly as possible. The bank provides satisfactory service over the phone or in personal visits, but it missed a chance to satisfy the customer on the spot, and at a lower cost.



Another is the expense: on average, handling an inbound telephone call typically costs a company $6 to $8; an interaction using social media, less than $1.[3] Not every service request suits social media, of course. These channels work best for simpler issues that lend themselves to a full response in writing. But that kind of written communication can be quite fluid: one large retailer joins social-media conversations to offer support and guidance for customers who discuss relevant products or express frustration with competitors' offerings.

How it looks in practice

When a financial-services company pushed ahead with plans to build a social channel, it achieved new levels of collaboration between its marketing and service operations. The chief marketing officer maintained control of the broad social-media strategy. Ownership of the service channel, however, was given to the chief operations officer, with the specific objective of saving money by diverting traffic from the organization's call centers. Together, the CMO and COO chaired a steering

committee overseeing cross-functional handoffs between marketing and operations.

The company selected a group of experienced customer-service agents and tasked them with developing the new service. Leaders realized that balancing two goals—productivity and a satisfying customer experience—would raise the performance bar considerably. They also understood the risks of managing services across an open channel, particularly if customers perceived the interactions to be ineffective. To minimize those risks, the agents chosen for the new roles shared some important characteristics: deep product experience, excellent writing skills, and the ability to act as strong customer advocates. They were given additional training, both on the technical side of social media and on compliance (such as the kind of information appropriate to share in a public channel and when to take a conversation private, either through private digital channels, such as direct messaging on Twitter or e-mail, or through a phone call).

Initial IT investments were kept low. Rather than investing up front in the changes required to integrate social-media channels into the existing service IT infrastructure, the company gave its social-media agents a specialized software tool separate from that system, which they can access when necessary. This not only allowed the company to bring social-media service online faster but also provided a real-world test that could help to shape the development of a fully integrated system down the road.

As this example suggests, realigning customer service for the digital age gives senior leaders a new range of opportunities and challenges. Integrating social customer-care efforts with service operations while also boosting coordination across the full range of social-media functions will probably become an increasingly important part of many companies' strategies for engaging customers. After all, they will only become more insistent that companies hear them out and deal with their problems in the social spaces where they are spending much of their time.

[1] *2012 State of Social Customer Service Report*, NM Incite (a joint venture between McKinsey and Nielsen), December 2012.

[2] Mike Stenger, "71 percent of businesses use social media for customer service," *Social News Daily*, October 15, 2012, socialnewsdaily.com.

[3] For insights into one sample industry, see Jon Anton and Bruce Belfiore, *Benchmark Report: Best-in-Class Call Center Performance*, Benchmark Portal, October 2012, benchmarkportal.com. Cited industry averages for the cost of calls can vary dramatically, depending on the method of calculation and the variability of other factors—for example, the hourly wage of service representatives.

The author would like to acknowledge the contribution of Greg Malen to the research underpinning this article.

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The strength of ‘weak signals’

Martin Harrysson, Estelle Métayer, and Hugo Sarrazin

Snippets of information, often hidden in social-media streams, offer companies a valuable new tool for staying ahead.

As information thunders through the digital economy, it’s easy to miss valuable “weak signals” often hidden amid the noise. Arising primarily from social media, they represent snippets—not streams—of information and can help companies to figure out what customers want and to spot looming industry and market disruptions before competitors do. Sometimes, companies notice them during data-analytics number-crunching exercises. Or employees who apply methods more akin to art than to science might spot them and then do some further number crunching to test anomalies they’re seeing or hypotheses the signals suggest. In any case, companies are just beginning to recognize and capture their value. Here are a few principles that companies can follow to grasp and harness the power of weak signals.

Engaging at the top

For starters, given the fluid nature of the insights that surface, it’s often useful to get senior leaders actively involved with the social-media sources that give rise to weak signals. Executives who are curious and attuned to the themes emerging from social media are more likely to spot such insights.[1] For example, a global manufacturer whose high quality and low prices were the topic of one customer’s recent social-media post almost certainly would not have examined it but for a senior executive who was a sensitive social “listener” and found its implications intriguing. Did the company have an opportunity, the executive wondered, to increase prices or perhaps to seek market share more aggressively at the current prices?

To find out, the executive commissioned research to quantify what had started out as a qualitative hunch. Ultimately, the low-price perception turned out to be an anomaly, but the outsize perception of the product’s quality was widely held. In response, the company has started funneling marketing resources to the product in hopes of building its market share by capitalizing on its quality and differentiating it further from the offerings of competitors.

Listening and mapping

As the manufacturer's example implies, spotting weak signals is more likely when companies can marshal dispersed networks of people who have a deep understanding of the business and act as listening posts. One global beverage company is considering including social-media awareness in its hiring criteria for some managers, to build its network and free its management team from "well-rehearsed habits."

Weak signals are everywhere, of course, so deciding when and where to keep the antennae out is critical. One such situation involves a product, market, or service that doesn't yet exist—but could. Consider the case of a global advertising company that was investigating (for one of its clients) a US growth opportunity related to child care. Because no one was offering the proposed service, keyword searches on social media (and on the web more broadly) wouldn't work. Instead, the company looked to social-media platforms where it might find weak signals—finally discovering an online content service that allows users to create and share individualized newspapers.

In the child-care arena, digital-content channels are often curated by mothers and fathers, who invite conversations about their experiences and concerns, as well as assemble relevant articles by experts or government sources. Analysts used semantic clues to follow hundreds of fine-grained conversations on these sites. The exercise produced a wealth of relevant information about the types of services available in individual markets, the specific levels of service that parents sought, the prices they were willing to pay, the child-care options companies already sponsored, the strength of local providers (potential competitors), and the people in various communities who might become ambassadors for a new service. This wasn't a number-crunching exercise; instead, it took an anthropological view of local child care—a mosaic formed from shards of information found only on social media. In the end, the weak signals helped the company to define the parameters of a not-yet-existing service.

Spotting visual clues

It's also useful to search for weak signals when customers start engaging with products or services in new, tech-enabled ways, often simply by sharing perceptions about a company's offerings and how they are using them. This can be hard for companies to relate to at first, as it's quite removed from the usual practice of finding data patterns, clustering, and eliminating statistical noise. Spotting weak signals in such circumstances requires managers and employees to have the time and space to surf blogs or seek inspiration through services such as Tumblr or Instagram.

As intangible as these techniques may sound, they can deliver tangible results. US retailer Nordstrom, for example, took

an early interest in the possibilities of Pinterest, the digital-scrapbooking site where users "pin" images they like on virtual boards and share them with a larger community. Displayed on Pinterest, the retailer's products generate significant interest: the company currently has more than four million followers on the site.

Spotting an opportunity to share this online engagement with in-store shoppers, the company recently started displaying popular Pinterest items in two of its Seattle-area stores. When early results were encouraging, Nordstrom began rolling out the test more broadly to capitalize on the site's appeal to customers as the "world's largest 'wish list,'" in the words of one executive.[2] The retailer continues to look for more ways to match other customer interactions on Pinterest with its products. Local salespeople already use an in-store app to match items popular on Pinterest with items in the retailer's inventory. As the "spotting" ability of companies in other industries matures, we expect visual tools such as Pinterest to be increasingly useful in detecting and capitalizing on weak signals.

Crossing functions

As the Nordstrom example demonstrates, listening for weak signals isn't enough—companies must channel what's been learned to the appropriate part of the organization so the findings can influence product development and other operational activities. Interestingly, TomTom, a company that offers products and services for navigation and traffic, found that the mechanism for spotting weak signals proved useful in enhancing its product-development process.

As part of normal operations, TomTom monitored social media closely, mining conversations to feed into performance metrics for marketing and customer-service executives. The normal process changed after an attentive company analyst noted that users posting on a UK forum were focused on connectivity problems. Rather than let the tenuous comments get lost in the company's performance statistics, he channeled them to product-development teams. To resolve the issue, the teams worked directly—and in real time—with customers. That helped short-circuit an otherwise costly process, which would have required drivers using TomTom's offerings to check out connectivity issues in a number of locales. The broader payoff came in the form of new R&D and product-development processes: TomTom now taps directly into its driving community for ideas on design and product features, as well as to troubleshoot new offerings quickly.

At most companies, weak signals will be unfamiliar territory for senior management, so an up-front investment in leadership time will be needed to clarify the strategic, organizational, and resource implications of new initiatives. The new

roles will require people who are comfortable navigating diverse, less corporate sources of information.

Regardless of where companies observe weak signals, the authority to act on them should reside as close to the front lines as possible. Weak signals are strategic enough to demand top-management attention. They are sufficiently important to the day-to-day work of customer-service, technical-development, and marketing teams to make anything other than deep organizational engagement unwise.

[1] See Martin Harrysson, Estelle Métayer, and Hugo Sarrazin, "How 'social intelligence' can guide decisions," *McKinsey Quarterly*, November 2012, mckinsey.com.

[2] See Rachel Brown, "Nordstrom touts merchandise with Pinterest," *Women's Wear Daily*, July 2, 2013, wwd.com.

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Industry dynamics

Global gas markets: The North American factor

Giorgio Bresciani, Dieuwert Inia, and Peter Lambert

New exports of low-cost gas from Canada and the United States could threaten liquefied natural gas projects in other regions.

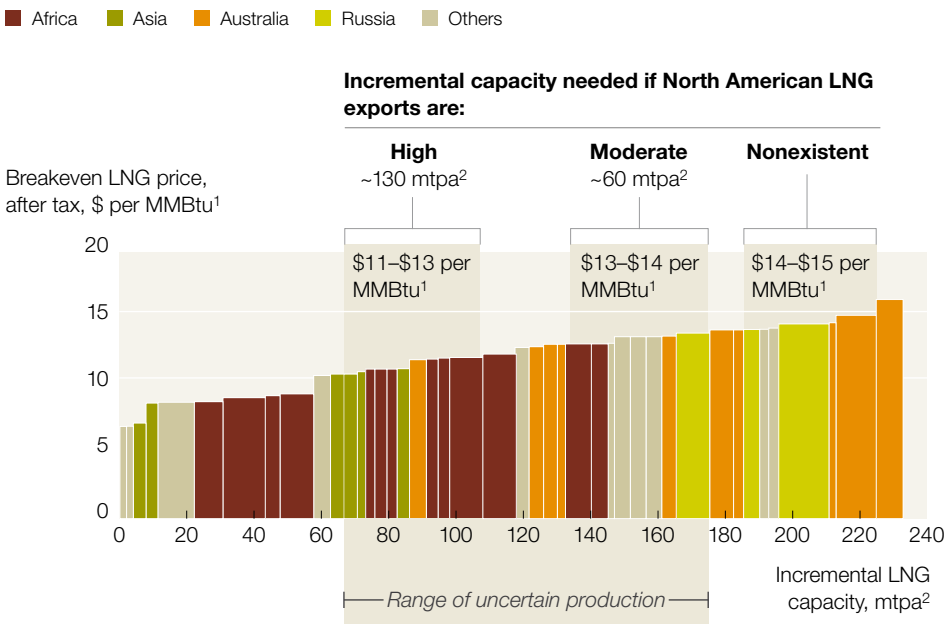
Cost curves, which array blocks of supply according to their expense, can clarify the dynamics of supply in commodity industries. They are particularly useful when multiple new sources compete to serve a finite market. Such a situation exists today for liquefied natural gas (LNG). Exporters from North America—now among the world's low-cost gas producers, given recent advances in recovering shale gas—aim to export LNG in competition mostly with projects in Africa, Australia, and Russia.

The exhibit shows how the required breakeven costs of global LNG projects could shift in three North American export scenarios. The Canadian and US governments have so far permitted the building of six LNG export terminals, with capacity equivalent to 25 percent of current global LNG demand (moderate scenario). An additional 20 terminals, which could process the equivalent of some 75 percent of global demand, have also been proposed. Up to 70 percent of them could actually be built (high scenario). If these additional projects were authorized and constructed, the market would need less capacity from higher-cost exporters in Africa, Australia, and Russia. Of course, the development of unconventional gas sources outside North America, the trajectory of gas demand in Asia, and the evolution of oil prices will also influence global natural-gas supplies.

The authors wish to thank Daniel Cramer, Jaap Strengers, and Rembrandt Sutorius for their contributions to our perspectives on this topic.

Giorgio Bresciani is a director in McKinsey's London office, where **Peter Lambert** is a senior expert; **Dieuwert Inia** is a principal in the Amsterdam office.

Increased liquefied natural gas (LNG) exports from North America would outcompete high-cost supplies.



Understanding this cost curve: The *x*-axis shows available industry capacity in order of increasing cost. Each block in the curve is a distinct facility (or basin) for supplying LNG. The cost curve displays how much each facility is able to supply (*x*-axis) and at what cost (*y*-axis). Facilities whose costs go above a market-driven price point are usually taken offline.

[1]Million British thermal units.
[2]Million metric tons per annum.

Source: McKinsey analysis of data provided by Energy Insights (a McKinsey Solution)

Industry dynamics

Breaking through the start-up stall zone

Ted Callahan, Eric Kutcher, and James Manyika

An early rush of revenue growth is necessary—but not sufficient—for long-term survival.

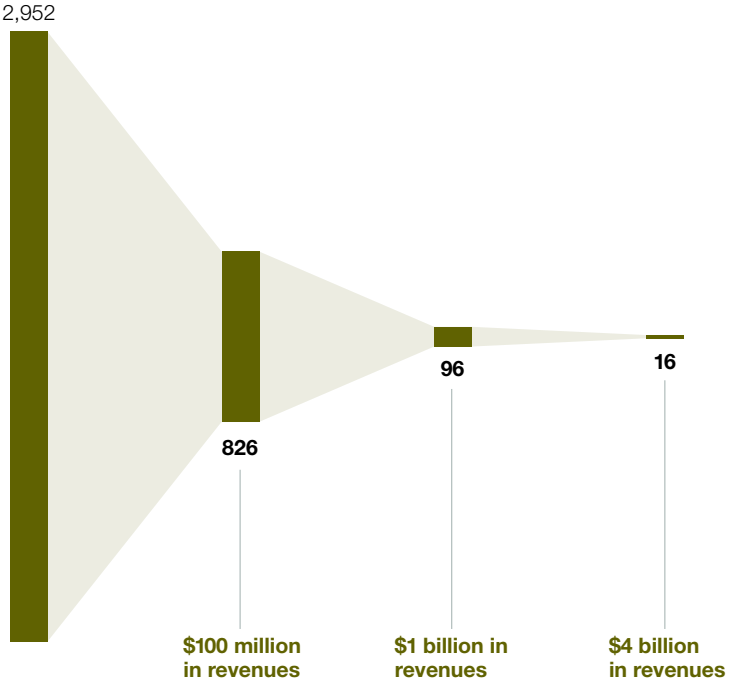
The rapid pace of creative destruction in today's global economy makes the ability to launch and grow (or to shut down and move on from) new businesses critical for companies large and small. Competitive dynamics have long been in overdrive in the software and Internet sectors, where we have studied patterns of birth and death for nearly 3,000 companies between 1980 and 2012. Seventy-two percent of them failed to reach the $100 million mark. Only 3 percent made it to $1 billion in sales (exhibit).

Typically, the small minority of companies that grew from $100 million to $1 billion did so rapidly. Ten percent of companies in the $100 million club grew at annual rates of 60 percent or more within two years of achieving that milestone. This group was eight times more likely than the remaining $100 million companies to hit $1 billion in sales. Staying in the high-growth club appears to depend on a company's ability to create new markets with hundreds of millions of users (think Facebook, Google, or Microsoft), disrupt existing markets through new business models (eBay or salesforce.com), set new and revenue-rich technology standards (Adobe Systems), or develop truly innovative products (Citrix Systems or Electronic Arts). Furthermore, some of these companies (such as Oracle, through a series of acquisitions and industry-consolidation efforts) have been able to transition to an "Act 2" product or market before their "Act 1" was tapped out—a tall order in software or any other industry.

Ted Callahan is an associate principal in McKinsey's Silicon Valley office, where **Eric Kutcher** is a director; **James Manyika** is a director in the San Francisco office and a director of the McKinsey Global Institute.

Very few software companies grow beyond $1 billion in revenues.

Number of software companies[1] that reached given revenue point, 1980–2012, n = 2,952



16 companies with >$4 billion in revenues by 2012

Activision Blizzard
Adobe Systems
CA Technologies
eBay
Electronic Arts
Facebook
Google
Intuit
Microsoft
Nintendo
Oracle
SAP
Symantec
Tencent
VMware
Yahoo!

[1]Companies that are currently public and fall within 1 of the following categories: applications, gaming, Internet, and systems (excludes pure network providers).

Industry dynamics

The next wave of African mobile payments

Jake Kendall and Robert Schiff

Kenya has led the way so far, but the market's potential spans the continent.

Roughly two-thirds of adults in sub-Saharan Africa have a mobile phone, but digital payments have not yet reached their full potential, even though they are vastly more efficient and secure than cash. In the few markets where mobile-payment operators have gained traction, the formula has been to focus on larger payments that happen at a distance and sending cash is risky—including peer-to-peer (P2P) payments such as domestic remittances, as well as wages and payments from government social-benefit programs. More than half of all adults make or receive these payments, which total $760 billion in volume annually, though 50 to 60 percent remains in cash.

One country that is demonstrating more and more of what's possible is Kenya, where the penetration rate for digital payments is 70 percent, mostly because Safaricom's mobile money-transfer system, M-Pesa,[1] has been widely adopted. If P2P and other payments across the region were digitized to current Kenyan levels and P2P payments grew as they did in the country after the launch of M-Pesa, we estimate that digital revenues could rise from $6.6 billion to $15.5 billion (exhibit). About $3.8 billion of that growth would result directly from higher digital-payment rates at today's transaction volumes, the remaining $5.1 billion from more rapid growth in the total number of P2P transactions, such as the increase Kenya experienced between 2006 and 2009 as the number of people transacting and of transactions per person rose steadily. A $15.5 billion prize is equivalent to 25 percent of all African mobile revenues for voice and data—and may be only a fraction of the potential if mobile payments gain ground in retail transactions while enabling financial services such as credit and insurance.

[1] Vodafone developed M-Pesa with grant assistance from the United Kingdom's Department for International Development. The system was launched in 2007 through Vodafone's subsidiary Safaricom.

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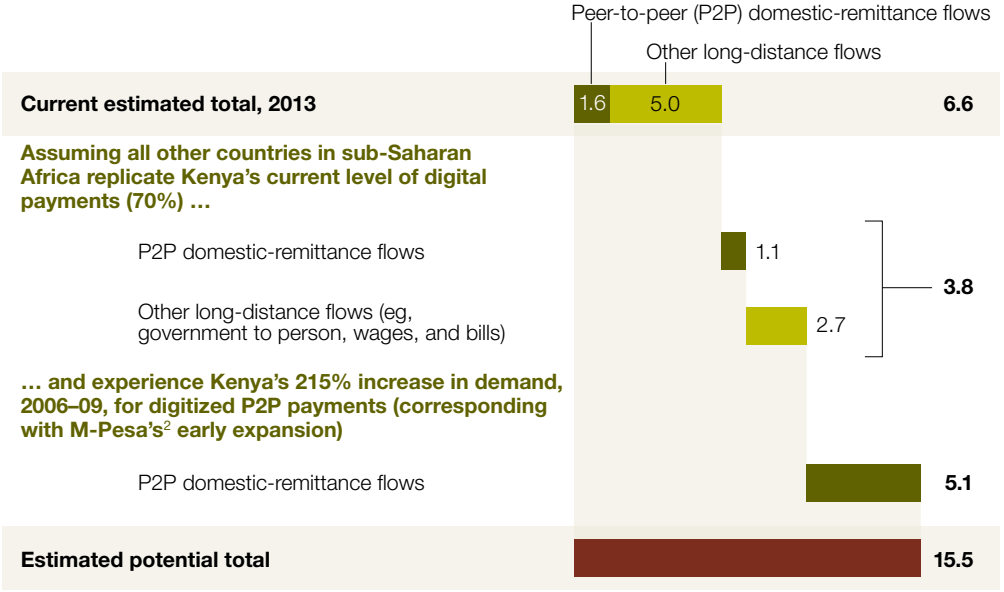
For a more complete discussion of this research, download the full report, *Sub-Saharan Africa: A major potential revenue opportunity for digital payments*, on mckinsey.com.

Mobile-money revenues could more than double if other sub-Saharan African countries achieve Kenya's penetration levels for digitized long-distance transactions.

Total provider revenues associated with mobile-money flows for long-distance payments,[1] $ billion



[1] Long-distance payments include all domestic remittances (even if carried across country to pay in person), government-to-person payments, wages, and bills that are paid remotely, as well as goods or services paid for over a long distance (eg, supplies purchased from merchant in another town). Excludes retail or other payments made in person.

[2] M-Pesa is an SMS-based money-transfer system developed by global telecom Vodafone and operated by Kenyan cell-phone company Safaricom.

Source: 2012 Gallup survey of 1,000 adults in 11 countries: Botswana, the Democratic Republic of the Congo (DRC), Kenya, Mali, Nigeria, Rwanda, Sierra Leone, South Africa, Tanzania, Uganda, and Zambia; Gallup survey was conducted for the Bill & Melinda Gates Foundation; 2006 and 2009 FinScope surveys

Industry dynamics

Uncovering hidden investment opportunities in Africa

Alastair Green, Conor Kehoe, and Farid Sedjelmaci

Recent research on the African private-equity market reveals a mismatch between supply and demand for financing that could point to investment opportunities.

Private equity is set to grow rapidly across Africa. Continent-wide demand for capital should increase by 8 percent a year between now and 2018. Annual growth could reach 20 percent in resource-rich Angola and nine other countries, and $50 billion in total investment is possible over the next decade.[1]

But there will be wide variations by country and industry, and the supply of capital doesn't seem to match the growing demand. Large international investors often prefer proven investment managers, sizable investments, and diversification across Africa. Those preferences may lead them to overlook some attractive—and growing—country and sector gems.

The exhibit shows the mismatch between supply and demand by investment type. On the right are segments with rapidly growing opportunities but relatively little money chasing them. These include infrastructure funds (which some investors view as too risky and politically fraught) and small- and midcap funds in East, West, and Southern Africa (excluding South Africa, which will remain a magnet for funding). On the other end are funds that will probably raise more money but face greater competition to complete attractive deals, often involving larger target companies. Multinationals seeking viable acquisition targets might look outside the active markets to mid-size African companies.

[1] Estimate based on interviews with 70 leaders in the African private-equity market and an analysis of proprietary data.

The authors would like to acknowledge the contributions of Mayamiko Kachingwe to the development of this article.

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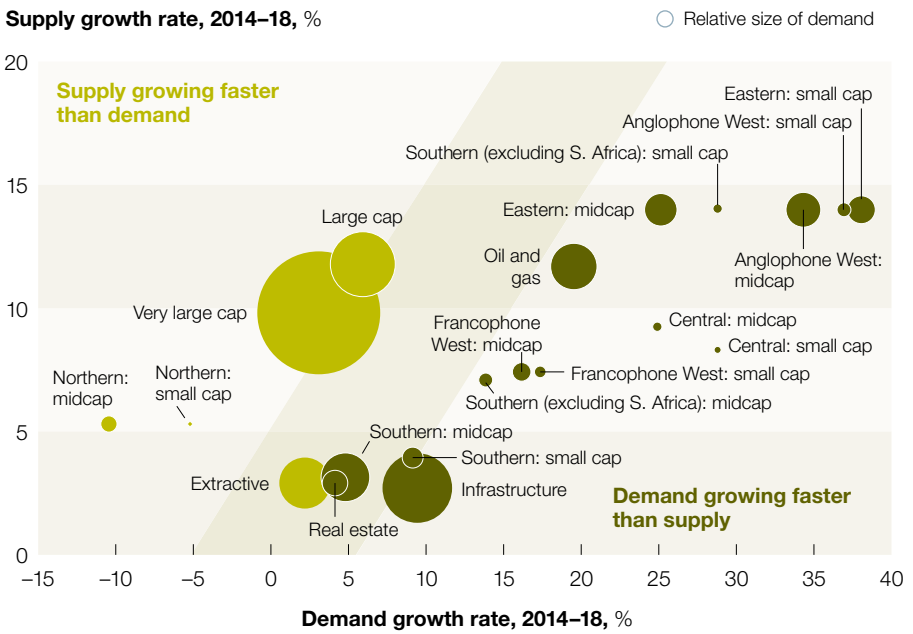
Tracking projected supply and demand in African private equity reveals rapidly growing but underfinanced opportunities.

Distribution of African private equity, based on projected demand and supply growth rates



Source: Standard & Poor's Capital IQ; Preqin; Zawya; McKinsey analysis

Next-shoring: A CEO's guide

Katy George, Sree Ramaswamy, and Lou Rassey

Proximity to demand and innovative supply ecosystems will trump labor costs as technology transforms operations in the years ahead.

The problem

Demand for manufactured goods in emerging markets is surging and fragmenting as factor costs shift; technological advances, such as more powerful robotics and the Internet of Things, are creating a range of new opportunities for manufacturers to digitize operations.

Why it matters

Manufacturing strategies built on labor-cost arbitrage are becoming outmoded; the race is on to get ahead of what comes next.

What to do about it

Place greater emphasis on proximity to both demand and innovation while:

- Making location decisions that balance economies of scale against the growing diversity of tastes within and across global markets
- Building supplier ecosystems that combine technical expertise with local domain and market knowledge
- Developing the people and skills needed to make the most of technological advances across the organization

For a summary of 3-D printing's management implications, see "3-D printing takes shape," on page 40.

