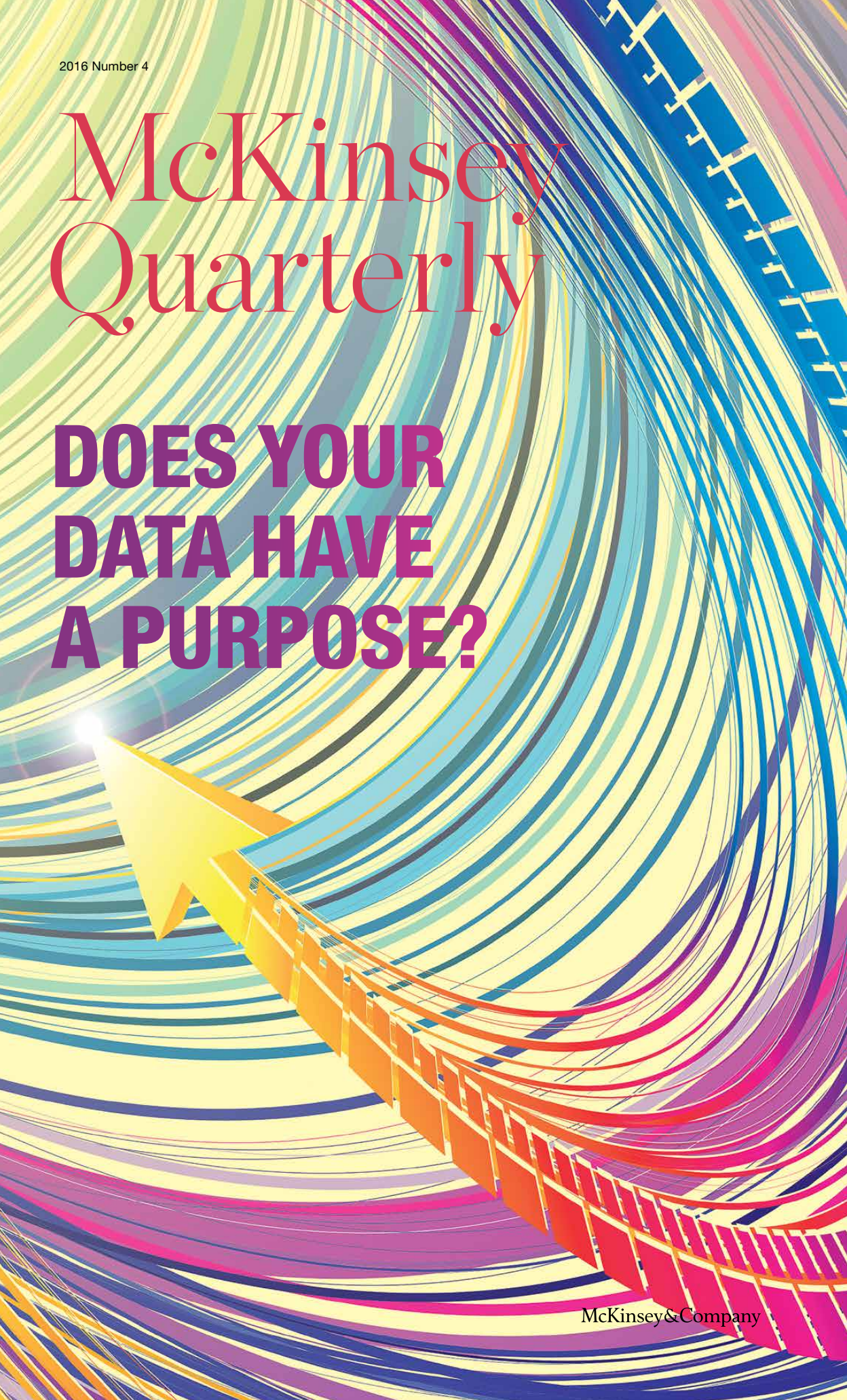
2016 Number 4

McKinsey Quarterly

DOES YOUR DATA HAVE A PURPOSE?



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THIS QUARTER

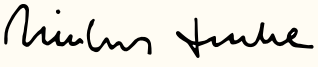
The data revolution is relentless, uneven, democratic, game changing, terrifying, and wondrous. We are creating more data than ever before, sharing more information on devices fixed and mobile, seeding and feeding from Internet clouds—and we're doing it faster than ever. Digital natives such as Amazon and Google have built their business models around analytics. But many leading players still struggle to harvest value, even while investing substantially in analytics initiatives and amassing vast data stores.

A simpler landscape might call for a road map. Data analytics requires a reimagining. We are witnessing not just a shift in the competitive environment but the development of entire ecosystems—linked by data—that have the power to reshape industry value chains and force us to rethink how value is created. Consider medicine brokerage or automotive navigation or any of the thousands of examples where businesses and customers interact with each other in ways that were unfathomable just a few years ago.

Data assets, analytics methodologies (including, but by no means limited to, machine learning), and data-driven solutions make it essential that leaders contemplate their company's own data strategy and the threats and opportunities that go with it. At the same time, many executives have the feeling that advanced analytics require going so deep into the esoteric information weeds, and crunching the numbers with such a degree of technical sophistication, that it becomes tempting simply to "leave it to the experts."

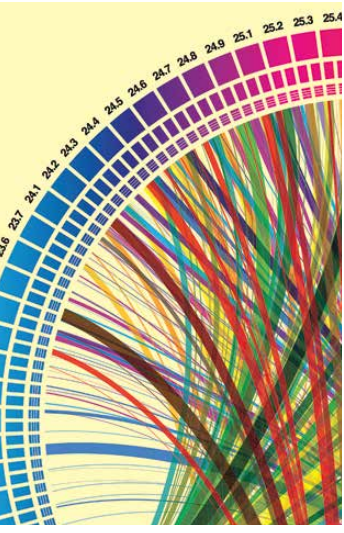
We hope this issue of the *Quarterly* will help leaders avoid that mistake. My colleagues and I have sought to illuminate the leadership imperative in two ways. First, we've created a sort of practitioner's guide to data analytics for senior executives. "Making data analytics work for you—instead of the other way around" advances eight principles that leaders can embrace to clarify the purpose of their data and to ensure that their analytics efforts are being put to good use. Second, in "Straight talk about big data," we've suggested a set of questions that the top team should be debating to determine where they are and what needs to change if they are to deliver on the promise of advanced analytics. Regardless of their starting point, we hope senior leaders will find these articles helpful in better assessing and advancing their own analytics journeys.

Some of this issue's other areas of focus also are connected with the power of analytics. Consider the way new technologies are changing supply, demand, and pricing dynamics for many natural resources, or the way China's digital sophistication has continued to expand even as the country's growth has slowed. Indeed, the digital revolution and the data-analytics revolution are ultimately intertwined. You can't do analytics without streams of digital data, and digitally enabled business models depend upon advanced analytics. Leaders who focus on the big issues we've tried to stake out in this issue—on the essential purposes, uses, and questions surrounding analytics—stand a better chance of cultivating the necessary intuition to guide their organizations toward a more digital, data-driven future. Q



Nicolaus Henke
Senior partner, London office
McKinsey & Company

On the cover



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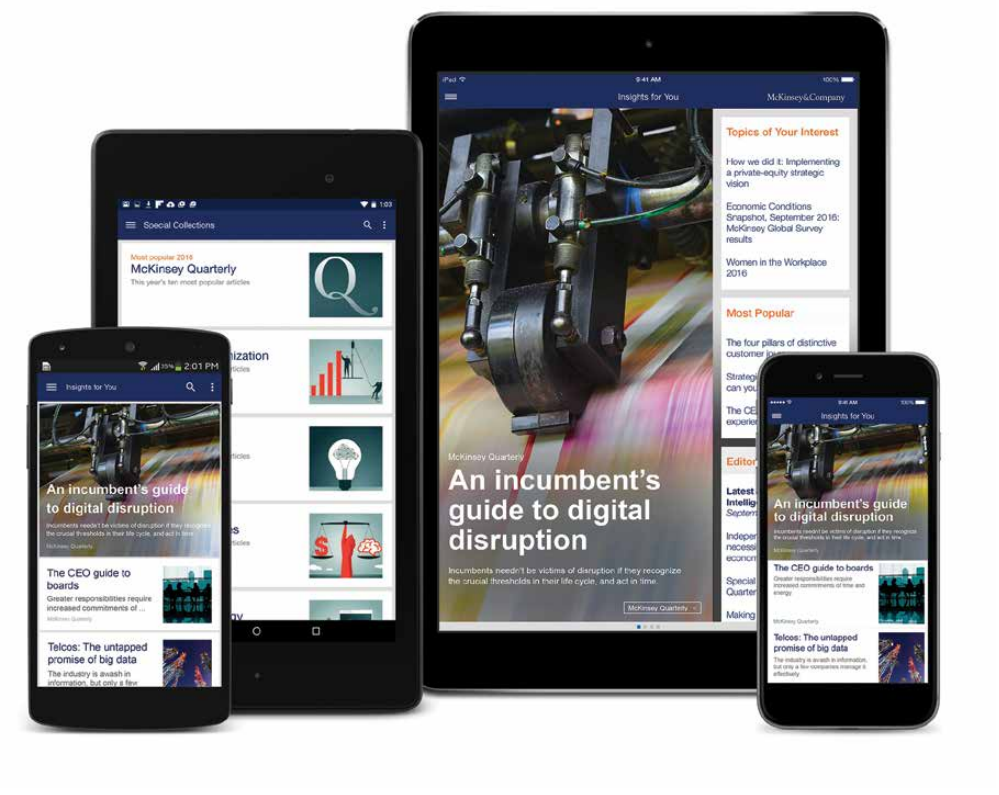

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FINDING THE TRUE COST OF PORTFOLIO COMPLEXITY

A fine-grained allocation of costs can help companies weed out "freeloader" products and improve performance.

by Fabian Bannasch and Florian Bouché

Portfolio complexity is swamping many businesses. In the wake of globalization, some manufacturers have launched large and unwieldy numbers of country-specific models to suit particular markets: one vehicle manufacturer that had 30 models in the 1990s, for example, now has more than 300, and other companies have responded to the growing demands of customers for more customized—and sophisticated—offerings. We also see local product managers pushing variation to meet sales goals in the tough postcrisis economic environment.

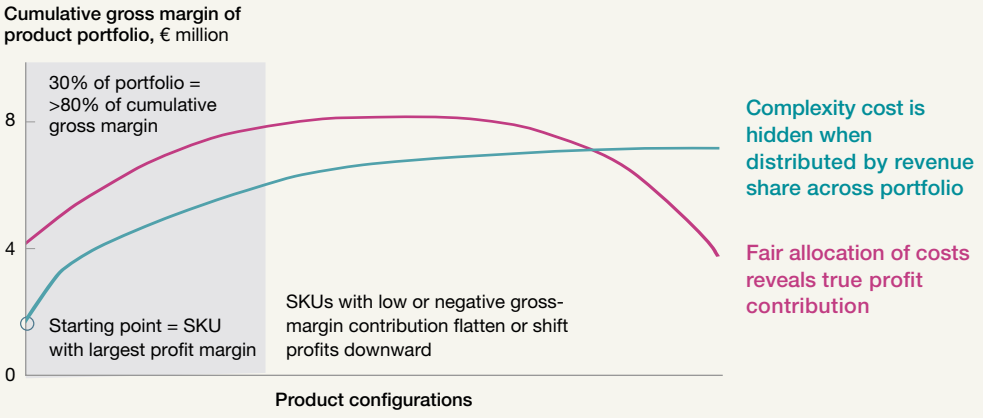
Rooting out unnecessary—and costly—complexity is made more difficult in many cases by the lack of accounting transparency around niche offerings and products that sell in small quantities. Typically, costs are allocated by share of revenues. But since many specialized models have higher *true* costs arising from customization and lower production runs, they effectively freeload off more profitable lines. They often require more investment in R&D, tooling, testing, marketing, purchasing, and certification. Moreover, smaller batch sizes, lower levels of automation, longer assembly set-up times, and higher-cost technologies located further down the S-curves (for example, customized, small-run technology for a new truck axle) will likely incur additional (and not always visible) expenses. Such distortions can lead to poor decisions. One truck executive we know argued for, and won, investment in a new, smaller engine to match a competitor, claiming it cost 10 percent less to manufacture than the company's standard engine. In fact, with costs fairly allocated, it cost 20 percent more.

To identify hidden complexity costs, companies must dive deep into the data, applying granular assessments to individual components so as to understand

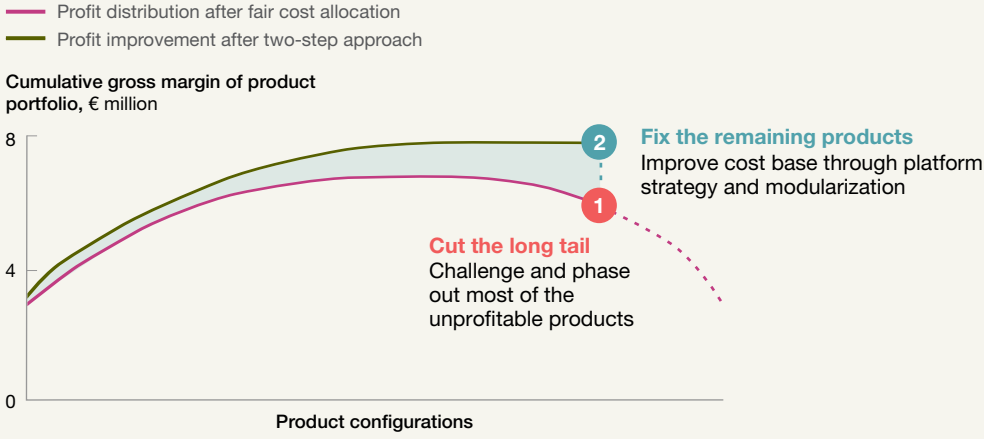
Exhibit

Traditional accounting systems often fail to capture fully and allocate correctly the actual costs of complexity.

Illustration: machinery and equipment-manufacturing portfolio



However, a two-step approach to rationalizing a product portfolio can mitigate complexity and improve profitability.



the impact of customization or scale on the cost profiles of each model. The top of the exhibit shows the true contribution to profitability of one manufacturing portfolio and the amount of cost concealed by traditional accounting practices.

Executives should be prepared to take strong action to eliminate "hopeless cases" (products that sharply diminish margins) by moving up and left of the profit curve as shown in the bottom of the exhibit. They can then further improve margins by recouping scale losses through greater standardization. In our experience, this process can reduce costs by up to 7 percent.

Fabian Bannasch is a senior expert in McKinsey's Munich office, where **Florian Bouché** is a consultant.

WILL CAR USERS SHARE THEIR PERSONAL DATA?

Surveyed consumers in China, Germany, and the United States say yes, if they see value in return.

by Michele Bertoncello, Paul Gao, and Hans-Werner Kaas

Advanced data analytics comes with a significant set of challenges, such as determining data quality, rendering data in functional form, and creating sophisticated algorithms to achieve practical insight. But one of the first problems to solve is whether the data can be viewed at all. This can be especially sensitive when companies seek personal information from private individuals. Will people share the data they have? And if so, what kind? Would they share only technical data (such as oil temperature and airbag deployment), or would they agree to communicate vehicle location and route, for example, or allow access to even more personal data like their calendar or communications to and from the car (such as email and text messages)?

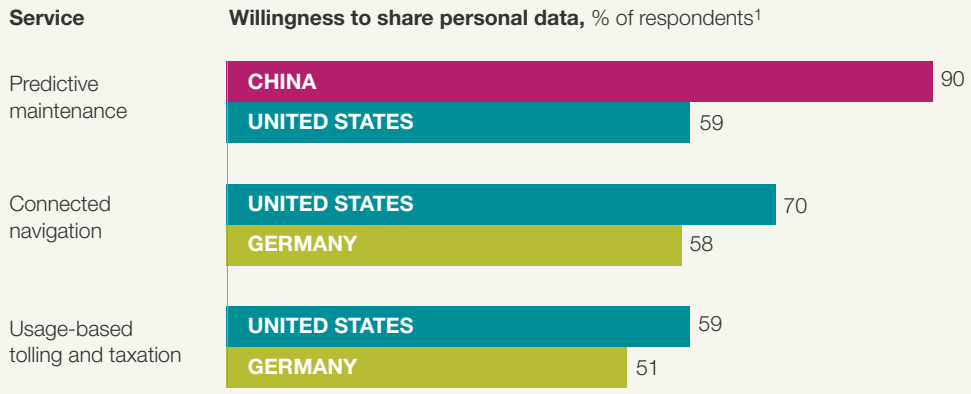
We surveyed more than 3,000 car buyers and frequent users of shared-mobility services across China, Germany, and the United States (more than 1,000 in each country), taking care to represent consumers across personal demographics, car-buying segments, and car-using characteristics.[1] Among other issues, we sought to learn more about car buyers' attitudes, preferences, and willingness to use and pay for services made possible by the sharing of vehicle-specific and related personal data.

Car buyers across geographies seem both aware about matters of data privacy and increasingly willing to share their personal data for certain applications (exhibit). Of all respondents, 90 percent (up from 88 percent in 2015) answered yes to the question, "Are you aware that certain data (such as your current location, address-book details, and browser history) are openly accessible to applications and shared with third parties?" And 79 percent (up from 71 percent in 2015) of respondents answered yes when asked, "Do you consciously decide to grant certain applications to your personal data (for example, your current location, address-book details, and browser history), even if you may have generally disabled this access for other applications?" In each case, American consumers proved somewhat more guarded than their Chinese or German counterparts, but even at the low end, 85 percent of the US respondents answered in the affirmative to the first question, and 73 percent answered yes to the second.[2]

When it comes to sharing personal data for auto-related apps, a majority of respondents in each country were on board—if the use case was one that met the consumer's needs. For example, among American respondents, 70 percent

Exhibit

Respondents were willing to share personal data in return for services they preferred.



[1] Respondents selected version of given offering that requires access to personal and system data.

Source: 2016 McKinsey survey of >3,000 car buyers and frequent users of "shared-mobility services" across China, Germany, and the United States

were willing to share personal data for connected navigation (the most popular use case among surveyed American car buyers), while 90 percent of Chinese respondents would share personal data to enable predictive maintenance (the most popular use-case option in that country). Even more encouraging for automakers, surveyed consumers expressed willingness to *pay* for numerous data-enabled features. In Germany, for example, 73 percent of surveyed consumers indicated they would pay for networked parking services, and in China 78 percent would pay for predictive maintenance rather than choose free, ad-supported versions of those options. Even in data-sensitive America, 73 percent would pay for usage-monitoring services, 72 percent for networked parking, and 71 percent for predictive maintenance instead of selecting free ad-supported versions. Although the game is still early, these expressions of consumer cooperation—in the auto industry, at least—suggest that concerns about data-sharing can be satisfied when the value proposition is apparent.

[1] The survey was in the field from April 27, 2016, to May 16, 2016, and received responses from 3,186 recent car buyers (three-quarters of the panel per country) and frequent shared-mobility users (one-quarter of the panel per country) of different ages, genders, incomes, and places of residence.

[2] Of surveyed Chinese car buyers, 91 percent answered yes to the first question and 86 percent answered yes to the second, versus 94 percent and 76 percent, respectively, for German car buyers.

Michele Bertoncello is an associate partner in McKinsey's Milan office, **Paul Gao** is a senior partner in the Hong Kong office, and **Hans-Werner Kaas** is a senior partner in the Detroit office.

The authors wish to thank Sven Beiker and Timo Möller for their contributions to this article.

LESSONS FROM DOWN-CYCLE MERGERS IN OIL AND GAS

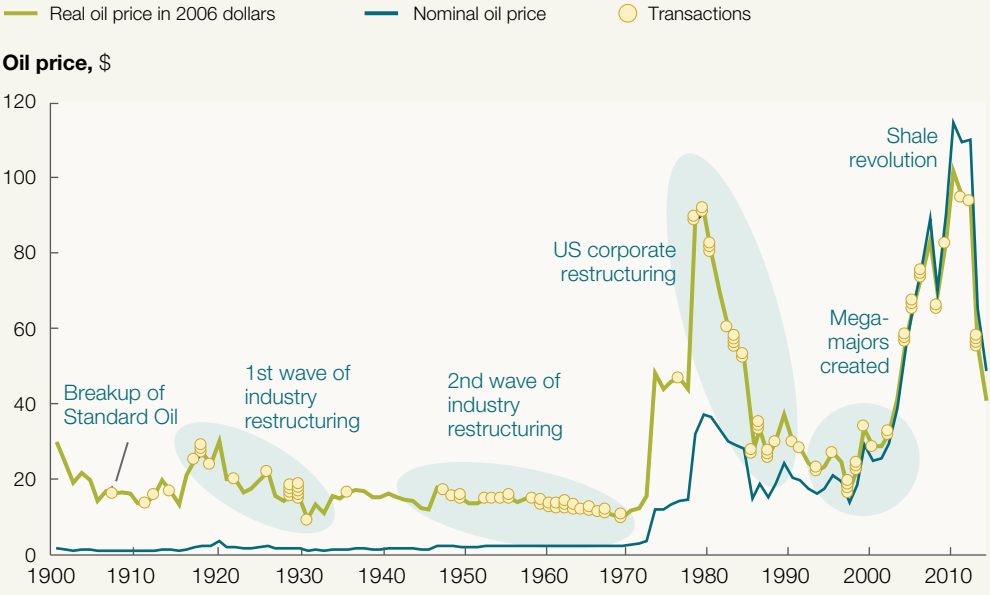
Research shows that acquiring assets when oil prices are low doesn't guarantee value creation over the long haul.

by Bob Evans, Scott Nyquist, and Kassia Yanosek

Oil and gas prices have fallen sharply over the last two years, imposing severe financial pressure on the industry. Like most commodity-oriented sectors, history suggests the energy business is most prone to consolidation during downsides in the business cycle (Exhibit 1). It's more likely, after all, that companies will be available at distressed (and to acquirers, attractive) prices during trough periods. Surprisingly, however, while the ease of acquisition increases during these times, we have found that down-cycle deals can just as easily destroy value as create it. We analyzed the performance of deals in the United States during a previous period of low prices, from 1986 to 1998, and the period from 1998 to 2015, which was characterized mostly by a rising oil-price trend, segmenting the transactions by motive. In the low-price period, only megadeals,[1] on average,

Exhibit 1

Historically, oil-price down cycles have led to an increase in M&A activity.



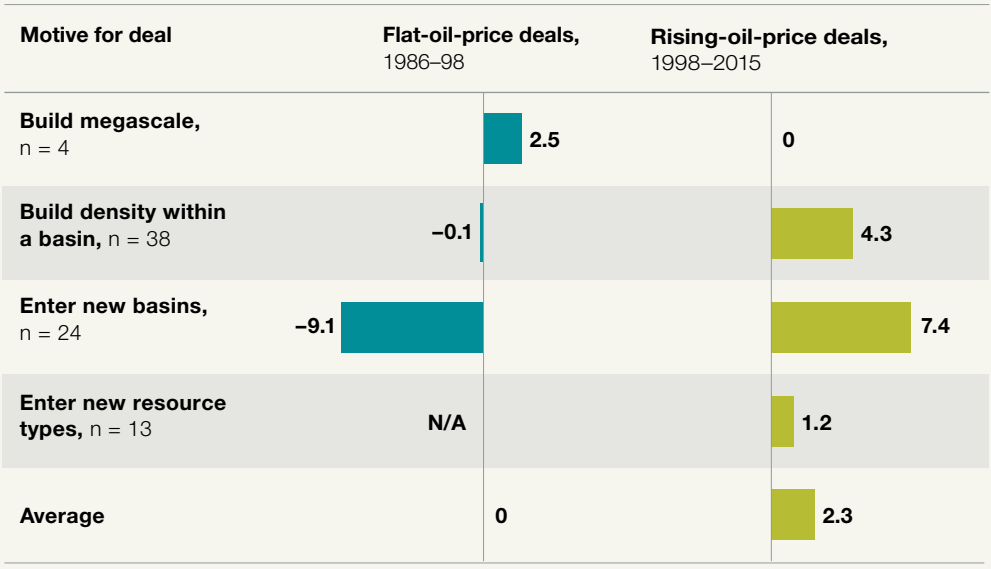
Source: *BP Statistical Review of World Energy 2003*; Eric V. Thompson, *A brief history of major oil companies in the Gulf region*, Petroleum Archives Project, Arabian Peninsula and Gulf Studies Program, University of Virginia; Daniel Yergin, *The Prize: The Epic Quest for Oil, Money & Power*, reissue edition, New York, NY: Free Press, 2008; Platts, McGraw Hill Financial; Securities Data Company; McKinsey analysis

Exhibit 2

When oil prices are low, only megadeals, on average, perform better than their market index five years after announcement.

Performance of acquirers' median TRS vs MSCI Oil, Gas & Consumable Fuels Index, 5 years after deal[1]

Compound annual growth rate, %



[1] TRS = total returns to shareholders; deals prior to 1995 are measured against MSCI World Index, while deals announced after Jan 1995 are measured against MSCI Oil, Gas & Consumable Fuels Index.

Source: IHS Herold; McKinsey analysis

outperformed their market index five years after announcement (Exhibit 2). Periods of low prices appear to favor those combinations that focus on cost synergies, exemplified by the megamergers but also including some deals that increased the density of an acquirer's presence within a basin and so helped to reduce overall costs. By contrast, in the 1998 to 2015 period, when oil and gas prices were generally rising, more than 60 percent of all deals outperformed the market indexes five years out. This environment rewarded deals focused on growth through acquisitions in new basins or on new types of assets (such as conventional players entering unconventional gas and shale-oil basins), as well as ones building basin density. While the dynamics of the oil and gas industry are notoriously cyclical, executives beyond energy should at least be aware of the cautionary lesson: picking up bargains in tough times doesn't assure success. Q

[1] Defined as deals worth more than $60 billion.

Bob Evans is a consultant in McKinsey's New York office, where **Kassia Yanosek** is an associate partner; **Scott Nyquist** is a senior partner in the Houston office.

For additional findings, see "Mergers in a low oil-price environment: Proceed with caution," on McKinsey.com.

FINTECHS CAN HELP INCUMBENTS, NOT JUST DISRUPT THEM

A growing number of start-ups are partnering with banks to offer services that plug operational gaps and generate new revenues.

by Miklos Dietz, Jared Moon, and Miklos Radnai

Fintechs—start-ups and established companies that use technology to make financial services more effective and efficient—have lit up the global banking landscape over the past four years. Much market and media commentary has emphasized the threat to established banking models. Yet incumbents have growing opportunities to develop new fintech partnerships for better cost controls and capital allocations and more effective ways of acquiring customers.

We estimate that a substantial majority—almost three-fourths—of fintechs focus on payment systems for small and midsize enterprises, as well as on retail banking, lending, and wealth management. In many of these areas, start-ups have sought to target end customers directly, bypassing traditional banks and deepening the impression that the sector is ripe for innovation and disruption.

However, our most recent analysis suggests that the structure of the fintech industry is changing and that a new spirit of cooperation between these firms and incumbents has begun. When we looked at about 600 start-ups in the McKinsey Panorama FinTech database over the period beginning in 2010, we found that the number of fintechs with B2B offerings has increased steadily (exhibit).[1] While each year's sample size is somewhat modest, the trend is in line with our experience: more B2B fintechs are partnering with—and providing services for—established banks that continue to maintain relationships with end customers.

Fintech innovations are helping banks in many aspects of their operations, from improved costs and better capital allocations to higher revenues. The trend is particularly prevalent in corporate and investment banking, for which two-thirds of all fintechs provide B2B products and services.

The incumbents' core strategic challenge is choosing the right fintech partners. Cooperating with the bewildering number of players can be complex and costly as banks test new concepts and match their in-house technical capabilities with solutions from external providers. Successful incumbents will need to consider many options, including acquisitions, simple partnerships, and more formal joint ventures.

[1] Some new players may have both B2B and B2C offerings.

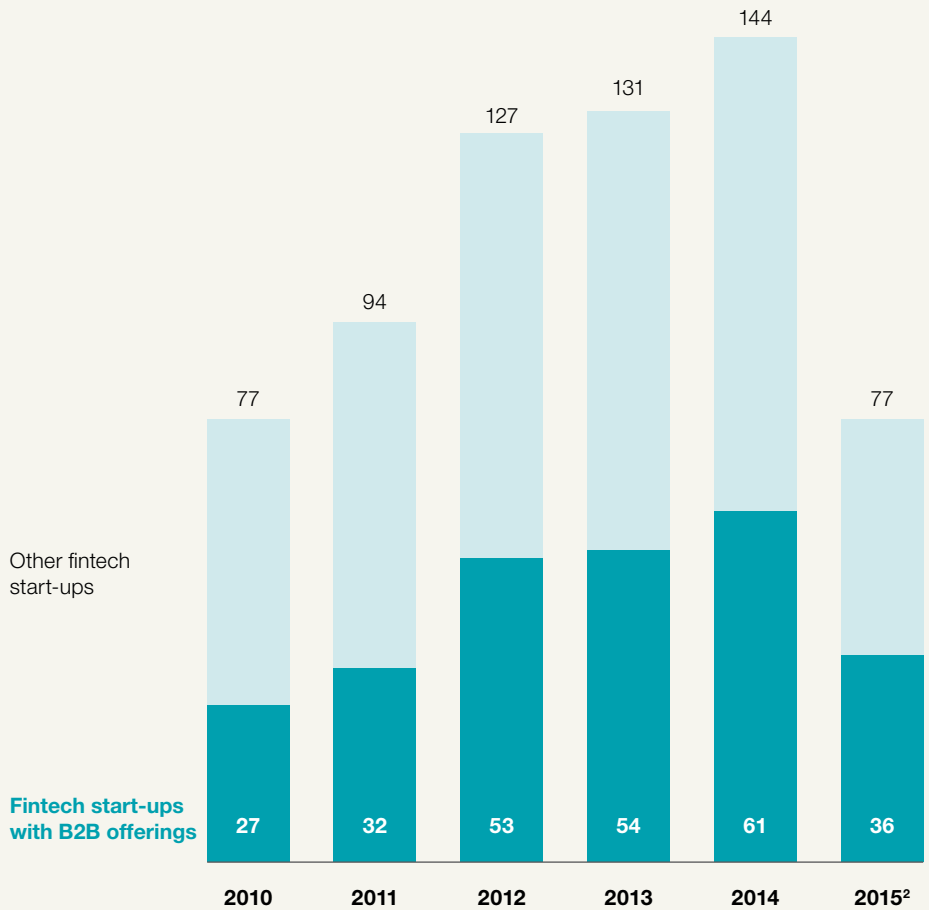
Miklos Dietz is a senior partner in McKinsey's Vancouver office; **Jared Moon** is a partner in the London office, where **Miklos Radnai** is a consultant.

For additional insights, see the longer version of this article, on McKinsey.com.

Exhibit

B2B fintechs are rising players in the start-up game.

Number of fintech start-ups[1]



[1] Fintechs are financial-services businesses, usually start-ups, that use technologically innovative apps, processes, or business models.

[2] Sample might be slightly underrepresented, since some 2015 start-ups may not be well known enough to show up in public sources.

Source: Panorama by McKinsey

A BIGGER BATTLEGROUND FOR CHINA'S INTERNET FINANCE

Innovations across consumer and corporate markets are pushing the country's fintech sector far beyond its payments stronghold.

by Xiyuan Fang, John Qu, and Nicole Zhou

China's Internet finance industry leads the world in the sheer size of its user base. Payment transactions still dominate the sector, with Alipay and Tenpay—the offspring of powerful e-commerce giant Alibaba and social-media and gaming group Tencent—leading the way. But as regulations ease, allowing fintech start-ups access to underserved Chinese customer segments, a range of new B2C and B2B financial-service models is emerging (exhibit). At the same time, banking and insurance incumbents, buoyed by strong profits, have developed a new appetite for digital experimentation and risk taking.

Wealth management

Investment in money-market and mutual funds by way of new fintech apps is growing rapidly, a pattern spreading to other products such as trusts and insurance products, albeit from a smaller base. Low barriers to entry, high returns, and a base of sophisticated Internet and mobile users are driving the growth. Alipay's Yu'ebao and Tencent's Licaitong, as well as dedicated wealth-management platforms such as eastmoney.com and LU.com, are carving out leading positions.

Consumer and business financing

Digitally savvy, younger Chinese have flocked to online offers of personal-finance products such as consumer loans and credit cards. Leading platform players like Alibaba are creating digital-finance units geared to individuals and small and medium-size enterprises. Retailers Gome and Suning are crossing sector borders and moving into B2B digital finance with offerings to their supply-chain partners. Peer-to-peer lending and microfinance have mushroomed, though asset quality is a rising concern in some subsegments.

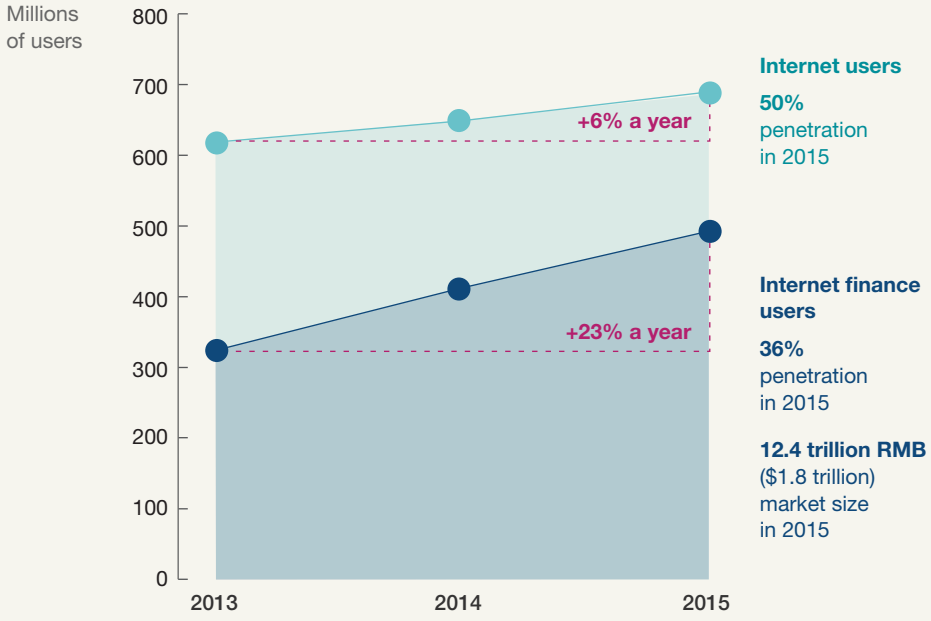
Other segments

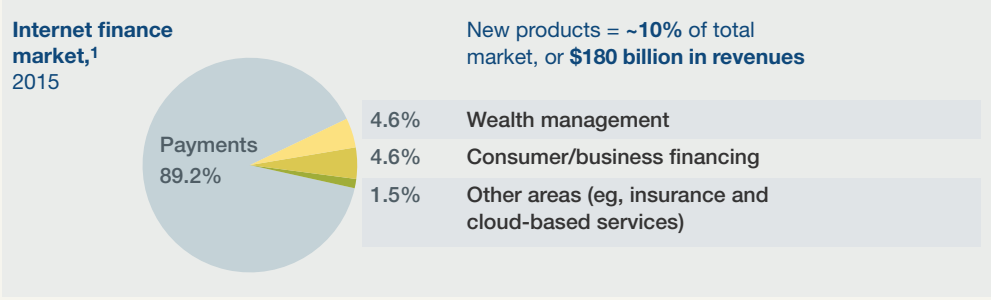
Online insurer Zhong An is pioneering the launch of digital property and casualty-insurance products and targeting auto loans at its customer base. Digital infrastructure-provider opportunities beckon too, particularly the cloud and data-service platforms needed to power fintech start-ups.

A three-way race will shape the fintech landscape. Digital attackers such as Alibaba and Tencent will continue to ply their huge base of customer data and analytics strength to expand their financial ecosystems. Financial-industry incumbents,

Exhibit

China's Internet finance industry is growing at a fast pace.





[1] Figures do not sum to 100%, because of rounding.

Source: CNNIC; iResearch; McKinsey analysis

meanwhile, are building on their offline customer relationships and risk-management skills. Financial group Ping An, for one, has built a digital ecosystem of its own with more than 242 million online and mobile users in financial and non-financial services. Large commercial banks such as Industrial and Commercial Bank of China are pushing forward with e-commerce platforms. Finally, non-financial players with industry expertise will likely become more active. Real-estate giant Wanda Group, for example, with its shopping, entertainment, and dining operations, has data that could feed into digital-finance products like payments and credit ratings.

Xiyuan Fang is a partner in McKinsey's Hong Kong office, where **John Qu** is a senior partner; **Nicole Zhou** is an associate partner in the Shanghai office.

The authors wish to thank Vera Chen, Feng Han, Joshua Lan, and Xiao Liu for their contributions to this article.

To read the full report on which this article is based, see *Disruption and connection*, on McKinsey.com.

THE CASE FOR PEAK OIL DEMAND

Developments in vehicle technology and changes in plastics usage could lead to peak demand for liquid hydrocarbons by 2030.

by Occo Roelofsen, Namit Sharma, and Christer Tryggestad

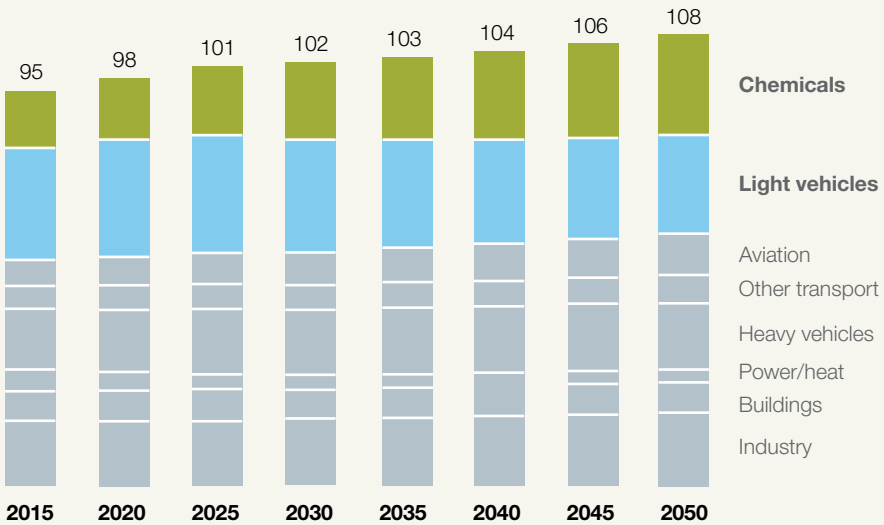
The energy industry has long debated the disruptive potential of peak oil supply, the point at which rates of petroleum extraction reach their maximum and energy demand is still rising. Less discussed is the flip side disruption of peak oil demand. With both the production and use of energy changing rapidly, we explored the market dynamics that could produce such a scenario in McKinsey's most recent Global Energy Perspective.[1]

Our analysis started with a "business-as-usual" (BAU) energy outlook through the year 2050 that combines current McKinsey views on economic-growth fundamentals[2] and detailed sector and regional insights. This base case assumes stability in today's market structures, incorporates current and expected regulation, and plays forward current technology and behavioral trends. Under BAU conditions, oil demand flattens after 2025, growing only by 0.4 percent annually through 2050 (Exhibit 1). The tapering of growth occurs because demand from passenger cars—historically the largest factor in oil

Exhibit 1

Liquids demand will play out as a tug of war between light vehicles and chemicals.