When offshoring entered the popular lexicon, in the 1990s, it became shorthand for efforts to arbitrage labor costs by using lower-wage workers in developing nations. But savvy manufacturing leaders saw it as more: a decisive change in globalization, made possible by a wave of liberalization in countries such as China and India, a steady improvement in the capabilities of emerging-market suppliers and workers, a growing ability to transfer proven management processes to new locales, and increasingly favorable transportation and communications economics.

Something of equal moment is occurring today. As we settle into a "new normal" catalyzed by the global financial crisis, the ensuing recession, and an uneven global recovery, traditional arbitrage models seem increasingly outmoded.[1] For some products, low labor costs still furnish a decisive competitive edge, of course. But as wages and purchasing power rise in emerging markets, their relative importance as centers of demand, not just supply, is growing.

Global energy dynamics too are evolving—not just the now-familiar shale-gas revolution in the United States, but also rising levels of innovation in areas such as battery storage and renewables—potentially reframing manufacturers' strategic options. Simultaneously, advances stemming from the expanding Internet of Things, the next wave of robotics, and other disruptive technologies are enabling radical operational innovations while boosting the importance of new workforce skills.

Rather than focus on offshoring or even "reshoring"—a term used to describe the return of manufacturing to developed markets as wages rise in emerging ones—today's manufacturing strategies need to concentrate on what's coming next. A *next-shoring* perspective emphasizes proximity to demand and proximity to innovation. Both are crucial in a world where evolving demand from new markets places a premium on the ability to adapt products to different regions and where emerging technologies that could disrupt costs and processes are making new supply ecosystems a differentiator. Next-shoring strategies encompass elements such as a diverse and agile set of production locations, a rich network of innovation-oriented partnerships, and a strong focus on technical skills.

[1]See Ian Davis, "The new normal," *McKinsey Quarterly*, March 2009, mckinsey.com.

In this article, we'll describe the economic forces sweeping across the manufacturing landscape and examine technologies coming to the fore. Then we'll suggest some principles for executives operating in this new world. The picture we're painting is of necessity impressionistic: next-shoring is still taking shape and no doubt will evolve in unexpected ways. What's increasingly clear, though, is that the assumptions underlying its predecessor, offshoring, are giving way to something new.

Economic fundamentals

The case for next-shoring starts with the economic fundamentals of demand (since the importance of local factors is growing) and supply (as the dynamics of labor and energy costs evolve).

The importance of local demand factors

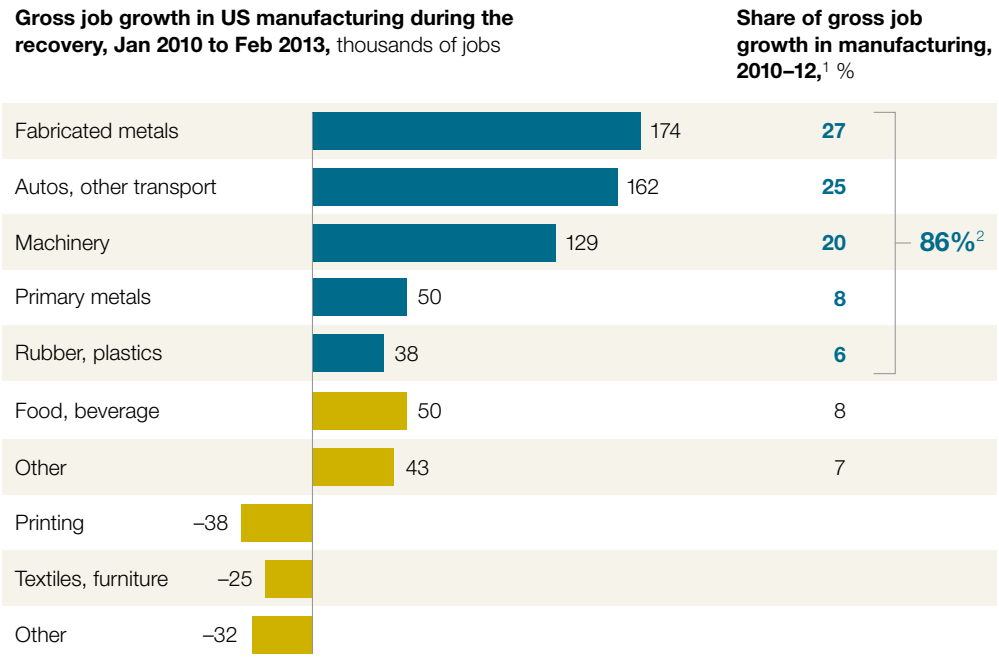
More than two-thirds of global manufacturing activity takes place in industries that tend to locate close to demand. This simple fact helps explain why manufacturing output and employment have recently risen—not only in Europe and North America, but also in emerging markets, such as China—since demand bottomed out during the recession following the financial crisis of 2008.

Regional demand looms large in sectors such as automobiles, machinery, food and beverages, and fabricated metals. In the United States, about 85 percent of the industrial rebound (half a million jobs since 2010) can be explained just by output growth in automobiles, machinery, and oil and gas—along with the linkages between these sectors and locally oriented suppliers of fabricated metals, rubber, and plastics (Exhibit 1).[2] The automotive, machinery, and oil and gas industries consume nearly 80 percent of US metals output, for example.

[2]See *Manufacturing the future: The next era of global growth and innovation*, McKinsey Global Institute, November 2012, on mckinsey.com, for an in-depth analysis of the economics and trends surrounding five types of manufacturing industries: *global technologies* (for instance, electronics) that are R&D intensive and highly traded, *global innovation for local markets* (autos, machinery) that are R&D intensive but tend to produce adjacent to demand, *labor-intensive regional processors* (food, fabricated metals) that are highly localized and locate adjacent to demand, *resource-intensive commodities* (metals, paper and pulp) that are energy intensive and locate near demand or resources, and *labor-intensive tradables* (apparel, footwear) that are highly traded and locate where labor is cheap.

Exhibit 1

In the recent US industrial rebound, about 85 percent of the job growth in manufacturing occurred in automobiles, machinery, and regional-supplier industries.



[1]Figures do not sum to 100%, because of rounding.
[2]Data reflect growth for local-supplier industries to the oil and gas sector, in addition to those for automobiles and machinery.

Source: US Bureau of Labor Statistics; McKinsey Global Institute analysis

In China too, locally oriented manufacturers have contributed significantly to rising regional investment and employment. The country has, for example, emerged as the world's largest market and producer for the automotive industry, and many rapidly growing manufacturing sectors there have deep ties to it. As automotive OEMs expand their capacity in emerging markets to serve regional demand, their suppliers have followed; the number of automotive-supplier plants in Asia has tripled in just the past decade.

The emerging markets' share of global demand is steadily climbing, from roughly 40 percent in 2008 to an expected 66 percent by 2025 (Exhibit 2). As that share rises, it also is fragmenting into many product varieties, feature and quality levels, price points, service

needs, and marketing channels. The regional, ethnic, income, and cultural diversity of markets such as Africa, Brazil, China, and India (where some local segments exceed the size of entire markets in developed nations) is raising the ante for meeting local demand. In the automobile industry, for example, fragmenting customer demand has led to a 30 to 50 percent increase in the number of models. Ninety percent of recent capital expenditures in the automotive sector have involved product derivatives worldwide and capacity expansions in new markets.

The limits of labor-cost arbitrage

Surging local demand helps explain why rapid wage growth in China hasn't choked off manufacturing expansion there. Wages have nearly doubled since 2008, partly as a result of domestic minimum-wage policies.[3] (The country's 2011 five-year plan called for 13 percent average annual minimum-wage increases, a rate some provinces have already exceeded.) True, in a few labor-intensive, trade-oriented industries, such as apparel production and consumer electronics, labor-cost changes do tend to tip the balance between different geographic regions; manufacturing employment in Bangladesh and Vietnam, for instance, has benefited from China's wage surge, even as Chinese manufacturers are seeking to raise productivity.

But these are far from the only implications of rising wages. Just as Henry Ford's $5 day helped create a new consuming class, so higher wages in China are increasing local demand, thus reinforcing the local-investment choices of OEMs and suppliers. At the same time, there is little evidence of a zero-sum game between China and advanced economies, such as the United States. Rather, the narrowing labor-cost gap reinforces the importance of local demand factors in driving manufacturing employment. Indeed, factor costs often have the greatest impact on location decisions *within* a region—for example, Airbus moving to Alabama instead of Texas or North Carolina. These costs interact with policy factors, such as infrastructure spending and tax incentives, to shape a region's overall economic attractiveness.

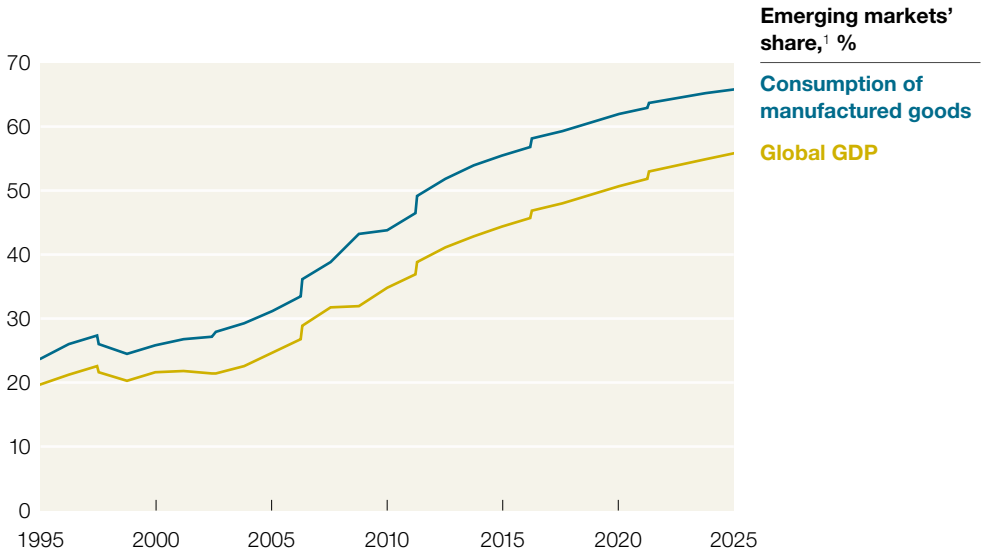
The impact of energy costs

The price of natural gas in the United States has fallen by two-thirds as gas production from shale deposits rose by 50 percent annually since 2007. A narrow range of sectors—gas-intensive manufacturing,

[3]Measured in nominal dollars.

Exhibit 2

Emerging markets' share of global demand is expected to reach 66 percent by 2025.



[1]Both measured in US dollars.

Source: IHS Global Insight; McKinsey Global Institute analysis

such as the production of petrochemicals, fertilizer, and steel—are benefiting most directly. Some downstream players in the energy value chain have begun shifting investments. Dow Chemical, BASF, and Methanex, for example, have announced plans for new US manufacturing capacity to take advantage of cheaper, abundant energy supplies.

These moves are important for such companies and subsectors; McKinsey Global Institute (MGI) research suggests that by 2020, lower-cost energy could boost US GDP by somewhere between $400 billion and $700 billion.[4] But do they presage a dramatic rebalancing of global manufacturing activity? Electricity costs were already lower in the United States than in many countries, including China—which, along with others, also has opportunities to boost its own energy output through hydraulic fracturing. And fossil fuels aren't the only area where the energy-supply picture is morphing.

[4]For more, see the full McKinsey Global Institute report, *Game changers: Five opportunities for US growth and renewal*, July 2013, on mckinsey.com.

Consider, for example, the potential impact of energy-storage technologies, especially lithium-ion batteries and fuel cells, which are becoming more capable and less costly. At the same time, the improving economics of renewable-energy production—particularly solar and wind power—offers manufacturers an expanding range of future supply options. In some developing regions where power grids are unreliable or nonexistent, factory complexes served by distributed solar power may be feasible. Distributed generation is also growing in combined heat–power (CHP) plants, which use heat created in the production process to run steam turbines and generate electricity locally.

None of these is a silver bullet today. But as advances continue over time, more and more companies may become able to ask themselves where they would place major strategic bets if the availability and price of energy were lesser concerns. That too will probably lead back to a focus on local demand patterns. Interestingly, the country representing the greatest source of future demand growth—China—also is actively stimulating the development of a range of new energy sources and storage technologies through a focus on new strategic industries in its five-year plans.[5]

Technology disruption ahead

Technology is affecting far more than energy dynamics. Advanced robotics, 3-D printers, and the large-scale digitization of operations are poised to alter fundamental assumptions about manufacturing costs and footprints.[6] To derive value from these shifts, companies will have to make significant investments and ensure access to hubs of innovation, capable suppliers, and highly skilled workers.

Advanced robotics

Investments in industrial robots have increased by nearly 50 percent since 2008—even in emerging nations such as China—as a new generation of advanced systems develops, with greater dexterity and ability to process information. These robots can perform an expanding

[5]See Guangyu Li and Jonathan Woetzel, "What China's five-year plan means for business," July 2011, mckinsey.com.

[6]For more, see *Disruptive technologies: Advances that will transform life, business, and the global economy*, McKinsey Global Institute, May 2013, on mckinsey.com.

array of factory tasks—for instance, manipulating small electronic parts, and picking and packing individual products. They can work side by side with humans and be trained by factory-floor operators rather than programmed by teams of highly paid engineers. Improved economics and capabilities eventually may yield productivity gains that are unforeseen today, as well as better products and faster speed to market. As that happens, companies will be able to retool their manufacturing systems to provide new roles for these mechanical "workers."

Cheaper, more proficient robots that can substitute for a wider variety of human tasks are another reason companies may locate more manufacturing closer to major demand markets, even where wage rates are higher. In developing nations, robots could speed up rates of automation and help bridge shortages of some production skills. MGI research suggests that 15 to 25 percent of the tasks of industrial workers in developed countries and 5 to 15 percent of those in developing countries could be automated by 2025.

Further out, highly robotized factories also equipped with other information technologies might shift competition to areas such as the ownership of customer networks, which should become increasingly valuable as information embedded in them starts guiding production priorities and flows. Flexible, intelligent assembly robots also should enable contract manufacturers to serve an increasingly diverse range of customers, creating new opportunities for attackers to target attractive microsegments.

3-D printing

The economics of 3-D printing are improving rapidly, as well. While still only a sliver of value in the manufacturing sector (0.02 percent), sales of 3-D printers are set to double, to $4 billion, by 2015, and prices for the equipment are declining swiftly.[7] Also, 3-D printers open up the possibility of more distributed production networks and radical customization. In early manufacturing applications, some companies are using the devices to accelerate product development, since they eliminate wait times for prototyping by faraway specialists. Companies will be able to consider new supply-chain models and, in some cases, replace traditional suppliers of parts with targeted usage of in-house printers.

[7] *Wohlers Report 2013: Additive Manufacturing and 3D Printing State of the Industry*, Wohlers Associates, May 2013, wohlersassociates.com.

These printers won't replace traditional high-volume modes of production, such as die casting and stamping. For more specialized goods, though, it's easy to imagine the emergence of service businesses—the equivalent of copy or print shops—that would manufacture items based on design specifications provided by B2B or B2C customers. Crowdsourcing networks for new-product ideas could one day complement traditional R&D activities for some manufacturers. (For more on 3-D printing, see "3-D printing takes shape," on page 40.)

Digitized operations

Significant as advanced robotics and 3-D printers are, they represent just two plot lines in a much bigger story about the digitization of operations. Cloud computing, mobile communications, and the Internet of Things[8] are beginning to combine with advanced analytics to create threads of intelligent data that link assets and stakeholders as never before. Increasingly, products will communicate with each other, with robots and advanced machines inside factories, and with customers and suppliers. Digital "DNA" for parts (including the materials, equipment, and time required to make them) will also be increasingly available.

The implication is that we are approaching a day when manufacturers will have unprecedented global visibility into who makes what, where, and how well. They'll be able to run virtual operations "war rooms" on their phones. They'll have new opportunities to solve plant-floor optimization problems as intelligent machines interface with each other and with people on the line. In the near future, manufacturers also will exploit opportunities for crowdsourced design and on-demand production. These opportunities will extend well beyond goods made by 3-D printers; manufacturers will pursue the buying and selling of previously underutilized production lines "by the hour" and will rely on dynamic databases to determine what every part should cost. And new forms of technology-enabled collaboration, such as the three-dimensional virtual assembly and testing of vehicles, will redefine what it means to be proximate to innovation—which may be locally generated or accessed via broadband.

Digital operations aren't a far-off fantasy. GE already has a 400-person industrial Internet software team and its employees use iPads to run an advanced battery factory in New York State. Amazon.com is employing

[8]The growing collection of sensors and actuators embedded in products and equipment.

growing numbers of smart warehouse robots. Fiat has reduced the number of physical prototypes needed to introduce a new product; Alcoa has compressed prototyping time and costs for some products; and an auto supplier recently slashed an eight-month prototyping process to one week.

Next-shoring

Although these forces are still gathering strength, they're already pointing toward two defining priorities for manufacturing strategy in the era of next-shoring: proximity to *demand* and proximity to *innovation*, particularly an innovative base of suppliers. In developed and emerging markets alike, both ingredients will be critical. Next-shoring isn't about the shift of manufacturing *from* one place *to* another but about adapting to, and preparing for, the changing nature of manufacturing everywhere.

Optimizing location decisions

Being close to demand is particularly important at a time when consumption in emerging markets is growing rapidly, boosting with it the diversity of the regional preferences that manufacturers must contend with. In a 2012 interview with McKinsey, Timken CEO James Griffith explained his company's approach: "Over the last ten years, we've added a very strong Eastern European, Indian, and Chinese manufacturing base," not because wages are low there "but because those were the markets that were growing." This expansion has been accompanied by a strategic shift away from a focus on automotive parts—"we could make a car last for a million miles, but nobody cares." The new emphasis is on fast-growing mining, trucking, steelmaking, and cement-making customers in emerging markets. For them, Timken's reliability is a decisive asset.[9]

Locating manufacturing close to demand makes it easier to identify and meet local needs. It's a delicate balancing act, though, to create an efficient global manufacturing footprint that embraces a wide range of local tastes, since economies of scale still matter in many industries. Volkswagen has coped by moving from vehicle platforms to more modular architectures that provide greater flexibility for manufacturing several product variants or derivatives.

[9] See "Manufacturing's new era: A conversation with Timken CEO James Griffith," December 2012, mckinsey.com.

New products, market segments, and consumer preferences are combining with perennial risks (such as seasonal variations in demand and fluctuations in wages and currency rates) to boost uncertainty in manufacturing and supply networks. That uncertainty places a premium on operational agility—the ability to adapt design, production, and supply chains rapidly to fluctuating conditions.[10] This too may play into location decisions.

Take the experience of a consumer-products company that had relied on one plant to supply its major market. When the company began experiencing unaccustomed spikes in regional and seasonal purchasing patterns, shortages and lost sales ensued. To accommodate rising variations in demand, the company built a second plant, with similar cost characteristics, in a different region. This additional capacity helped ensure supplies to the prime market, where the problems were most acute, while also allowing the company to meet growing demand opportunistically in several new markets close to the new plant. Although the investment was considerable, it lowered the company's risk exposure, eliminated damaging stockouts, and improved the bottom line.

Building supplier ecosystems

New combinations of technical expertise and local domain knowledge will become the basis for powerful new product strategies. Responsive, collaborative, and tech-savvy supplier ecosystems will therefore be increasingly important competitive assets in a growing number of regional markets. To keep up with the opportunities afforded by technological change, for example, a major manufacturer that until recently had relied on a low-cost supplier in Mexico for parts has begun working with a new supplier that has cutting-edge 3-D printing capabilities. The new relationship has lowered stocking costs (since parts are made on demand), while providing avenues for developing prototypes more quickly.

Examples like this are just a start. As information flows among partners become more robust, they will usher in a range of improvements, from surer logistics to better payment systems. These will create a virtuous cycle of collaborative benefits. The supply bases of many manufacturers thus may soon need significant upgrades and capital

[10] For more on operational agility, see Mike Doheny, Venu Nagali, and Florian Weig, "Agile operations for volatile times," *McKinsey Quarterly*, May 2012, mckinsey.com.

investments to create joint competencies in areas such as robotics. Collaboration and management investment in skill-development programs could be necessary as well. In some cases, it may be valuable to collaborate with local or national governments to create the conditions in which the manufacturing ecosystems of the future can flourish. Tighter supply networks also will foster production systems that reduce the need for virgin natural resources, a topic addressed in more detail by our colleagues in "Remaking the industrial economy," on page 46.

A failure to develop innovative supply ecosystems will have growing competitive implications for countries as well as companies. The competitive challenges facing the United States sometimes look more like a system failure than an economic one. US investment in advanced robotics, for example, often lags behind that of other developed economies, with trade deficits prevailing even in sectors where wage-rate differentials aren't a big influence on location decisions.

Developing people and skills

All this will place a premium on manufacturing talent, creating a range of regional challenges. In Europe and the United States, educational institutions aren't producing workers with the technical skills advanced manufacturers need. In developing economies, such as China, the millions of lower-cost production associates who are well adapted to routine manufacturing may find it difficult to climb to the next level. Line supervisors—often fresh out of regional universities—struggle to manage baseline operations and to coordinate teams. Organizations will need to invest more in formal training and on-the-job coaching to bridge the gaps. They must also cast a wider net, supporting local community colleges and technical institutes to shape curricula and gain access to new talent streams.

A related challenge is the need for new management muscle. As it gets harder to hide behind labor-cost arbitrage, regional manufacturing executives and midlevel managers will need to become both better at running a tight operational ship and more versatile. They should be able to grasp the productivity potential of a range of new technologies and have enough ground-level knowledge of local markets to influence product strategies and investment trade-offs. The

ability to build external relationships—with suppliers, education partners, and local-government officials who can influence the development of vibrant, sophisticated supply ecosystems—will also be a source of competitive advantage.

• • •

Next-shoring will look different in different locales, of course. Europe and the United States have impressive advantages in areas such as biopharmaceuticals, automotive engineering, and advanced materials. China, meanwhile, is quickly climbing the expertise curve, with increasingly sophisticated corporate and university research facilities and growing experience in advanced processes and emerging industries.[11] In the world we're entering, the question won't be whether to produce in one market for another but how to tailor product strategies for each and how to match local needs with the latest veins of manufacturing know-how and digital expertise. While the road map for every company, industry, and location will be different, we believe that the principles we've laid out here should be useful for all.

[11] See Gordon Orr and Erik Roth, "The CEO's guide to innovation in China," *McKinsey Quarterly*, February 2012; and "China's innovation engine picks up speed," *McKinsey Quarterly*, June 2013, both available on mckinsey.com.

The authors would like to thank Michael Chui, James Manyika, and Venu Nagali for their contributions to this article.

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3-D printing takes shape

Daniel Cohen, Matthew Sargeant, and Ken Somers

Additive manufacturing is evolving quickly. Senior executives should begin preparing for five disruptions that will accompany it.

3-D printing, or additive manufacturing,[1] has come a long way from its roots in the production of simple plastic prototypes. Today, 3-D printers can not only handle materials ranging from titanium to human cartilage but also produce fully functional components, including complex mechanisms, batteries, transistors, and LEDs.

The capabilities of 3-D printing hardware are evolving rapidly, too. They can build larger components and achieve greater precision and finer resolution at higher speeds and lower costs. Together, these advances have brought the technology to a tipping point—it appears ready to emerge from its niche status and become a viable alternative to conventional manufacturing processes in an increasing number of applications.

Should this happen, the technology would transform manufacturing flexibility—for example, by allowing companies to slash development time, eliminate tooling costs, and simplify production runs—while making it possible to create complex shapes and structures that weren't feasible before. Moreover, additive manufacturing would help companies improve the productivity of materials by eliminating the waste that accrues in traditional (subtractive) manufacturing and would thus spur the formation of a beneficial circular economy (for

[1]Additive-manufacturing techniques build objects layer by layer, rather than through molding or "subtractive" techniques, such as machining.

more, see "Remaking the industrial economy," on page 46). The economic implications of 3-D printing are significant: McKinsey Global Institute research suggests that it could have an impact of up to $550 billion a year by 2025.[2]

The advantages of 3-D printing over other manufacturing technologies could lead to profound changes in the way many things are designed, developed, produced, and supported. Here are five 3-D printing disruptions that senior executives should begin preparing for.

Accelerated product-development cycles

Reducing time in product development was a key benefit of the first 3-D printing machines, which were designed to speed the creation of product prototypes (and in some cases helped reduce turnaround times to a matter of hours, from days or weeks). Now many industries are poised for a second wave of acceleration as the line between additive and conventional manufacturing blurs.

For example, additive manufacturing is already being used to get prototypes into the hands of customers faster, for quicker and more detailed feedback. (This is happening thanks to advances in printer resolution, higher-definition coloration, and the broader use of materials, such as elastomers, that help customers envision the final product.) The ability to make prototypes without tooling lets companies quickly test multiple configurations to determine customer preferences, thus reducing product-launch risk and time to market. Companies could even go into production using 3-D printed parts and start selling products while the traditional production tools were still being manufactured or before the decision to produce them had been made. When companies did order those tools, they could use additive-manufacturing techniques to make them, saving even more time and money.

We expect that the use of such techniques will contribute to significant reductions in product-development cycle times over the next decade. (For example, 3-D printing makes some aspects of day-to-day R&D

[2] For the full McKinsey Global Institute report, see *Disruptive technologies: Advances that will transform life, business, and the global economy*, May 2013, on mckinsey.com.

work, such as producing simple lab apparatus, vastly more productive.) Over time, 3-D printing will begin to affect how companies think about R&D more broadly, given how the technology enhances the ability to crowdsource ideas through remote cooperation. For some companies, that crowdsourced brainpower might one day begin supplanting R&D activities, making its management a new priority.