Projected global demand for liquid hydrocarbons,[1] millions of barrels a day



[1] A large portion of the demand for chemicals will be for light-end products made from natural-gas liquids, rather than crude.

Source: Energy Insights by McKinsey

demand—peaks by 2025, driven primarily by improved efficiency of the internal-combustion engine. However, that slackening is offset by continued robust growth in petrochemicals, largely stemming from developing-market demand.

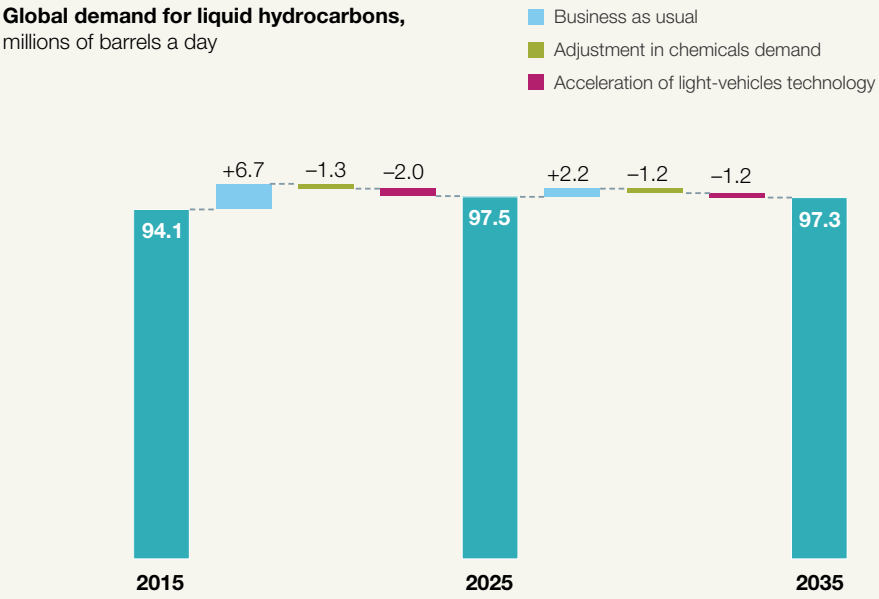
This tug of war between chemicals and vehicles led us to conduct a thought experiment on what it would take for overall liquid-hydrocarbon demand to reach a peak and over what time period.[3] We recalibrated assumptions about the demand dynamics in these two sectors and found that realistic adjustments could result in peak oil demand by around 2030 (Exhibit 2). Here's how the scenario could unfold.

Light vehicles: McKinsey's most recent consensus outlook for automobiles suggests that by 2030 new sales of electric vehicles, including hybrids and battery-powered vehicles, could reach close to 50 percent of all new vehicles sales in China, Europe, and the United States, and about 30 percent of all global sales. In our BAU case, we also account for the impact of emerging business models and technologies—specifically autonomous vehicles, car and ride sharing—on the efficiency of auto usage and thus on oil demand.[4] If, however, the market penetration of electric, autonomous, and shared vehicles accelerates, reaching levels shown in Exhibit 3, oil demand could be 3.2 million barrels lower in 2035 than suggested by our BAU case.

Petrochemicals: The rule of thumb in the energy industry has been that the demand for chemicals (accounting

Exhibit 2

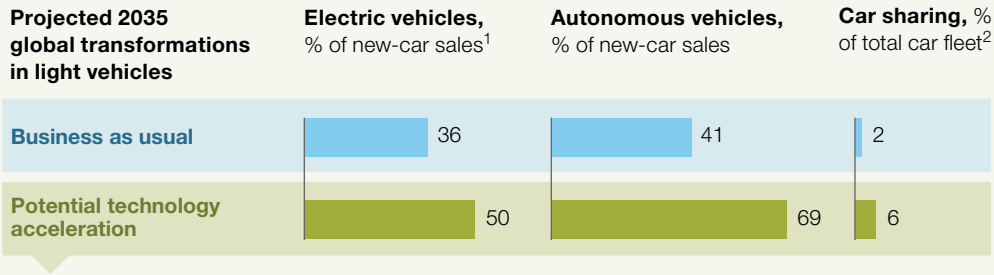
Under certain conditions, global demand for liquid hydrocarbons may peak between 2025 and 2035.

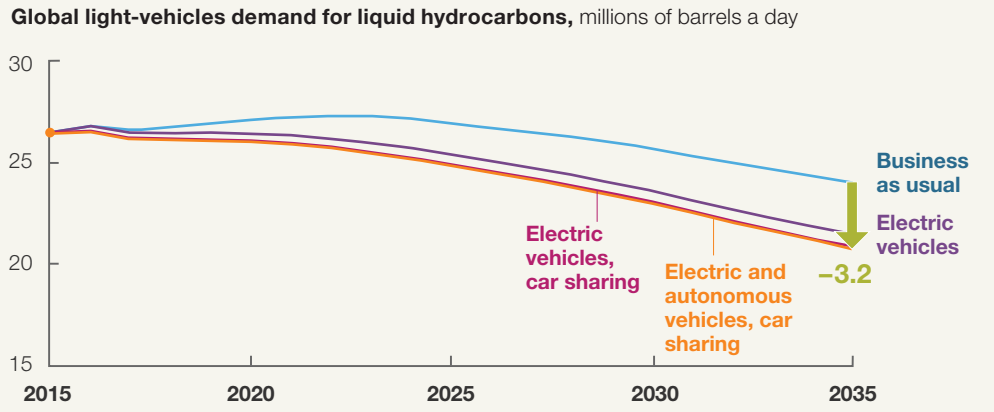


Source: Energy Insights by McKinsey

Exhibit 3

Accelerated adoption of technology in light vehicles might drive the demand for liquid hydrocarbons down even further.





[1] Including battery-electric vehicles, plug-in hybrids (main power source is electric), and hybrids (main power source is internal-combustion engine). Share of new-car sales is a global average weighted by each country's contribution to the global total.
[2] Vehicle-kilometer savings as a result of car sharing in 2035; business as usual: 14% urban, 12% rural; technology acceleration: 30% urban, 24% rural.

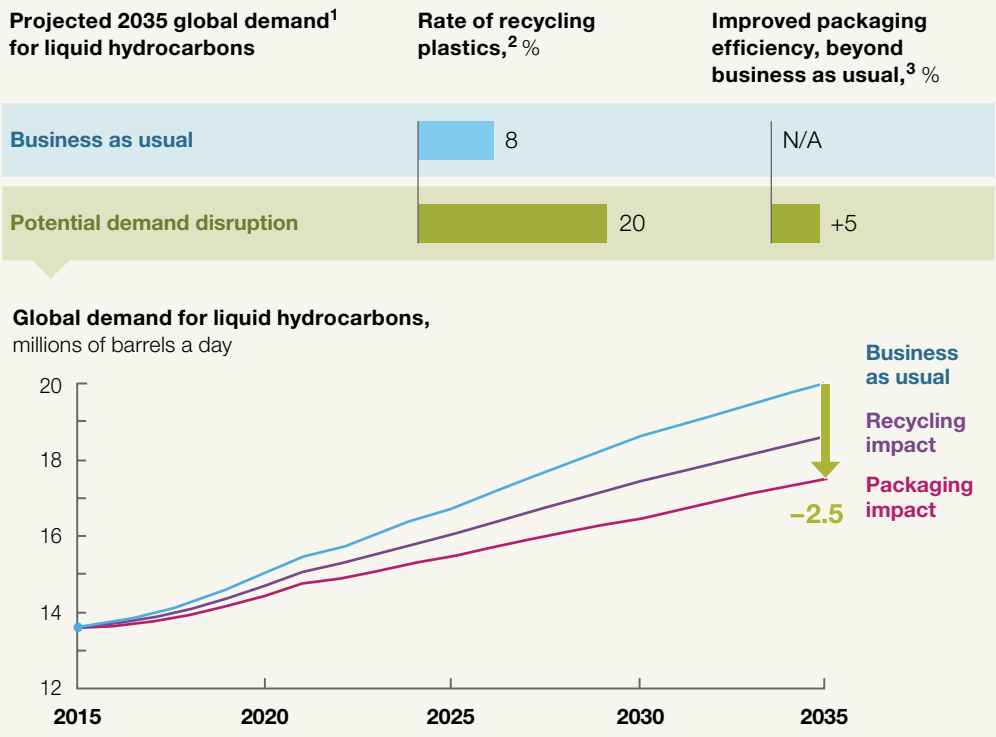
Source: Energy Insights by McKinsey

for about 70 percent of the growth in demand for liquids through 2035) expands at a rate that's 1.3 to 1.4 times the rate of overall GDP growth. But this relationship is changing, chiefly because the demand for plastics in mature markets is reaching a saturation point, even declining in markets such as Germany and Japan. Over the longer term, our base case forecasts that chemical demand growth could converge with GDP growth. Two elements could further depress demand in a substantial way: plastics recycling and plastic-packaging efficiency. If global plastic recycling increases from today's 8 percent rate to 20 percent in 2035 and plastic-packaging use declines by 5 percent beyond current projections (both in line with policy aspirations in many countries and recent successes in some), the demand for liquid hydrocarbons could fall 2.5 million barrels per day below our BAU case (Exhibit 4).

Combined with the acceleration in electric-vehicle adoption and related technology advances, these adjustments in plastics demand could reduce 2035 oil demand by nearly six million barrels per day compared to our BAU scenario. Under these conditions the demand for

Exhibit 4

Improved recycling and packaging efficiency could redraw global demand for hydrocarbons.



[1] Weighted averages across plastics at global level; potential varies for individual plastics.
[2] Across 8 main plastics (EPS, HDPE, LPDE, LLDPE, PET resins, PP, PS, PVC), where increased recycling thereby reduces ethylene and propylene production.
[3] More efficient packaging in B2B and B2C applications for 8 main plastics, plus olefin feedstocks.

Source: Energy Insights by McKinsey

oil would peak by around 2030 at a level below 100 million barrels per day.

Crucially, in the case of oil, the market reaction does not start when the market actually hits peak demand, but when the market begins believing that peak demand is in sight. The looming prospect of a peak would affect the investment decisions that energy producers, resource holders, and investors are making today as well as the profitability of current projects and ultimately the businesses of their customers. It would also have implications for the structure of markets and their dynamics, bending supply curves as the likelihood of shrinking demand may discourage low-cost producers to hold back production.

Our thought experiment, however, may carry a broader lesson. (For more on those top management implications, see “The future is now: Winning the resource revolution,” on page 106.) Structural changes in demand, behavioral shifts, and advances in technology across industries—often unfolding less visibly and operating indirectly—can trigger abrupt changes in industry

fundamentals. That's worth noting for executives managing in environments that increasingly are in flux. Q

[1] Occo Roelofsen, Namit Sharma, Rembrandt Sutorius, and Christer Tryggestad, "Is peak oil demand in sight?," June 2016, McKinsey.com.

[2] Richard Dobbs, James Manyika, and Jonathan Woetzel, *No Ordinary Disruption: The Four Forces Breaking All the Trends*, first edition, New York, NY: PublicAffairs, 2015.

[3] Liquid hydrocarbons includes crude oil, unconventional oil produced from oil sands and shale, and oil liquids extracted from natural gas.

[4] We project that car sharing and autonomous vehicles will reduce total mileage driven by more than a third.

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CAN YOU ACHIEVE AND SUSTAIN G&A COST REDUCTIONS?

Yes, but not by playing it safe. Set big goals, insist on a cultural shift, and model from the top.

by Alexander Edlich, Heiko Heimes, and Allison Watson

The companies that currently make up the S&P Global 1200 index spend an estimated $1.8 trillion annually in aggregate general and administrative (G&A) expenses. Likely, many corporate leaders believe their organizations can do at least a little better in keeping G&A expenses under control. But we found that only about one in four Global 1200 companies during the period we studied were able to maintain or improve their ratio of G&A expenses to sales and sustain those improvements for a significant period of time. That matters: forthcoming McKinsey research has also found that reducing sales, general, and administrative (SG&A) expenses by more than the industry median over a ten-year period is a leading predictor among companies that jump into the top quintile of economic value creation.[1]

Findings

We analyzed every company in the S&P Global 1200 that reported G&A as a line item from 2003 through 2014 and announced reduction initiatives through 2010. We sought to identify those companies that had announced a G&A cost-reduction program and then were able to not only achieve reductions within the first year but also sustain their reductions for at least three full years thereafter.[2] Our focus was on the commonalities—and differences—of those organizations that achieved and then sustained their success in

the months and years after the initial announcement. In all, we found that 238 companies in the S&P Global 1200 had announced such initiatives from 2003 through 2010, and only 62 of those companies (one in four) were able to sustain their reductions for four years.

The fundamental metric of our analysis was G&A as a percentage of revenue. Tying G&A to sales at the announcement starting point allowed us to take a wide lens on how those two lines, costs and revenues, proceeded over time. This approach also meant that the long-term G&A winners would fall into one of three categories: companies whose revenues were contracting but whose G&A expenses were contracting at an even faster rate (we called these companies the "survivors"), companies whose revenues were growing and whose G&A expenses were growing at a slower rate than that of their top line (the "controlled growers"), and "all-star" companies, whose revenues were growing and whose G&A expense had, as an absolute amount, decreased (exhibit).

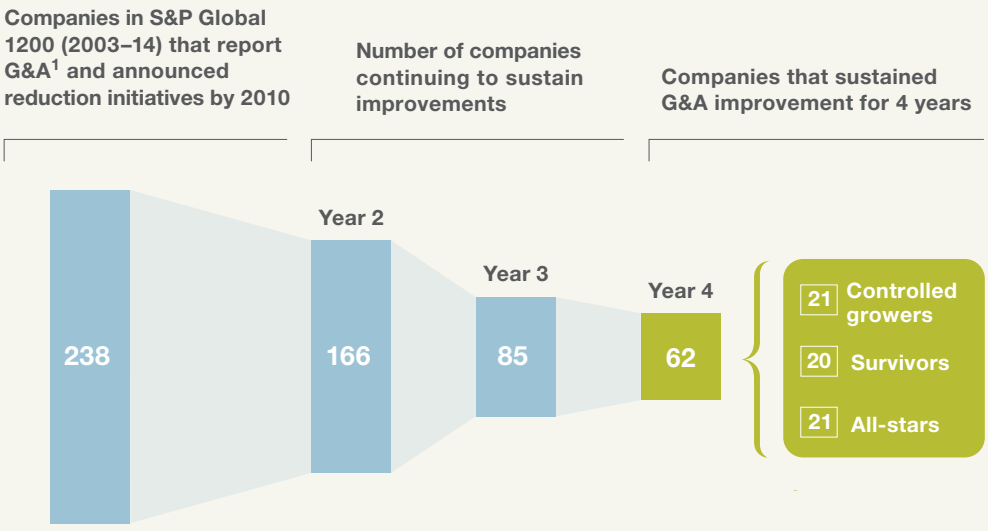
It turned out that the numbers of survivors (20), controlled growers (21), and all-stars (21) were almost identical—an encouraging indication, indeed, that companies can fight and win on both the cost and growth fronts. We were also intrigued to discover that winners were not necessarily those that, at the time of their initial announcement, had so-called burning platforms. Companies with initially poor G&A-to-sales ratios compared to their peers were moderately more likely to make major improvements over the first year and maintain those improvements over time. Even companies that were already performing at or better than their industry G&A-efficiency median, though, were among those that succeeded in implementing and sustaining G&A reductions for the long term. These included several companies that were in the top efficiency quartile at the time of their initial announcement. Success also bore little to no correlation with industry category, company size, or geography. However, in studying each of the winners more carefully, we noted certain key commonalities that suggested that the results were not random.

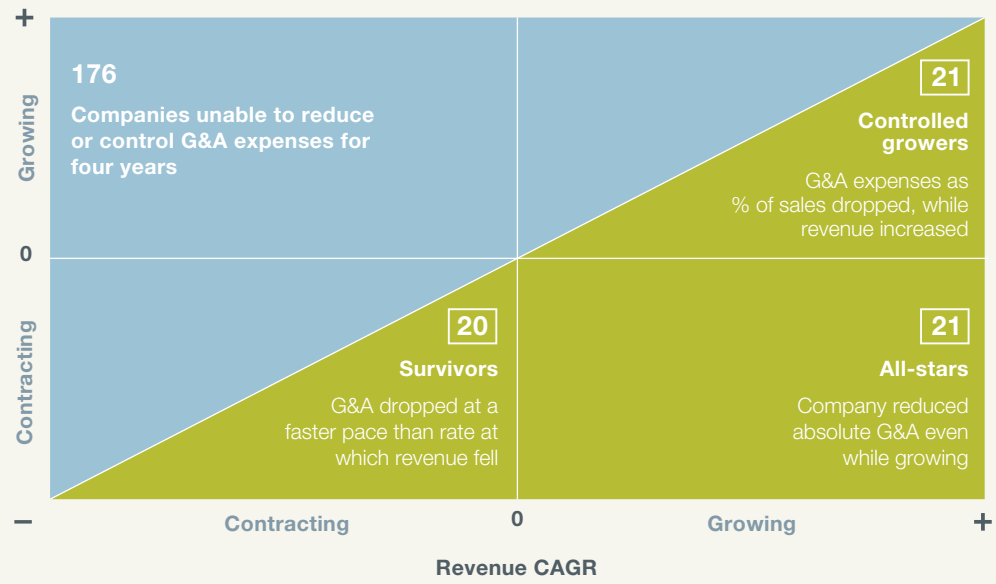
Secrets of success

What makes a long-time G&A winner? In our experience, there are no pat answers, just a recognition that G&A productivity is in fact harder than many executives believe. Different organizations confront different challenges over their life cycles. When a company is in a "growth at any cost" mode, it is understandable that a gold-plated mentality may settle in. When a company confronts stark privations, on the other hand, the reactive (but understandable) instinct is to turn to the proverbial "back office" and slash away. Whatever the situation, however, head-count reductions are not a cure-all. Terminating the employment of people who are performing duplicative roles (or whose positions are eliminated for any number of reasons) can result in a quick jolt of cost savings. But eliminating salaries and related expenses will not by itself sustain long-term G&A success, especially for companies tempted to believe they've trimmed as far as they can go. Best-in-class companies think in terms of making support processes more efficient and eliminating the inefficiencies

Exhibit

Only one in four companies were able to sustain their improved rates of G&A spending relative to sales.





[1] General and administrative expenses.
[2] For 4-year period beginning with a company's announcement of G&A-reduction initiative; CAGR = compound annual growth rate.

that lead to job cuts in the first place. That suggests a cultural shift—and indeed three profoundly cultural themes for long-term G&A success emerged from our findings.

Go bold

Don't be afraid to embrace radical change right out of the gate. Slow and steady does not always win the race. In fact, when making and sustaining G&A cost reductions, incremental change can be a recipe for failure. Companies that trimmed G&A by more than 20 percent in year one were four times more likely to be among the one-in-four long-term success stories than those organizations that were more steady in their reductions.