2 New manufacturing strategies and footprints

As of 2011, only about 25 percent of the additive-manufacturing market involved the direct manufacture of end products. With a 60 percent annual growth rate, however, that is the industry's fastest-growing segment. As costs continue to fall and the capabilities of 3-D printers increase, the range of parts that can be economically manufactured using additive techniques will broaden dramatically. Boeing, for example, already uses printers to make some 200 part numbers for ten different types of aircraft, and medical-products companies are using them to create offerings such as hip replacements.[3]

Nonetheless, not every component will be a candidate for the technology and reap its benefits (cost reductions, performance improvements, or both). Companies should understand the characteristics that help determine which ones are. These include components with a high labor-cost element (such as time-consuming assembly and secondary machining processes), complex tooling requirements or relatively low volumes (and thus high tooling costs), or high obsolescence or scrap rates. Forward-looking manufacturers are already investigating ways of triaging their existing parts inventories to determine which hold the most potential.

Additive-manufacturing techniques also have implications for manufacturing-footprint decisions. While there is still a meaningful labor component to 3-D printed parts, the fact that it is lower than that of conventionally manufactured ones might, for example, tip the balance toward production closer to end customers. Alternatively, companies could find that the fully digital nature of 3-D printing

[3]For example, the Mayo Clinic uses 3-D printed hip-joint models—which are based on patient CT scans—to run practice surgeries. Later, the models are sent to a manufacturer that produces custom implants.

makes it possible to produce complex parts in remote countries with lower input costs for electricity and labor.

A related area that executives should watch with interest is the development of the market for printing materials. The cost of future materials is uncertain, as today many printers use proprietary ones owned or licensed by the manufacturer of the printing equipment. Should this change and more universal standards develop—thus lowering prices—the implications for executives devising manufacturing strategies and making footprint decisions would become very significant very quickly.

Shifting sources of profit

Additive-manufacturing technologies could alter the way companies add value to their products and services. The outsourcing of conventional manufacturing helped spur companies such as Nike to rely more on their design skills. Likewise, 3-D printing techniques could reduce the cost and complexity of other kinds of production and force companies to differentiate their products in other ways. These could include everything from making products more easily reparable (and thus longer lived) to creating personalized designs.

Indeed, reducing the reliance on hard tooling (which facilitates the manufacture of thousands of identical items) creates an opportunity to offer customized or bespoke designs at lower cost—and to a far broader range of customers. The additive manufacture of individualized orthodontic braces is just one example of the potential of these technologies. As more such offerings become technically viable, companies will have to determine which are sufficiently appealing and commercially worthwhile. The combination of mass customization and new design possibilities will up the ante for many companies and could prove very disruptive to traditional players in some segments.

In certain parts of the value chain, the application of additive manufacturing will be less visible to customers, although its impact may be just as profound. A key challenge in traditional aftermarket supply chains, for example, is managing appropriate inventories of spare parts, particularly for older, legacy products. The ability to

manufacture replacement parts on demand using 3-D printers could transform the economics of aftermarket service and the structure of industries. Relatively small facilities with on-site additive-manufacturing capabilities could replace large regional warehouses. The supply of service parts might even be outsourced: small fabricators (or fabs) located, for example, at airports, hospitals, or major manufacturing venues could make these parts for much of the equipment used on site, with data supplied directly by the manufacturers.

Of course, retailers too could someday use fabs—for example, to let customers tailor products such as toys or building materials to suit their needs. That business model could represent a value-chain play for manufacturers if, for instance, they owned the machines, core designs, or both.

New capabilities

Design is inherently linked to methods of fabrication. Architects can't design houses without considering construction techniques, and engineers can't design machines without considering the benefits and limitations of casting, forging, milling, turning, and welding. While there is a wealth of knowledge around design for manufacturing, much less is available on design for printing. Our conversations with executives at manufacturing companies suggest that many are aware of this gap and scrambling to catalog their design know-how.

Getting the most out of additive-manufacturing techniques also involves technical challenges, which include setting environmental parameters to prevent shape distortion, optimizing the speed of printing, and adjusting the properties of novel materials. Indeed, tuning materials is quite a challenge. While plastics are relatively straightforward to work with, metals are more difficult. Slurries and gels (for example, living tissue or the material for printed zinc–air batteries) are extremely difficult.

The most successful players will understand these challenges. Some are already creating centers of excellence and hiring engineers with strong experience in additive manufacturing.

Disruptive competitors

Many benefits of 3-D printing could cut the cost of market entry for new players: for example, the use of the technology to lower tooling costs makes it cheaper to begin manufacturing, even at low volumes, or to serve niche segments. The direct manufacturing of end products greatly simplifies and reduces the work of a designer who would only have to take products from the computer screen to commercial viability. New businesses are already popping up to offer highly customized or collaboratively designed products. Others act as platforms for the manufacture and distribution of products designed and sold online by their customers. These businesses are gaining insights into consumer tastes and building relationships that established companies could struggle to match.

Initially, these new competitors will be niche players, operating where consumers are willing to pay a premium for a bespoke design, complex geometry, or rapid delivery. Over the longer term, however, they could transform industries in unexpected ways, moving the source of competitive advantage away from the ability to manufacture in high volumes at low cost and toward other areas of the value chain, such as design or even the ownership of customer networks. Moreover, the availability of open-source designs for 3-D printed firearms shows how such technologies have the potential to create ethical and regulatory dilemmas and to disrupt industries.

The authors would like to thank Michael Chui and Markus Hammer for their contributions to this article.

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Remaking the industrial economy

Hanh Nguyen, Martin Stuchtey, and Markus Zils

A regenerative economic model—the circular economy—is starting to help companies create more value while reducing their dependence on scarce resources.

The problem
Unprecedented prices and volatility in natural-resource markets are pressuring the traditional "take, make, and dispose" approach to manufacturing.

Why it matters
Creating an industrial system that restores material, energy, and labor inputs would benefit business and society alike. The savings in materials alone could top $1 trillion a year.

What to do about it
Learn how value is created in a circular economy to better design and optimize products for multiple cycles of disassembly and reuse.

Create new relationships with customers to ensure materials are returned.

Focus on the economics and logistics of turning products into materials—not just the other way around.

Cooperate with other companies in the precompetitive sphere in order to create scalable markets for complex materials.

To learn how the Dutch manufacturer Philips is benefiting from circular-economy thinking, see "Toward a circular economy: Philips CEO Frans van Houten," on page 64.

Visualize, for a moment, the industrial economy as a massive system of conveyor belts—one that directs materials and energy from resource-rich countries to manufacturing powerhouses, such as China, and then spirits the resulting products onward to the United States, Europe, and other destinations, where they are used, discarded, and replaced. While this image is an exaggeration, it does capture the essence of the linear, one-way production model that has dominated global manufacturing since the onset of the Industrial Revolution.

Increasingly, however, the linear approach to industrialization has come under strain. Some three billion consumers from the developing world will enter the middle class by 2030. The unprecedented size and impact of this shift is squeezing companies between rising and less predictable commodity prices, on the one hand, and blistering competition and unpredictable demand, on the other. The turn of the millennium marked the point when a rise in the real prices of natural resources began erasing a century's worth of real-price declines. The biggest economic downturn since the Great Depression briefly dampened demand, but since 2009, resource prices have rebounded faster than global economic output (Exhibit 1). Clearly, the era of largely ignoring resource costs is over.

In light of volatile markets for resources, and even worries about their depletion, the call for a new economic model is getting louder. In response, some companies are questioning the assumptions that underpin how they make and sell products. In an effort to keep control over valuable natural resources, these companies are finding novel ways to reuse products and components. Their success provokes bolder questions. Could economic growth be decoupled from resource constraints? Could an industrial system that is regenerative by design—a "circular economy," which restores material, energy, and labor inputs—be good for both society *and* business? If the experience of global automaker Renault is any indicator, the answer appears to be yes.

- Renault's plant in Choisy-le-Roi, near Paris, remanufactures automotive engines, transmissions, injection pumps, and other components for resale. The plant's remanufacturing operations use 80 percent less energy and almost 90 percent less water (as well as generate about 70 percent less oil and detergent waste)

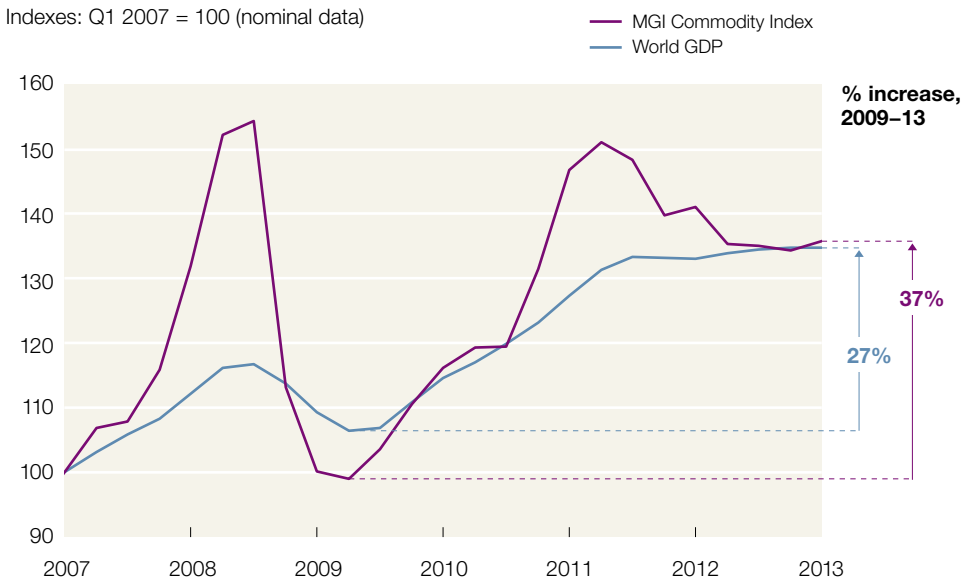
than comparable new production does. And the plant delivers higher operating margins than Renault as a whole can boast.

- More broadly, the company redesigns certain components to make them easier to disassemble and use again. It also targets components for closed-loop reuse, essentially converting materials and components from worn-out vehicles into inputs for new ones. To support these efforts, Renault formed joint ventures with a steel recycler and a waste-management company to bring end-of-use expertise into product design. Together, these moves help Renault save money by maintaining tighter control of its raw materials throughout its vehicles' life cycles—or *use cycles*.

- Renault also works with suppliers to identify "circular benefits" that distribute value across its supply chain. For example, the company helped its provider of cutting fluids (a coolant and lubricant used in machining) to shift from a sales- to a performance-based model. By changing the relationship's nature and terms, Renault

Exhibit 1

Since 2009, resource prices have rebounded more quickly than global economic output.



Source: Food and Agriculture Organization of the United Nations (FAO); International Monetary Fund (IMF); Organisation for Economic Co-operation and Development (OECD); Oxford Economics; World Bank; UN Comtrade database; McKinsey Global Institute (MGI) analysis

motivated the supplier to redesign the fluid and surrounding processes for greater efficiency. The result was a 90 percent reduction in the volume of waste discharge. This new arrangement benefits both companies: the supplier is moving up the value chain so that it can be more profitable, while Renault's total cost of ownership for cutting fluids fell by about 20 percent.

Renault's experience is just one data point in a growing body of evidence suggesting that the business opportunities in a circular economy are real—and large. In this article, we'll explore the concept of such an economy, examine the arguments and economics underpinning it, and discuss the challenges that must be overcome to make it a reality. The work, which draws on McKinsey's recent collaboration with the Ellen MacArthur Foundation and the World Economic Forum[1] (see sidebar, "An enabler in a big system," on page 54) suggests that in addition to the implicit environmental benefits that a circular economy would bring, there is a significant economic impact. In fact, our research suggests that the savings in materials alone could exceed $1 trillion a year by 2025 and that, under the right conditions, a circular economy could become a tangible driver of global industrial innovation, job creation, and growth for the 21st century.

Circular thinking

A circular economy replaces one assumption—disposability—with another: restoration. At the core, it aims to move away from the "take, make, and dispose" system by designing and optimizing products for multiple cycles of disassembly and reuse.[2] This effort starts with materials, which are viewed as valuable stock to be used again, not as elements that flow through the economy once. For a sense of the scale involved, consider the fast-moving consumer-goods

[1]This work is summarized in three reports: *Towards the Circular Economy: Accelerating the scale-up across global supply chains*, World Economic Forum, January 2014; *Towards the circular economy: Economic and business rationale for an accelerated transition*, Ellen MacArthur Foundation, January 2012; and *Towards the circular economy: Opportunities for the consumer goods sector*, Ellen MacArthur Foundation, January 2013. All are available on ellenmacarthurfoundation.org.

[2]For readers interested in learning more about circular economies and the thinking behind them, we recommend two seminal books: Michael Braungart and William McDonough, *Cradle to Cradle: Remaking the Way We Make Things*, first edition, New York, NY: North Point Press, 2002; and Walter R. Stahel, *The Performance Economy*, second edition, Basingstoke, Hampshire: Palgrave Macmillan, 2010.

industry: about 80 percent of the $3.2 trillion worth of materials it uses each year is not recovered.

The circular economy aims to eradicate waste—not just from manufacturing processes, as lean management aspires to do, but systematically, throughout the various life cycles and uses of products and their components. (Often, what might otherwise be called waste becomes valuable feedstock for successive usage steps.) Indeed, tight component and product cycles of use and reuse, aided by product design, help define the concept of a circular economy and distinguish it from recycling, which loses large amounts of embedded energy and labor.

Moreover, a circular system introduces a strict differentiation between a product's consumable and durable components. Manufacturers in a traditional economy often don't distinguish between the two. In a circular economy, the goal for consumables is to use nontoxic and pure components, so they can eventually be returned to the biosphere, where they could have a replenishing effect. The goal for durable components (metals and most plastics, for instance) is to reuse or upgrade them for other productive applications through as many cycles as possible (Exhibit 2). This approach contrasts sharply with the mind-set embedded in most of today's industrial operations, where even the terminology—value chain, supply chain, end user—expresses a linear view.

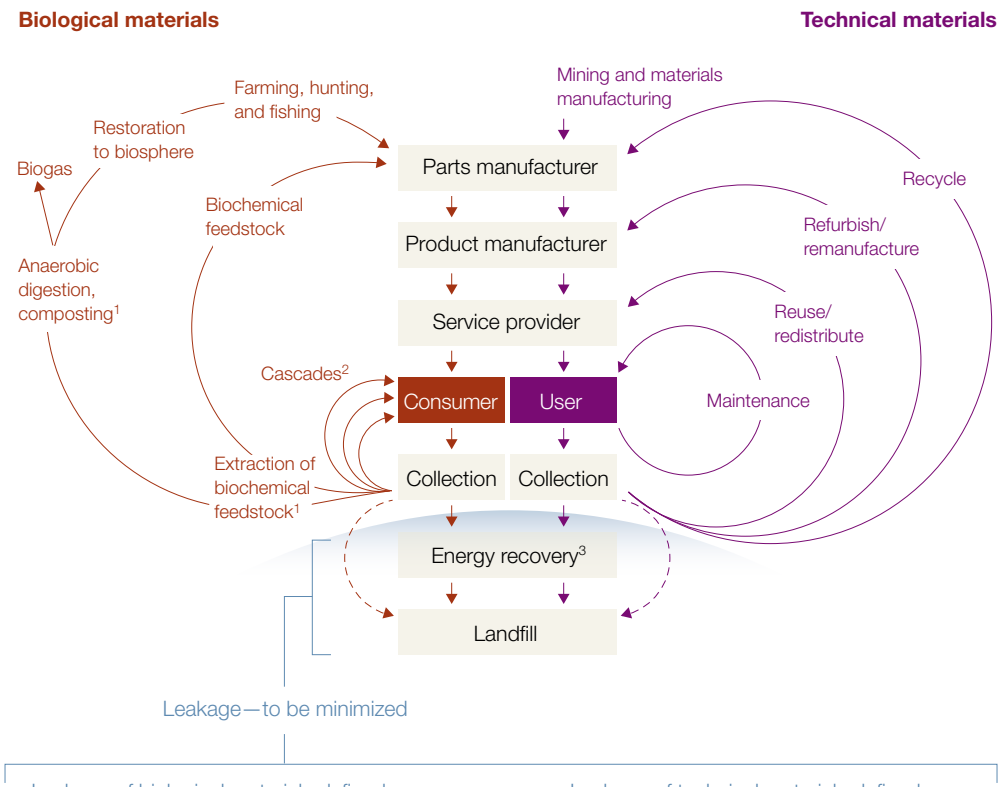
Since restoration is the default assumption in a circular economy, the role of consumer is replaced by that of user. For companies, this change requires a different way of thinking about their implicit contract with customers. For example, in a buy-and-consume economy, the goal is to sell the product. In a circular economy, the aspiration might be to rent it out to ensure that its materials were returned for reuse. When products must be sold, companies would create incentives to guarantee their return and reuse. While all this might sound rather utopian, a number of companies are starting to pull four (often mutually reinforcing) levers to convert theory into hard-hitting practice.

1. The power of the inner circle

Ricoh, a global maker of office machines, designed its GreenLine brand of office copiers and printers to maximize the reusability of

Exhibit 2

In a circular economy, products are designed to enable cycles of disassembly and reuse, thus reducing or eliminating waste.



[1]Can take both postharvest and postconsumer waste as an input.
[2]Diversifying reuse across value streams—eg, cotton clothing reused as secondhand clothing, as fiber fill for upholstery, and as insulatation for construction.
[3]Can reduce opportunities for reuse of materials. For example, excess capacity of incinerators could set up competition between their operators and recyclers for end-of-use materials.

Source: *Towards the Circular Economy: Accelerating the scale-up across global supply chains*, World Economic Forum, January 2014

products and components, while minimizing the use of virgin materials. Products returning from their leasing contracts are inspected, dismantled, and taken through an extensive refurbishing process that includes replacing components and updating software before the machines reenter the market. By designing the components to be reused or recycled in Ricoh facilities, the company reduces the

need for new materials in production and creates a tight "inner circle" of use that allows it to employ less material, labor, energy, and capital. GreenLine products are now offered in six major European markets, where they account for 10 to 20 percent of Ricoh's sales by volume and earn margins that are as much as two times higher than those of the company's comparable new products—without a reduction in quality.

For products that can't be remanufactured, refurbished, or upgraded, Ricoh harvests the components and recycles them at local facilities. The company is currently considering a plan to return some recycled materials to its manufacturing plants in Asia for use in making new components. After factoring in the price differences between virgin and recycled materials (polypropylene, for example) and the cost of Asia-bound container shipping, Ricoh estimates it could save up to 30 percent on the cost of materials for these components. Overall, the company says, it's on track to reduce the input of new resources in its products by 25 percent below their 2007 levels no later than 2020.

2. The power of circling longer

A closely related way companies can benefit from a circular economy is to maximize the number of consecutive product cycles (cycles of reuse, repair, or remanufacture), the time products spend in each of them, or both. If designed appropriately, each additional cycle eliminates some measure of the net material, energy, and labor costs of creating a new product or component. For example, Renault leases batteries for electric cars, in large part to recover them more easily so they can be reengineered or recycled for additional duty. Keeping close control over the process helps ensure the product's quality and gives Renault a chance to strengthen its ties to customers.

Leasing isn't new in the automotive industry, of course: tire-maker Michelin leased automobile tires in the 1920s. In 2011, Michelin Fleet Solutions had 290,000 vehicles under contract in more than 20 European countries. The group offers tire upgrades, maintenance, and replacement to optimize the performance of trucking fleets and to lower their total cost of ownership. By maintaining control over the tires, Michelin can collect them when they wear out and can extend their technical utility by retreading or regrooving them for resale. The company estimates that retreads, for example, require half of the raw materials new tires do but deliver up to 90 percent of the performance.

An enabler in a big system

Dame Ellen MacArthur made history in 2005, when she became the fastest solo sailor to circumnavigate the globe. She now leads the Ellen MacArthur Foundation, an organization that works with businesses, universities, and governments to accelerate the transition to a circular economy.

When you set off around the world on a boat, you know that you only have so much food, so much diesel. And you become incredibly connected to those resources. As you watch those resources go down, you understand just what "finite" means because you're two and a half thousand miles from the nearest town. I realized that our global economy is no different—powered by resources that are ultimately finite—and that there is a much greater challenge out there than sailing around the world. Our global economic system relies on taking something out of the ground and making it into something else, and the material or the product it's made into ultimately gets thrown away. In the long term, that just can't work. When you finish a round-the-world journey on a boat, you can restock and do it again. But we're not able to do that on a global economic scale.

One of the most striking things I learned from talking to analysts and investors is that a century of real declines in commodity prices was erased in just ten years. That increase in, and growing volatility of, raw-materials prices means that the conversation with businesses quickly turns to efficiency and the need to use less energy in manufacturing. Businesses are receptive because they understand that there will be further pressure on commodity prices as three billion new middle-class consumers are created in emerging

Meanwhile, in a few stores, the UK-based retailer B&Q is piloting a take-back program for its power tools. Customers can exchange used ones either for cash or a charity donation. The company plans to refurbish the tools it collects in Europe for resale locally or to recycle them and thus recover raw materials that could be used to make new power tools in the company's facilities in China. Our research suggests that the margin-improvement potential, primarily resulting from savings in the cost of materials, could be as high as ten percentage points.

3. The power of cascaded use

Another source of value creation is to take a product or component and diversify its reuse more widely across the value chain, redistributing the materials so they can substitute for inflows of

For the full video interview, see "Navigating the circular economy: A conversation with Dame Ellen MacArthur," on mckinsey.com.

markets. It's not just about tweaking the system—it's about rethinking how the economy can run in the long term.

When we set up the foundation, in 2010, our goal was, first, to demonstrate the economics through analysis. Second, to work with business, we created the Circular Economy 100 platform, bringing together corporations such as Coca-Cola, H&M, and Unilever; emerging innovators and small businesses; and regions. Finally, we are working with universities in Europe, the United States, and India, and next year will be adding universities in China and Brazil. We see ourselves as an enabler in a big system. In the first three years, we have seen the "circular economy" move from a phrase that was barely used to something that is becoming mainstream, and we're glad to have helped this framework become credible. Now we're into a phase where companies need to take this on and unlock more value. And the faster that happens, the faster everyone else will be chasing. This isn't something that needs to take 50 years, though. It can happen a lot more quickly.

This commentary is adapted from an interview with **Tim Dickson,** a member of McKinsey Publishing who is based in the London office.

virgin ones somewhere else. For example, the Australian property and infrastructure company Lend Lease uses scrapped-wood chips from timber mills to create cross-laminated timber panels for construction.

Global apparel retailer H&M launched an in-store collection program encouraging customers to bring in old clothes in exchange for discount vouchers on new H&M clothing. The company partners with I:CO, a reverse-logistics provider, to sort the clothes for a range of subsequent "cascaded" uses.[3] The majority of items collected are dispatched to the global secondhand-apparel market. Clothes that are no longer suitable to wear are used as substitutes for virgin

[3]Cascading is the process of putting materials and components to use, across value streams and industries, after their end of life.

materials in other applications—for example, as cleaning cloths and textile yarns or as inputs for damping and insulation materials in the auto industry or for pipe insulation in the construction industry. When all other options are exhausted, the remaining textiles (1 to 3 percent, according to I:CO estimates) become fuel to produce electricity.

H&M executives view the program as a way to increase in-store traffic and customer loyalty. It is also the first step in the company's longer-term goal of recycling all of its textile fibers for additional purposes and using yarns made from collected textiles in its new products—a move that would bring greater arbitrage opportunities.

4. The power of pure inputs

The final way companies can benefit from the principles of a circular economy is by designing products and components so they are easier to separate into consumable and durable elements later on, thus helping to ensure the purity and nontoxicity of materials along the manufacturing process. Greater ease of separation also increases the efficiency of collection and redistribution while maintaining the quality of the materials—a crucial economic consideration and often a substantial challenge. In the United States, for example, less than one-third of the rubble generated during the construction and demolition of buildings is recycled or reused, though it contains high concentrations of recyclable steel, wood, and concrete.[4] Even in paper recycling (where the inputs are generally considered "pure" and recycling rates approach 80 percent in Europe), the difficulty of removing inks, fillers, and coatings from paper without degrading it results in a loss of materials worth $32 billion a year.

In some cases, companies work with their supply partners to create ecosystems that support circular product designs. For example, Desso, a Dutch manufacturer of carpets, operates a take-back program that collects end-of-use carpet tiles to recover their materials for further production or for sale to secondary materials suppliers. The carpet-backing material can be fully recycled in the company's own production processes; Desso's supplier, Aquafil, converts the Nylon 6–based top yarn back into new yarn. Because the nylon inputs are pure, they can be reused over and over again without degradation. In general, designing a product to use the purest

[4] *Buildings and Their Impact on the Environment: A Statistical Summary*, revised April 22, 2009, US Environmental Protection Agency, epa.gov.

materials possible helps maintain their residual value and supports recycling and reuse.

Squaring the circle

Given the potential of the circular economy to replace untapped value through resource arbitrage, why isn't it taking off faster? Three barriers have slowed the realization of that potential; each holds clues about moves companies can make to convert themselves from linear to circular economics.

Geographic dispersion

The most tangible barrier for corporate decision makers is all around them, in the extensive supply and manufacturing footprints that companies have created to thrive in the linear economy. This problem is evident even in seemingly simple products. For example, B&Q estimates that its cordless drills contain up to 80 components derived from 14 raw materials sourced in as many as seven countries. A product such as a car is significantly more complex. Understandably, closing product and component loops for most products is difficult, despite attractive arbitrage opportunities.

Moreover, good standards for reusable materials require global support, which is not always present. Whether companies attempt to create closed global loops (like Ricoh) or geographically open cascades (as H&M and I:CO are attempting to do in the apparel industry), there is always a risk that an efficient and effective collection, reuse, and recycling process will break down. That is particularly true in developing countries, where the collection and recycling of valuable end-of-use materials frequently falls to the informal sector. In China, for example, the formal sector covers only about 20 percent of the "e-waste" collected.[5] Without adequate standards, reprocessing is inefficient and, worse, creates health and safety hazards for the workers involved.