Going bold also means going beyond mere cheerleading, and calls for closely keeping score. That starts with clear metrics. There should be hard targets on aspirations and starting points, and reduction metrics should not be open to different interpretations. For example, organizations should be clear on points like cost avoidance (reductions that result in a future spending decrease but do not reduce current spending levels) and when—if at all—it's appropriate to use such a strategy. Either way, the company must articulate up front what its cost goals will require.

Moreover, the consequences for failing to meet predefined metrics should have teeth. Incentives work, and companies that succeed in maintaining G&A cost reductions often make sure to incorporate cost-control metrics into their performance-management programs and payment-incentive frameworks. For example, one global chemical company that succeeded in reducing G&A by more than 20 percent within one year and sustaining its improvements for more than three years thereafter did so after investing substantial effort in identifying discrete cost-saving opportunities within multiple functions, rigorously tracking performance against predefined objectives, and involving hundreds of employees company-wide in the performance initiative. In all, the company realized savings of well more than $100 million and earnings before interest, taxes, and amortization (EBITDA) margin improvements of about 3 percentage points over two years, and then sustained it.

By contrast, we found that companies that do not build sufficiently robust incentives and metric infrastructures often see their improvements peter out over time—or even boomerang back to higher cost levels. This was the case for one consumer-packaged-goods (CPG) company: it announced a reduction program with fanfare, cut successfully over the first year, but then saw its expenses return to and then exceed initial spending levels. Company leaders admitted that after seeing reductions in one area, they moved on too quickly to the next, without finishing what they had started. That called for shoring up new ways of working, cost-conscious policies, cost-reduction capabilities, and management commitment. The next time they declared "victory" on reaching a cost-cutting target, it was with a solid core of incentives, metrics, and aligned employees in place and a clear understanding that released employees would as a general matter not be hired back—at least, not for their prior roles.

Go deep

If going bold can be summarized as making your aggressive cost-control

objectives clear from the very start, going deep means looking beyond interim targets and imbuing a cost-control approach in your organization's working philosophy. That starts with the mandate that all functions need to play—and that the game is iterative. While reaching clear targets is important, sustaining G&A cost reductions requires more than just meeting a bar. In our experience, cost-cutting exercises are too often viewed by employees as merely target-based—something to work through, as opposed to a new way of working.

But best-practice organizations frame cost reduction as a philosophical shift. Transparency is essential: employees should not be kept in the dark about an initiative's importance and implementation. In our experience, a broad internal communication from the top has real impact when it includes a personal story on why change is needed and what is going to happen. A large CPG company, for example, drilled home the message that cost management would be a core element of its ongoing strategy and even a source of competitive advantage. The employees took the message to heart, and the company succeeded in counting itself among the one-in-four G&A success stories.

In our experience, however, no matter how resounding the message, the payoff will be minimal unless every function plays its part. For example, one large company, with a market capitalization in the tens of billions of dollars, responded to a call for G&A reductions by focusing its efforts in the finance function. Key individuals were able and enthused, but their reductions barely made a dent company-wide. It was as though the other support functions had been given a "hall pass." The result: consolidated G&A costs rose over the same time period at a faster pace than consolidated sales increased. That's not surprising; unless all functions are in scope, calls for cultural change ring hollow, and company-wide cost-savings initiatives often disappoint.

In addition to absolute clarity about purpose and buy-in across functions, skills and capabilities matter, too. One top performer, a major energy company, helped drive down G&A costs by augmenting its top team and replacing some executives with others who had previously led G&A improvement efforts. While some companies look outside for this talent, other successful organizations choose primarily to look in-house, training employees in both general and function-specific capabilities to improve efficiency, preserve or even improve customer experience, and see a more standardized approach lead to fewer internal inaccuracies. Of course, a combination of both "buy" (hiring new personnel) and "build" (training existing employees), while taking other initiatives, can work as well. One company we studied went as far as to institute a lean-management boot camp and to supplement employee learning with ongoing manager coaching.

Empowered change agents can carry the cost-reduction message beyond the C-suite walls. A global, diversified products-and-services company with headquarters in the United States embeds leaders throughout key administrative functions. These individuals are specifically charged with sharing the company's future-state vision, leading

specific initiative teams, and overseeing change-management efforts on the ground. Their efforts include, where appropriate, the outsourcing of several formally in-house processes and the migration to shared services of duplicative activities and tasks. All told, the company's comprehensive redesign of its support functions delivered a 30 percent reduction in G&A costs over two years.

Model from the top

G&A expense management should never be far from top of mind. For CEOs and others in the C-suite, that means not only active sponsorship of the cost-reduction programs, but walking the talk as well. One major European utility started its multiyear cost-reduction endeavor by slimming down the corporate headquarters' overhead functions and corresponding management team *before* involving the business units. Not only did the savings improve the bottom line, the efforts involved signaled high credibility for the top team's willingness to make cost control a priority. Indeed, C-level support and reinforcement is often a key to communicating C-level commitment. While this generally does not go so far as naming a chief G&A officer, investing organizational high performers with the authority to drive cost-savings initiatives makes clear where senior leaders' priorities lie. When differences of opinion occasionally bubbled up between line leaders and G&A change agents in the case of the European utility, for example, senior leadership consistently and forcefully backed the change agents.

Ironically, modeling from the top can involve a profoundly bottom-up mentality, as well. One instance is clean sheeting, as practiced by, for example, a major CPG company. The initiative leader framed the challenge not as having, say, "20 percent fewer HR employees than today," but rather by assuming a clean slate in which the HR organization had no employees, and determining how many workers should be added, and where they should be deployed, in order to run the function as effectively and efficiently as possible. It was that level of thinking—posed from above and for the company-wide good, rather than from a more limited, "defend my turf" position—that helped lead the company to save more than $1 billion in less than two years.

That degree of reduction, especially when sustained for the long term, suggests that success is not a coincidence. It is indeed possible for companies—including those in healthy growth mode—to reduce their G&A costs dramatically and to sustain those improvements. One in four companies prove the point: bold targets, institutional change, and strong leadership can produce enduring results. Q

[1] For more on economic profit, see Chris Bradley, Angus Dawson, and Sven Smit, "The strategic yardstick you can't afford to ignore," *McKinsey Quarterly*, October 2013, McKinsey.com.

[2] We chose a four-year postannouncement time frame because some of the companies issued proclamations of G&A reductions early in a fiscal year, others later in the year, and several had reductions in different fiscal years altogether.

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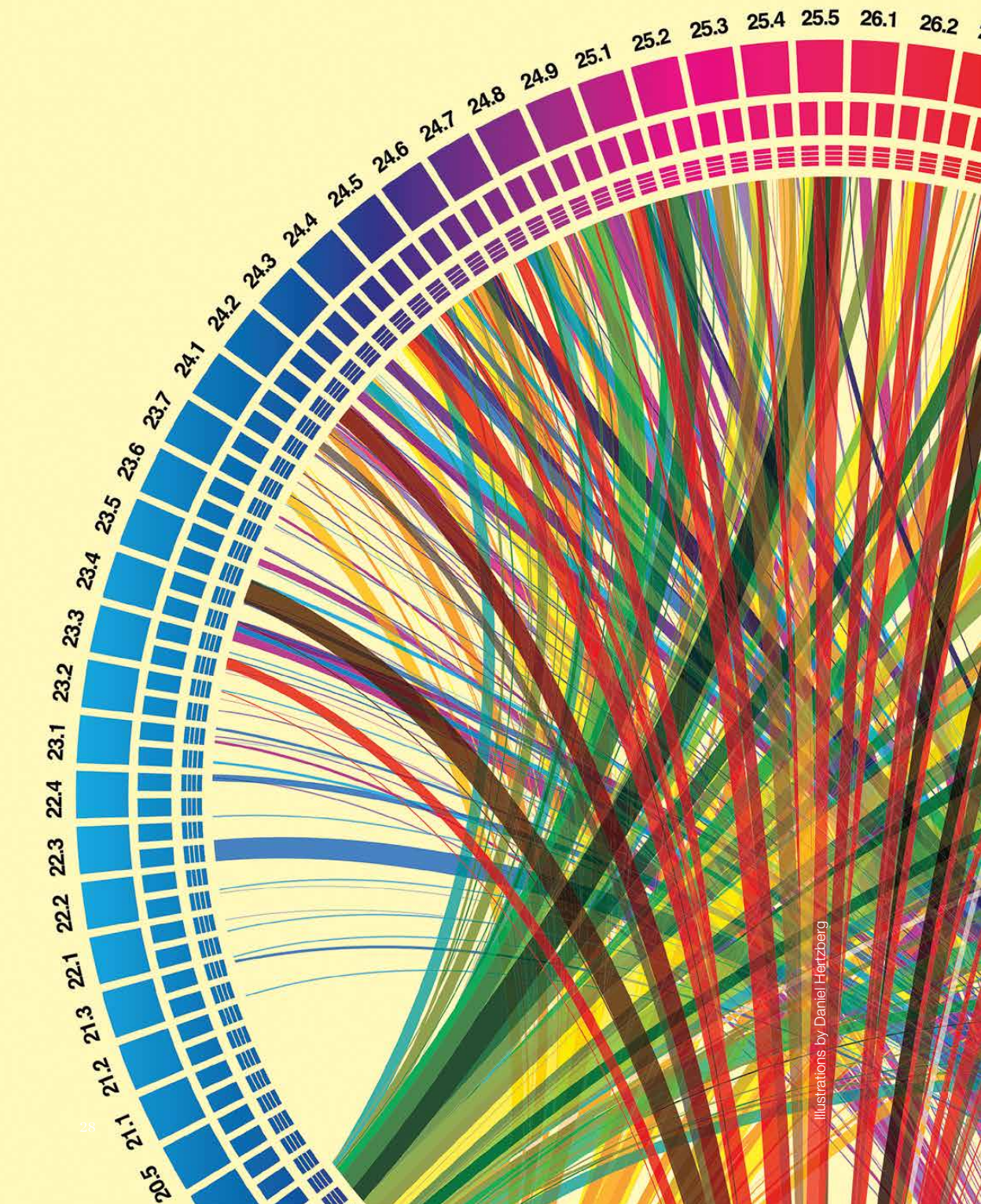
DOES YOUR DATA HAVE A PURPOSE?



Illustrations by Daniel Hertzberg

Making data analytics work for you—instead of the other way around

Stop spinning your wheels. Here's how to discover your data's purpose and then translate it into action.

by Helen Mayhew, Tamim Saleh, and Simon Williams

The data-analytics revolution now under way has the potential to transform how companies organize, operate, manage talent, and create value. That's starting to happen in a few companies—typically ones that are reaping major rewards from their data—but it's far from the norm. There's a simple reason: CEOs and other top executives, the only people who can drive the broader business changes needed to fully exploit advanced analytics, tend to avoid getting dragged into the esoteric "weeds." On one level, this is understandable. The complexity of the methodologies, the increasing importance of machine learning, and the sheer scale of the data sets make it tempting for senior leaders to "leave it to the experts."

But that's also a mistake. Advanced data analytics is a quintessential *business* matter. That means the CEO and other top executives must be able to clearly articulate its purpose and then translate it into action—not just in an analytics department, but throughout the organization where the insights will be used.

This article describes eight critical elements contributing to clarity of purpose and an ability to act. We're convinced that leaders with strong intuition about

both don't just become better equipped to "kick the tires" on their analytics efforts. They can also more capably address many of the critical and complementary top-management challenges facing them: the need to ground even the highest analytical aspirations in traditional business principles, the importance of deploying a range of tools and employing the right personnel, and the necessity of applying hard metrics and asking hard questions. (For more on these, see "Straight talk about big data," on page 42.[1]) All that, in turn, boosts the odds of improving corporate performance through analytics.

After all, performance—not pristine data sets, interesting patterns, or killer algorithms—is ultimately the point. Advanced data analytics is a means to an end. It's a discriminating tool to identify, and then implement, a value-driving *answer*. And you're much likelier to land on a meaningful one if you're clear on the purpose of your data (which we address in this article's first four principles) and the uses you'll be putting your data to (our focus in the next four). That answer will of course look different in different companies, industries, and geographies, whose relative sophistication with advanced data analytics is all over the map. Whatever your starting point, though, the insights unleashed by analytics should be at the core of your organization's approach to define and improve performance continually as competitive dynamics evolve. Otherwise, you're not making advanced analytics work for you.

'PURPOSE-DRIVEN' DATA

"Better performance" will mean different things to different companies. And it will mean that different types of data should be isolated, aggregated, and analyzed depending upon the specific use case. Sometimes, data points are hard to find, and, certainly, not all data points are equal. But it's the data points that help meet your specific purpose that have the most value.

Ask the right questions

The precise question your organization should ask depends on your best-informed priorities. Clarity is essential. Examples of good questions include "how can we reduce costs?" or "how can we increase revenues?" Even better are questions that drill further down: "How can we improve the productivity of each member of our team?," "How can we improve the quality of outcomes for patients?," "How can we radically speed our time to market for product

[1] For more on the context and challenges of harnessing insights from more data and on using new methods, tools, and skills to do so, see "Is big data still a thing?," blog entry by Matt Turck, February 1, 2016, mattturck.com; David Court, "Getting big impact from big data," *McKinsey Quarterly*, January 2015, McKinsey.com; and Brad Brown, David Court, and Paul Willmott, "Mobilizing your C-suite for big-data analytics," *McKinsey Quarterly*, November 2013, McKinsey.com.

development?" Think about how you can align important functions and domains with your most important use cases. Iterate through to actual business examples, and probe to where the value lies. In the real world of hard constraints on funds and time, analytic exercises rarely pay off for vaguer questions such as "what patterns do the data points show?"

One large financial company erred by embarking on just that sort of open-ended exercise: it sought to collect as much data as possible and then see what turned up. When findings emerged that were marginally interesting but monetarily insignificant, the team refocused. With strong C-suite support, it first defined a clear purpose statement aimed at reducing time in product development and then assigned a specific unit of measure to that purpose, focused on the rate of customer adoption. A sharper focus helped the company introduce successful products for two market segments. Similarly, another organization we know plunged into data analytics by first creating a "data lake." It spent an inordinate amount of time (years, in fact) to make the data pristine but invested hardly any thought in determining what the use cases should be. Management has since begun to clarify its most pressing issues. But the world is rarely patient.

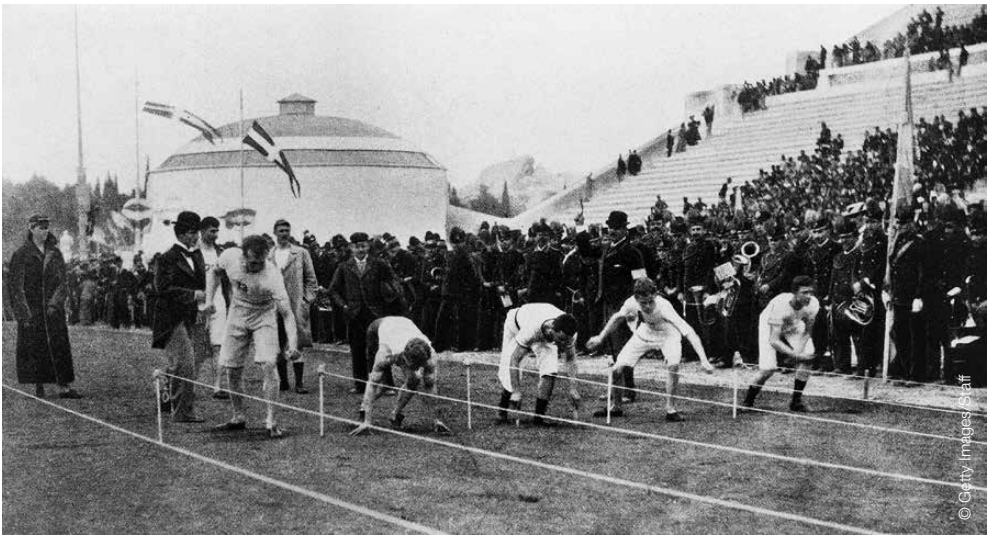
Had these organizations put the question horse before the data-collection cart, they surely would have achieved an impact sooner, even if only portions of the data were ready to be mined. For example, a prominent automotive company focused immediately on the foundational question of how to improve its profits. It then bore down to recognize that the greatest opportunity would be to decrease the development time (and with it the costs) incurred in aligning its design and engineering functions. Once the company had identified that key focus point, it proceeded to unlock deep insights from ten years of R&D history—which resulted in remarkably improved development times and, in turn, higher profits.

In the real world of hard constraints on funds and time, analytic exercises rarely pay off for vaguer questions such as "what patterns do the data points show?"

Think really small . . . and very big

The smallest edge can make the biggest difference. Consider the remarkable photograph below from the 1896 Olympics, taken at the starting line of the 100-meter dash. Only one of the runners, Thomas Burke, crouched in the now-standard four-point stance. The race began in the next moment, and 12 seconds later Burke took the gold; the time saved by his stance helped him do it. Today, sprinters start in this way as a matter of course—a good analogy for the business world, where rivals adopt best practices rapidly and competitive advantages are difficult to sustain.

The good news is that intelligent players can still improve their performance and spurt back into the lead. Easy fixes are unlikely, but companies can identify small points of difference to amplify and exploit. The impact of "big data" analytics is often manifested by thousands—or more—of incrementally small improvements. If an organization can atomize a single process into its smallest parts and implement advances where possible, the payoffs can be profound. And if an organization can systematically combine small improvements across bigger, *multiple* processes, the payoff can be exponential.



The variety of stances among runners in the 100-meter sprint at the first modern Olympic Games, held in Athens in 1896, is surprising to the modern viewer. Thomas Burke (second from left) is the only runner in the crouched stance—considered best practice today—an advantage that helped him win one of his two gold medals at the Games.

Just about everything businesses do can be broken down into component parts. GE embeds sensors in its aircraft engines to track each part of their performance in real time, allowing for quicker adjustments and greatly reducing maintenance downtime. But if that sounds like the frontier of high tech (and it is), consider consumer packaged goods. We know a leading CPG company that sought to increase margins on one of its well-known breakfast brands. It deconstructed the entire manufacturing process into sequential increments and then, with advanced analytics, scrutinized each of them to see where it could unlock value. In this case, the answer was found in the oven: adjusting the baking temperature by a tiny fraction not only made the product taste better but also made production less expensive. The proof was in the eating—and in an improved P&L.

When a series of processes can be decoupled, analyzed, and resynched together in a system that is more universe than atom, the results can be even more powerful. A large steel manufacturer used various analytics techniques to study critical stages of its business model, including demand planning and forecasting, procurement, and inventory management. In each process, it isolated critical value drivers and scaled back or eliminated previously undiscovered inefficiencies, for savings of about 5 to 10 percent. Those gains, which rested on hundreds of small improvements made possible by data analytics, proliferated when the manufacturer was able to tie its processes together and transmit information across each stage in near real time. By rationalizing an end-to-end system linking demand planning all the way through inventory management, the manufacturer realized savings approaching 50 percent—hundreds of millions of dollars in all.

Embrace taboos

Beware the phrase "garbage in, garbage out"; the mantra has become so embedded in business thinking that it sometimes prevents insights from coming to light. In reality, useful data points come in different shapes and sizes—and are often latent within the organization, in the form of free-text maintenance reports or PowerPoint presentations, among multiple examples. Too frequently, however, quantitative teams disregard inputs because the quality is poor, inconsistent, or dated and dismiss imperfect information because it doesn't feel like "data."