To get a handle on the challenge of geographic dispersion, senior executives must start thinking as hard about reverse-network activities (moving from products to components to materials) as they do about the traditional inbound ones. They will have to deal with a

[5]Euromonitor; expert interviews.

host of thorny trade-offs. Should refurbishment take place in the region of manufacture or of usage? When is it more economical to reduce components to their constituent materials and sell them on global markets? How cost effective would it be to establish postusage loops with business partners as opposed to making new components with virgin materials?

Developing a clear picture of the economics will be crucial, as will the ability to create "win–win" partnerships. For example, in exchange for lower prices and guaranteed access to supplies, Philips Healthcare returns used components to its suppliers and lets them decide whether to reuse the components for new builds and service parts or to sell them to raw-materials suppliers as high-quality, recyclable (or even ready-to-use) feedstock. (See "Toward a circular economy: Philips CEO Frans van Houten," on page 64.)

Reverse-logistics skills (such as collection, sorting, remanufacturing, and refurbishment) will be critical. One of the success factors in Ricoh's GreenLine operations is the company's "take-back" system, which optimizes supply and demand for remanufactured machines. This system requires sophisticated reverse-network-management capabilities, such as tracking the location and condition of used devices and components, as well as storing bill-of-materials information.

Complex materials

The second point of leakage involves the sheer complexity and proliferation of modern product formulations, which are rarely labeled or made public and are therefore devilishly difficult to identify after the fact, even for manufacturers. In the world of plastics, for example, companies have broadened the spectrum of materials used, in creative and complex ways. Most innovations in polymer-materials science have come courtesy of new additives that act, for example, as heat stabilizers, flame retardants, pigments, or antimicrobial agents.

In addition, the proliferation of materials can come from sheer habit or even management inattention. Companies, for example, often add materials to cut costs or innovate and then later fail to revisit these decisions; in their purchasing practices, say, they might introduce 16 plastics, where 4 would cover all functional specifications and application needs. These problems have exponentially increased the complexity of materials, while making it hard to classify and

collect them on the scale required to create arbitrage opportunities or to demonstrate the returns needed to attract investors.

Moreover, companies often have no cost-efficient way of using chemical or physical processes to extract embedded raw materials without degrading the product, so most of the original value is lost in current, smelter-based recycling processes. For example, only $3 worth of gold, silver, and palladium can currently be extracted from a mobile phone that, when new, contains $16 worth of raw materials.

Despite the difficulties, some companies are making progress. Veolia's Magpie materials-sorting system, for example, uses infrared and laser technologies to sort some plastics quickly. The company's facility in Rainham, in the United Kingdom, can separate nine grades of plastics while processing 50,000 metric tons of them a year. Nonetheless, current technologies still depend on accurate (and often manual) presorting, which must meet minimum purity requirements to ensure an economically viable yield.

As Veolia's example suggests, tackling the problem of complex materials will ultimately come down to extracting them at scale, so that they have a marketable value. This will in turn require companies to cooperate in the precompetitive sphere. Arbitrage opportunities already exist across the value chain—from raw-materials suppliers to product manufacturers, players in end-of-use management, and suppliers of the enabling information technologies. Successful first movers could capture significant economic benefits, including an outsized influence on global standards or on the design of products and supply chains.

The curse of the status quo

The final barrier against a circular economy is the sheer difficulty of breaking ingrained habits. Many aspects of the current system reflect decisions made long ago. While some are relatively innocuous (for instance, QWERTY keyboards and the shape of power plugs), others incur higher costs.

Misaligned incentives dot the industrial landscape, making it hard to create, capture, and redistribute value. Customers, for instance, are used to evaluating the expense of products only at the point of sale, even if costlier but longer-lasting products would be more economical in the long term. Leasing models are unheard of in many

industries, though they would benefit both customers and companies. Research from the Ellen MacArthur Foundation suggests, for example, that leasing high-end home washing machines would lower the cost of use for customers by one-third over five years. During that time, manufacturers would earn roughly one-third more in profits because they could lease their fleets of machines multiple times before refurbishment.[6]

Ingrained habits within companies also thwart change. Senior executives rightly worry about the higher levels of capital needed to change products, as well as the friction of moving from familiar sales- to usage-based approaches. One of the biggest concerns for Ricoh's executives before launching GreenLine, for example, was that it might cannibalize new products. Only after creating a control plan to monitor sales of GreenLine and other offerings was the company confident that it could guarantee strong coverage across different customer segments while not cannibalizing its products.

Misaligned incentives also exist between companies. Dividing the gains from optimized designs of more circular products or processes is tricky given the different motivations involved. For example, in the European beer industry, the closed-loop model for returnable bottles is well established. Yet in some markets, the share of bottles completing the circle back to the manufacturer dropped to one-third, from one-half, between 2007 and 2012. The reason: store owners preferred to dispose of the empty bottles themselves because that maximized the sales space available to promote new products. Addressing such challenges requires companies to develop profit-sharing models across their value chains. They should also learn how to spot "moments of truth" when it might be easier to break with the status quo—for example, when companies enter new markets, renegotiate agreements with suppliers and service providers, or face choices about big capital investments.

Toward a circular economy

Ultimately, the systemic nature of the barriers means that individual corporate actions, while necessary, won't suffice to create a circular economy at scale. The real payoff will come only when

[6]For more, see *Towards the circular economy: Economic and business rationale for an accelerated transition*, Ellen MacArthur Foundation, January 2012, ellenmacarthurfoundation.org.

multiple players across the business and research communities, supported by policy makers and investors, come together to reconceive key manufacturing processes and flows of materials and products. Should that happen, our research finds, the benefits would be huge. They include:

- Net materials savings. On a global scale, the net savings from materials could reach $1 trillion a year. In the European Union alone, the annual savings for durable products with moderate lifespans could reach $630 billion. The benefits would be highest in the automotive sector ($200 billion a year), followed by machinery and equipment.

- Mitigated supply risks. If applied to steel consumption in the automotive, machining, and transport sectors, a circular transformation could achieve global net materials savings equivalent to between 110 million and 170 million metric tons of iron ore a year in 2025. Such a shift could reduce demand-driven volatility in these industries.

- Innovation potential. Redesigning materials, systems, and products for circular use is a fundamental requirement of a circular economy and therefore represents a giant opportunity for companies, even in product categories that aren't normally considered innovative, such as the carpet industry.

- Job creation. By some estimates, the remanufacturing and recycling industries already account for about one million jobs in Europe and the United States.[7] The effects of a more circular industrial model on the structure and vitality of labor markets still need to be explored. Yet we see signs that a circular economy would—under the right circumstances—increase local employment, especially in entry-level and semiskilled jobs, thus addressing a serious issue facing many developed countries. Ricoh's remanufacturing plant, for instance, employs more than 300 people.

Focusing a collective effort on the leverage points that would have a systemic impact is the key to unlocking this potential. Our research suggests that the place to start is materials flows, as they represent the most universal industrial assets. The ultimate objective is to

[7]According to the Automotive Parts Remanufacturers Association (United States) and SITA (the waste-management arm of Suez Environnement).

close materials loops on a global level and to achieve tipping points that would bring major streams of materials back into the system, at high volume and quality levels, through established markets. Creating pure-materials stocks for companies would help jump-start that process while giving companies strong incentives to innovate.

The ubiquitous PET[8] provides a useful analogy for how this could happen. The polymer's strong adoption as the basic input for bottles in the beverage industry created a recycled-PET market that extended beyond bottles. This in turn created a stable platform for beverage companies to use PET for their own innovative purposes. Innovation therefore shifted from materials (new additives harder to isolate and later remove) and toward products and processes (for example, novel shapes for sports-drink bottles, new process innovations that allow hot drinks to be injected into bottles, and thinner-walled water bottles requiring lower amounts of materials to create).

Establishing de-facto standards for other materials would act as a catalyst for further action. Our research identified four types of materials, each at a different stage of maturity in its evolution toward the circular economy. These four thus represent realistic starting points where pilot projects would make the greatest difference right away (Exhibit 3).

Mobilizing multiple stakeholders is always challenging, of course, and could take several forms, including industry partnerships and consortia. Nonprofits and nongovernmental organizations will also play a vital convening role.[9] Regardless of the route companies choose, by joining forces they can begin using existing science to develop the projects and enabling mechanisms that could trigger a self-reinforcing virtuous cycle. That would in turn ultimately benefit stakeholders on every level—customers, businesses, and society as a whole.

The "take, make, and dispose" model of production has long relied on cheap resources to maintain growth and stability. That world no

[8]Polyethylene terephthalate.

[9]For example, the Ellen MacArthur Foundation's Circular Economy 100 program aims to bring companies and innovators together across regions to help develop and accelerate various commercial opportunities. Similarly, the World Economic Forum has created a number of initiatives focused on circular-economy issues.

Exhibit 3

A large-scale transformation would focus on four types of materials at different stages of maturity.

	Current level of maturity of reverse cycle[2]	Triggers for future development
Golden oldies are well-established recyclates—eg, glass, metals, paper, PET[1]	• High volume and collection rate • Moderately good quality of recovered materials • Emerging technologies for sorting and recovering high-quality materials; able to scale up quickly	• Enhanced purity of recovered materials
High potentials—eg, PP, PE,[1] and other polymers—currently don't have systematic reuse solutions	• High-volume, moderate collection rate; low quality of recovered materials • Emerging technologies for sorting and recovering high-quality materials; able to scale up quickly	• Enhanced purity of recovered materials • Improved collection rates
Rough diamonds are by-products of manufacturing processes—eg, carbon dioxide, concrete, food waste	• Emerging technologies for sorting and recovering high-quality materials; able to scale up quickly	• Scaled-up technologies and applications • Reverse system in place[3]
Future blockbusters—eg, bio-based materials and 3-D printing—are innovative materials that support fully restorative usage cycles	• Available technologies that could be scaled up	• Standardized emerging materials • Scaled-up technologies and applications • Reverse system in place[3]

[1]PET = polyethylene terephthalate; PP = polypropylene; PE = polyethylene.
[2]Reverse cycle = postconsumption flow of raw materials through cycles of reuse to disposal or restoration.
[3]Logistics, infrastructure, and technologies are set up for sorting and treatment.

Source: Ellen MacArthur Foundation; World Economic Forum; McKinsey analysis

longer exists. By applying the principles of a circular economy—a system that is regenerative by design—forward-looking companies can seize growth opportunities while laying the groundwork for a new industrial era that benefits companies and economies alike. Capitalizing on the opportunities will require new ways of working, but the benefits are well worth the cost.

The authors wish to thank Tomas Nauclér, Jeremy Oppenheim, Ken Somers, Fraser Thompson, and Helga Vanthournout for their contributions to this article.

Hanh Nguyen is a consultant in McKinsey's Zurich office; **Martin Stuchtey** is a director in the Munich office, where **Markus Zils** is a principal.

Toward a circular economy: Philips CEO Frans van Houten

A new economic model is helping the Dutch manufacturer improve its resource efficiency and financial attractiveness.

Two years ago, we decided to embed circular-economy thinking in our strategic vision and mission, both as a competitive necessity and with the conviction that companies solving the problem of resource constraints will have an advantage. We believe that customers will increasingly consider natural resources in their buying decisions and will give preference to companies that show responsible behavior—something we are already seeing. Designing products and services for a circular economy can also bring savings to a company. The first impression people always have is that it adds costs, but that's not true. We find that it drives breakthrough thinking and can generate superior margins.

In our lighting business, for example, rapidly changing technology and the economic crisis made business and municipal customers reluctant to make big investments, because they felt uncertain. This led us to consider lighting as a service. After all, why do these customers buy light fixtures and luminaires? It's not for the fixture but for the light itself.

For business customers, we therefore now sell lighting as a service: customers only pay us for the light, and we take care of the technology risk and the investment. In many cases, we also take the

equipment back when it's the right moment to recycle the materials or upgrade them for reuse. Similarly, for municipal customers we now have streetlight installations in Singapore and, more recently, a contract in Buenos Aires to replace the majority of the 125,000 existing streetlights there with LED luminaires over the next three years. We install the equipment, maintain it, and make sure that it runs for a very long time.

The benefits are substantial: the energy savings are anywhere from 50 to 70 percent, depending on the installation, so customers can pay us out of the savings for the light output. The LEDs have five times the lifetime of normal lights—which, in turn, means much lower maintenance and operating costs for us. We are putting networking capabilities in these lights, as well, essentially making them part of an IT network. This lets the community adjust the lights depending on the circumstances. For example, if there is low traffic density at night, then the lights can be turned further down. But if there is a soccer match one night, the lights can go up. And, of course, we can apply all sorts of algorithms as well to give customers even more control. These kinds of innovations help us move away from selling products and toward selling higher-value solutions.

A second place we are using circular-economy principles is Philips Healthcare, where we establish leasing relationships with customers to take back equipment and upgrade it, then refurbish it and send it on to another customer. In the process, we might upgrade the first customer to a more state-of-the art technology, and in doing so we make both customers happy. This is already a €200 million business for us.

Meeting the external challenges

I don't want to make this sound easy. In our health-care business, for example, a lot of customers initially thought: *A secondhand product? We don't want it.* Of course, we are refurbishing it and guaranteeing it as new, but convincing a hospital customer, for example, is challenging and requires a major educational program. We still have much more to do given the size of the market, but as we work with

hospitals and establish ourselves as technology partners—and not just sellers of a "box"—we can more easily convince customers of the mutual benefits of circular-economy principles.

Similarly, for municipal-lighting customers, the thinking around the tendering process needs to change. These customers are used to looking at the initial purchase price, not the total cost of ownership and the ecological impact. Changing the ownership of the lights is also tricky, as it often gets into legislative issues with municipal governments.

There are supply challenges in operating in this new way, as well. We need to get our products back. Streetlights are fairly simple because the lights don't walk away, but consumer lamps are another story. Here we work with partners to organize for collection, but even then it's very hard. Currently, in Europe we recover about 40 percent of our lamps, of which 85 percent are recycled for reuse.

Changing minds at Philips

Above all, operating with circular-economy principles requires the people of Philips to challenge ourselves and to change. We can't think in terms of designing products that we throw over the wall to customers, but instead we need to design products that are upgradable and maintainable and that can be mined for materials and components that can be reused. Our mind-set needs to be 15 years out—not just "now"—and it requires us to think in an end-to-end way, involving our suppliers and sales force.

I'll admit this was challenging at first. Even though we have a long-standing focus on sustainability—a natural stepping stone toward a circular economy—people still tested us when we initially stepped up our circular-economy work. They wanted to make sure this wasn't "just words." But after seeing the KPIs on the Philips "dashboard" and learning that if you were in the red you could expect a call from the CEO, people said OK. People become resourceful and inventive when you challenge them.

Frans van Houten

Vital statistics
Born April 26, 1960, in Eindhoven, the Netherlands

Married, with 4 children

Education
Graduated with an MA in economics and business management in 1985 from Erasmus University, Rotterdam

Career highlights
Philips (1986–2006, 2010–present)

President, chairman, and CEO (2011–present)

CEO, Philips Semiconductors (2004–06)

Co-CEO, Consumer Electronics division (2002–04)

NPX Semiconductors
(formerly Philips Semiconductors) (2006–09)

CEO (2006–09)

Fast facts
Is a member of the European Round Table of Industrialists

Serves on the International Institute for Management Development's (IMD) Foundation Board

In our innovation process, we have a program we call Design for Excellence. It comes in a number of flavors, such as designing for recyclability, upgradability, and serviceability. As part of the effort, we set criteria for every product in order to challenge the business-unit managers. To reach the targets, the businesses need to meet criteria associated with the circular economy, and we continuously raise the targets. For example, in our Consumer Lifestyle group, where we make domestic appliances, we are asking for 10 percent recycled materials in our total portfolio by 2015, compared with a 2 percent target in 2012. Meeting goals like these often takes the form of multiweek workshops where we tear down the entire value proposition of a product to see what we might change and how. We

It's rewarding to see how enthusiastic people can be when they learn what they can do from a circular-thinking point of view.

involve our suppliers in this activity so that it becomes cocreative and so that we can learn to design our value chains better.

To help accelerate the transformation to circular principles, we created a center of expertise—a permanent internal group that helps with methodologies and programs. The center is networked through the entire organization, and every business unit has a flag bearer there. This is important because the circular economy needs to be intrinsic in our end-to-end value chain and embedded in all our processes, metrics, and structures. This is integral to our strategy.

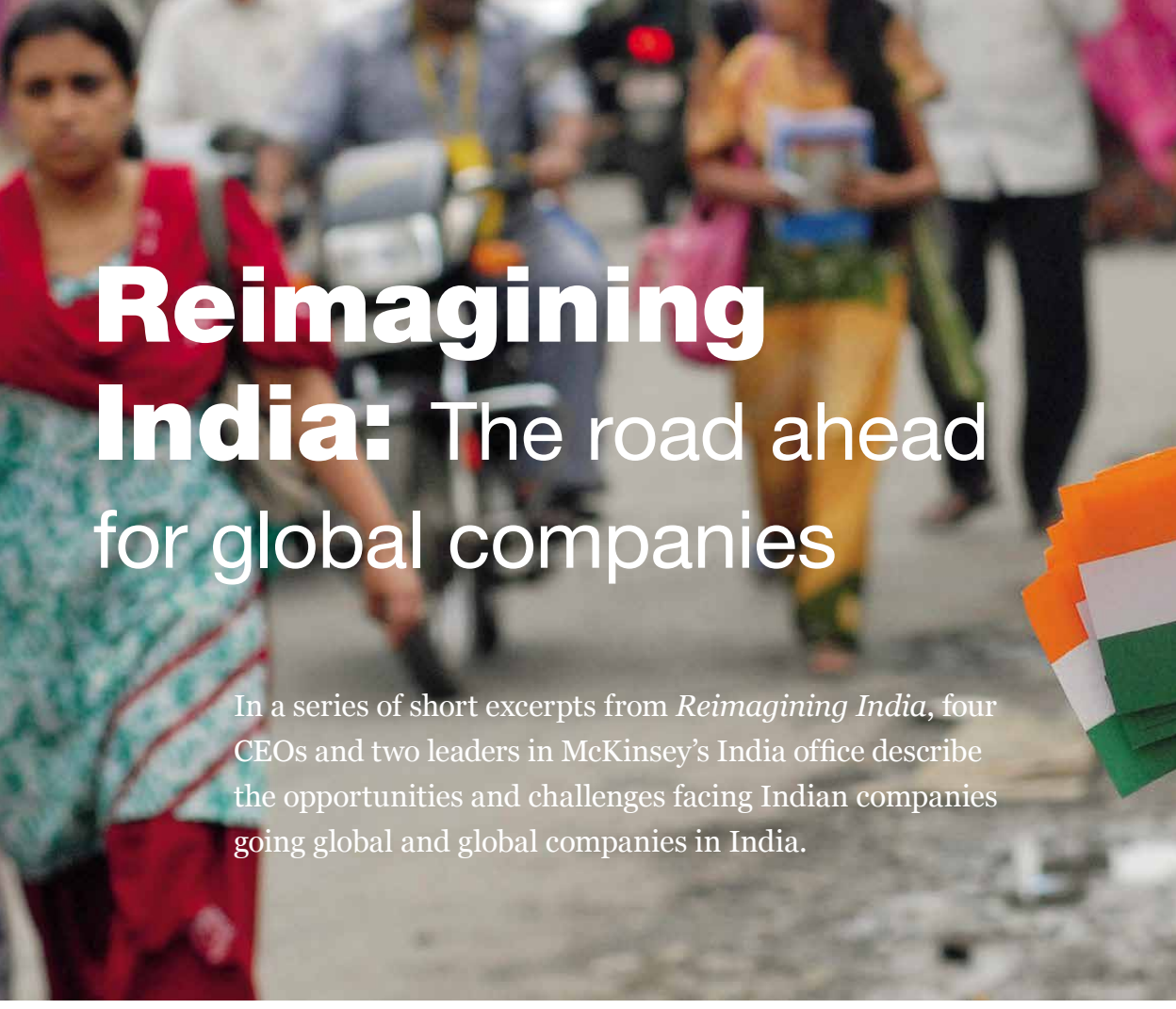
Looking ahead

Even though we still have far to go, I see a real eagerness in the organization to think in these new ways, and business units are being quite creative in coming up with good solutions. The thinking is very much driven by the engineers on the ground, and they are very good at challenging themselves. It's rewarding to see how enthusiastic people can be when they learn what they can do from a circular-thinking point of view. That's when you know you've reached the tipping point inside the company—when the enthusiasm and creativity are self-reinforcing—and I'm convinced that's where we are headed.

Ultimately, we can do a lot on our own, but a circular economy on a worldwide scale will require a lot of players to change simultaneously, and that's a bit of a chicken-and-egg problem. It would help tremendously if governments took the lead and changed their procurement policies so that a certain proportion of what they buy—be it 50 percent, 25 percent, or some other figure—represented products

manufactured according to circular-economy principles. We hope that we can play the role of catalyst and help to reach a much bigger tipping point by putting our weight on the entire value chain, as well as by educating customers and suppliers. We hope that by setting the right example, we can help encourage the right behavior. This is just the beginning.

This commentary is adapted from an interview with **Thomas Fleming,** a member of McKinsey Publishing who is based in the Chicago office, and **Markus Zils,** a principal in McKinsey's Munich office.



Reimagining India: The road ahead for global companies

In a series of short excerpts from *Reimagining India*, four CEOs and two leaders in McKinsey's India office describe the opportunities and challenges facing Indian companies going global and global companies in India.

Transforming Indian firms into truly global competitors

Alok Kshirsagar and Gautam Kumra

More than 30 percent of the revenues of India's top 50 listed nonbanking companies now come from international sources—more than double the percent in 2006. Birla, a conglomerate that is a top-ten global cement manufacturer, as well as Asia's biggest aluminum producer, gets 60 percent of its revenues from outside India. Airtel, an integrated telecom-services provider founded in 1995, already operates in 19 countries and has the world's fourth-biggest subscriber base. Mahindra, the world's largest tractor company, operates in 100 countries. Generic drugs by companies such as Dr. Reddy's, Sun Pharma, and Zydus are sold all over the world.

In addition to these success stories, India has a broader mass of firms with the aspirations, strong capabilities, and balance-sheet

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strength from which to build truly global companies. We believe that over the next 15 years, India can develop at least 50 world-class multinationals that have progressed from increasing their exports and overseas investments to establishing global platforms and brands. But it will take more than imagination. It will require many acts of will, calculated daring, and new capabilities. Drawing on McKinsey's experiences working with Indian companies, we suggest four imperatives for the successful globalization of India Inc.

1. Deepen market insights: think local while going global

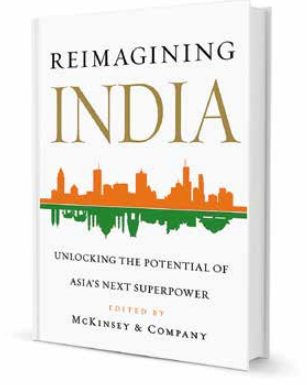
Many Indian companies have grown internationally via a combination of opportunistic export-led growth and product-driven sales. Some in the pharma and IT industries have developed tailored services for different customer segments, but most companies have faltered when it comes to developing deep local insights. Increasing international market share requires much greater levels of investment in segment and market insight. Indian companies have to tailor their offerings, not just replicate their business model. For some, this requires a fundamental shift in mind-set.

The approach Tata Motors took with Jaguar Land Rover in China is a good example of the rewards of doing this right. Since the acquisition of JLR in 2008, Tata has made substantial investments in China and built a new factory, which it operates with a local joint-venture partner. In the financial year ending March 2012, sales for JLR China surged nearly 50 percent. China is now JLR's largest market and a big factor in its turnaround.

2. Create and institutionalize global processes

Founders and entrepreneurs have led India's globalization. These kinds of leaders made their mark via intuition, inspiration, and navigation of personal networks. But what works in India does not necessarily work overseas. The need is for a more process-driven form of management that can be rolled out in different countries. To create order and consistency across their global operations, Indian companies need to create systems for everything from how to get supplies to their factories to how they operate their plants.

In particular, Indian firms must place greater emphasis on managing unfamiliar risks. Most Indian companies, especially those in the top 100, are very good at managing domestic risks on an intuitive and reactive basis. Their ability (with the help of one or two phone calls) to understand the underlying reason for regulatory changes, commodity price shifts, the lack of suppliers, and labor union troubles is extraordinary. When they go abroad, however, they encounter unfamiliar challenges. They do not know the regulator, the unions, the policy makers, or the nature of the local partners. A much more disciplined process to identify and manage these risks is required—not just to check a box for compliance or regulatory purposes but as a critical way to increase value and build resilience.



The essays featured in this section are excerpted from a new McKinsey-edited book, *Reimagining India: Unlocking the Potential of Asia's Next Superpower*, which convenes leading thinkers from around the world to explore and debate the challenges and opportunities facing India.

3. Be an active owner to create value from M&A

Traditional M&A involves consolidation and back-office synergies, but when acquiring an asset overseas, it is essential to increase revenues. Indian acquirers often buy an asset that is already distressed, troubled, or starved of investment. It is necessary to focus on revenue growth by bringing in new technology, attracting new customers, and finding new markets. These will make a big difference to the morale of the acquired organization.

Unfortunately, some senior Indian leaders have the view that Indian companies are preferred because they are relatively passive investors who are apt to leave the acquired company alone. This is not always the right view to take. Being passive can mean losing value. And being active does not necessarily mean slash and burn; it can be about bringing in three or four new managers to improve performance in a disciplined fashion and to work on mind-sets and capabilities.