But we can achieve sharper conclusions if we make use of fuzzier stuff. In day-to-day life—when one is not creating, reading, or responding to an Excel model—even the most hard-core "quant" processes a great deal of qualitative information, much of it soft and seemingly taboo for data analytics—in a

nonbinary way. We understand that there are very few sure things; we weigh probabilities, contemplate upsides, and take subtle hints into account. Think about approaching a supermarket queue, for example. Do you always go to register four? Or do you notice that, today, one worker seems more efficient, one customer seems to be holding cash instead of a credit card, one cashier does not have an assistant to help with bagging, and one shopping cart has items that will need to be weighed and wrapped separately? All this is soft "intel," to be sure, and some of the data points are stronger than others. But you'd probably consider each of them and more when you decided where to wheel your cart. Just because line four moved fastest the last few times doesn't mean it will move fastest today.

In fact, while hard and historical data points are valuable, they have their limits. One company we know experienced them after instituting a robust investment-approval process. Understandably mindful of squandering capital resources, management insisted that it would finance no new products without waiting for historical, provable information to support a projected ROI. Unfortunately, this rigor resulted in overly long launch periods—so long that the company kept mistiming the market. It was only after relaxing the data constraints to include softer inputs such as industry forecasts, predictions from product experts, and social-media commentary that the company was able to get a more accurate feel for current market conditions and time its product launches accordingly.

Of course, Twitter feeds are not the same as telematics. But just because information may be incomplete, based on conjecture, or notably biased does not mean that it should be treated as "garbage." Soft information does have value. Sometimes, it may even be essential, especially when people try to "connect the dots" between more exact inputs or make a best guess for the emerging future.

To optimize available information in an intelligent, nuanced way, companies should strive to build a strong data provenance model that identifies the source of every input and scores its reliability, which may improve or degrade over time. Recording the quality of data—and the methodologies used to determine it—is not only a matter of transparency but also a form of risk management. All companies compete under uncertainty, and sometimes the data underlying a key decision may be less certain than one would like. A well-constructed provenance model can stress-test the confidence for a go/no-go decision and help management decide when to invest in improving a critical data set.

Connect the dots

Insights often live at the boundaries. Just as considering soft data can reveal new insights, combining one's sources of information can make those insights sharper still. Too often, organizations drill down on a single data set in isolation but fail to consider what different data sets convey in conjunction. For example, HR may have thorough employee-performance data; operations, comprehensive information about specific assets; and finance, pages of backup behind a P&L. Examining each cache of information carefully is certainly useful. But additional untapped value may be nestled in the gullies among separate data sets.

One industrial company provides an instructive example. The core business used a state-of-the-art machine that could undertake multiple processes. It also cost millions of dollars per unit, and the company had bought hundreds of them—an investment of billions. The machines provided best-in-class performance data, and the company could, and did, measure how each unit functioned over time. It would not be a stretch to say that keeping the machines up and running was critical to the company's success.

Even so, the machines required longer and more costly repairs than management had expected, and every hour of downtime affected the bottom line. Although a very capable analytics team embedded in operations sifted through the asset data meticulously, it could not find a credible cause for the breakdowns. Then, when the performance results were considered in conjunction with information provided by HR, the reason for the subpar output became clear: machines were missing their scheduled maintenance checks because the personnel responsible were absent at critical times. Payment incentives, not equipment specifications, were the real root cause. A simple fix solved the problem, but it became apparent only when different data sets were examined together.

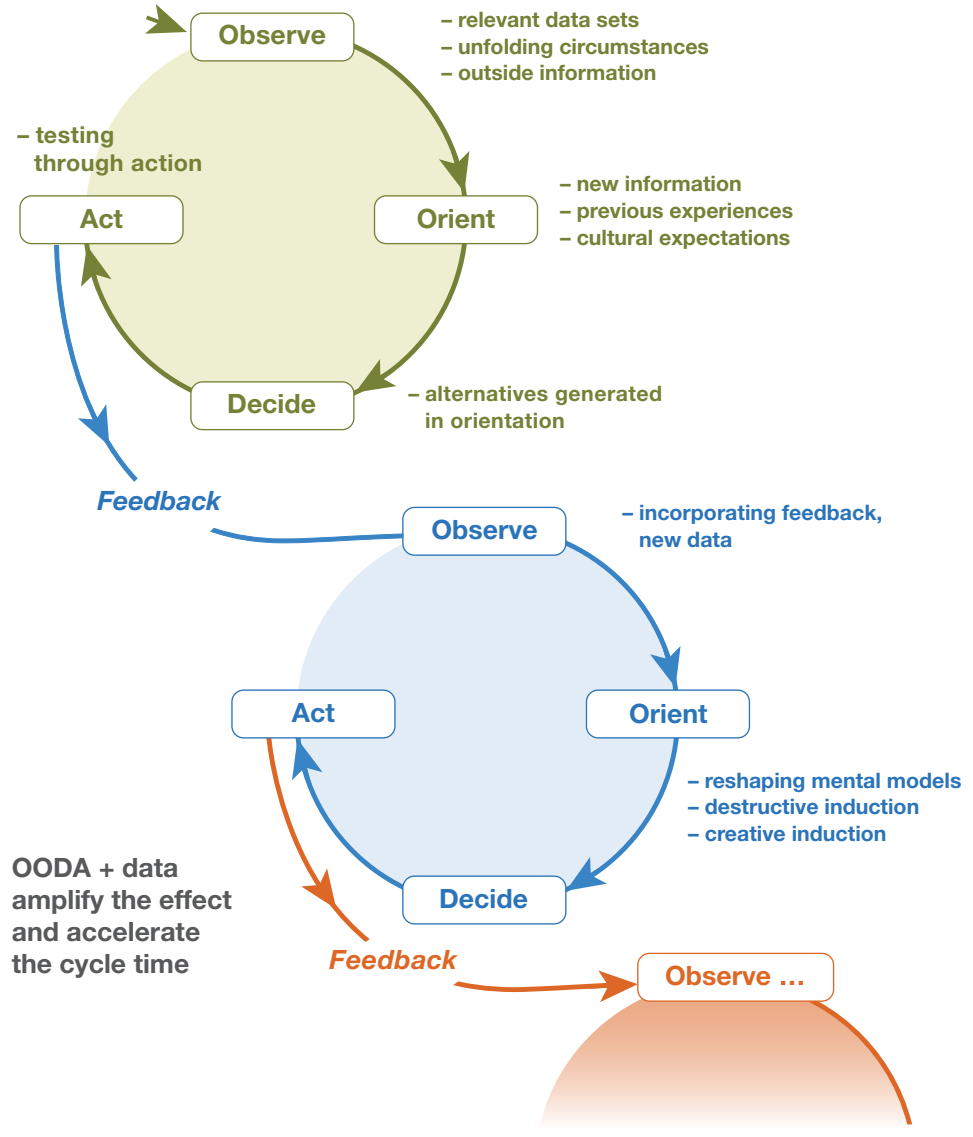
FROM OUTPUTS TO ACTION

One visual that comes to mind in the case of the preceding industrial company is that of a Venn Diagram: when you look at 2 data sets side by side, a key insight becomes clear through the overlap. And when you consider 50 data sets, the insights are even more powerful—if the quest for diverse data doesn't create overwhelming complexity that actually inhibits the use of analytics. To avoid this problem, leaders should push their organizations to take a multifaceted approach in analyzing data. If analyses are run in silos, if the outputs do not work under real-world conditions, or, perhaps worst of all, if the conclusions would work but sit unused, the analytics exercise has failed.

Exhibit

Best-in-class organizations continually test their assumptions, processing new information more accurately and reacting to situations more quickly.

The OODA loop[1]



[1] Observe, orient, decide, and act—a strategic decision-making model developed by US Air Force colonel John R. Boyd.

Run loops, not lines

Data analytics needs a purpose and a plan. But as the saying goes, "no battle plan ever survives contact with the enemy." To that, we'd add another military insight—the OODA loop, first conceived by US Air Force colonel John Boyd: the decision cycle of observe, orient, decide, and act. Victory, Boyd posited, often resulted from the way decisions are made; the side that reacts to situations more quickly and processes new information more accurately should prevail. The decision process, in other words, is a loop or—more correctly—a dynamic series of loops (exhibit).

Best-in-class organizations adopt this approach to their competitive advantage. Google, for one, insistently makes data-focused decisions, builds consumer feedback into solutions, and rapidly iterates products that people not only use but love. A loops-not-lines approach works just as well outside of Silicon Valley. We know of a global pharmaceutical company, for instance, that tracks and monitors its data to identify key patterns, moves rapidly to intervene when data points suggest that a process may move off track, and refines its feedback loop to speed new medications through trials. And a consumer-electronics OEM moved quickly from collecting data to "doing the math" with an iterative, hypothesis-driven modeling cycle. It first created an interim data architecture, building three "insights factories" that could generate actionable recommendations for its highest-priority use cases, and then incorporated feedback in parallel. All of this enabled its early pilots to deliver quick, largely self-funding results.

Digitized data points are now speeding up feedback cycles. By using advanced algorithms and machine learning that improves with the analysis of every new input, organizations can run loops that are faster and better. But while machine learning very much has its place in any analytics tool kit, it is not the only tool to use, nor do we expect it to supplant all other analyses. We've mentioned circular Venn Diagrams; people more partial to three-sided shapes might prefer the term "triangulate." But the concept is essentially the same: to arrive at a more robust answer, use a variety of analytics techniques and combine them in different ways.

In our experience, even organizations that have built state-of-the-art machine-learning algorithms and use automated looping will benefit from comparing their results against a humble univariate or multivariate analysis. The best loops, in fact, involve people and machines. A dynamic, multipronged decision process will outperform any single algorithm—no matter how advanced—by testing, iterating, and monitoring the way the quality of

data improves or degrades; incorporating new data points as they become available; and making it possible to respond intelligently as events unfold.

Make your output usable—and beautiful

While the best algorithms can work wonders, they can't speak for themselves in boardrooms. And data scientists too often fall short in articulating what they've done. That's hardly surprising; companies hiring for technical roles rightly prioritize quantitative expertise over presentation skills. But mind the gap, or face the consequences. One world-class manufacturer we know employed a team that developed a brilliant algorithm for the options pricing of R&D projects. The data points were meticulously parsed, the analyses were intelligent and robust, and the answers were essentially correct. But the organization's decision makers found the end product somewhat complicated and didn't use it.

We're all human after all, and appearances matter. That's why a beautiful interface will get you a longer look than a detailed computation with an uneven personality. That's also why the elegant, intuitive usability of products like the iPhone or the Nest thermostat is making its way into the enterprise. Analytics should be consumable, and best-in-class organizations now include designers on their core analytics teams. We've found that workers throughout an organization will respond better to interfaces that make key findings clear and that draw users in.

Build a multiskilled team

Drawing your users in—and tapping the capabilities of different individuals across your organization to do so—is essential. Analytics is a team sport. Decisions about which analyses to employ, what data sources to mine, and how to present the findings are matters of human judgment.

Assembling a great team is a bit like creating a gourmet delight—you need a mix of fine ingredients and a dash of passion. Key team members include data scientists, who help develop and apply complex analytical methods; engineers with skills in areas such as microservices, data integration, and distributed computing; cloud and data architects to provide technical and systemwide insights; and user-interface developers and creative designers to ensure that products are visually beautiful and intuitively useful. You also need "translators"—men and women who connect the disciplines of IT and data analytics with business decisions and management.

In our experience—and, we expect, in yours as well—the demand for people with the necessary capabilities decidedly outstrips the supply. We've also seen that simply throwing money at the problem by paying a premium for a cadre of new employees typically doesn't work. What does is a combination: a few strategic hires, generally more senior people to help lead an analytics group; in some cases, strategic acquisitions or partnerships with small data-analytics service firms; and, especially, recruiting and reskilling current employees with quantitative backgrounds to join in-house analytics teams.

We're familiar with several financial institutions and a large industrial company that pursued some version of these paths to build best-in-class advanced data-analytics groups. A key element of each organization's success was understanding both the limits of what any one individual can be expected to contribute and the potential that an engaged team with complementary talents can collectively achieve. On occasion, one can find "rainbow unicorn" employees who embody most or all of the needed capabilities. It's a better bet, though, to build a collaborative team comprising people who collectively have all the necessary skills.

That starts, of course, with people at the "point of the spear"—those who actively parse through the data points and conduct the hard analytics. Over time, however, we expect that organizations will move to a model in which people across functions use analytics as part of their daily activities. Already, the characteristics of promising data-minded employees are not hard to see: they are curious thinkers who can focus on detail, get energized by ambiguity, display openness to diverse opinions and a willingness to iterate together to produce insights that make sense, and are committed to real-world outcomes. That last point is critical because your company is not supposed to be running some cool science experiment (however cool the analytics may be) in isolation. You and your employees are striving to discover practicable insights—and to ensure that the insights are used.

Make adoption your deliverable

Culture makes adoption possible. And from the moment your organization embarks on its analytics journey, it should be clear to everyone that math, data, and even design are not enough: the real power comes from adoption. An algorithm should not be a point solution—companies must embed analytics in the operating models of real-world processes and day-to-day work flows. Bill Klem, the legendary baseball umpire, famously said, "It ain't nothin' until I call it." Data analytics ain't nothin' until you use it.

We've seen too many unfortunate instances that serve as cautionary tales—from detailed (and expensive) seismology forecasts that team foremen didn't use to brilliant (and amazingly accurate) flight-system indicators that airplane pilots ignored. In one particularly striking case, a company we know had seemingly pulled everything together: it had a clearly defined mission to increase top-line growth, robust data sources intelligently weighted and mined, stellar analytics, and insightful conclusions on cross-selling opportunities. There was even an elegant interface in the form of pop-ups that would appear on the screen of call-center representatives, automatically triggered by voice-recognition software, to prompt certain products, based on what the customer was saying in real time. Utterly brilliant—except the representatives kept closing the pop-up windows and ignoring the prompts. Their pay depended more on getting through calls quickly and less on the number and type of products they sold.

When everyone pulls together, though, and incentives are aligned, the results can be remarkable. For example, one aerospace firm needed to evaluate a range of R&D options for its next-generation products but faced major technological, market, and regulatory challenges that made any outcome uncertain. Some technology choices seemed to offer safer bets in light of historical results, and other, high-potential opportunities appeared to be emerging but were as yet unproved. Coupled with an industry trajectory that appeared to be shifting from a product- to service-centric model, the range of potential paths and complex "pros" and "cons" required a series of dynamic—and, of course, accurate—decisions.

By framing the right questions, stress-testing the options, and, not least, communicating the trade-offs with an elegant, interactive visual model that design skills made beautiful and usable, the organization discovered that increasing investment along one R&D path would actually keep three technology options open for a longer period. This bought the company enough time to see which way the technology would evolve and avoided the

worst-case outcome of being locked into a very expensive, and very wrong, choice. One executive likened the resulting flexibility to "the choice of betting on a horse at the beginning of the race or, for a premium, being able to bet on a horse halfway through the race."

It's not a coincidence that this happy ending concluded as the initiative had begun: with senior management's engagement. In our experience, the best day-one indicator for a successful data-analytics program is not the quality of data at hand, or even the skill-level of personnel in house, but the commitment of company leadership. It takes a C-suite perspective to help identify key business questions, foster collaboration across functions, align incentives, and insist that insights be used. Advanced data analytics is wonderful, but your organization should not be working merely to put an advanced-analytics initiative in place. The very point, after all, is to put analytics to work for you. Q

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Straight talk about big data

Transforming analytics from a "science-fair project" to the core of a business model starts with leadership from the top. Here are five questions CEOs should be asking their executive teams.

by Nicolaus Henke, Ari Libarikian, and Bill Wiseman

The revolution isn't coming—it's already under way. In the science of management, the revolution in big data analytics is starting to transform how companies organize, operate, manage talent, and create value. Changes of this magnitude require leadership from the top, and CEOs who embrace this opportunity will increase their companies' odds of long-term success. Those who ignore or underestimate the eventual impact of this radical shift—and fail to prepare their organizations for the transition—do so at their peril.

It's easy to see how analytics could get delegated or deprioritized: CEOs are on the hook for performance, and for all of the potential associated with analytics, many leaders operating in the here and now are reporting underwhelming results. In fact, when we surveyed a group of leaders from companies that are committed to big data–analytics initiatives, three-quarters of them reported that their revenue or cost improvements were less than 1 percent. Some of the disconnect between promise and payoff may be attributed to undercounting—the sum of the parts is not always immediately apparent. Ironically, the results of "big data" analytics are often thousands— or more—of incrementally *small* improvements realized system-wide. Individually, any one of these gains may appear insignificant, but when considered in the aggregate they can pack a major punch.

The shortfalls, however, are more than just a matter of perception, and the pitfalls are real. Critically, an analytics-enabled transformation is as much about a cultural change as it is about parsing the data and putting in place advanced tools. "This is something I got wrong," admits Jeff Immelt, the CEO of GE. "I thought it was all about technology. I thought if we hired a couple thousand technology people, if we upgraded our software, things like that, that was it. I was wrong. Product managers have to be different; salespeople have to be different; on-site support has to be different."

CEOs who are committed to a shift of this order, yet wonder how far the organization has truly advanced in its data-analytics journey to date, should start by stimulating a frank discussion with their top team. That includes a clear-eyed assessment of the fundamentals, including your company's key value drivers, your organization's existing analytics capabilities, and, perhaps most important, your purpose for committing to analytics in the first place. (See "Making data analytics work for you—instead of the other way around," on page 29.) This article poses questions—but not shortcuts—to help a company's senior leaders determine where they are and what needs to change for their organization to deliver on the promise of advanced analytics.

TWO SCENES FROM THE FRONT LINES OF THE REVOLUTION

Immelt reached his conclusions from witnessing—and, in many respects, leading—the revolution. GE's CEO is keenly aware that so far in the 21st century, the digitization of commerce and media has allowed a handful of US Internet stalwarts to capture almost all the market value created in the consumer sector. To avoid a similar disruption as the industrial world goes online over the coming decade, Immelt is driving a radical shift in the culture and business model of his 124-year-old company. GE is spending $1 billion this year alone to analyze data from sensors on gas turbines, jet engines, oil pipelines, and other machines and aims to triple sales of software products by 2020 to roughly $15 billion. To make sense of those new streams of data, the company is also building a cloud-based platform called Predix, which combines its own information flows with customer data and submits them to analytics software that can lower costs and increase uptime through vastly improved predictive maintenance. Getting this right will require hiring several thousand new software engineers and data scientists, retraining tens of thousands of salespeople and support staff, and fundamentally shifting GE's business model from product sales coupled with service licenses to outcomes-based subscription pricing. "We want to treat analytics like it's as core to the company over the next 20 years as material science has been over the past 50 years," says Immelt.

To understand further the growing power of advanced analytics, consider as well how a consumer-electronics OEM is picking up more speed in an inherently slow-growth market. The company started with a Herculean effort to pull together information on more than 1,000 variables previously collected in silos across millions of devices and sources—product sales and usage data, channel data, online transactions, and service tickets, plus external consumer data from third-party suppliers such as Acxiom. Mining this integrated big data set allowed the company to home in on a dozen or so unrealized opportunities where a shift in investment patterns or processes would really pay off. Armed with a host of new, fine-grained insights on which moves offered the greatest odds to increase sales, reduce churn, and improve product features, the company went on to realize $400 million in incremental revenue increases in year one. As success builds, the leadership has begun to fundamentally rethink how it goes about new-business development and what future capabilities its top managers will require.