4. Develop and recruit global talent

Indian executives can readily recite the challenges that foreign companies have faced in finding their feet in India. Among them: they were not committed to the long term; they didn't have the right people; they changed their (expatriate) bosses every three years; they didn't know how to manage a local joint venture; and they were not integrated into society. There is truth in this critique. There is also irony because Indian companies often make the exact same mistakes in their own overseas ventures.

When asked who will manage international expansion, they usually come up with the same set of five or ten trusted people who have been managing everything for them in the domestic market. It is typical in the Indian C-suite for executives never to have held an international assignment or even to have worked outside their companies or business units. These leaders may be brilliant at managing domestic businesses, but that does not mean they are well prepared to run global ones. One key priority for global Indian companies, then, is to start to build a cadre of 50 to 100 internationally oriented middle to senior managers now so that leadership capabilities can match global ambitions.

Fortunately, most of today's managers grew up in a multicultural country with a complex, dynamic, and competitive environment. In

many ways, India does not operate as a single market. The complexity of competing across state borders with different tax systems, consumer habits, and local government policies is akin to competing across national borders. Indian executives have learned to be resilient and know how to adapt in a volatile business environment. These capabilities can now prove very valuable as they venture out, particularly to other emerging markets that share some of the same conditions.

Not only does India lack internationally experienced leaders, but many companies don't consider giving outsiders a real shot. It's not hard to find firms that get more than three-quarters of their revenues from outside India—and have 95 percent Indian senior leadership. The CEO of Coke was born in Turkey, the CEO of Pepsi in India, the former CEO of Sony in Britain. At the moment, it is hard to imagine any Indian company of similar stature selecting a non-Indian for the top spot. This glass ceiling, coupled with the fact that few Indian companies have great global brand names, prevents top talent from joining even the best Indian firms. They need to show executives that there are clear, performance-based career paths and no impediments to advancement.

Alok Kshirsagar is a director in McKinsey's Mumbai office, and **Gautam Kumra** is a director in the New Delhi office.

Serving butter chicken at Birla

Kumar Mangalam Birla

When I took over the company in 1996 at age 29, after the sudden death of my father, no meat was cooked in Birla cafeterias; no wine or whiskey was served at company functions.

Seven years later, we bought a small copper mine in Australia. The deal wasn't a huge one, worth only about $12.5 million, but it presented me with a unique challenge of the sort I had not yet faced as chairman. Our newest employees were understandably worried

about how life might change under Indian ownership. Would they have to give up their Foster's and barbecues at company events? Of course not, we reassured them.

But then several of my Indian managers asked why *they* should have to go meatless at parties, if employees abroad did not. I was genuinely flustered. My lieutenants were relentless: I had never faced a situation where my own people felt so strongly about something. Yet at the same time I knew vegetarianism was a part of our values as a family and as a company. A core belief! Fortunately, my grandparents merely laughed when I approached them with my dilemma: They understood better than I did that our company had to change with the times. If we wanted to make our mark on the world, we had to be prepared for the world to leave its mark on us.

The Aditya Birla Group is now one of India's most globalized conglomerates. We have operations in 36 countries on five continents and employ 136,000 people around the world. Over 60 percent of our revenues come from overseas, in sectors as varied as mining, pulp, aluminum, and insurance. We've branched out into Australia, America, Canada, and Europe. For the moment, our top management remains all-Indian, but I would guess that within a decade, half of our senior-most staff will be non-Indian.

We have expanded internationally for many reasons—sometimes to spread our bets, sometimes because we found it impossible to open a plant in India as fast and as cheaply as we could abroad. In each case we've made our decision based on whether or not the deal would increase shareholder value. Yet when I look around me, I see too many Indian companies eager simply to be written about as global players. Sometimes that clouds the fundamentals of making an overseas acquisition or having an overseas presence. To globalize for the sake of globalizing—as a matter of ego—is perilous. Expanding internationally is hard, risky work. And as I was reminded the first time I saw butter chicken being served in a Birla canteen, the most difficult challenges turn out to be the ones you least expect.

Kumar Mangalam Birla is chairman of the Aditya Birla Group.

Success on India's terms

Muhtar Kent

In India, appearances can be deceiving. For outsiders, there is always a hint of mystery. Even if you live and work there, you can never be entirely sure you understand. It is best to assume that you do not. If you come to India with some grand, predetermined strategy or master plan, prepare to be distracted, deterred, and even demoralized.

That's something I keep in mind as I think of The Coca-Cola Company's experience in India. Coca-Cola launched operations in India in 1950, shortly after independence. Our business grew steadily. But in 1977, we exited (along with other multinational companies) after a new law diluted ownership of our assets and operations.

We returned to rebuild our business in 1993 as economic reforms unleashed a period of robust growth. It was harder going than we'd imagined. We struggled at first to find and keep talented employees. We learned that although Indian consumers were eager to embrace global brands, they resented any hint of global corporate dominance. It took us time to understand that small stores, many operated by families out of the front of their homes, were an unappreciated source of economic opportunity.

Today our India business is thriving. India now ranks among our top ten markets in unit-case sales. I still see enormous potential in India—which is why last summer I went to New Delhi to announce that The Coca-Cola Company and its global bottling partners will invest $5 billion in our India operations between 2012 and 2020. By the end of that period, we think India could be one of our top five global markets. But the key to our success so far has been learning to see the Indian market as it is, not as we wished it to be, and to seek success on India's terms. We have learned to see our investments in India in broad terms—not just as capital investment in bottling plants and trucks but also human investment in schools and training, social investment in women entrepreneurs, and technological investment in innovations like solar carts that can power a cooler, mobile phone, or a lantern by which a young boy or girl can study.

Muhtar Kent is chairman and CEO of The Coca-Cola Company.

The power of partnership

Howard Schultz

We hope to have thousands of stores in India. I look forward to a day in the not-too-distant future when India takes its place alongside China as one of our two largest markets outside North America. But we know getting there won't be easy. And our successful beginning in India has not been without hurdles; on the contrary, it was a complicated six-year journey. Along the way, we learned a lot about India and ourselves.

One key to our success has been our partnership with the Tata Group. We announced our joint venture with Tata in January 2012. Ten months later, the Indian government loosened restrictions on foreign investment in the retail industry. From a legal standpoint, we could have tried to set up shop in India on our own. But I can't imagine bringing Starbucks to India without the assistance we've received from Tata. They helped us find great locations for our stores. They helped with store design and in getting the food menu right (*tandoori paneer* rolls and cardamom-flavored croissants!). They helped us overcome the many logistical and infrastructure obstacles to make sure everything on our India menu is fresh. They also helped with recruiting, which is crucial for us because no matter how big we get, the essence of Starbucks is to make that human connection: serving coffee one person, one cup, one neighborhood at a time.

The other unique aspect of our alliance with Tata is the ability to source and roast coffee beans locally in India. India is the only major market in the world where we can do that, and it is only because of our relationship with Tata, which is the largest coffee estate owner in all of Asia. They not only own farms but also operate their own roasting facilities. We were able to work with them to develop an India-only espresso roast, designed specifically for India, that is every bit as good as the espresso we serve all over the world.

Developing that blend required us to do some things differently. We created a unique blend for India, and it's not roasted by our team, which is something we had never done before. It was a real test of our trust in our new partner because it required us to share with Tata some of the roasting secrets we have perfected over four decades and guarded very closely. But the result has been well worth it. In the

process, we learned that not everything needs to be invented in Seattle, and that with the right partner, we can collaborate and coauthor, as long as there is a foundation of trust.

Howard Schultz is chairman, president, and CEO of Starbucks Coffee Company.

Finding the right prescription

Miles White

In business, sometimes you find the most valuable insights in places you'd least expect them. In my case, it was a crowded Mumbai alley full of "chemist" shops where I went to buy some medicine. That brief visit helped me understand why, after imagining India for a long while, my company had to become an integral part of it.

It was 2009. I had embarked on what might be called an immersion course in India—in particular in its health system. I toured its hospitals and other health-care facilities, at all levels of service. I visited private homes across a broad spectrum of socioeconomic levels. I tried to understand as well as I could what it was like to be an Indian citizen during this extraordinary moment in the country's history and what it was like to provide and receive health care.

As it happened, in the course of investigating India's health-care system, I came to need a little care myself. That's how I found myself in the lanes surrounding Bombay Hospital, where about 30 chemist shops, each with a storefront perhaps three to five meters wide, serve the hospital's many patients. The scene I encountered was eye-opening. Clerks clamored for my attention as I walked past. Indian pharmacies function as informal doctors as well as medicine purveyors, but the people manning these shops were unexpectedly young and could have been selling any commodity. Once I chose a shop, the young man at the counter asked numerous questions about the malady I wanted to treat. After a loud discussion between him and someone in the back—during which passersby could easily overhear details of my symptoms—I received a small bag of generic medicines. The drugs prescribed were just what I needed, and I was stunned by how little they cost—a fraction of the price I would

have paid for them in the United States or almost any other developed country. In a way that no spreadsheet or PowerPoint ever could, this experience drove home to me how crucial it was for us at Abbott to be part of India's health-care solution.

The medicines I bought that day were what are known as "branded generics," and their prevalence in India underscores the essence of the country's health-care system. At the tip of the iceberg is outstanding care for the relatively few who can afford it. But the overwhelming majority of people receive a very different level of care, if any. For this majority, branded generics are appealing because, although their patent protection has expired, they offer the quality of manufacture and trustworthiness of consistency that comes with the imprimatur of a major pharmaceutical firm, at a much more accessible price than newer, patent-protected drugs. India is a powerhouse for these drugs, due to its wealth of scientific and managerial talent and its low production costs. We concluded that securing a major foothold in India would provide Abbott an ideal base from which to sell not only to the 1.2 billion people in India but also to fast-growing markets throughout the developing world.

We made a series of key transactions in 2010, acquiring the pharmaceutical business of Belgium-based Solvay, which had an Indian operation larger than our own, and forming a partnership with a major Indian pharmaceutical maker to market drugs in emerging economies outside India. Then came the deal that was fundamental to our vision: our $3.7 billion acquisition of Piramal Healthcare Solutions, a part of Piramal Group, one of India's largest companies. These actions made us one of the largest players in the health-care system of the second-most-populous nation on earth. In just four years, we've achieved our goal of attaining a number-one position in India's pharmaceutical sector where we have about 7 percent of the market. India now represents more than 4 percent of our total sales and almost 5 percent of profits—percentages that will surely grow.

Miles White is chairman and CEO of Abbott Laboratories.

Bad to great:
The path to scaling up excellence

Huggy Rao and Robert I. Sutton

Before senior executives try to spread best practices, they should use seven techniques to clear out the negative behavior that stands in the way.

The problem
Destructive behavior—selfishness, nastiness, fear, laziness, dishonesty—packs a far bigger wallop than constructive behavior. In particular, research has found that negative interactions with bosses and coworkers have five times more impact than positive ones.

Why it matters
When bad behavior crowds out good, it results in confusion, destructive conflict, distrust, and dead ends that can undermine the scaling of excellence—one of the toughest challenges senior leaders face.

What to do about it
To spread and sustain the good, you must first remove the bad. Seven proven methods can help leaders do so: nipping bad behavior fast; putting mundane improvements before inspirational ones; seeking adequacy before excellence; using well-respected staff to squelch bad behavior; killing the thrill destructive behavior generates; time-shifting from current to future selves; and focusing on the best times, the worst times, and the end.

Illustration by Davide Bonazzi

Leaders who aim to boost organizational performance often start with efforts to kindle good behavior, however they define it. Yet case studies and rigorous academic research show that if you want to create and spread excellence, eliminating the negative is the first order of business. Destructive behavior—selfishness, nastiness, fear, laziness, dishonesty—packs a far bigger wallop than constructive behavior. Organizational researcher Andrew Miner and colleagues, for example, measured the moods of 41 employees at random intervals throughout the workday. The researchers discovered that negative interactions with bosses and coworkers had five times more impact on employees' moods than positive interactions.[1] This "bad is stronger than good" effect holds in nearly every other setting studied, from romantic relationships to group effectiveness.

Efforts to scale up excellence stall when bad behavior crowds out good. Scaling is one of the toughest challenges that senior leaders face. Executives can always point to places where a company is doing a great job. What drives them, keeps them up at night, and devours their workdays is the difficulty of spreading excellence to *more* people and *more* places. This "problem of more" is tough to crack. Scaling requires pressing each person, team, group, division, or organization to change what they believe, feel, or do.

Eliminating destructive behavior and beliefs clears the way for excellence to spread—particularly when these impediments clash with the mind-set that propels your organization's performance. When it comes to mind-sets, however, one size does not fit all; what is good for another company may be bad for yours. At Facebook, everyone from senior executives to new engineers lives the mantra "move fast and break things." When we asked an executive at one company if its people lived this mind-set, he answered that "move fast and break things" was wrong for many of its businesses, especially the unit that builds software for nuclear submarines!

Negative actions and beliefs also come in different flavors. Whatever their exact characteristics, bad behavior undermines scaling efforts by introducing confusion, destructive conflict, distrust, and dead ends. To spread and sustain something good, you've first got

[1]Theresa M. Glomb, Charles Hulin, and Andrew G. Miner, "Experience sampling mood and its correlates at work," *Journal of Occupational and Organizational Psychology*, 2005, Volume 78, Number 2, pp. 171–93.

to take out the bad. Seven methods can help leaders who are bent on "breaking bad."

1. Nip it in the bud

In 1982, criminologist George L. Kelling and political scientist James Q. Wilson described what they called the "broken windows" theory: they observed that in neighborhoods where one broken window was left unrepaired, the remaining windows would soon be broken, too. Allowing even a bit of bad to persist suggests that no one is watching, no one cares, and no one will stop others from doing far worse things.[2] The theory soon had a big impact on public policy, particularly in New York, where crime plummeted after efforts were made to stamp out minor offenses such as graffiti and panhandling.

Much research supports this theory. Charles O'Reilly and Barton Weitz, for example, studied 141 supervisors in a large retail chain. They focused on how supervisors handled salespeople who were tardy, unhelpful, uncooperative, discourteous to customers, or unproductive. O'Reilly and Weitz found that supervisors of the most productive units confronted problems more directly and quickly, issued more warnings, used formal punishments more often, and promptly fired employees when warnings failed.[3]

This isn't an argument for striking fear among employees. The best bosses nip bad behavior in the bud but treat people with dignity. Mauria Finley is CEO of the start-up Citrus Lane, which sends monthly care packages of baby goods to moms. We asked her how she struck the right balance as the company grew from 6 people to 20. Finley explained that her years as a manager at Netscape, eBay, and elsewhere taught her never to withhold bad news or hesitate to tell employees when and why their work wasn't up to snuff—but to deliver such messages with empathy. When we interviewed Finley, she told us that one of her direct reports described her as a "compassionate hard-ass." She laughed and said, "that's me."

[2]George L. Kelling and James Q. Wilson, "Broken windows: The police and neighborhood safety," the *Atlantic,* March 1, 1982, theatlantic.com.

[3]Charles A. O'Reilly III and Barton A. Weitz, "Managing marginal employees: The use of warnings and dismissals," *Administrative Science Quarterly*, 1980, Volume 25, Number 3, pp. 467–84.

Many employees who are prone to selfishness, nastiness, incompetence, cheating, and laziness change their ways after getting feedback and coaching or moving to a workplace where such behavior isn't tolerated. Stanford's Perry Klebahn is known for his mastery at coaching and turning around dysfunctional teams in the hands-on creativity classes for master's students and programs for visiting executives at the Hasso Plattner Institute of Design (which everyone calls "the Stanford d.school"). During several recent executive programs, he and his fellow coaches identified some bad apples who harmed their groups. So Klebahn put all of these destructive characters together "in the same barrel"—a new team. Then he moved it to a corner where they wouldn't infect others and recruited a no-nonsense coach to guide them.

This technique works. A couple of bad-apple teams have performed poorly, but a few others have produced "shockingly good" prototypes of new products and improved customer experiences. When a team filled with alpha types has a coach who can handle them, constructive dynamics often emerge. Although those big personalities may trample on less aggressive people, a "balance of power" emerges when you put a bunch of these overbearing types together. Such people, Klebahn observed, usually have lot of energy; the trick is getting them to channel it toward the design challenge rather than pushing around their teammates.

2. Plumbing before poetry

Stanford's James March distinguishes between leaders who are "poets" and "plumbers."[4] Getting people to focus on small, mundane, and gritty details is effective for eliminating negativity. In March's lingo, you've got to fix the plumbing before you spout the poetry.

Consider the incredible mess that the Alameda Health System (AHS), in Oakland, California, experienced a decade ago.[5] By 2005, it had

[4]Mie Augier, "James March on education, leadership, and Don Quixote: Introduction and interview," *Academy of Management Learning & Education*, 2004, Volume 3, Number 2, p. 169–77.

[5]Russ Mitchell, "The medical wonder: Meet the CEO who rebuilt a crumbling California hospital," *Fast Company*, May 2, 2011, fastcompany.com; and John Commins, "HL20: Wright L. Lassiter III—Getting better all the time," *HealthLeaders*, December 13, 2011, healthleadersmedia.com.

churned through ten CEOs in 11 years. AHS was losing $1 million a month and had a deficit of more than $50 million, partly because employees did a poor job collecting Medicare and MediCal payments. Working conditions were horrendous. A doctor was beaten and strangled by a patient—and left on the floor for half an hour before a janitor found him. Nurses defied doctors and supervisors. Employees' cars filled the garage, forcing patients to circle around to find parking spots.

New CEO Wright Lassiter III and new COO Bill Manns decided that so many things were broken at AHS that talking about values and strategy would backfire, so they repaired one broken part at a time. They started by launching a "grassroots money hunt," which they now call "the foundation of our success." Lassiter and Manns put 85 top managers into 12 "odd couple teams" including doctors, nurses, managers, and technicians. He asked the teams to find $21 million by cutting costs and increasing revenues. Lassiter told them, "It's up to you." They came up with many good ideas; for example, they replaced a $96.50 tool to test the umbilical-cord blood of newborns with a 29-cent solution that worked just as well—saving $322,000 a year. They found new sources of revenue, too.

An especially tough problem was working with the union to get rid of terrible nurses. As a veteran physician told *Fast Company*, "I'd say, 'Nurse, draw this man's blood,' and she'd say, 'Why don't you do it yourself?'" This doctor noted that most AHS colleagues were highly professional and "wanted those nurses gone." Dozens of them were fired. Lassiter and Manns also worked with unions to free parking spots for patients, not only opening up spaces, but also creating a gateway experience in which employees embraced a mind-set Lassiter and Manns hoped to spread: putting patients' needs first.

3. Adequacy before excellence

As we noted earlier, before you can spread something good, the first order of business is to drive out bad behavior. This may seem obvious, but as our colleague Jeffrey Pfeffer loves to say, great leaders and teams are masters of the obvious—a rare talent.

The Customer Contact Council of the Corporate Executive Board (CEB) found that many companies don't follow this path. When the firm surveyed 100 customer-service heads, 89 reported that "their main strategy is to exceed expectations." But CCC's surveys of more than 75,000 customers revealed that most aren't looking for over-the-top service. What drives them away—and hurts companies—is bad service: "They exact revenge on airlines that lose their bags, cable providers whose technicians keep them waiting, cellular companies whose reps put them on permanent hold, and dry cleaners who don't understand what 'rush order' means."

CEB researcher Matthew Dixon and his colleagues report that 25 percent of customers are likely to say something positive about a good customer-service experience, but 65 percent are likely to say something negative about a bad one. Similarly, 23 percent of customers who received good service told ten or more people, compared with 48 percent who experienced bad service. This research shows that making things easy for customers is crucial for maintaining their loyalty.[6] Smart companies, for example, find ways to ensure that customers don't have to call back a second time to make purchases, set appointments, complete transactions, or resolve problems. One CEB client, an Australian telecommunications company, eliminated productivity metrics for reps who work the phones. It now evaluates them by interviewing customers and asking "if the service they received met their needs." Calls take slightly longer, but repeat calls have fallen by 58 percent.

4. Use the 'cool kids' (and adults) to define and squelch bad behavior

The people you recruit for a scaling effort have a big impact on its success. Recruit your organization's most admired and connected people, teach them what "bad" looks like, and encourage them to stop being perpetrators.

A senior executive from a large South American retail chain, for example, told us he was fed up with top-team members who used

[6]Matthew Dixon, Karen Freeman, and Nicholas Toman, "Stop trying to delight your customers," *Harvard Business Review*, 2010, Volume 88, Numbers 7–8, pp. 116–22.

their smartphones during meetings, despite his repeated requests to put them away. On several occasions, "those damn little screens" (his words) caused participants to miss important facts and to zone out when their wisdom was needed. So the executive pulled aside two of the most admired members of his team—two of the worst offenders—and asked them to keep their phones off and in their pockets during meetings and to help him encourage fellow team members to do the same. The two role models didn't look at their phones during the next meeting and began pressing teammates to stop doing so. Now, when a team meeting starts, everyone powers off their phones and puts them away.

5. Kill the thrill

As Mark Twain said, "There is a charm about the forbidden that makes it unspeakably desirable." One of our favorite examples of the thrill of bad behavior—and how to squelch it—comes from an intervention the University of Toronto's Gary Latham helped to invent, implement, and study at a large sawmill.[7] Hourly employees stole a million dollars' worth of equipment a year, and management couldn't figure out how to stop them. Although many workers disapproved of the stealing and didn't do it themselves, peer pressure prevented them from reporting the thieves.

Latham's interviews revealed that workers didn't need most of what they stole; they stole because that was a source of prestige among peers. Because the thieves never sold this stuff, they argued heatedly about who should store it. Although workers weren't afraid of management, they feared "the wrath of their spouses," who complained that the loot was "clogging up their garages, basements, and attics."

Eventually, with Latham's help, managers decided to eliminate the thrill by letting employees check out equipment for personal use anytime they wished. The theft rate immediately dropped to virtually zero, though workers almost never checked out equipment. Bragging about stealing something that's there for the taking doesn't earn you prestige. And other kinds of bad behavior did not increase.

[7]Gary P. Latham, "The importance of understanding and changing employee outcome expectancies for gaining commitment to an organizational goal," *Personnel Psychology*, 2001, Volume 54, Number 3, pp. 707–16.

6. Try time shifting: From current to future selves

You can sometimes break bad patterns by getting people to think about who they hope to be, not just who they are. Research from New York University's Hal Hershfield and his colleagues shows that people are more prone to behave unethically when they are preoccupied with their present selves. But when they focus on the link between who they are now and who they want to be in the future, they behave more ethically and engage in other constructive long-term behavior, such as saving more money.[8]

Sometimes, encouraging employees to look to the future—time shifting—just requires finding ways to make the impact of negative actions more vivid to them, so they link short-term actions with long-term consequences. BG Group executives explained to us how they had tackled such a problem in India. In some cities, the company is the only energy supplier, and its employees were often contemptuous of customers. Managers hit upon an ingenious solution, organizing role-playing sessons where consumers behaved like rude frontline employees and employees took the consumers' role. The employees got the point, and accountability took hold.

7. Focus on the best times, the worst times, and the end

Research by Nobel Prize winner Daniel Kahneman uncovered the "peak–end rule": no matter how good or bad an experience is or how long it lasts, judgments about it are shaped most strongly by the best and worst moments and by how it ended.[9]

In a project at the Stanford d.school, for example, three of Sutton's students followed and interviewed JetBlue passengers through their journeys in and out of two airports. For many, the worst part of flying was claiming baggage; they were anxious about when (and if)

[8]Taya R. Cohen, Hal E. Hershfield, and Leigh Thompson, "Short horizons and tempting situations: Lack of continuity to our future selves leads to unethical decision making and behavior," *Organizational Behavior and Human Decision Processes*, 2012, Volume 117, Number 2, pp. 298–310.

[8]Daniel Kahneman et al., "When more pain is preferred to less: Adding a better end," *Psychological Science*, 1993, Volume 4, Number 6, pp. 401–5.

their stuff would arrive—and surrounded by similarly tense people. The baggage-carousel experience was not only the worst part of an airplane trip but also happened at its end.

The students tested an "experience prototype" they called Blue Cares by going to the airport, hanging out in the baggage-claim area, and offering to help passengers. The students focused on those who looked most anxious or confused, because they were most in need of help and if their anxieties were calmed, negative emotions wouldn't infect others. The positive responses the prototype generated from customers and JetBlue employees impressed company leaders, who redoubled their efforts to make the baggage-claim experience as smooth for passengers as possible, though adding this new role wasn't economically feasible given the industry's competitive pressures.

Postscript: Some warning signs

How can you recognize when bad behavior exists—or soon will? Here are four feelings to watch for; when pervasive, they signal trouble.

The first is fear of responsibility, especially the sense that it is safer to do nothing—or something bad—than the right thing. Silence is among the most reliable signs that people fear personal responsibility and that the learning and self-criticism needed for excellence aren't happening.

In a study of drug-treatment errors in eight nursing units, Harvard's Amy Edmondson demonstrated the stifling effects of such fears.[10] At first, Edmondson was bewildered because her findings revealed that nurses in units with the best managers and coworker relationships reported making as many as ten times more mistakes than nurses in the worst units. She sent a researcher with no knowledge of these findings to spend two months doing interviews and observations in the eight units. Eventually, Edmondson realized that nurses in the worst ones reported fewer mistakes because they were afraid to admit making them. In the best units, nurses and

[10] Amy C. Edmondson, "Learning from mistakes is easier said than done: Group and organizational influences on the detection and correction of human error," *Journal of Applied Behavioral Science*, 1996, Volume 32, Number 1, pp. 5–28; and Amy C. Edmondson and Anita L. Tucker, "Why hospitals don't learn from failures: Organizational and psychological dynamics that inhibit system change," *California Management Review*, 2003, Volume 45, Number 2, pp. 55–72.

managers expected everyone to report mistakes immediately and to discuss their root causes. When nurses learned how to avoid a mistake, they told their colleagues. In other words, silence isn't always golden; it often signals that people are afraid to speak the truth.