BIG CHALLENGES, BIGGER OPPORTUNITIES

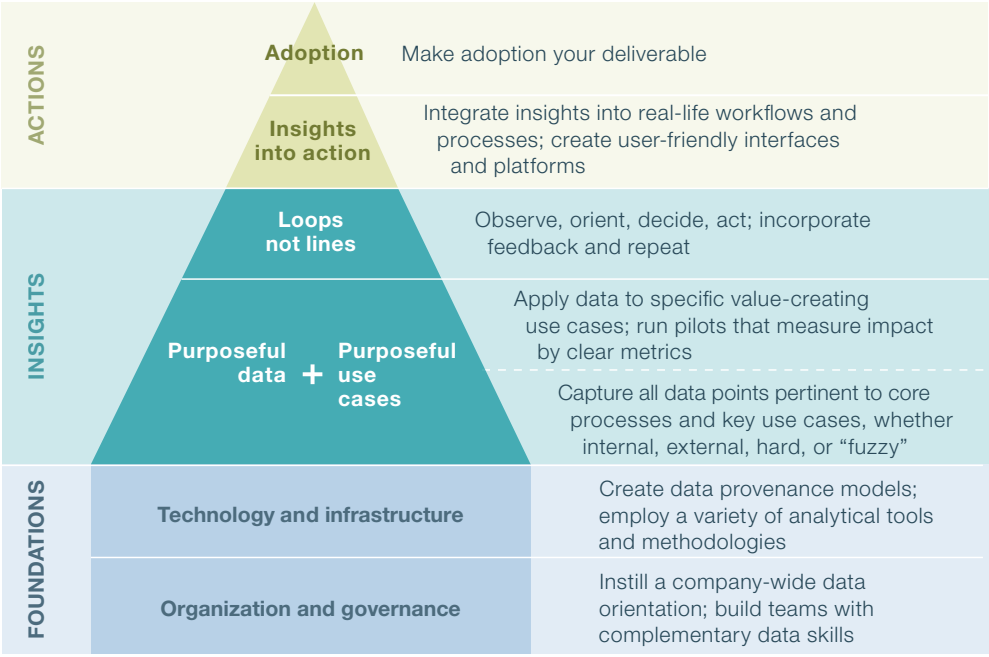
But for all the enormous promise, most companies—outside of a few digital natives such as Amazon, Facebook, Google, Netflix, and Uber—have so far struggled to realize anything more than modest gains from their investments in big data, advanced analytics, and machine learning. Many organizations remain preoccupied with classic large-scale IT-infrastructure programs and have not yet mastered the foundational task of creating clean, powerful, linked data assets; building the capabilities they need to extract insight from them; and creating the management capacity required to lead and direct all this toward purposeful action (exhibit).

Still, similar birthing pains have marked every previous major technology transition as well. And we're still in the early days of this one: though about 90 percent of the digital data ever created in the world has been generated in just the past two years, only 1 percent of that data has been analyzed. Often, those analyses are conducted as discrete one-offs—nifty experiments, but not much more. Indeed, in many companies, analytics initiatives still seem more like sideline science-fair projects than the core of a cutting-edge business model.

But the potential for significant breakthroughs demands an overhaul of that model, and the speed at which these breakthroughs advance will only accelerate. As computer-processing power and cloud-storage capacity swell, the world's current data flood becomes a tidal wave. By 2020, some 50 billion smart devices will be connected, along with additional billions of smart sensors, ensuring that the global supply of data will continue to more than double every two years.

Exhibit

Data analytics should have a purpose, be grounded in the right foundation, and always be conducted with adoption in mind.



LEADING QUESTIONS

All of these developments ensure that there will be a lot of data to analyze. Almost by definition, big data analytics means going deep into the information weeds and crunching the numbers with a technical sophistication that can appear so esoteric that senior leadership may be tempted simply to "leave it to the experts" and disengage from the conversation. But the conversation is worth having. The real power of analytics-enabled insights comes when they become so fully embedded in the culture that their predictions and prescriptions drive a company's strategy and operations and reshape how the organization delivers on them. Extending analytics from the realm of tactical insights into the heart of the business requires hard work, but the benefits can be profound. Consider, for example:

- A global airline stitched together data from multiple operational systems (including those related to aircraft location and aerobridge position) to identify more precisely when and why flights were delayed as they pushed back or arrived at a gate. Its advanced prediction algorithms were able to quantify the knock-on impact of events such as mishandled luggage and helped build a system to alert supervisors in real time so that they

could react before potential problems developed. Impact: a reduction in delayed arrivals of about 25 percent over the past 12 months.

- A global consumer-packaged-goods company seeking to drive growth across categories integrated a wide range of information (including financial, promotional, and even weather-related factors) into a single data source and then developed sophisticated algorithms to understand the incremental effects that changes based on this source could have at even granular levels. Sifting through disparate data and building up from the ground level enabled the company to identify valuable insights about its competitive landscape as a whole, such as optimal price points and opportunities for new products. Impact: a gross-profit increase in the tens of millions of dollars within one year.

- A pharmaceuticals company is using analytics to stem the rising cost of clinical trials. After spending billions of dollars conducting hundreds of trials over the past five years, the company began integrating information on more than 100,000 patient participants with operational data from finance and HR. Out of those tens of millions of data points, it has started to pinpoint which locations are most efficient, which patient-screening techniques increase "pass rates," and how best to configure its own teams. Analysis of email and calendar data, for example, underscored that improving collaboration between a team leader and two specific roles within clinical operations was among the most significant predictors of delays. The anticipated result: cost savings of more than 10 percent and better-quality outcomes.

And the list goes on: case after case of reduced churn, less fraud, improved collections, better return on investment from marketing and customer acquisition, and enhanced predictive maintenance. Right now, only a few leaders outside the tech sector are truly transforming their organizations with data. But more could be. To that end, we suggest five questions that company leaders should be prepared to explore in depth.

1. Do we have a value-driven analytics strategy?

Businesses can waste a lot of energy collecting data and mining them for insights if their efforts aren't focused on the areas that matter most for the company's chosen direction. Successful big data and advanced-analytics transformations begin with assessing your own value drivers and capabilities versus those of the competition and developing a picture of the ideal future state, one aligned with the broad business strategy and key use cases. Asking the right questions is the critical first step. These should start big: "What is

the size of this opportunity? If I had the additional insights possible through advanced analytics, how much could I save? How much additional revenue could I achieve?" And they should quickly get granular. To frame and develop the right hypotheses, frontline managers must engage alongside the analytics experts throughout the process.

That consumer-electronics OEM's planning exercise, for example, led the team to ask several questions: "Who are our highest-value customers, how do we reach them, and what do we talk about? How can we drive more cross-sell of our broader portfolio of products and services? Which product features drive the highest usage or engagement, and how do we promote higher adoption of them?" At a leading private bank, the questions from a similar exercise included these: "How can we set optimal price points, day in and day out, and by the thousands each day? Which customers are most at risk of leaving, which are most likely to respond favorably to retention efforts, and what types of retention efforts work best?"

2. Do we have the right 'domain data' to support our strategy?

In answering such questions, companies typically identify 10 to 20 key use cases in areas such as revenue growth, customer experience, risk management, and operations where advanced analytics could produce clear-cut improvements. On the basis of that self-assessment and the anticipated impact on earnings, the use cases are ranked and pilot projects are sequenced. Measuring the impact of each use case, with specific indicators and benchmarks, highlights what data are needed and keeps things on track.

A critical foundational step is to overcome obstacles to using existing data. This work could include cleaning up historical data, integrating data from multiple sources, breaking down silos between business units and functions, setting data-governance standards, and deciding where the most important opportunities may lie to generate new internal data—for example, by adding sensors, or, in the case of, say, casinos, by installing webcams to assess high-roller betting behavior.

Most companies, even those with rich internal data, will also conclude they need to mine the far-larger universe of structured and unstructured external sources. When one emerging-markets insurer decided to launch a new peer-to-peer-lending start-up, it realized it could make even better credit decisions by analyzing potential customers' data and movements on its various platforms, including social networks.[1]

[1] For more on opportunities to use public information and shared data from private sources, see *Open data: Unlocking innovation and performance with liquid information*, McKinsey Global Institute, October 2013, on McKinsey.com.

All these data eventually can be pooled into more shareable, accessible assets, such as new "data lakes." Getting the foundation sorted is not the work of weeks or even months, as anyone who has wrestled with the shortcomings of legacy IT systems knows. And the cost can eventually run into hundreds of millions of dollars, while the full impact of those investments will not always be obvious in one quarter, or two, or three. But that doesn't mean you should wait for years to capture value. Which makes it all the more important to ask the next question.

3. Where are we in our journey?

Like any transition, the data-and-analytics journey takes place in stages. It's crucial both to start laying the foundation and to start building analytics capabilities even before the foundation is set. Or, as one of our clients recently recalled as he thought about his company's successful analytics transformation: "We needed to walk before we could run. And then we ran like hell."

To step smartly in fast-forward mode, the consumer-electronics OEM created an interim data architecture focused on building and staffing three "insights factories" that could generate actionable recommendations for its highest-priority use cases. While further foundational investments continued in parallel, those factories enabled the early pilots to deliver quick results that made them largely self-funding. The key is to move quickly from data collection to "doing the math," with an iterative, hypothesis-driven modeling cycle. Such rapid successes help break down silos and build enthusiasm and buy-in among often skeptical frontline managers. Even if it works, a "black box" developed by data scientists working in isolation will usually prove a recipe for rejection. End users need to understand the basic assumptions and how to apply the model's output: Are its recommendations binding, or is there flexibility to deviate? Will it be integrated directly into core tools such as customer relationship management, or will it be an additional overlay? What visual display will be most useful for the front line—in general, simpler is better—once the data are produced? Pilots should be designed to answer these questions even before the data are collected and the model is built.

Once proof of concept is established and points start going on the board, it's critical to go big as quickly as possible, which can require an infusion of talent. Best-practice companies rarely cherry-pick one or two specialist profiles to recruit to address isolated challenges. In our recent survey of more than 700 companies, we found that 15 percent of operating-profit increases were linked to the hiring of data-and-analytics experts at scale.

4. Are we modeling the change personally?

In a recent survey of more than 500 executives, we turned up a distressing finding: while 38 percent of CEOs self-reported that they were leading their companies' analytics agendas, only 9 percent of the other C-suite executives agreed. They instead identified the chief information officer or some other executive as the true point person. What we've got here, to paraphrase the warden in *Cool Hand Luke*, is more than a failure to communicate; it's about not walking the talk.

While CEOs and other members of the executive team don't need to be the experts on data science, they must at least become conversant with a jungle of new jargon and buzzwords (Hadoop, genetic algorithms, in-memory analytics, deep learning, and the like) and understand at a high level the limits of the various kinds of algorithmic models. In addition to constant communication from the top that analytics is a priority and public celebration of successes, small signals such as recommending and showing up for learning opportunities also resonate.

The most important role modeling a CEO can deliver, of course, is to ensure that the right kind of conversations are taking place among the company's top management. That starts with ensuring that the right people are both in the room and empowered, and then continues with direct intervention and questioning to ensure the transition from experience-based decision making to data-based decision making: Was a conclusion A/B tested? What have we done to build up our capability to conduct rapid prototyping, to test and learn and experiment, to constantly engage in what Google chief economist Hal Varian calls "product kaizen"?[2]

5. Are we organizing and leading for analytics?

The most important shift, which only the CEO can lead, is to reorganize to put advanced analytics at the center of every core process. The aspiration, in fact, should be to eventually eliminate the distinct term "analytics" from the company lexicon. Data flow through the whole organization, and the analytics should organically follow. "I just think it's infecting everything we do, in a positive way," says GE's Immelt.

[2] See Hal R. Varian, "Kaizen, that continuous improvement strategy, finds its ideal environment," *New York Times*, February 8, 2007, nytimes.com; and Hal R. Varian, *Computer mediated transactions*, UC Berkeley and Google presentation, Berkeley, CA, January 3, 2010, people.ischool.berkeley.edu.

Still, even a central nervous system requires a brain—a central analytics hub, or center of excellence. Without a dedicated team and leader, whether a chief analytics officer or a chief data officer or a senior C-level executive clearly tasked with the role, companies struggle to create a distinctive culture that can attract and nurture the best talent. But at the same time, as with a function like finance, individuals connected with the central team should also be embedded in the separate business units. We've found that executives from companies with a hybrid model reported a greater impact from analytics on revenue and costs than other respondents did.

What additional roles, skills, and structures are necessary? Clearly, scaling up analytics requires recruiting and retaining a sufficient number of world-class data scientists and model builders. Buying such talent on an outsourced model is only an option for those still in the exploratory phase of their journey. But, to take one example, most banks in the post-stress-test world have created separate, in-house units with their own reporting lines, charged with constantly testing and validating those models to minimize the risk of spurious correlations. We believe this approach makes sense for nonbanks as well.

To turn modeling outputs, however robust, into tangible business actions, companies also need a sufficient supply of "translators," people able to connect the needs of the business units with the technical skills of the modelers. Don't assume such "two sport" leaders are easy to find. In our experience, executives often report that attracting and retaining business users with analytics skill sets is actually slightly harder than recruiting those in-demand data scientists themselves. Alongside aggressive recruiting, winning this war for talent requires doubling down on training and improved HR analytics.

In general, most organizations are underinvesting in creating intuitive tools with easy-to-use interfaces that can help frontline managers integrate data into day-to-day processes. Our rule of thumb: for the highest payoff, split your analytics investments roughly 50–50 between spending on building better models and spending on tools and training to ensure that the front line uses the new insights being generated. In many companies, that ratio is still closer to 80–20, or worse.

Beyond big data and analytics, an even broader shift is under way, as robots, machine-learning algorithms, and "soft AI" systems, such as IBM's Watson, take on more and more of the tasks that human labor used to conduct. Early in 2016, AlphaGo, a system developed by DeepMind, a British company owned

by Google, unexpectedly rolled over a celebrated human champion in the ancient game of Go.[3] To prepare for a contest in which, unlike chess, there are more possible positions than grains of sand in the universe, AlphaGo trained itself by playing endless rounds of games, which enabled the path-optimization strategies.[4]

As the use of data and analytics incorporates machine learning, and artificial intelligence continues to blur, humans can take comfort from one near certainty: as proved true in chess after 1997, when IBM's Deep Blue defeated Garry Kasparov, the new "best players" of Go will turn out to be neither humans nor machines alone, but rather humans working in tandem with machines. Mastering how to leverage that combination may be the ultimate CEO management challenge.

Science-fiction writer Arthur C. Clarke once said that "any sufficiently advanced technology is indistinguishable from magic." We haven't advanced to that level—yet. But as the age of big data gives way to the age of advanced analytics and machine learning, we are entering an era where the ability to analyze data will deliver a predictive capability that feels almost like magic.

As in other historic shifts, such as when modern firearms "disrupted" the crossbow, the competition between those who master the new technology and those who don't will be fierce. But the upside of adaptation is as inspiring as the downside is stark. In the years ahead, the companies and institutions that address these challenges frankly, transform their organizations accordingly, and apply these near-magical abilities seamlessly to the world's most complex and critical issues will deliver a level of value creation that today we can barely imagine. Q

[3] For more details about the match, see Choe Sang-Hun, "Google's computer program beats Lee Se-dol in Go tournament," *New York Times*, March 15, 2016, nytimes.com. For more on Google's acquisition of AlphaGo, see Rolfe Winkler, "Google acquires artificial-intelligence company DeepMind," *Wall Street Journal*, January 26, 2014, wsj.com.

[4] For more on AlphaGo's learning process, see *Google Research Blog*, "AlphaGo: Mastering the game of Go with machine learning," blog entry by Demis Hassabis and David Silver, January 27, 2016, research.googleblog.com.

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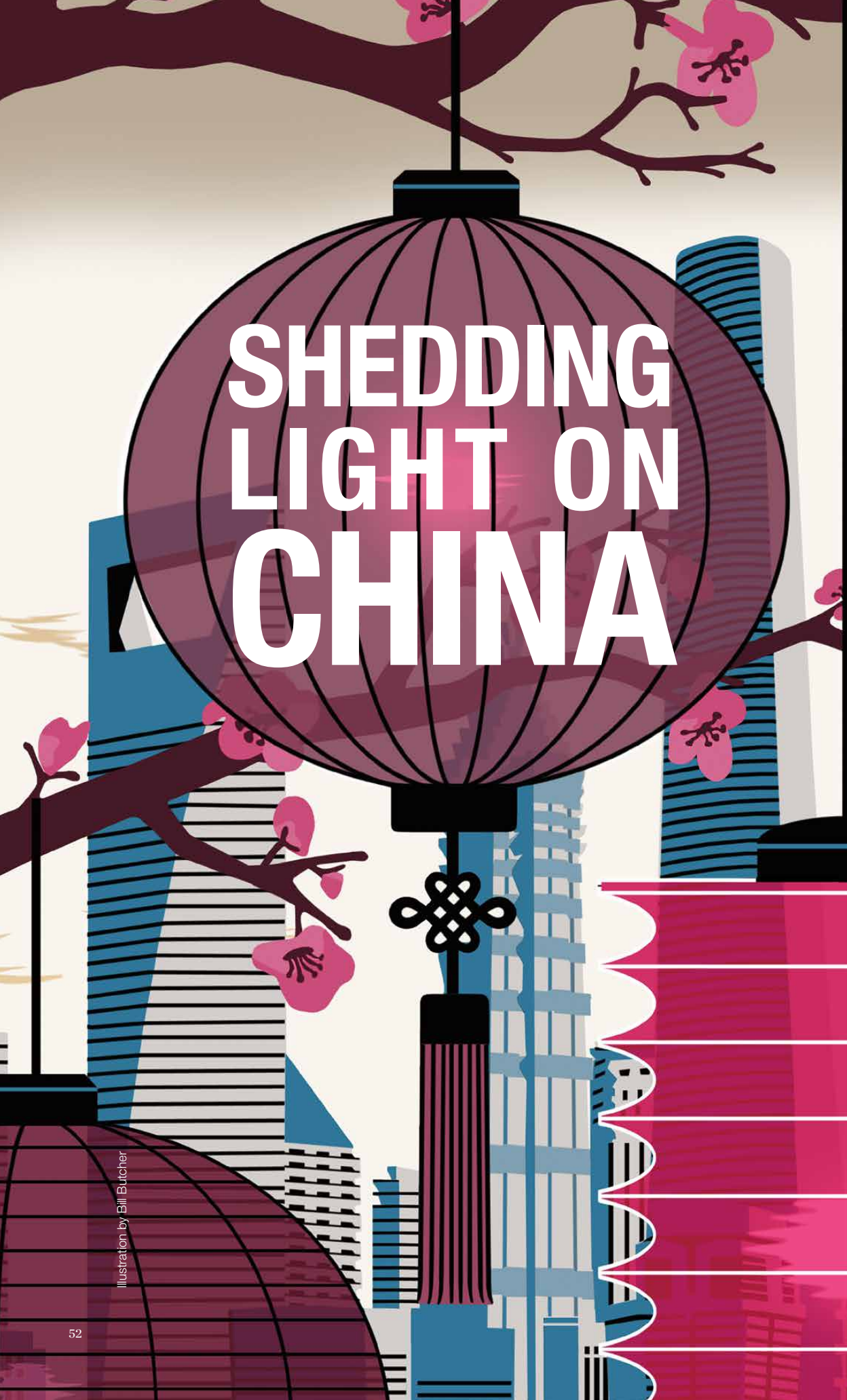


SHEDDING LIGHT ON CHINA

Illustration by Bill Butcher

The country's economic slowdown has challenged global executives. Prepare for the road ahead by reviewing a guidebook to the future, a veteran business leader's reflections, and a look at how the Chinese consumer is evolving.

The CEO guide to China's future

How China's business environment will evolve on its way toward advanced-economy status.

For ten years or more, China has been a uniquely powerful engine of the global economy, regularly posting high single-figure or even double-digit annual increases in GDP. More recently, growth has slowed, prompting sharp falls in international commodity prices and casting a shadow over the near-term prospects for developed and emerging markets.