Feelings of injustice are the second warning sign. Numerous studies show that when people think they are getting a raw deal from their employer, bad behavior runs rampant. As Stanford d.school professor Michael Dearing told us, his experience as a senior executive (and, more recently, as a venture capitalist who financed more than 80 start-ups) taught him that "there is a difference between what you do and how you do it." Whether you are doing something difficult (such as announcing pay cuts or demotions) or something pleasant (raises and promotions), employees work harder and more loyally if you explain your actions, talk about how changes will unfold, and treat people with dignity.

Helplessness is the third dangerous feeling. When people feel powerless to stop bad forces and events, they shirk responsibility. As psychologist Martin Seligman's classic research on learned helplessness demonstrates, even when people can actually escape from a bad situation easily or make it better for others, they sulk and suffer if they believe they cannot do anything to improve their lot.[11] Before Lassiter and Manns arrived at the Alameda Health System, for example, its employees had been in a downward spiral for so long that they felt it was impossible for them or anyone else to make meaningful improvements. That's why Lassiter and Manns were smart to skip the poetry and start the money hunt right away. The diverse and influential employees who joined the money hunt did more than just dig up more than $20 million. They also demonstrated, to themselves and their colleagues, that they weren't helpless.

The final dangerous feeling is anonymity: the belief that no one is watching you closely, so you can do whatever you want. In the 1990s, Michael Dearing managed the original flagship department store of Filene's Basement. At the time, this century-old institution in downtown Boston was the city's second-most-popular tourist attraction (after Fenway Park); it finally closed its doors in 2007. His mentors taught him that when employees worked in brightly lit, open spaces,

[11]Martin E. P. Seligman, *Helplessness: On Depression, Development, and Death*, first edition, San Francisco, CA: W. H. Freeman, 1975.

the amount of lost, damaged, or stolen merchandise fell and labor efficiency rose. An experiment by the University of Toronto's Chen-Bo Zhong and his colleagues bolsters Dearing's insight.[12] They found that people are less honest and more selfish when they work in darker rooms or wear sunglasses rather than clear glasses.

Accountability is difficult to sustain when employees see the people they serve as nameless and faceless. Making their humanity more vivid to employees increases accountability. In a study by Emory University's Srini Tridandapani and his colleagues,[13] for instance, ten licensed radiologists were asked to examine 20 pairs of chest X-rays. Each pair was supposed to be for the same patient at two different junctures in his or her life. Most were, but two to four pairs in each set were intentionally mismatched, so that the radiologists actually reviewed pictures of different patients. When they saw the first 200 images, they detected 12.5 percent of the mismatches. Each radiologist was then asked to review another batch of pairs of chest X-rays from different patients; as before, there were mismatches in each set. This time the patient's picture was attached to each pair of X-rays. The radiologists detected 64 percent of the mismatches.

This stark contrast is instructive for anyone bent on stamping out bad behavior and scaling up excellence: leaders and employees do the right thing when they focus, not on their own needs and wants, but on the people affected by their actions.

[12]Vanessa K. Bohns, Francesca Gino, and Chen-Bo Zhong, "Good lamps are the best police: Darkness increases dishonesty and self-interested behavior," *Psychological Science*, 2010, Volume 21, Number 3, pp. 311–14.

[13]Srini Tridandapani et al., "Increasing rate of detection of wrong-patient radiographs: Use of photographs obtained at time of radiography," *American Journal of Roentgenology*, 2013, Volume 200, Number 4, pp. W345–W352; and Irith Hadas-Halpern, David Raveh, and Yehonatan N. Turner, "The effects of including a patient's photograph to the radiographic examination," paper presented at the 94th meeting of the Radiological Society of North America, 2008.

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Data analytics: Getting to the next level

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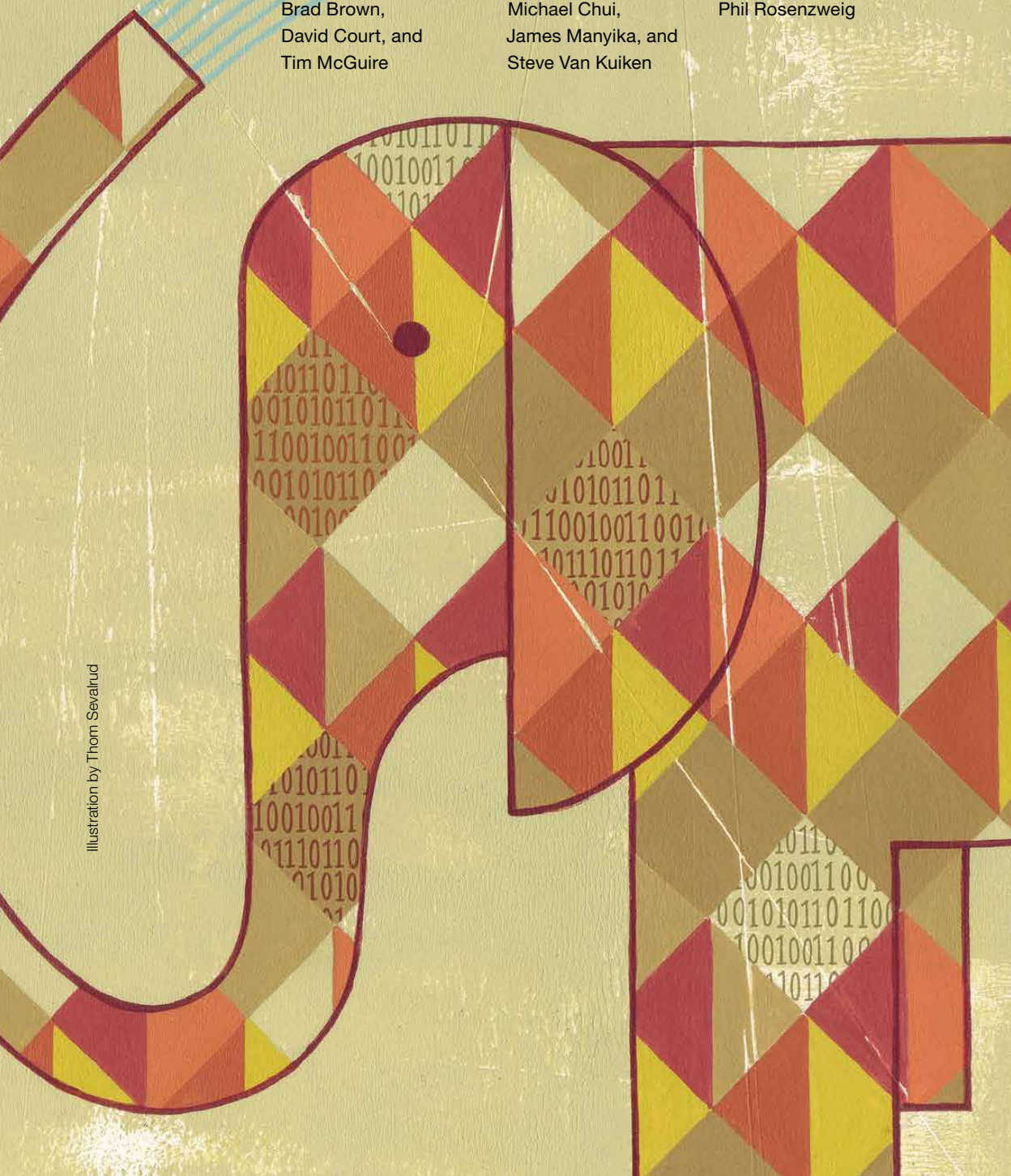
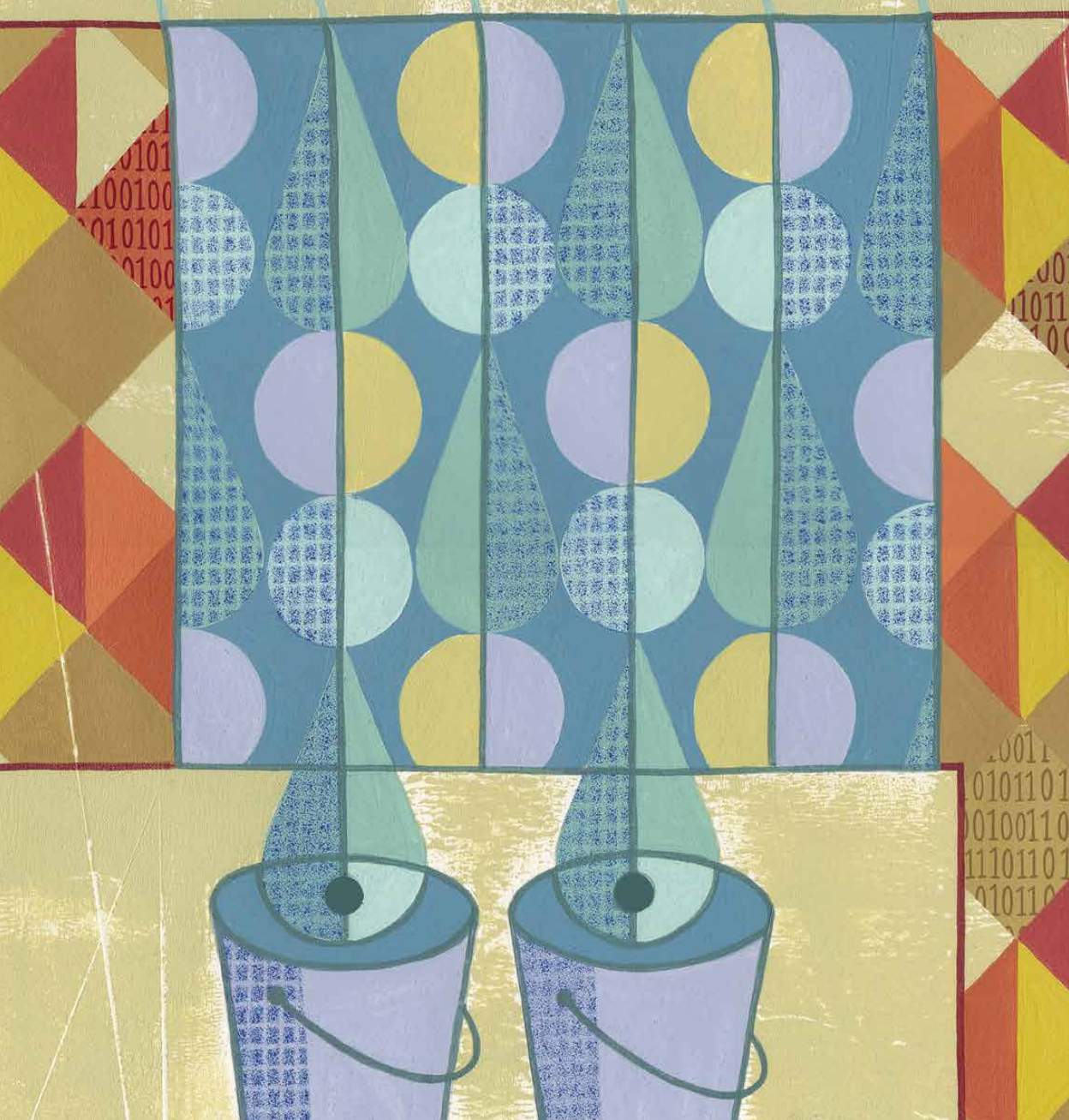


Illustration by Thom Sevalrud

The top-management implications of data analytics continue to grow. In this package, eight executives at the forefront offer their perspectives on applying advanced analytics to real business problems. Avoid lapsing into management autopilot cautions IMD professor Phil Rosenzweig, who flags the limitations of models for decisions in which leadership, initiative, and confidence heavily influence outcomes. And embrace the flood of openly available data, which is amping up big data's disruptive power, according to new research from the McKinsey Global Institute.



Views from the front lines of the data-analytics revolution

Brad Brown, David Court, and Tim McGuire

At a unique gathering of data-analytics leaders, new solutions began emerging to vexing privacy, talent, organizational, and frontline-adoption challenges.

This past October, eight executives from companies that are leaders in data analytics got together to share perspectives on their biggest challenges. All were the most senior executives with data-analytics responsibility in their companies, which included AIG, American Express, Samsung Mobile, Siemens Healthcare, TD Bank, and Wal-Mart Stores. Their backgrounds varied, with chief information officers, a chief data officer, a chief marketing officer, a chief risk officer, and a chief science officer all represented.[1] We had seeded the discussion by asking each of them in advance about the burning issues they were facing.

[1]Murli Buluswar, chief science officer, AIG Property Casualty; Ash Gupta, president, Risk and Information Management, and chief risk officer, American Express; Mark Ramsey, chief data officer, Samsung Mobile; John Glaser, chief executive officer, Health Services, Siemens Healthcare; Teri Currie, group head, Direct Channels, Corporate Shared Services, Marketing, and People Strategies, TD Bank; Karenann Terrell, executive vice president and chief information officer, Wal-Mart Stores.

For these executives, the top five questions were:

- Are data and analytics overhyped?
- Do privacy issues threaten progress?
- Is talent acquisition slowing strategy?
- What organizational models work best?
- What's the best way to assure adoption?

Here is a synthesis of the discussion.

1. Data and analytics aren't overhyped—but they're oversimplified

Participants all agreed that the expectations of senior management are a real issue. Big-data analytics are delivering an economic impact in the organization, but too often senior leaders' hopes for benefits are divorced from the realities of frontline application. That leaves them ill prepared for the challenges that inevitably arise and quickly breed skepticism.

The focus on applications helps companies to move away from "the helicopter view," noted one participant, in which "it all looks the same." The reality of where and how data analytics can improve performance varies dramatically by company and industry.

Customer-facing activities. In some industries, such as telecommunications, this is where the greatest opportunities lie. Here, companies benefit most when they focus on analytics models that optimize pricing of services across consumer life cycles, maximize marketing spending by predicting areas where product promotions will be most effective, and identify tactics for customer retention.

Internal applications. In other industries, such as transportation services, models will focus on process efficiencies—optimizing

routes, for example, or scheduling crews given variations in worker availability and demand.

Hybrid applications. Other industries need a balance of both. Retailers, for example, can harness data to influence next-product-to-buy decisions and to optimize location choices for new stores or to map product flows through supply chains. Insurers, similarly, want to predict features that will help them extend product lines and assess emerging areas of portfolio risk. Establishing priorities wisely and with a realistic sense of the associated challenges lies at the heart of a successful data-analytics strategy.

Companies need to operate along two horizons: capturing quick wins to build momentum while keeping sight of longer-term, groundbreaking applications. Although, as one executive noted, "We carefully measure our near-term impact and generate internal 'buzz' around these results," there was also a strong belief in the room that the journey crosses several horizons. "We are just seeing the tip of the iceberg," said one participant. Many believed that the real prize lies in reimagining existing businesses or launching entirely new ones based on the data companies possess.

New opportunities will continue to open up. For example, there was a growing awareness, among participants, of the potential of tapping swelling reservoirs of external data—sometimes known as open data—and combining them with existing proprietary data to improve models and business outcomes. (See "What executives should know about 'open data,'" on page 102.) Hedge funds have been among the first to exploit a flood of newly accessible government

Establishing priorities wisely and with a realistic sense of the associated challenges lies at the heart of a successful data-analytics strategy.

data, correlating that information with stock-price movements to spot short-term investment opportunities. Corporations with longer investment time horizons will need a different playbook for open data, but few participants doubted the value of developing one.

2. Privacy concerns must be addressed—and giving consumers control can help

Privacy has become the third rail in the public discussion of big data, as media accounts have rightly pointed out excesses in some data-gathering methods. Little wonder that consumer wariness has risen. (Data concerns seem smaller in the business-to-business realm.) The flip side is that data analytics increasingly provides consumers, not to mention companies and governments, with a raft of benefits, such as improved health-care outcomes, new products precisely reflecting consumer preferences, or more useful and meaningful digital experiences resulting from a greater ability to customize information. These benefits, by necessity, rest upon the collection, storage, and analysis of large, granular data sets that describe *real people*.

Our analytics leaders were unanimous in their view that placing more control of information in the hands of consumers, along with building their trust, is the right path forward.

Opt-in models. A first step is allowing consumers to opt in or opt out of the collection, sharing, and use of their data. As one example, data aggregator Acxiom recently launched a website (aboutthedata.com) that allows consumers to review, edit, and limit the distribution of the data the company has collected about them. Consumers, for instance, may choose to limit the sharing of their data for use in targeted Internet ads. They control the trade-off between targeted (but less private) ads and nontargeted ones (potentially offering less value).

Company behavior. Our panelists presume that in the data-collection arena, the motives of companies are good and organizations will act responsibly. But they must earn this trust continually; recovering from a single privacy breach or misjudgment could take years. Installing internal practices that reinforce good data stewardship,

while also communicating the benefits of data analytics to customers, is of paramount importance. In the words of one participant: "Consumers will trust companies that are true to their value proposition. If we focus on delivering that, consumers will be delighted. If we stray, we're in problem territory."

3. Talent challenges are stimulating innovative approaches—but more is needed

Talent is a hot issue for everyone. It extends far beyond the notoriously short supply of IT and analytics professionals. Even companies that are starting to crack the skill problem through creative recruiting and compensation strategies are finding themselves shorthanded in another area: they need more "translators"—people whose talents bridge the disciplines of IT and data, analytics, and business decision making. These translators can drive the design and execution of the overall data-analytics strategy while linking IT, analytics, and business-unit teams. Without such employees, the impact of new data strategies, tools, and methodologies, no matter how advanced, is disappointing.

The amalgam is rare, however. In a more likely talent scenario, companies find individuals who combine two of the three needed skills. The *data strategists*' combination of IT knowledge and experience making business decisions makes them well suited to define the data requirements for high-value business analytics. *Data scientists* combine deep analytics expertise with IT know-how to develop sophisticated models and algorithms. *Analytic consultants* combine practical business knowledge with analytics experience to zero in on high-impact opportunities for analytics.

A widespread observation among participants was that the usual sources of talent—elite universities and MBA programs—are falling short. Few are developing the courses needed to turn out people with these combinations of skills. To compensate, and to get more individuals grounded in business and quantitative skills, some companies are luring data scientists from leading Internet companies; others are looking offshore.

The management and retention of these special individuals requires changes in mind-set and culture. Job one: provide space and freedom to stimulate exploration of new approaches and insights. "At times, you may not know exactly what they"—data scientists—"will find," one executive noted in describing the company's efforts to provide more latitude for innovation. (So far, these efforts are boosting retention rates.) Another priority: create a vibrant environment so top talent feels it's at the cutting edge of technology change and emerging best practices. Stimulating engagement with the data-analytics ecosystem (including venture capitalists, analytics start-ups, and established analytics vendors) can help.

4. You need a center of excellence—and it needs to evolve

To catalyze analytics efforts, nearly every company was using a center of excellence, which works with businesses to develop and deploy analytics rapidly. Most often, it includes data scientists, business specialists, and tool developers. Companies are establishing these centers in part because business leaders need the help. Centers of excellence also boost the organization-wide impact of the scarce translator talent described above. They can even help attract and retain talent: at their best, centers are hotbeds of learning and innovation as teams share ideas on how to construct robust data sets, build powerful models, and translate them into valuable business tools.

Our participants agreed that it's worth creating a center of excellence only if you can locate it in a part of the company where data-analytics assets or capabilities could have a dramatic strategic impact. For some companies, this meant IT; for others, marketing and sales or large business units. At one company, for instance, the analytics agenda is focused on exploiting a massive set of core transactional data across several businesses and functions. In this case, the center of excellence resides within IT to leverage its deep knowledge of this core data set and its role as a shared capability across businesses.

The goal should be for these centers to be so successful at building data-analytics capabilities across the organization that they can

tackle increasingly ambitious priorities. One executive suggests that as businesses build their analytics muscle, centers of excellence will increasingly focus on longer-term projects more akin to sophisticated R&D, with an emphasis on analytics innovation and breakthrough insights.

5. Two paths to spur adoption—and both require investment

Frontline adoption was the most important issue for many leaders. Getting managers and individual contributors to use new tools purposefully and enthusiastically is a huge challenge. As we have written elsewhere,[2] companies simply don't invest enough, in time or money, to develop killer applications that combine smart, intuitive design and robust functionality. However, our participants see two clear paths leading to broad adoption.

Automation. One avenue to spurring adoption works for relatively simple, repetitive analytics: creating intuitive end-user interfaces that can be rolled out rapidly and with little training. For example, a mobile application on a smartphone or tablet might give brand managers instant visibility into volume and sales trends, market share, and average prices. These tools become part of the daily flow of decision making, helping managers to figure out how intensely to promote products, when tactical shifts in pricing may be necessary to match competitors, or, over time, where to begin pushing for new products. According to one executive, "Little or no training is required" with simple tools like these. Provided they are "clear and well designed, with strong visualization qualities, end users will seek them out."

Training. A second path requires significant investments in training to support more complex analytics. Consider a tool for underwriting small and midsize business loans. The tool combines underwriters' knowledge and the power of models, which bring consistency across

[2]Brad Brown, David Court, and Paul Willmott, "Mobilizing your C-suite for big-data analytics," *McKinsey Quarterly*, November 2013; and Stefan Biesdorf, David Court, and Paul Willmott, "Big data: What's your plan?," *McKinsey Quarterly*, March 2013, both available on mckinsey.com.

underwriting judgments, clarifying risks and minimizing biases. But underwriters need training to understand where the model fits into the underwriting process flow and how they can incorporate what the models and tools say into their own experience of customer characteristics and their business priorities.

Whichever path is chosen, it should start with pilot efforts and clear rules for making "go/no-go" decisions about the shift from exploratory analytics to a full-scale rollout. Some models don't end up being predictive enough to deliver the desired impact; better to shelve them before they become investment sinkholes and undermine organizational confidence in analytics. Executives need to be willing to press "pause" and remind the organization that the failure of some analytics initiatives to materialize is nothing to worry about; in fact, this is the reason for pursuing a portfolio of them. The combination of success stories and hard-nosed decisions to pull the plug is all part of creating a climate where business units, functions, top management, and frontline employees embrace the transformational possibilities of data analytics.

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What executives should know about 'open data'

Michael Chui, James Manyika, and Steve Van Kuiken

Novel and more accessible forms of information from government and private sources represent a new and rapidly growing piece of the big-data puzzle.

Not all data that's valuable is internal and proprietary. New initiatives by governments as diverse as those of the United States, Mexico, and Singapore are opening the spigots of readily usable public data. Corporate information too is becoming more "liquid," moving across the economy as companies begin sharing data with their business partners and, sometimes, consumers. Also surging is the richness of the information from data aggregators, which are assembling, rendering anonymous, and selling (to interested third parties) a wide range of data flows. Then add huge volumes of data from social-media interactions, available from providers of digital platforms such as Twitter and Facebook.[1]

These new sources of open data represent an expanding trove of largely unexploited value. One everyday illustration of open data at work is a smartphone app that uses real-time data (provided by transit authorities) to tell commuters when the next bus or train will arrive. Using open or pooled data from many sources—all the businesses in a particular sector, for example—often combined with proprietary big data, can help companies develop insights they could not have uncovered with internal data alone.

[1]Data sets range from completely open to completely closed, across four dimensions: *accessibility* (the range of users permitted to access the data), *machine readability* (the ease with which the data can be processed automatically), *cost* (the price to obtain data), and *rights* (limitations on the use, transformation, and distribution of the data).

Demographic data, financial transactions, health-care benchmarks, and real-time location data are among the myriad new information sources a company can exploit to create novel products and services and to make its operations more effective and efficient. New research from the McKinsey Global Institute, the McKinsey Center for Government, and McKinsey's Business Technology Office suggests that $3 trillion or more in annual value could arise from the use of open data in applications across seven domains of the global economy (exhibit). About a third of those potential benefits would involve the use of benchmarks to identify areas for improvement.

Whether or not individual executives at large companies choose to work with open data of various types, the magnitude of the value at stake suggests that some of them will—and that these applications will probably affect a wide range of industries, markets, and customers. Layering open-data mandates into the ongoing development of data and analytics strategies by considering both the use and sharing of more liquid data should therefore become an increasingly important priority for a wide range of companies. Here are a few examples of open data's potential:

- Energy exploration. As new technologies have made it possible to drill in a wider range of geological formations, reservoirs have become more complex. That's raising costs and risks—estimated ratios of prospects to explored targets can be as high as 50 to 1. The sharing of information on drilling permits and on seismic and other data across companies could reduce the number of dry holes and help optimize investments. While the widespread sharing of seismic data is unlikely, sharing among even a few companies could produce significant new value in the oil and gas industry. Governments keen on maximizing resource wealth could take the lead in structuring processes for granting permits so that grants of initial drilling licenses would require greater sharing of seismic data. Sharing data on projected costs and development timetables (through third parties) could establish benchmarks that, we estimate, would reduce per-project costs by 15 to 25 percent.

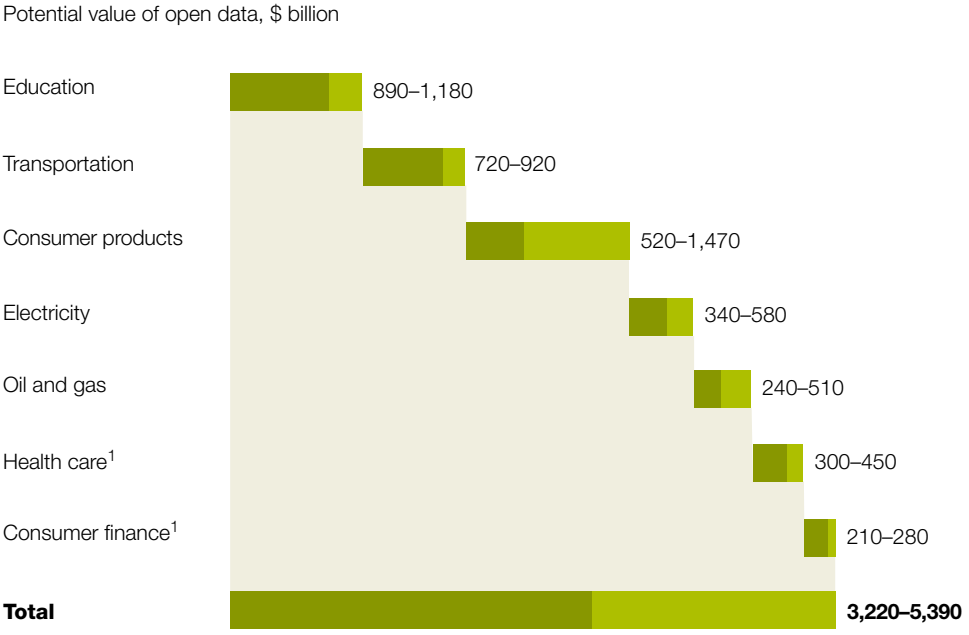
- Consumer insights. In the consumer-products sector, sharing data among retailers and manufacturers in limited circumstances—avoiding exchanges with direct competitors, for example—could lead to marketing approaches not possible with proprietary data

alone. Take Nectar, a UK-based program for loyalty cards, which can be used at Sainsbury's for groceries, BP stations for gasoline, and Hertz for car rentals. Sharing aggregated data allows the three companies to gain a broader, more complete perspective on consumer behavior, while safeguarding their competitive positions.

- Agriculture. San Francisco–based Climate Corporation combined more than 30 years of weather data, 60 years of data on crop yields, and multiple terabytes of information on soil types—all data from public sources. With that reservoir of historical information and real-time data flows, the company offers fee-based advice to farmers and customized crop- and weather-insurance products based on sophisticated algorithms. The company was recently acquired for about $1 billion by Monsanto.

Exhibit

Open data can help unlock $3 trillion to $5 trillion in economic value annually across seven sectors.



[1]Values for health care and consumer finance are drawn from examples of open-data potential and are not a comprehensive sizing of potential value across the 2 sectors; health-care figures are based on US values only.

Source: McKinsey Global Institute analysis

Other possibilities abound. Premium pricing for some goods could be facilitated if companies shared detailed information about products, such as the materials they use or the conditions under which they were manufactured (for example, with renewable energy). On the flip side, open-data applications may also create new areas of consumer value. In a budding trend known as MyData, organizations share information they have collected about individuals with them, in useful forms. Patients could access targeted medical data from a hospital, for instance, to help them manage their health.

Powerful as open data can be, many companies have valid concerns. Consider the sharing of data to establish industry benchmarks. Even if a company uses a third party and gets assurances of anonymity, there's always a risk that its identity might be revealed and that competitors could see how well or poorly it was doing. Shared data also could give away sources of competitive advantage or compromise intellectual property. Similarly, tapping social data could heighten privacy worries among consumers.

Still, it's hard to imagine that the open-data wave will slow down. Third-party open-data aggregators will certainly proceed to sell and publish corporate data, such as customer ratings, safety records, defect complaints and recalls, and comparative price data. Open-data initiatives also continue to proliferate in the public sector. In June 2013, G8 governments adopted an Open Data Charter, which establishes the expectation that the default policy should be the open publication of government data. Traditional competitors and entrepreneurial attackers can take advantage of open-data sources such as social-media comments and crowdsourced ideas to come up with new products and services. Open data, in short, seems to be another of the many relentless shifts in the digital landscape to appear unexpectedly, create new opportunities and strategic complexities, and leave established players with no place to hide.

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For more on this research, see the full McKinsey report, *Open data: Unlocking innovation and performance with liquid information*, on mckinsey.com.

The benefits—and limits—of decision models

Phil Rosenzweig

Big data and models help overcome biases that cloud judgment, but many executive decisions also require bold action inspired by self-confidence. Here's how to take charge in a clear-headed way.

The growing power of decision models has captured plenty of C-suite attention in recent years. Combining vast amounts of data and increasingly sophisticated algorithms, modeling has opened up new pathways for improving corporate performance.[1] Models can be immensely useful, often making very accurate predictions or guiding knotty optimization choices and, in the process, can help companies to avoid some of the common biases that at times undermine leaders' judgments.

Yet when organizations embrace decision models, they sometimes overlook the need to use them well. In this article, I'll address an important distinction between outcomes leaders can influence and those they cannot. For things that executives cannot directly influence, accurate judgments are paramount and the new modeling tools can be valuable. However, when a senior manager can have a direct influence over the outcome of a decision, the challenge is quite different. In this case, the task isn't to *predict* what will happen but

[1]See these recent articles: Brad Brown, Michael Chui, and James Manyika, "Are you ready for the era of 'big data'?," *McKinsey Quarterly*, October 2011; Erik Brynjolfsson, Jeff Hammerbacher, and Brad Stevens, "Competing through data: Three experts offer their game plans," *McKinsey Quarterly*, October 2011; Brad Brown, David Court, and Paul Willmott, "Mobilizing your C-suite for big-data analytics," *McKinsey Quarterly*, November 2013; and Stefan Biesdorf, David Court, and Paul Willmott, "Big data: What's your plan?," *McKinsey Quarterly*, March 2013, all available on mckinsey.com.

to *make* it happen. Here, positive thinking—indeed, a healthy dose of management confidence—can make the difference between success and failure.

Where models work well

Examples of successful decision models are numerous and growing. Retailers gather real-time information about customer behavior by monitoring preferences and spending patterns. They can also run experiments to test the impact of changes in pricing or packaging and then rapidly observe the quantities sold. Banks approve loans and insurance companies extend coverage, basing their decisions on models that are continually updated, factoring in the most information to make the best decisions.

Some recent applications are truly dazzling. Certain companies analyze masses of financial transactions in real time to detect fraudulent credit-card use. A number of companies are gathering years of data about temperature and rainfall across the United States to run weather simulations and help farmers decide what to plant and when. Better risk management and improved crop yields are the result.

Other examples of decision models border on the humorous. Garth Sundem and John Tierney devised a model to shed light on what they described, tongues firmly in cheek, as one of the world's great unsolved mysteries: how long will a celebrity marriage last? They came up with the Sundem/Tierney Unified Celebrity Theory, which predicted the length of a marriage based on the couple's combined age (older was better), whether either had tied the knot before (failed marriages were not a good sign), and how long they had dated (the longer the better). The model also took into account fame (measured by hits on a Google search) and sex appeal (the share of those Google hits that came up with images of the wife scantily clad). With only a handful of variables, the model did a very good job of predicting the fate of celebrity marriages over the next few years.

Models have also shown remarkable power in fields that are usually considered the domain of experts. With data from France's premier wine-producing regions, Bordeaux and Burgundy, Princeton economist Orley Ashenfelter devised a model that used just three

variables to predict the quality of a vintage: winter rainfall, harvest rainfall, and average growing-season temperature. To the surprise of many, the model outperformed wine connoisseurs.

Why do decision models perform so well? In part because they can gather vast quantities of data, but also because they avoid common biases that undermine human judgment.[2] People tend to be overly precise, believing that their estimates will be more accurate than they really are. They suffer from the recency bias, placing too much weight on the most immediate information. They are also unreliable: ask someone the same question on two different occasions and you may get two different answers. Decision models have none of these drawbacks; they weigh all data objectively and evenly. No wonder they do better than humans.

Can we control outcomes?

With so many impressive examples, we might conclude that decision models can improve just about anything. That would be a mistake. Executives need not only to appreciate the power of models but also to be cognizant of their limits.

Look back over the previous examples. In every case, the goal was to make a prediction about something that could not be influenced directly. Models can estimate whether a loan will be repaid but won't actually change the likelihood that payments will arrive on time, give borrowers a greater capacity to pay, or make sure they don't squander their money before payment is due. Models can predict the rainfall and days of sunshine on a given farm in central Iowa but can't change the weather. They can estimate how long a celebrity marriage might last but won't help it last longer or cause another to end sooner. They can predict the quality of a wine vintage but won't make the wine any better, reduce its acidity, improve the balance, or change the undertones. For these sorts of estimates, finding ways to avoid bias and maintain accuracy is essential.

[2]Dan P. Lovallo and Olivier Sibony, "Distortions and deceptions in strategic decisions," *McKinsey Quarterly*, February 2006, mckinsey.com.

Executives, however, are not concerned only with predicting things they cannot influence. Their primary duty—as the word *execution* implies—is to get things done. The task of leadership is to mobilize people to achieve a desired end. For that, leaders need to inspire their followers to reach demanding goals, perhaps even to do more than they have done before or believe is possible. Here, positive thinking matters. Holding a somewhat exaggerated level of self-confidence isn't a dangerous bias; it often helps to stimulate higher performance.

This distinction seems simple but it's often overlooked. In our embrace of decision models, we sometimes forget that so much of life is about getting things done, not predicting things we cannot control.

The insight of Billy Beane . . .

The failure to distinguish between what we can and cannot control has led to confusion in many fields. Perhaps nowhere has the gap been more evident than in the application of decision models to baseball. For decades, baseball managers made tactical decisions according to an unwritten set of rules, known as *going by the book*. Beginning in the 1970s, a group of statistically minded fans—practitioners of *sabermetrics*, a term coined in honor of the Society for American Baseball Research—began to apply the power of data analysis to test some of baseball's cherished notions, often with surprising results.

Take a common tactic, the sacrifice bunt. With a runner on first base and one or no outs, should the batter bunt the ball to advance the runner? Conventional wisdom said yes. As Bill James, a pioneer of sabermetrics, put it, "The experts all knew that when there was a runner on first and no one out, the percentage move was to bunt."[3] Until recently, there was no way to conduct a decent empirical analysis of the sacrifice bunt, but now there is. A simple test compares the runs that result from two situations: a runner at first base with no outs and a runner at second base with one out. Analyzing an entire season of major-league games revealed that, on average, making an out to advance the runner leads to fewer runs. The sacrifice bunt is just one example of how conventional wisdom in baseball can be wrong. James concluded, "A very, very large percentage of the things that the experts all knew to be true turned out, on examination, not to be true at all."[4]

The use of data analysis was the key insight of Michael Lewis's 2003 bestseller, *Moneyball: The Art of Winning an Unfair Game*. Lewis described how the Oakland Athletics, a low-budget team in a small market, posted several consecutive years of excellent results. Athletics general manager Billy Beane used decision models to discover what truly led to a winning performance and applied those insights to assemble a team of very good players at bargain prices. In "decision speak," he was trying to *optimize runs scored per dollar spent*. Oakland compiled a strong record for several consecutive years, despite a low payroll, largely thanks to its reliance on decision analytics.

With the publication of *Moneyball*, the use of statistics in baseball became widely accepted. Statistically minded general managers, some of them disciples of Billy Beane, spread throughout major-league baseball. Soon a host of new statistics was devised to measure increasingly esoteric aspects of play. One tracks the location and velocity of every single pitch, providing for the ever-finer analysis of any pitcher's performance. Another records every ball in play and extends statistical analysis to fielding, the aspect of play least amenable to quantification. Insights into the batting patterns of

[3]Bill James, *Solid Fool's Gold: Detours on the Way to Conventional Wisdom*, first edition, Chicago, IL: ACTA Sports, 2011, p. 185.

[4]James, p. 186.

individual players now help teams to shift the positions of their fielders for each batter. America's pastime has fully embraced the digital age, bringing Cupertino to Cooperstown.

. . . and the wisdom of Joe Morgan

The notion that players could be evaluated by statistical models was not universally accepted. Players, in particular, insisted that performance couldn't be reduced to figures. Statistics don't capture the intangibles of the game, they argued, or grasp the subtle qualities that make players great. Of all the critics, none was more outspoken than Joe Morgan, a star player from the 1960s and 1970s. "I don't think that statistics are what the game is about," Morgan insisted. "I played the Game. I know what happens out there. . . . *Players* win games. Not theories."[5]

Proponents of statistical analysis dismissed Joe Morgan as unwilling to accept the truth, but in fact he wasn't entirely wrong. Models are useful in predicting things we cannot control, but for players—on the field and in the midst of a game—the reality is different. Players don't *predict* performance; they have to *achieve* it. For that purpose, impartial and dispassionate analysis is insufficient. Positive thinking matters, too.

When we stand back from the claims and counterclaims, Billy Beane and Joe Morgan are both right—just about different things. The job of a general manager is to assemble a team that will perform well on the field. When general managers evaluate players, decide whom to sign and how much to pay, whom to promote and whom to trade, they do best by relying on dispassionate analysis. There's nothing to be gained from wishful thinking or biased judgments. Billy Beane was known to work out in the clubhouse gym during games rather than watch the action on the diamond. Why? Because as general manager, he doesn't throw a ball or swing a bat. He can exercise control over the composition of the team, but once the game begins he's powerless.

[5]Tommy Craggs, "Say-It-Ain't-So Joe," *SF Weekly*, July 6, 2005, sfweekly.com.

Part of the appeal of decision models lies in their ability to make predictions, to compare those predictions with what actually happens, and then to evolve so as to make more accurate predictions.

For players, the reality is entirely different: their job is to hit the ball and drive in the runs. A mind-set with high self-confidence—even a level of confidence that is, by some definitions, slightly excessive—is vital. Perhaps it shouldn't be surprising that this point was articulated so intuitively by Joe Morgan, a diminutive man who not only won the National League's Most Valuable Player award in 1975 and 1976 but is also considered one of the greatest second basemen of all time.

Pitting baseball traditionalists against proponents of statistical analysis makes for a spirited debate. But that's a false dichotomy, not conducive to a better understanding of the game. When the *Moneyball* controversy was at its height, St. Louis Cardinals manager Tony LaRussa wisely observed that no single approach was best: "The 'Moneyball' kind of stuff has its place, but so does the human. Really, the combination is the answer."[6]

The same distinction applies to managers of all kinds. The question, boiled down to its essence, is whether we are trying to predict something we cannot influence or something we can control, at least in part. Decision models are increasingly powerful for tasks requiring the impartial analysis of vast amounts of data. When we can and must shape outcomes, however, they do not suffice. An executive may be wise to rely on decision models when estimating consumer reactions to a promotion or meteorological conditions, but motivating a team to achieve high performance is a different matter. A combination of skills is the answer.

[6]David Leonhardt, "Science and art at odds on the field of dreams," the *New York Times*, August 29, 2005, nytimes.com.

Influence, direct and indirect

The use of decision models raises a third possibility, in addition to direct influence and no influence: *indirect influence*. Even if we cannot directly shape an outcome, a model's prediction may be communicated in a way that alters behavior and indirectly shapes an outcome. Indirect influence takes two forms. If it increases the chance an event will occur, that's a self-fulfilling prediction. If it lowers the chance an event will occur, that's a self-negating prediction.

Consider a bank that uses a decision model to review loan applications. The model has no direct influence on a borrower's behavior; it can't control spending habits or make sure that anyone saves enough money each month to repay a loan. Suppose that instead of simply turning down the application, however, a banker meets an aspiring borrower and explains the reasons for concern. Such an intervention could cause the applicant to behave differently, perhaps by devising a monthly budget or by asking for direct payment via payroll deduction. Even though the model had no direct influence on the outcome, it could exert an indirect influence. The same goes for one of the most impressive examples of decision models in recent years: the electoral model. Models do not directly affect the outcome of an election—they do not cast votes. But if the projections of models are communicated broadly, they may embolden some supporters and discourage others, and thereby have an indirect influence.

The crucial lesson for executives is not simply to marvel at the power of decision analytics but also to understand the role these techniques play in achieving a desired outcome. If that outcome is an accurate prediction, models have unparalleled power. If we can shape it, then concerted effort—aided by positive thinking—can be vital. And in some instances, the output of a decision model can be communicated to influence a desired outcome indirectly. Models are powerful tools; keeping in mind the desired end is paramount.

Improving models over time

Part of the appeal of decision models lies in their ability to make predictions, to compare those predictions with what actually happens, and then to evolve so as to make more accurate predictions.

In retailing, for example, companies can run experiments with different combinations of price and packaging, then rapidly obtain feedback and alter their marketing strategy. Netflix captures rapid feedback to learn what programs have the greatest appeal and then uses those insights to adjust its offerings. Models are not only useful at any particular moment but can also be updated over time to become more and more accurate.

Using feedback to improve models is a powerful technique but is more applicable in some settings than in others. Dynamic improvement depends on two features: first, the observation of results should not make any future occurrence either more or less likely and, second, the feedback cycle of observation and adjustment should happen rapidly. Both conditions hold in retailing, where customer behavior can be measured without directly altering it and results can be applied rapidly, with prices or other features changed almost in real time. They also hold in weather forecasting, since daily measurements can refine models and help to improve subsequent predictions. The steady improvement of models that predict weather—from an average error (in the maximum temperature) of 6 degrees Fahrenheit in the early 1970s to 5 degrees in the 1990s and just 4 by 2010—is testimony to the power of updated models.

For other events, however, these two conditions may not be present. As noted, executives not only estimate things they cannot affect but are also charged with bringing about outcomes. Some of the most consequential decisions of all—including the launch of a new product, entry into a new market, or the acquisition of a rival—are about mobilizing resources to get things done. Furthermore, the results are not immediately visible and may take months or years to unfold. The ability to gather and insert objective feedback into a model, to update it, and to make a better decision the next time just isn't present.

None of these caveats call into question the considerable power of decision analysis and predictive models in so many domains. They help underscore the main point: an appreciation of decision

analytics is important, but an understanding of when these techniques are useful and of their limitations is essential, too.

Most executives today would probably admit that they are overwhelmed by the volume and complexity of the decisions they face and are grateful when models may relieve some of the burden. But they need to be careful. Decision models are often so impressive that it's easy to be seduced by them and to overlook the need to use them wisely. As University of Calgary associate professor Jeremy Fox observed, the growing popularity of "technically sophisticated, computationally intensive statistical approaches" has an unfortunate side effect: a "shut up and calculate the numbers" ethos, rather than one that promotes critical thinking and stimulates ideas about what the numbers actually mean.[7] Before leaders and their teams apply models, they should step back and consider their ability to influence the outcome. When it is high, the answer isn't to ignore the data and fly blind, but to establish priorities for tipping the scales through the strength and confidence that are hallmarks of effective leadership.

[7] *Oikos Online*, "Frequentist vs. Bayesian statistics: Resources to help you choose," blog entry by Jeremy Fox, October 11, 2011, oikosjournal.wordpress.com.

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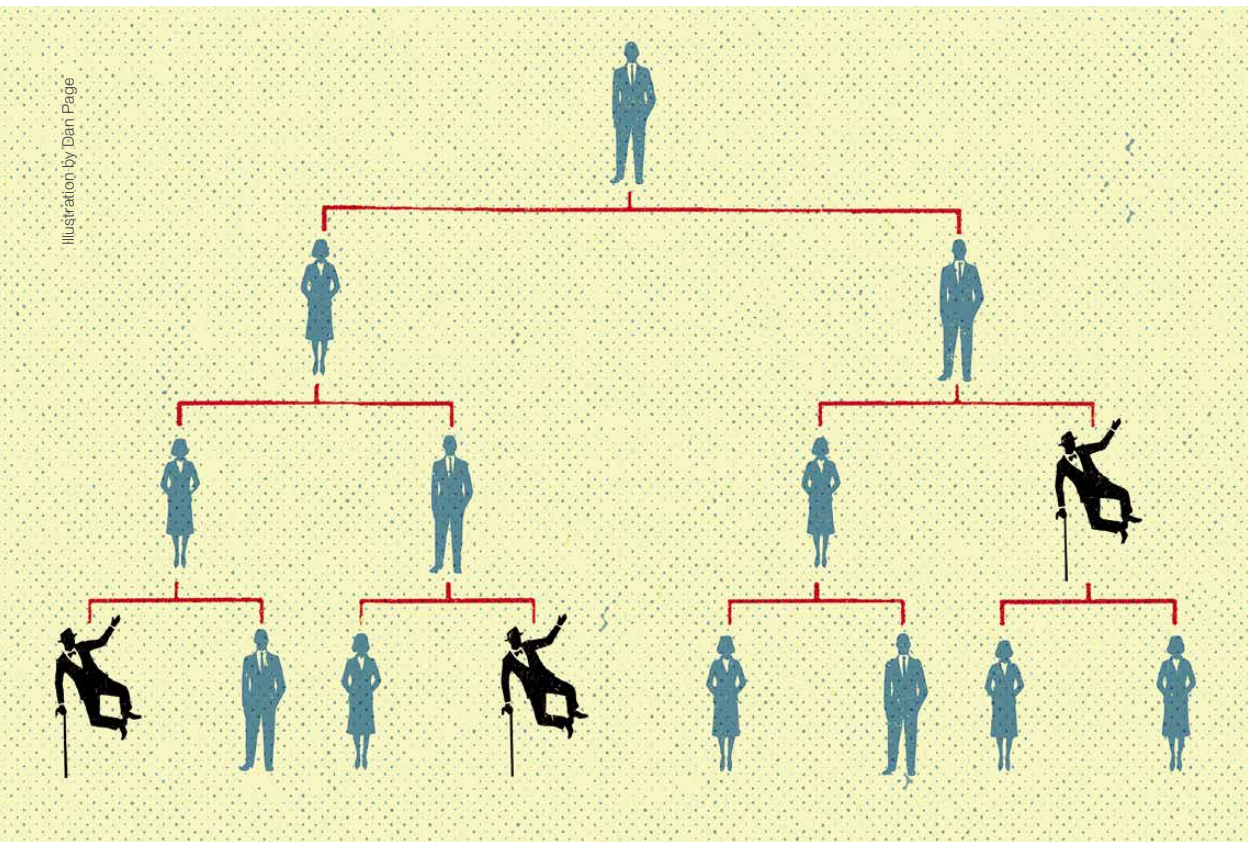

Illustration by Dan Page

Tapping the power of hidden influencers

Lili Duan, Emily Sheeren, and Leigh M. Weiss

A tool social scientists use to identify sex workers and drug users can help senior executives find the people most likely to catalyze—or sabotage—organizational-change efforts.

Employee resistance is the most common reason executives cite for the failure of big organizational-change efforts.[1] Winning over skeptical employees and convincing them of the need to change just isn't possible through mass e-mails, PowerPoint presentations, or impassioned CEO mandates. Rather, companies need to develop strong change leaders employees know and respect—in other words, people with informal influence. But there's one problem: finding them. How can company leaders identify those people beforehand to better harness their energy, creativity, and goodwill—and thereby increase the odds of success?

One way we've found is "snowball sampling," a simple survey technique used originally by social scientists to study street gangs, drug users, and sex workers—hidden populations reluctant to participate in formal research. These brief surveys (two to three minutes) ask recipients to identify acquaintances who should also be asked to participate in the research. Thus, one name or group of names quickly snowballs into more, and trust is maintained, since referrals are made anonymously by acquaintances or peers rather than formal identification.[2]

In business settings, the methodology is easily adapted to better understand the patterns and networks of influence that operate below the radar.[3] Indeed, informal influencers exist in every organization, across industries, cultures, and geographies. They are, simply put, people other employees look to for input, advice, or ideas about what's really happening in a company. They therefore have an outsized influence on what employees believe about the future, as well as on morale, how hard people work, and their willingness to support—or resist—change.

Finding these employees is relatively easy using snowball sampling. Companies can construct simple, anonymous e-mail surveys to ask, for example: "Who do you go to for information when you have trouble at work?" or "Whose advice do you trust and respect?" In shop-floor and retail-store settings where workers don't have ready access to e-mail, companies can use anonymous paper surveys. By asking employees to nominate three to five people (or more in very large organizations) who are also surveyed, executives can quickly identify a revealing set of influencers across a company. When the names of

nominees start to be repeated—often, after only three to four rounds—the survey can end.

The results are often surprising. For example, in our work using the methodology in the aerospace, financial-services, health-care, manufacturing, retailing, and trucking industries (as well as in public-sector settings), we've found that influencer patterns almost never follow the organizational chart. Informal influencers exist at all levels of a company and aren't easily identified or predicted by role or tenure (although relatively few are senior company leaders, as might be expected given their formal influence).

Moreover, we find that even when company leaders believe they know who the influencers will be, they are almost always wrong. At one large North American retailer, for instance, we compared a list of influencers that two store managers created before the survey with its actual results. Between them, the managers overlooked almost two-thirds of the influential employees their colleagues named; worse, both managers missed three of the top five influencers in their own stores. The retailer's inability to recognize its influencers is no anomaly; we've observed a similar pattern in every other industry and geography we've studied.

Armed with a better sense of how influence operates, senior executives can begin applying that knowledge in useful ways. For example, they can encourage influencers to help communicate necessary changes, convince skeptical employees of the need for change, or, best of all, do these things as active architects of the program. Indeed, the most powerful way to use hidden influencers is to bring them into such efforts in the earliest stages and to get their input and guidance on planning and direction—as well as help with execution. Changes made with the support of these influential employees are vastly more likely to succeed in the long run than changes delivered from on high.

Consider the experiences of an aerospace company that used snowball sampling to jump-start an operational-change program across its factory network and of a large manufacturer that used this approach to support a major cultural-change initiative. A close look at their experiences suggests four principles useful for other organizations looking to tap into the power of hidden influencers.

1. Think broad, not deep. The manufacturer started with a pilot effort to identify about two dozen influencers and later expanded it to include an additional 75 or so. The company sought influencers in a swath of regions, functions, and roles (including frontline ones). The diversity of opinion and experience not only helped provide energy and good ideas but also later proved important in communicating the changes, in role-modeling them across the company, and in combating skepticism.