What will happen next? Pessimists struggle to see what China can do for an encore after what they say was an extraordinary, one-off period of catching up. Optimists believe that during the next 10 to 15 years, China has the potential to continue to outperform the rest of the world and to take its place as a full-fledged advanced economy (see summary infographic, "What's next for China?").

While most observers look at China at the national or, at most, the sector level, recent research from the McKinsey Global Institute (MGI) analyzes more than two thousand companies in order to identify a set of opportunities for policy makers and business to speed up the transition.[1] This CEO guide discusses this and other recent research to help executives plot their course in China's fast-changing economic landscape.

[1] See "Capturing China's $5 trillion productivity opportunity," McKinsey Global Institute, June 2016, on McKinsey.com.

What's next for China?

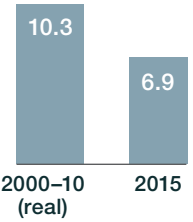
The pessimist

The warning signs show China is headed for a financial crisis.

Corporate debt as % of GDP doubled

from **107%** in 2007
to **155%** in 2015

GDP growth decreased, %



Foreign reserves fell in 2015 by around **$500 billion …**
… and by midyear, the stock market had dropped by **43%**

The optimist

A productivity-led growth model will allow China to continue to perform. That model will:

lift labor productivity by **1–8% a year** by 2030 depending on the sector

sustain GDP increases at **5.6% a year** over the next 15 years

boost household incomes by **>$5 trillion** by 2030, compared with investment-led path

China's new way forward

- Shifting consumption
- Increasing digital commerce and services
- Moving from imitation to innovation
- Going global
- Revitalizing the core

Source: World Bank; McKinsey Global Institute analysis

A NEW GROWTH MODEL

Front and center in any discussion about China these days are concerns about the country's economy. Last year, GDP and employment growth dipped to the lowest levels in 25 years, corporate debt continued to soar, foreign reserves fell by around $500 billion, and by mid-2015 the stock market had dropped by 43 percent—all signs, pessimists say, that China could be on track for a financial crisis.

For those reasons, nearly everyone, including the Chinese government itself, recognizes that China's investment-led economic model, for all its accomplishments, has to change—and soon. Capital productivity and corporate returns are falling. And MGI's stress-test analysis finds that the amount of nonperforming loans could reach 15 percent in 2019, from today's official figure of 1.7 percent. While a worsening of that figure would not necessarily lead to a systemic banking crisis, the collateral damage would likely include a substantial and unnecessary slowdown in growth.

The opportunities identified by MGI have, according to its estimates, the potential to lift labor productivity by 1 to 8 percent per year depending on the sector, boost household incomes by more than $5 trillion by 2030 compared with the current investment-led path, and sustain GDP increases at 5.6 percent per annum over the next 15 years (Exhibit 1). Whether China will realize that potential depends in part on the ability of China's leading companies to generate and meet demand, raise productivity, and create value through the means described below. Certainly, sufficient financial capital exists for them to do so, even absent the politically less palatable (and therefore less likely) rationalization of excess economic capacity (for instance, in coal and steel) that would raise longer-term prospects even as it caused shorter-term job losses.

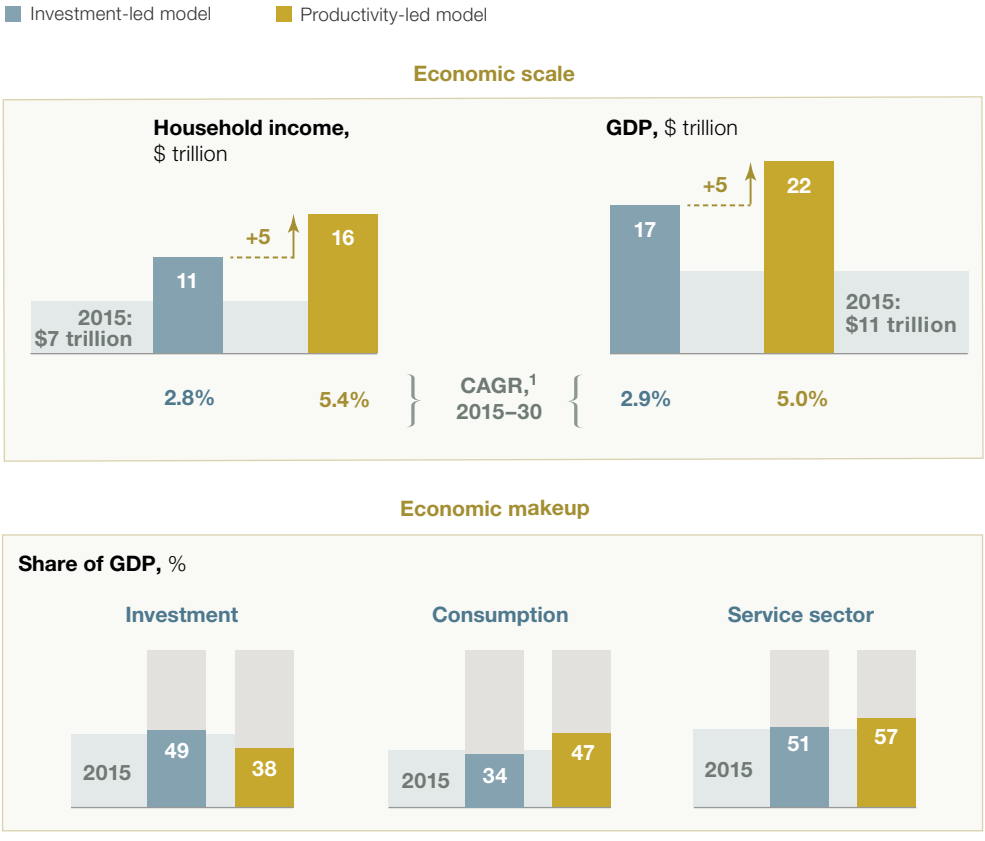
Realizing these transitional opportunities isn't a foregone conclusion. To no small degree, they require the help of government policy makers. But they're likely to get an organic boost, too, as the forces of capitalism motivate the combined efforts of locally owned and multinational companies alike. By unleashing the power of China's consumers and its corporate sector, a productivity-led model for growth is likely to create a new context for the companies that compete there.

THE CONSUMPTION SHIFT

First and foremost, perhaps, the transition to advanced-economy status requires stoking and meeting demand from China's emerging middle class, whose spending is now only 5 to 20 percent of what it is in most advanced

Exhibit 1

A productivity-driven approach can add $5 trillion more to GDP and household income by 2030 than the current growth model.



[1] Compound annual growth rate.

Source: McKinsey Global Institute analysis

economies. To be sure, this group is enormous. MGI recently put the opportunity in perspective, citing China's working-age consumers (15–59 year-olds) as one of three groups that will drive roughly half the increase in global consumption between now and 2030. (The other two are retirees in the developed world, and 15–59 year-olds in North America.[2])

Already, there are signs of a growing propensity to spend more and save less. McKinsey's 2016 global sentiment survey, for instance, found that China's working-age consumers, compared with peers in other regions, are

[2] For more, see "Urban world: The global consumers to watch," McKinsey Global Institute, March 2016, on McKinsey.com.

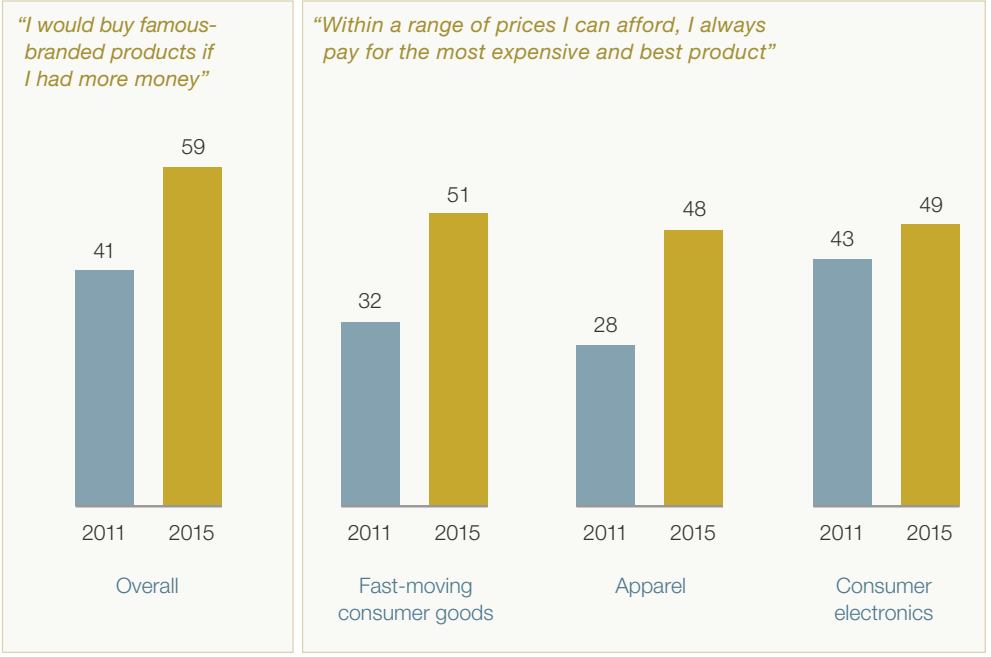
most inclined to prioritize spending over saving or paying off debt. As they spend more, they are also likely to broaden their patterns of consumption, which are currently limited by the quality and variety of Chinese goods and services. In fact, Chinese consumers are increasingly trading up from mass products to premium products. A McKinsey research effort encompassing 10,000 in-person interviews with people aged 18–56 across 44 cities found that 50 percent now seek the best and most expensive offering, a significant increase over previous years (Exhibit 2).

The implication for CEOs is clear: recognize China's consumer potential and try to get ahead of the curve in meeting the demand. Some companies may need to beef up the research arm of their sales and marketing organizations. Others may require more sophisticated data analytics to inform their research. Still others will want to focus on delivery of exceptional customer experiences to set themselves apart from their competitors.

Exhibit 2

Chinese consumers increasingly desire premium products.

% agreeing with statement



Source: 2016 McKinsey survey of Chinese consumers

THE DIGITAL EFFECT

As China makes its transition, the impact of digital technologies on the evolution of commerce, the service sector, and talent management will be profound.

Digitizing commerce

China's massive online community—nearly 690 million Internet users (as of December 2015) and 700 million smartphone users—provides promising ways to identify and meet latent consumer demand. McKinsey's most recent survey of Chinese Internet users[3] indicates the main potential for the growth of e-commerce is in cities classified, by population, as Tier 3 and below. While online consumer spending in lower-tier cities caught up with spending in high-tier ones for the first time in 2015, some 160 million people in low-tier cities who use online services in other ways have yet to begin online shopping. That's nearly as many as the number of online shoppers in high-tier cities today.

Making the most of that opportunity will require e-commerce players in China to follow the data-analytics practices[4] of leading digital retailers in Europe and the United States to improve customer retention and stimulate consumption. Skills in social media are also gaining importance as more and more Chinese consumers make it a significant channel for deciding what to buy and for acting on those decisions.

Of the WeChat users in a recent McKinsey survey, for example, 31 percent initiated purchases on the platform—double the proportion of the previous year (Exhibit 3).

Digitizing the service sector

Digital technologies can also boost productivity in China's service sectors while raising the skills of the labor force to fill China's talent gap and sustain labor mobility. Many of the country's service sectors including retail, logistics, and healthcare have very low productivity compared with their counterparts in other countries. Retailers can use digital technology to enable the operations of modern-format physical stores such as big-box discount stores and improve the efficiency of existing businesses through better supply-chain management. E-commerce platforms can help retailers reach Tier 2 and Tier 3 cities, where the cost of building physical stores is prohibitive.

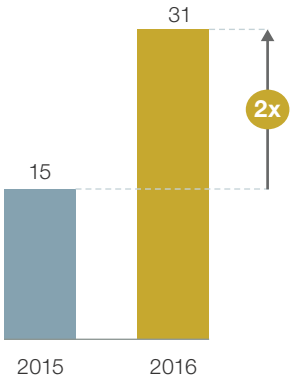
[3] Conducted online with more than 3,100 people in January 2016; for more, see Kevin Wei Wang, Alan Lau, and Fang Gong, "How savvy, social shoppers are transforming Chinese e-commerce," April 2016, McKinsey.com.

[4] Kevin Wei Wang, "Using analytics to turbocharge China's e-commerce performance," *McKinsey Quarterly*, June 2016, McKinsey.com.

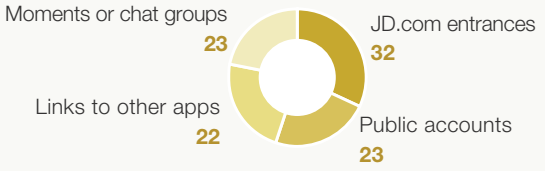
Exhibit 3

Purchases initiated from WeChat doubled in a year.

WeChat users who have shopped from WeChat,[1]
n = 525, %



Top channels, %



Top categories

Apparel	Personal care
60% of WeChat shoppers	**41%** of WeChat shoppers
32% of their online apparel spending	**25%** of their online personal-care spending

[1] Referring to those who have ever made purchases through WeChat's JD.com entrance, public accounts, Moments, group chats, or links to other apps.

Source: 2016 McKinsey survey of Chinese consumers

Digital platforms for scheduling can make the 700,000 companies in the logistics sector far more efficient. In the social-services sector, investment in online-learning platforms can reduce disparities in urban and rural education even as telemedicine systems enable doctors in cities to treat patients remotely in rural health clinics.

FROM IMITATION TO INNOVATION

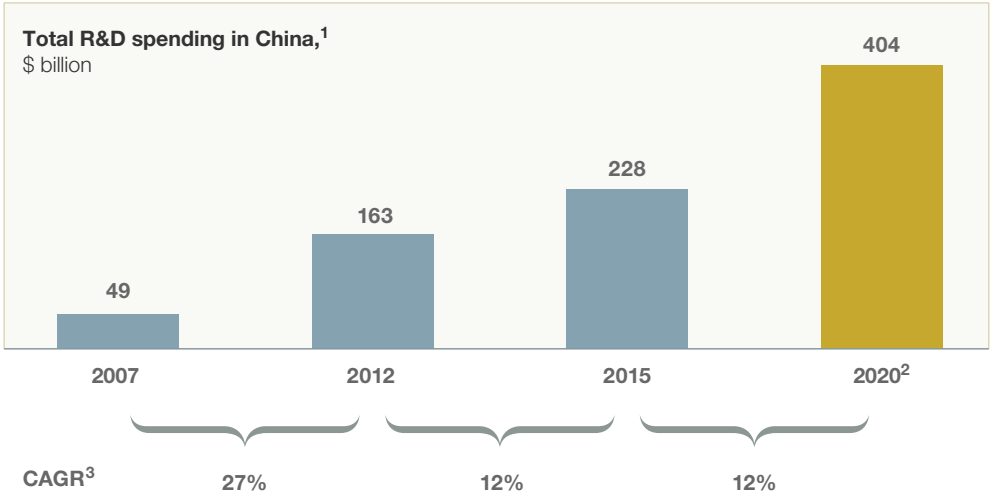
China's ambition to go from absorbing and adapting global technologies to being an innovation leader is a key plank of the productivity-led model. A McKinsey Global Institute report in October 2015 set out the case, showing the potential to carve out a world-leading position in pharmaceuticals, semiconductors, and communications equipment in the way that it has done in high-speed rail and wind turbines (global revenue shares of 41 percent and 20 percent, respectively).[5]

McKinsey synthesis of publicly available data about prominent Chinese companies and big multinational companies active there highlights the

[5] For more, see "Gauging the strength of Chinese innovation," McKinsey Global Institute, October 2015, on McKinsey.com.

Exhibit 4

China's R&D spending will continue its double-digit pace.



[1] R&D includes basic research, applied research, and experimental development; data reflect current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge and the use of knowledge for new applications.
[2] Estimate based on forecast of China GDP in 2020 (~$16,144 billion) and Chinese government's target R&D spending as % of GDP in 2020 (2.5%).
[3] Compound annual growth rate.

Source: China National Bureau of Statistics; International Monetary Fund; World Bank; McKinsey analysis

extent to which China is already an important center of innovation. The numbers show that R&D spending in China rose by 120 percent between 2007 and 2015 and is expected to accelerate over the next five years, across a variety of industries, as companies expand their design centers (Exhibit 4).[6] The challenge for many China-based design centers will be to move from a focus on making products for local markets to developing innovative new products for global markets.

But China appears to be ahead of the game in at least two areas: the pace of innovation and the quality of the mobile experience there, and the use of geolocation, according to the former president of Amazon China, Doug Gurr. "There's very little mapping in China, and there are many areas with no street addresses, but China has solved these logistics problems with geolocation," says Gurr. "You wouldn't have thought you'd see bicycle rickshaws with better

[6] Christopher Thomas, "China's evolution into an innovation leader: Trends in product development and R&D," forthcoming on McKinsey.com.

point-to-point geolocation and better GPS-enabled devices than you see anywhere else in the world. It's amazing and exciting—there's a blend of rough, old-fashioned ways of doing things coupled with technology that is way ahead in terms of the use of data informatics."[7]

The willingness of Chinese consumers to buy innovative products may quicken China's shift from imitation to innovation. A recent McKinsey survey of more than 3,500 Chinese consumers, for example, found that a majority of electric vehicle (EV) owners in China is keen to buy EVs again, and the proportion of consumers who say they are interested in buying an EV has tripled since 2011.[8]

As China ups its innovation game, CEOs globally will have to focus on faster, cheaper, and more global R&D with a stronger role for China. They should consider taking bigger bets on their China research platform and to accelerate their pace of project development to match local competitors. Leveraging Chinese talent will be a critical R&D success factor globally.

GLOBAL THRUSTS

While Chinese companies have become major global players in some industries by virtue of their shares of the massive China market, many Chinese companies have not yet started to do business around the world. China is second only to the United States with 110 companies in the *Fortune* Global 500, but the vast majority of Chinese companies on the list are largely domestic businesses in construction, infrastructure, energy, and finance. Many are asset-heavy operations and resource monopolies operating entirely in China, and 80 percent are state-owned enterprises. (One exception to the rule is Tencent, which recently agreed to buy most of Supercell, the Finnish video-gaming company that developed the widely played *Clash of Clans* game.)

The opportunity for Chinese companies to accelerate their growth outside of China can get a boost from the One Belt, One Road initiative, as discussed by McKinsey's Kevin Sneader in a recent video commentary. One Belt, One Road is a development strategy to link China with countries in Africa, Asia, and Europe. The Chinese government is budgeting close to $1 trillion for the initiative through state financial institutions and state-owned enterprises'

[7] James Naylor, "Amazon China's president on 'transformative' technologies," August 2015, McKinsey.com.

[8] See Paul Gao, Sha Sha, Daniel Zipser, and Wouter Baan, "Finding the fast lane: Emerging trends in China's auto market," April 2016, McKinsey.com.

For the full video and accompanying podcast, see "China's One Belt, One Road: Will it reshape global trade?," on McKinsey.com.

In the business community, there's a group that is already mobilizing and saying, "How do we figure out if we can actually deploy funds and be part of either the infrastructure buildout or the discussion around what the trading agreements should look like?" For example, Hong Kong hosted a conference on the subject and two-and-half-thousand business leaders showed up. The scale of that presence gave me a sense that there are a large number who decided that actually sitting it out carries more risk than trying to be a part of this now.

—Kevin Sneader,
Senior partner, Hong Kong office

global projects.[9] The extent to which multinational companies believe Chinese companies will be successful going global will inform the degree to which they prepare, in their own markets and geographies, for competitive intensity to increase.

LEANING OUT AND AUTOMATING

In parallel with shifts in consumption, digitization, innovation, and globalization, Chinese companies, like their peers in the West, must keep a close eye on operational excellence and automation.