While there is no formula to determine how many influencers a company should include, the sample must be wide enough to pull in a diversity of roles and perspectives. For the aerospace

company, this meant identifying 60 or so influencers working on different product lines and in different roles (including middle managers) on the shop floor. The goal is finding enough people with influence in enough roles to get a high degree of connectivity across the company through a relatively small number of connections (out of the total number possible). Some roles may prove to be particularly important: a retailer we studied, for example, found that its cashiers were generally well connected—most likely because they regularly interacted with colleagues in many departments. Cashiers who were influencers had considerable sway in the organization.

2. Trust, but verify. To build trust, participants at the manufacturer received letters of invitation explaining the program's goals, why these employees had been nominated, and how the company wanted them to help. It took pains to make the initiative voluntary—an approach the aerospace company also used. Having influencers opt into change efforts builds trust and encourages high-quality results. Indeed, many influencers will be eager to help and view the experience as an honor worthy of their best efforts.

But goodwill dissipates quickly if employees feel coerced. Before extending any invitations, the manufacturing company discreetly vetted all participants with Human Resources and local managers. Vetting the participants helps "screen in" influencers who are well regarded by both peers and superiors,[4] while acknowledging the reality that not all influence is positive and not all influencers want change. Although "bad eggs" should be screened out of important program roles, they still merit attention—as valuable sources of insight about how to convert skeptics.

3. Don't dictate—cocreate. Both the aerospace company and the manufacturer engaged their influencers as thought partners in the change effort, not just as mouthpieces for change. That's an important point because the influencers' informal authority dwindles if they seem to be doing the bidding of management. The manufacturer, for example, flew the participants out to a central location, where they contributed to a multiday series of workshops. The aerospace company invited influencers from different product lines to meet regularly for a working lunch on the shop floor. In both cases, the participants were organized in teams addressing themes they helped identify (for example, shop-floor safety, incentives for employees to think more innovatively, and actions to make the company more customer focused). Because both efforts required sustained input from the participants, the meetings inspired and motivated them. As the programs gathered steam, many of these employees helped to spread feelings of empowerment in their usual roles as well.

4. Connect the dots. To boost the odds of lasting change, the manufacturer created an online forum, supported by videoconferences, aimed at encouraging the influencers to meet and support one another periodically. In an effort to make these interactions as meaningful as possible, the company divided the influencers into smaller, volunteer-led

groups focused on common themes. This approach not only helps to produce more tangible actions and outcomes but also makes it easier for the groups to connect with colleagues working on similar projects in other regions or business units. The participants' sense of community, and of themselves as change leaders, grows as they share best practices, discuss new ideas, and address the inevitable challenges. The company's early commitment to in-person gatherings has made subsequent interactions by e-mail, telephone, or videoconference far more meaningful. In general, creating opportunities for influencers to meet in person usually pays big dividends.

• • •

Building on the themes identified by the manufacturer's pilot group, the company's full body of influencers is now implementing more than 50 culture-based initiatives. Some improvements are cross-cutting: for example, a new process to put employees' creative ideas in front of managers for rapid review and, if warranted, deployment. Others are targeted at business-level improvements: for instance, a customer dashboard that's meant to increase collaboration and has already dramatically improved sales. Thus far, several of the initiatives have led to promising increases in orders, market share, and margins. The aerospace company has implemented initiatives that helped to improve shop-floor safety, increase the number of on-time customer deliveries, and reduce plant inventory costs.

While the programs at both companies are works in progress, these early success stories have highlighted specific activities and behavior that drive performance. They are thus helping the companies to further articulate and accelerate the expected changes. Employee-satisfaction scores have also improved sharply at both companies, in large part thanks to increased levels of collaboration and empowerment.

[1]See Scott Keller and Colin Price, *Beyond Performance: How Great Organizations Build Ultimate Competitive Advantage*, first edition, Hoboken, NJ: John Wiley & Sons, 2011.

[2]For more about snowball sampling, see Rowland Atkinson and John Flint, "Accessing hidden and hard-to-reach populations: Snowball research strategies," University of Surrey Department of Sociology, *Social Research Update*, 2001, Number 33, sru.soc.surrey.ac.uk.

[3]See Lowell L. Bryan, Eric Matson, and Leigh M. Weiss, "Harnessing the power of informal employee networks," *McKinsey Quarterly*, November 2007, mckinsey.com.

[4]These influencers could well be future leaders of the company and are therefore particularly valuable.

The authors wish to thank Aaron De Smet for his contribution to this article.

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Illustration by Bill Butcher

Why leadership-development programs fail

Pierre Gurdjian, Thomas Halbeisen, and Kevin Lane

Sidestepping four common mistakes can help companies develop stronger and more capable leaders, save time and money, and boost morale.

For years, organizations have lavished time and money on improving the capabilities of managers and on nurturing new leaders. US companies alone spend almost $14 billion annually on leadership development.[1] Colleges and universities offer hundreds of degree courses on leadership, and the cost of customized leadership-development offerings from a top business school can reach $150,000 a person.

Moreover, when upward of 500 executives were asked to rank their top three human-capital priorities, leadership development was included as both a current and a future priority. Almost two-thirds of the respondents identified leadership development as their number-one concern.[2] Only 7 percent of senior managers polled by a UK business school think that their companies develop global leaders effectively,[3] and around 30 percent of US companies admit that they have failed to exploit their international business opportunities fully because they lack enough leaders with the right capabilities.[4]

We've talked with hundreds of chief executives about the struggle, observing both successful initiatives and ones that run into the sand. In the process, we've identified four of the most common mistakes. Here we explain some tips to overcome them. Together, they suggest ways for companies to get more from their leadership-development efforts—and ultimately their leaders—as these organizations face challenges ranging from the next demanding phase of globalization to disruptive technological change and continued macroeconomic uncertainty.

1. Overlooking context

Context is a critical component of successful leadership. A brilliant leader in one situation does not necessarily perform well in another. Academic studies have shown this, and our experience bears it out. The CEO of a large European services business we know had an outstanding record when markets were growing quickly, but he failed to provide clear direction or to impose financial discipline on the group's business units during the most recent economic downturn. Instead, he continued to encourage innovation and new thinking—hallmarks of the culture that had previously brought success—until he was finally replaced for underperformance.

Too many training initiatives we come across rest on the assumption that one size fits all and that the same group of skills or style of leadership is appropriate regardless of strategy, organizational culture, or CEO mandate.

In the earliest stages of planning a leadership initiative, companies should ask themselves a simple question: what, precisely, is this program for? If the answer is to support an acquisition-led growth strategy, for example, the company will probably need leaders brimming with ideas and capable of devising winning strategies for new or newly expanded business units. If the answer is to grow by capturing organic opportunities, the company will probably want people at the top who are good at nurturing internal talent.

Focusing on context inevitably means equipping leaders with a small number of competencies (two to three) that will make a significant difference to performance. Instead, what we often find is a long list of leadership standards, a complex web of dozens of competencies, and corporate values statements. Each is usually summarized in a seemingly easy-to-remember way (such as the three Rs), and each on its own terms makes sense. In practice, however, what managers and employees often see is an "alphabet soup" of recommendations. We have found that when a company cuts through the noise to identify a small number of leadership capabilities essential for success in its business—such as high-quality decision making or stronger coaching skills—it achieves far better outcomes.

In the case of a European retail bank that was anxious to improve its sales performance, the skill that mattered most (but was in shortest supply) was the ability to persuade and motivate peers without the formal authority of

direct line management. This art of influencing others outside formal reporting lines runs counter to the rigid structures of many organizations. In this company, it was critical for the sales managers to persuade the IT department to change systems and working approaches that were burdening the sales organization's managers, whose time was desperately needed to introduce important sales-acceleration measures. When managers were able to focus on changing the systems and working approaches, the bank's productivity rose by 15 percent.

Context is as important for groups and individuals as it is for organizations as a whole: the best programs explicitly tailor a "from–to" path for each participant. An Asian engineering and construction company, for example, was anticipating the need for a new cadre of skilled managers to run complex multiyear projects of $1 billion or more. To meet this challenge, it established a leadership factory to train 1,000 new leaders within three years.

The company identified three important leadership transitions. The first took experts at tendering (then reactive and focused on meeting budget targets) and sought to turn them into business builders who proactively hunted out customers and thought more strategically about markets. The second took project executors who spent the bulk of their time on site dealing with day-to-day problems and turned them into project directors who could manage relationships with governments, joint-venture partners, and important customers. The third targeted support-function managers who narrowly focused on operational details and costs, and set out to transform them into leaders with a broader range of skills to identify—and deliver—more significant contributions to the business.

2. Decoupling reflection from real work

When it comes to planning the program's curriculum, companies face a delicate balancing act. On the one hand, there is value in off-site programs (many in university-like settings) that offer participants time to step back and escape the pressing demands of a day job. On the other hand, even after very basic training sessions, adults typically retain just 10 percent of what they hear in classroom lectures, versus nearly two-thirds when they learn by doing. Furthermore, burgeoning leaders, no matter how talented, often struggle to transfer even their most powerful off-site experiences into changed behavior on the front line.

The answer sounds straightforward: tie leadership development to real on-the-job projects that have a business impact and improve learning. But it's not easy to create opportunities that simultaneously address high-priority needs—say, accelerating a new-product launch, turning around a sales region, negotiating an external partnership, or developing a new digital-marketing strategy—*and* provide personal-development opportunities for the participants.

A medical-device company got this balance badly wrong when one of its employees, a participant in a leadership-

development program, devoted long hours over several months to what he considered "real" work: creating a device to assist elderly people during a medical emergency. When he presented his assessment to the board, he was told that a full-time team had been working on exactly this challenge and that the directors would never consider a solution that was a by-product of a leadership-development program. Given the demotivating effect of this message, the employee soon left the company.

By contrast, one large international engineering and construction player built a multiyear leadership program that not only accelerated the personal-development paths of 300 midlevel leaders but also ensured that projects were delivered on time and on budget. Each participant chose a separate project: one business-unit leader, for instance, committed his team to developing new orders with a key client and to working on a new contract that would span more than one of the group's business lines. These projects were linked to specified changes in individual behavior—for instance, overcoming inhibitions in dealing with senior clients or providing better coaching for subordinates. By the end of the program, the business-unit head was in advanced negotiations on three new opportunities involving two of the group's business lines. Feedback demonstrated that he was now behaving like a group representative rather than someone defending the narrow interest of his own business unit.

The ability to push training participants to reflect, while also giving them real work experiences to apply new approaches and hone their skills, is a valuable combination in emerging markets. There, the gap between urgent "must do" projects and the availability of capable leaders presents an enormous challenge. In such environments, companies should strive to make every major business project a leadership-development opportunity as well, and to integrate leadership-development components into the projects themselves.

3. Underestimating mind-sets

Becoming a more effective leader often requires changing behavior. But although most companies recognize that this also means adjusting underlying mind-sets, too often these organizations are reluctant to address the root causes of why leaders act the way they do. Doing so can be uncomfortable for participants, program trainers, mentors, and bosses—but if there isn't a significant degree of discomfort, the chances are that the behavior won't change. Just as a coach would view an athlete's muscle pain as a proper response to training, leaders who are stretching themselves should also feel some discomfort as they struggle to reach new levels of leadership performance.

Identifying some of the deepest, "below the surface" thoughts, feelings, assumptions, and beliefs is usually a precondition of behavioral change—one too often shirked in development programs. Promoting the virtues of delegation and empowerment, for example, is fine in theory, but successful adoption is unlikely if the program participants have a clear "controlling" mind-set (*I can't lose my grip on the*

business; I'm personally accountable and only I should make the decisions). It's true that some personality traits (such as extroversion or introversion) are difficult to shift, but people *can* change the way they see the world and their values.

Take the professional-services business that wanted senior leaders to initiate more provocative and meaningful discussions with the firm's senior clients. Once the trainers looked below the surface, they discovered that these leaders, though highly successful in their fields, were instinctively uncomfortable and lacking in confidence when conversations moved beyond their narrow functional expertise. As soon as the leaders realized this, and went deeper to understand why, they were able to commit themselves to concrete steps that helped push them to change.

A major European industrial company, meanwhile, initially met strong resistance after launching an initiative to delegate and decentralize responsibility for capital expenditures and resource allocation to the plant level. Once the issues were put on the table, it became clear that the business-unit leaders were genuinely concerned that the new policy would add to the already severe pressures they faced, that they did not trust their subordinates, and that they resented the idea of relinquishing control. Only when they were convinced that the new approach would actually save time and serve as a great learning opportunity for more junior managers—and when more open-minded colleagues and mentors helped challenge the "heroic" leadership model—did the original barriers start to come down and decentralization start to be implemented.

Another company decided that difficult market conditions required its senior sales managers to get smarter about how they identified, valued, and negotiated potential deals. However, sending them on a routine finance course failed to prompt the necessary changes. The sales managers continued to enter into suboptimal and even uneconomic transactions because they had a deeply held mind-set that the only thing that mattered in their industry was market share, that revenue targets had to be met, and that failing to meet those targets would result in their losing face. This mind-set shifted only when the company set up a "control tower" for reflecting on the most critical deals, when peers who got the new message became involved in the coaching, and when the CEO offered direct feedback to participants (including personal calls to sales managers) applauding the new behavior.

4. Failing to measure results

We frequently find that companies pay lip service to the importance of developing leadership skills but have no evidence to quantify the value of their investment. When businesses fail to track and measure changes in leadership performance over time, they increase the odds that improvement initiatives won't be taken seriously.

Too often, any evaluation of leadership development begins and ends with participant feedback; the danger here is that trainers learn to game the system and deliver a syllabus that is more pleasing than challenging to participants. Yet targets *can* be set and their achievement

monitored. Just as in any business-performance program, once that assessment is complete, leaders can learn from successes and failures over time and make the necessary adjustments.

One approach is to assess the extent of behavioral change, perhaps through a 360 degree–feedback exercise at the beginning of a program and followed by another one after 6 to 12 months. Leaders can also use such tools to demonstrate their own commitment to real change for themselves and the organization. One CEO we know commissioned his own 360 degree–feedback exercise and published the results (good and bad) for all to see on the company intranet, along with a personal commitment to improve.

Another approach is to monitor participants' career development after the training. How many were appointed to more senior roles one to two years after the program? How many senior people in the organization went through leadership training? How many left the company? By analyzing recent promotions at a global bank, for example, senior managers showed that candidates who had been through a leadership-development program were more successful than those who had not.

Finally, try to monitor the business impact, especially when training is tied to breakthrough projects. Metrics might include cost savings and the number of new-store openings for a retail business, for example, or sales of new products if the program focused on the skills to build a new-product strategy. American Express quantifies the success of some of its leadership programs by comparing the average productivity of participants' teams prior to and after a training program, yielding a simple measure of increased productivity. Similarly, a nonprofit we know recently sought to identify the revenue increase attributable to its leadership program by comparing one group that had received training with another that hadn't.

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Companies can avoid the most common mistakes in leadership development and increase the odds of success by matching specific leadership skills and traits to the context at hand; embedding leadership development in real work; fearlessly investigating the mind-sets that underpin behavior; and monitoring the impact so as to make improvements over time.

[1] Laci Loew and Karen O'Leonard, *Leadership Development Factbook 2012: Benchmarks and Trends in U.S. Leadership Development*, Bersin by Deloitte, July 2012, bersin.com.

[2] See *The State of Human Capital 2012—False Summit: Why the Human Capital Function Still Has Far to Go*, a joint report from The Conference Board and McKinsey, October 2012, mckinsey.com.

[3] Matthew Gitsham et al., *Developing the Global Leader of Tomorrow*, Ashridge Business School, July 2009, ashridge.org.uk.

[4] Pankaj Ghemawat, "Developing global leaders," *McKinsey Quarterly*, June 2012, mckinsey.com.

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Unearthing the sources of value hiding in your corporate portfolio

Marc Goedhart, Sven Smit, and Alexander Veldhuijzen

Executives who rely on high-level metrics to manage will miss potential sources of value creation. A finer-grained look can help.

The senior leaders of a diversified global industrial company recently got a major shock when they took a more fine-grained look at corporate performance. Rather than viewing the company through the usual lens of the top-line growth, economic profit, and return on invested capital (ROIC) of its four divisions, the members of the top team broke things down much further—into 150 business segments. Two-thirds of those segments were falling so short of their economic-profit targets that they alone would have made the company overall miss its targets by 40 percent. The rest, however, were outperforming by enough to skew the averages for the company and each division, giving the appearance of only a 7 percent shortfall. Recognizing the performance disparities

helped the company identify a more significant set of opportunities to reallocate resources and stimulate value creation than anything that had been on the table previously.

The problem of averages hiding outliers is a common one, and it frequently undermines the corporate center's ability to take a strategic look across the organization and make selective course corrections or trade-offs between investments. That companies struggle with this is clear from the typical annual budgeting process, when many routinely allocate their capital, R&D, and marketing budgets to the same activities year after year, regardless of their relative contribution to performance and growth. The cost is high, since those that more actively reallocate resources generate, on average, 30 percent higher total returns to shareholders.

Companies are unlikely to enjoy these returns absent finer-grained insight into pockets of value creation at the level of individual businesses and market segments. It's also crucial to develop a strong understanding of the reasons those activities perform as they do and of the alignment between their potential for value creation and corporate investment priorities. Armed with this information, executives—particularly the CEO and CFO—become better able to adapt performance targets, differentiate where to drive growth or ROIC across the portfolio, and monitor performance. They also are better positioned to overcome resistance from managers, who may be protective of the people and activities they manage and resistant to what they see as micromanagement.

The best antidote, in our experience, is fostering a shared commitment to value creation as the decisive metric for decisions on strategic priorities, business targets, and budgeting.

The mechanics of identifying opportunities at this level of detail are not new. Efforts typically involve a standard discounted-cash-flow valuation or analysis of economic profit but for far more business units than most companies currently look at—often as many as 50 to 100. Managers who find that their companies lack the necessary financial data, such as revenue, operating earnings, and capital expenditures, will probably also find that they rely too heavily on averages when setting strategic priorities, financial targets, and resource budgets. Those who have the data will find that a finer-grained perspective reveals more opportunity to create value, as it dissects average performance and growth across the portfolio.

For example, when we analyzed four divisions within a corporate group in a consumer-durable-goods company, we found that all were generating returns well above the company's cost of capital and at fairly similar levels, between 12 and 18 percent. But at the next level of business units, returns were much more widely distributed—and even in the division with the highest returns, there was a unit earning less than its cost of capital. At the level of individual activities

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within business units, the improvement potential was much larger than expected, with weak performers even in the strongest units.

The aggregate impact can be significant, and analyses of both potential value and current value are useful. Analyzing the potential value projected by the business plans of around 100 business segments in another large company's profile, we found that more than 60 percent of the value improvement would be generated by less than a third of its product or market segments. This was the case even though they had contributed less than 40 percent of the company's current value. Once executives identified those segments, they were able to selectively evaluate the underlying strategic rationale for each, determine whether its business plan was grounded in concrete, viable initiatives, and assess whether it had sufficient corporate resources to be successful.

Understanding why an activity creates value

It is important to understand why an activity creates value when making decisions on pushing growth or earnings—or both. Executives at one consumer-goods company, for example, had long considered growth to be the key to value creation and set incentives for management that rewarded growth. Yet a detailed analysis of the business plans of over 150 segments in the company's corporate portfolio found that more than 60 percent of expected value creation would come from increases in earnings margin. The plans did foresee acceleration in growth for most of the portfolio's segments, but it ultimately had far less impact on value, and the company's incentives were misaligned.

The most useful insights won't come from the kinds of high-level metrics executives usually use to assess a business's value-creation potential, such as ROIC, economic profit, and top-line growth. Such metrics don't reflect the underlying causes of value creation and can be unreliable indicators of value in the long term. For example, a business might see a near-term increase in ROIC or earnings margin by lowering its advertising budget. But it will also likely destroy value in the long term by weakening its market position. Top-line growth, too, can be misleading. Executives at one global company, for example, considered a consumer-goods business in Asia to be the most successful in the company's portfolio because it consistently delivered double-digit growth. However, a more detailed analysis revealed that this business was losing market share because the relevant local markets were growing even faster—which would almost inevitably lead to lower value creation in the long term.

Instead, successful intervention requires executives to understand the more important leading indicators of growth and returns that are often overlooked. These include the growth of the relevant market, in size as well as in market share; changes in pricing and gross margin; and R&D and sales, general, and administrative expenses. For the large company with around 100 business segments, described earlier, this would

show that the most promising segment offers its strong value improvement off the tailwind of a doubling of local market demand. On one hand, this may call for a confirmation of that aggressive market outlook, given that this is what mostly drives the segment's value improvement. On the other hand, it may trigger a question about whether such growth could offer opportunities for capturing additional share beyond the three percentage points projected in the business plan. Having insights on underlying drivers could also reveal inconsistencies in the plans. Consider, for example, the experience of one high-tech company, where the executive board found that the business plans for a segment in a maturing market implied a value improvement of more than 40 percent. At first glance, this might not be an unreasonable target for a fast-growing company in that sector. But a closer look revealed an underlying assumption that the business could realize 10 percent annual top-line growth over five years, even as its relevant markets were shrinking. As this implied almost a doubling of its market share at stable prices, the board asked the business to revise its plans.

Evaluating the allocation of resources

Armed with detailed insights into what drives value creation in which segments across the portfolio, executives can more successfully intervene in the planning process and budget allocations, challenging and revising business plans and resource requirements for key segments. This could involve interventions in decisions on specific launches of new products or entries into individual markets, or even in individual R&D projects, if the value at stake for the company is significant. And all strategic resources should be considered, not just investments in physical capital—especially in companies where investments in R&D and brand advertising exceed capital investments by a wide margin, for instance, in sectors such as consumer packaged goods, pharmaceuticals, and high tech.

When executives intervene, they should budget resources in line with expected value creation at the level of individual business segments, since that's where the opportunities to create value are. For example, one consumer-goods company analyzed the allocation of all its strategic resources by following the plans of close to 100 business segments. Plotting the resource investments against the expected value of each segment's business plan in a resource-productivity chart, executives found that some segments with very strong value potential were allocated very limited resources, while some of the largest investments were made in segments that returned much less value per dollar of resources spent. How much of their resources should be reallocated to the more productive segments depends on how much those segments can invest at the same attractive returns—and whether lower investments in the less productive segments might lead to significantly lower or negative returns. But a company's executives should be aware of such large differences in resource productivity and investigate

whether a reallocation of resources could lead to higher value creation for the company as a whole.

Gaining acceptance for intervention

Naturally, executives will need to explain the benefits of selective intervention to skeptical line managers—it creates more value for the company as a whole and enables a more fact-based and meaningful dialogue about planning and performance. By turning the conversation away from one largely about changes in growth and earnings to one that includes concrete initiatives and their impact on market share, gross margin, and capital turnover, managers will have more opportunities to develop new businesses, exit less attractive markets, and initiate promising R&D projects on their true merits.

One of the benefits of doing this well is that it allows line managers to fully understand where their businesses create value and how much they create relative to other businesses and activities in the company. When managers can see which trade-offs are being made and why, it's easier to get behind allocation and budgeting decisions—and harder to be defensive. It's also easier to see that this kind of selective intervention doesn't mean executives are micromanaging the company's businesses; when confronted with detailed information from so many business segments, micromanaging would hardly be feasible anyway, and it certainly would not be productive. What counts is that information is transparent so that executives can intervene when and where needed.

A second advantage of managing at this level of detail is that it allows managers to tailor a package of incentives and compensation that reflects what each unit is expected to accomplish. Instead of rewarding just top-line growth, they can combine measures of growth with, for example, increases in market share. Instead of rewarding just earnings targets, they might consider earnings growth combined with targets for specific components, such as gross margin or R&D spending.

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Executives who manage at the level of a few divisions are more likely to be blinded by averages of top-line growth, economic profit, and ROIC. A more fine-grained review of what drives performance and growth at the level of 50 or more business segments can help.

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Extra Point

Finding value in a circular approach to manufacturing

Martin Stuchtey, Helga Vanthournout, and Markus Zils

A linear model of production—goods are manufactured from virgin raw materials and then sold, used, and discarded—has dominated global manufacturing since the Industrial Revolution. But in the face of increasing commodity-price volatility and worries about resource depletion, companies may realize greater commercial value by using a regenerative economic model known as the circular economy. Four principles describe how it can capture value that is often wasted in a linear approach.

A tight inner circle

Maximizes the reusability of products and components, while minimizing the use of virgin materials. The fewer changes required to reuse or refurbish a product, the faster it returns to use, thus conserving materials, labor, energy, and capital.

Circling longer

Extends the lifetime of a product or component in first use, reuse, or remanufacture. With each prolonged cycle, companies avoid additional investments in materials, energy, and labor to create new products or components.

Cascaded use

Diversifies reuse across value chains and market segments—for instance, cotton clothing reused as second-hand apparel and later as a substitute for virgin materials in other applications, such as fiber fill for upholstery or insulation for construction.

Pure inputs

Help to ensure the purity and nontoxicity of manufacturing materials. Designing products for ease of separation into consumable and durable components increases the efficiency of collection and redistribution while maintaining quality.

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For more on the circular economy, see "Remaking the industrial economy," on page 46.

Highlights:

Next-shoring: how proximity to demand and innovation will increasingly drive competitive advantage

The circular economy: restoring and reusing resources across the value chain

Taking data analytics to the next level: views from the front lines, what you should know about 'open data,' and IMD professor Phil Rosenzweig on the benefits and limits of decision models

Stanford's Bob Sutton and Huggy Rao on the path to scaling up excellence

Reimagining India: the road ahead for global companies

Why leadership-development programs fail

How social media's 'weak signals' sometimes generate surprisingly strong insights

Short takes on industry dynamics: African private equity and mobile money, natural gas, and software start-ups

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