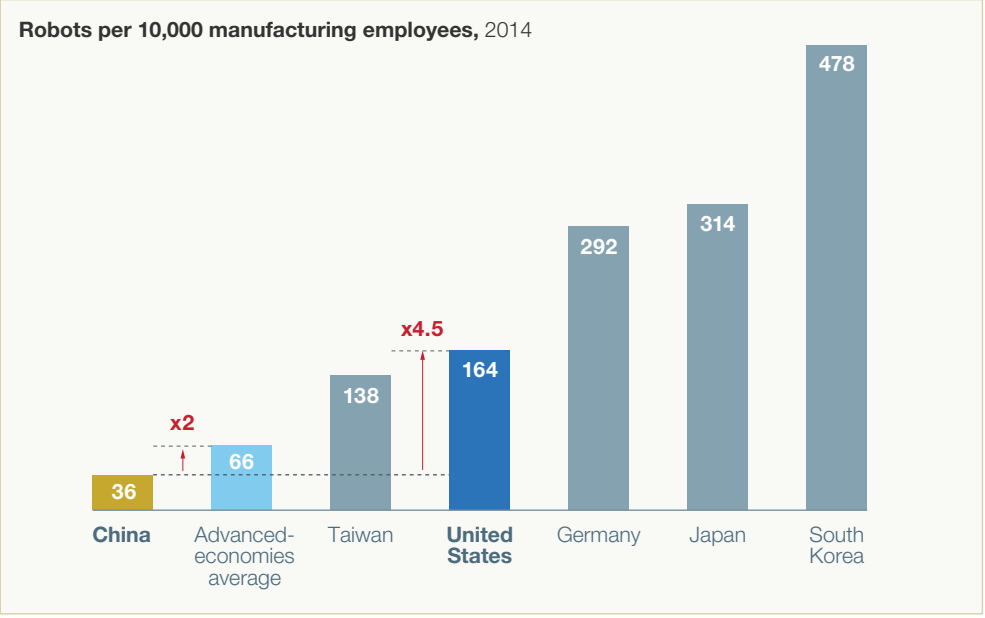
Across services and manufacturing, labor productivity in China remains just 15 to 30 percent of advanced-economy levels. Approaches such as lean and Six Sigma are not new to China, but they have had limited impact due to a focus on technical tools and too little attention paid to helping workers embrace and adapt to new processes.

That said, China also has a significant opportunity to introduce more automation into manufacturing. Even though China is the largest market for robots in the world, Chinese companies remain relatively unautomated, with only 36 robots per 10,000 manufacturing workers, about half the average of all advanced economies and less than one-fifth the US level (Exhibit 5).

[9] See "The new Silk Road," *Economist*, September 12, 2015, economist.com.

Exhibit 5

China's overall robotics usage is half the average of all advanced economies.



Source: International Federation of Robotics; World Robotics 2015; McKinsey Global Institute analysis

In China, where wages are still low (at least relative to Western economies), CEOs will want to examine carefully the economic case for automation. Recent MGI research indicates that the majority of benefits from automation may come not from reducing labor costs but from raising productivity through fewer errors, higher output, and improved quality, safety, and speed.[10]

China may be at a crossroads, but if the country succeeds in its transition to a productivity-driven growth model—and to an advanced economy—a fresh set of opportunities and challenges for businesses operating in China, and for the companies that compete with them, will surely emerge. Q

[10] See Michael Chui, James Manyika, and Mehdi Miremadi, "Where machines could replace humans—and where they can't (yet)," *McKinsey Quarterly*, July 2016, McKinsey.com.

Coping with China's slowdown

The China head of leading global elevator maker Kone says the country's days of double-digit growth may be past, but market prospects there remain bright.

When Kone entered China's elevator market, in 1996, the Finnish multinational was embarking on a journey of extraordinary growth, with high-rises proliferating across China's urban landscape. Today, the country provides around 35 percent of Kone's annual revenue, which hit €8.6 billion in 2015. Bill Johnson began serving as country manager of Kone's China division in 2004 and in 2012 became the executive vice president in charge of the company's newly formed Greater China division. In this interview with McKinsey's Allen Webb and Jonathan Woetzel, Johnson shares his thoughts on China's next phase of development, on the growth of services, and on the growing role of digitization throughout Kone's Chinese business.

The *Quarterly*: *Tell us a little bit about your personal experience with the Chinese growth slowdown.*

Bill Johnson: There has clearly been a slowdown in the economy over the last 12 to 18 months, and it's really begun to impact the elevator business. Last year was down about 5 percent in terms of units ordered, and this year we see another 5 to 10 percent decline coming in our market.

Most of our big customers are cautiously investing in the market and adjusting their development and building plans accordingly. They're pulling back;

they're waiting. There's still a lot of money in the system, but it's being deferred for the time being until there's a little bit more clarity about which way the economy is going.

China is still a critical market for us; it's the largest market in the world by a factor of ten. The second-largest market is less than 10 percent of the China market. So we're not backing off. In fact, we're looking for opportunities to accelerate some of the things that we've been doing.

The *Quarterly*: *What are some of those priorities that you want to push on even harder?*

Bill Johnson: Digitization is clearly one of the areas that we're looking at, and it comes in two separate streams. One is the hardware side, the equipment; and the other is the services side.

For example, with our new remote monitoring, customers can see where our people are at any given time and how their equipment is being maintained—all on their mobile device. This gives them a higher level of connection with us, and that has a lot of value, especially for professional property-management companies.

We're also increasing our service business and bringing on new people. Getting them up to speed with our technology takes time, so we're always looking for ways to shorten that education process. We've launched new mobile-training tools that allow our people in the field to receive training and tips on their devices throughout the day. We're able to send out videos that cut our work processes into discrete activities, demonstrated by current employees. We're also able to provide updates on what's happening with customers, and we can adjust an employee's work flow during the day, depending on any issues that happen with customers elsewhere.

So for us, it's not just about the connection with the customer; it's also about increasing the technology capabilities of our people. I'm still hiring nearly 2,000 people a year here in China, and I don't see that slowing down for the next couple of years. In fact, I believe that will accelerate because of digitization.

The *Quarterly*: *Do any of these innovation opportunities solve pain points unique to the Chinese market?*

Bill Johnson: Absolutely. One of the things to remember is that in Asia, the density of floors tends to be higher than in most places in Europe or North

America. You have many more people per square meter here in Asia. You don't see those densities anywhere else, except maybe for trading floors in New York City. So you need what's called the right dispatching. That means using algorithms that can learn how people move throughout the buildings and keep the elevators operating efficiently.

We have other innovations in what's called people-flow intelligence, which relates to the traffic of people throughout a building. One of the things we're looking at is how to help our customers design their lobbies so people flow seamlessly through security, entering and exiting the building in a comfortable way.

The *Quarterly*: *What kind of changes are you making on the hardware side to solve these issues?*

Bill Johnson: We have several hardware innovations to support the smooth flow of people in densely built cities. One of my favorites is what we call UltraRope, which is a carbon-fiber rope that significantly reduces the moving masses in the elevator system. It enables travel to heights that were not possible before—up to 1,000 meters—simply because the traditional steel ropes were so heavy the walls would not support them. Before, to get up to more than 500 meters, a passenger had to take several elevators, with a waiting time in-between. UltraRope has several other benefits: it's more durable than traditional steel ropes and doesn't need to be replaced as often, reducing the need for repair periods when fewer elevators are operating at any one time in a busy building.

The *Quarterly*: *You've got a bunch of R&D going on China. Could you say a little bit about those activities?*

Bill Johnson: Our R&D center in China—now our second-largest R&D center in the world—is headed by one of our own homegrown Chinese employees. It works in very close cooperation with our global R&D center, as well as sister R&D centers in India, in North America, and in Europe.

So now we can really do a lot more product development and basic research here, testing mid- and high-rise products in China—including the fastest high-rise product that we're going to offer anywhere in the world. What's interesting about China is that when customers are looking to buy an elevator, they want to go and see the supplier directly and learn about the latest technology. When they come see our R&D center and our test tower, they say, "Wow. This company

has really made a commitment to this market, to me as a customer." It lends credibility to our story here in China.

The *Quarterly*: *Many large global organizations struggle with communication and complexity. Are there any solutions that you've found particularly helpful in dealing with cross-border issues?*

Bill Johnson: Communication is critical, but the challenge is to achieve the right level of communication without disrupting our ability to complete our daily tasks. The critical issue for us—something we invested in a number of years ago and is really paying off more and more—is ensuring that we have the right processes in place. We got clarity early on, and we set this down on paper—taking as much of a pause as we could and saying, "OK, let's get these processes down and make sure that they make sense and work well for us throughout the organization." We took the time to define what is common to all Kone units worldwide and what could be adapted to local conditions. So we do things a little bit differently here in China, mainly to meet customer expectations, but in the grand scheme of things we use a common language and approach.

The *Quarterly*: *How worried are you about exports from local Chinese competitors heading out into some of your key developed markets overseas?*

Bill Johnson: We take this very seriously, but it's still early days for a lot of these local Chinese companies. In my experience, running a global operation is very different from running a domestic operation. Our products are not the kinds that you can just ship and forget. They require support throughout

BILL JOHNSON

Bill Johnson is the executive vice president of Kone Greater China and a member of Kone's executive board. He previously served as country manager of Kone's China division from 2004 to 2012.

the life cycle—during installation, during servicing. You've got to supply technical documentation. You've got to make sure that you have spare-part support. To build up a global organization like that, or even a regional organization, is a huge investment and takes a lot of time.

It also requires a certain culture change for a number of these companies. We're already seeing some of them in the early stages of doing that, so we don't underestimate the potential of our local competitors. They're pretty savvy, and they're very fast.

The *Quarterly*: *We're curious to know whether you see a shakeout coming either in equipment or in services, given the number of players and the market slowdown?*

Bill Johnson: When you look at the equipment side, we are very asset light. By that, I mean we manufacture the components we consider core Kone technology and outsource the other components. This means we can very flexibly adjust our capacity if needed. So when people say, "Oh, there's overcapacity in the elevator business," we kind of scratch our heads and say, "Well, that's not that critical an issue."

We'll probably see some consolidation of suppliers, but once things consolidate, new entrants come in thinking that they can do a better job. So far, our sourcing team has done a fantastic job of continuing to reduce costs and take advantage of the softened market.

When you look at the service side, there are about 6,000 companies—these are often just people who have a couple hundred units that they're servicing or a property-management company that's got a little elevator-service company. Digitization will put a lot more pressure on the smaller, less digitally capable companies. And that should contribute to a definite shift back to the OEMs.

In China, the OEMs only account for about 25 percent of the aftermarket business. The OEMs are likely to increase this percentage of aftermarket service for two reasons: One, we're all going to move toward digitization. And two, as the new-equipment business slows down, OEMs will say, "Hmm, we need to make money on services, as we do in more mature markets around the world," where services typically make up 50 percent of the business. Our service business, for example, still only represents about 10 percent of our overall revenue. So we've got a lot of opportunity in this area.

The *Quarterly*: *Why has it taken a while to enlarge the service business in China?*

Bill Johnson: It isn't so much that service hasn't been doing the job. It's that new equipment has just been so strong that you have a slightly different proportion here than you have in the rest of the world. Service is like a glacier—it builds up over time, and it moves along. And it just keeps getting bigger and bigger. But it moves at a much different pace than the new-equipment market.

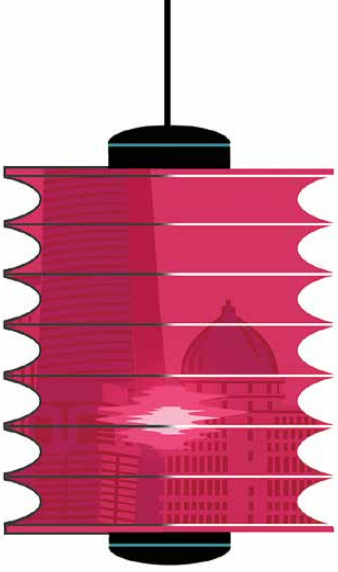
The *Quarterly*: *Ten years from now, if you look back, do you think this recent period will seem like a blip, or is it a change in the growth trajectory that will continue?*

Bill Johnson: This is probably more the new normal—though once there's a little bit more clarity about the direction of the economy and the social situation here, then there will be more opportunities for investment.

For now, though, on the real-estate side, there's still a lot of unused inventory that needs to be absorbed. It's mainly in the low-tier cities. In higher-tier cities, there is often too little inventory, and pricing is getting too high. So there are some imbalances that need to be worked through, and I suspect China will be struggling with those imbalances for a number of years. That's just going to be part of the process. We saw a unique period here in China, and I think the days of easy double-digit growth are over.

But in the years to come, the fundamental demand drivers in the industry will remain rather strong—these include urbanization, the middle class's demand for higher housing standards, and the ongoing upgrades to building stock in China's cities. The country will undoubtedly remain the world's largest elevator and escalator market for some time. And I believe that larger, more tech-savvy companies will differentiate themselves and win here. Q

Bill Johnson is the executive vice president of Kone Greater China and a member of Kone's executive board. This interview was conducted by **Allen Webb,** editor in chief of *McKinsey Quarterly*, who is based in McKinsey's Seattle office, and **Jonathan Woetzel,** a director of the McKinsey Global Institute and a senior partner in the Shanghai office.



Chinese consumers: Revisiting our predictions

As their incomes rise, Chinese consumers are trading up and going beyond necessities.

by Yuval Atsmon and Max Magni

In 2011, we tried our hand at predicting the ways in which, in the decade to come, Chinese consumers would change their preferences and behaviors.[1] This article takes stock of those predictions.

Why check in now? One reason is we're about halfway to 2020. Another is a comprehensive new McKinsey survey,[2] which follows nearly ten years of previous research that includes interviews with more than 60,000 people in upward of 60 cities in China. Along the way, we've bolstered our own team's data on consumer preferences and behavior with a number of complementary analyses and models, including McKinsey's macroeconomic and demographic studies of Chinese urbanization and income development. We've also interviewed academics to draw out the major trends shaping the course of the Chinese economy, such as its rapidly aging population, the growing independence of women in society, and the postponement of critical life milestones, such as marrying and having children.

[1] See Yuval Atsmon and Max Magni, "Meet the Chinese consumer of 2020," *McKinsey Quarterly*, March 2012, McKinsey.com.

[2] See Daniel Zipser, Yougang Chen, and Fang Gong, "Here comes the modern Chinese consumer," March 2016, McKinsey.com.

We've done it all with the abiding belief that companies getting ahead of the trends can build their brands and offerings to fit a rapidly evolving set of consumer needs in China. Deeper and more nuanced understanding of Chinese consumers can help reveal fresh opportunities—for new entrants and incumbents alike—and signal those areas where established players may need to be more wary.

Looking back nearly five years on, it is plain that Chinese consumers are evolving along many, though not all, of the lines we'd predicted. While geographic differences persist, Chinese consumers are, on the whole, more individualistic, more willing to pay for nonnecessities and discretionary items, more brand loyal, and more willing to trade up to more expensive purchases—even as their hallmark pragmatism endures.

EVOLVING GEOGRAPHIC DIFFERENCES

Much of the research we described five years ago highlighted the vast differences we found among consumers in China's various cities and regions. Just as it was then, generalizing about Chinese consumers continues to be almost as difficult (and maybe as foolish) as it is to generalize about European consumers.

We predicted these differences would remain—and even grow more significant, especially in the consumption patterns and tastes that relate to discretionary items. To help companies better tailor their go-to-market approach, we grouped most cities in China into clusters based on their similarities, including their geographic proximity and the transportation infrastructure that connects them.

As the economic structure in each of the 22 biggest city clusters has evolved—and as each of them has been affected differently by the recent slowdown of China's economy—significant differences, for instance, in consumer confidence, do indeed persist between these clusters.

For instance, some 70 percent of consumers in the Fuzhou–Xiamen city cluster, which lies on the coast across from Taiwan, said in our latest report that they are confident their income will significantly increase over the next five years. In that same report, the Byland–Shandong city cluster, which lies on the coast between Beijing and Shanghai, was comparatively pessimistic, with only 33 percent of its consumers expressing such confidence.

Furthermore, when our latest survey compared the consumers in the Shanghai area to those around Beijing and Hangzhou, certain spending attitudes also showed marked differences. For example, brand loyalty increased much faster in Shanghai (24 percent increase in three years versus just 7 percent in Beijing and 9 percent in Hangzhou), as did the willingness to pay for better or healthier products.

GROWING DISCRETIONARY SPENDING

Despite geographic differences, there are broad similarities among Chinese consumers. These mirror the general trends economists have found among consumers around the world as economies develop. The general tendency is for consumers, as they earn more, to spend a lower percentage of their income on food, a little more on healthcare, and even more on travel and transportation, as well as on recreational activities. It was no great stretch then, in our report five years ago, to predict a significant shift in consumption from necessities and seminecessities into discretionary categories.

Sure enough, our new survey shows Chinese consumers following the anticipated pattern. When we asked how they plan to increase spending as their income increases, dramatically fewer consumers said they will increase it on food (46 percent in the latest survey, compared to the 76 percent who said they would do so three years earlier).

Responses trended slightly up for healthcare products (from 16 percent to 17 percent), and increased for travel (from 14 percent to 23 percent) and leisure (from 17 percent to 25 percent).

ASPIRATIONAL TRADING UP

In our previous predictions, we also argued that as the income of Chinese consumers grew, they would aspire to improve their quality of life by not only spending more on discretionary items, but also by shifting their spending to more expensive items in the same categories.

In necessity categories such as food, for example, we predicted consumers would be willing to spend more for healthier versions of the same products—for instance, that olive oil would grow much faster than less healthy (and less expensive) oils. In seminecessity categories like apparel, we predicted people would buy more special-occasion and premium brands. We anticipated that the strongest beneficiaries of these changes would be in the more discretionary and aspirational categories, such as skincare and automotive.

So what has happened so far?

Premium categories have really accelerated. Comparing cosmetics purchases between 2011 and 2015, 44 percent of consumers have traded up their purchases, compared with 4 percent who traded down. Even for rice, 25 percent of consumers traded up versus 3 percent who traded down. Automotive was not included in our survey, but sales data from the Traffic Management Bureau of the Ministry of Public Security in China suggest significant trading up. In 2011, 51 percent of the renminbi spent on cars by Chinese consumers were for autos cheaper than 100,000 RMB. These sales accounted for only 43 percent of the market. Cars selling for 100,000 to 250,000 RMB grew twice as fast with a compound annual growth rate (CAGR) of 19 percent versus 9 percent. And cars with price tags between 250,000 and 400,000 RMB grew the fastest of all, with 23 percent CAGR.

EMERGING SENIOR MARKET

In 2011, we observed a big generational difference between consumers in their late 50s and early 60s, who were very conservative spenders, and all of the age cohorts younger than them.

We predicted that by 2020, as the needs of consumers over the age of 55 changed along with their economic confidence, their spending habits would follow suit, making this age group worth pursuing by consumer-product companies. If anything, we underestimated the speed and force with which this trend would unfold.

By 2015, the 55–65 age group had started to shift even faster than the rest of the population. For example, 52 percent of the people in this age group showed a preference for premium products, compared to just 32 percent in 2012. They leaped from being the most conservative age group to the one most likely to trade up. Similarly, the preference for famous brand names among these older buyers jumped by more than 20 percent, fully closing the previous difference among cohorts. As Exhibit 1 shows, these older consumers don't shy away from indulgences, and they have grown more likely to use the Internet to research their purchases, even if they still do so less often than younger consumers.

That said, the upper age group has remained more pragmatic and cost conscious than any other age group, as we discuss in the following section.

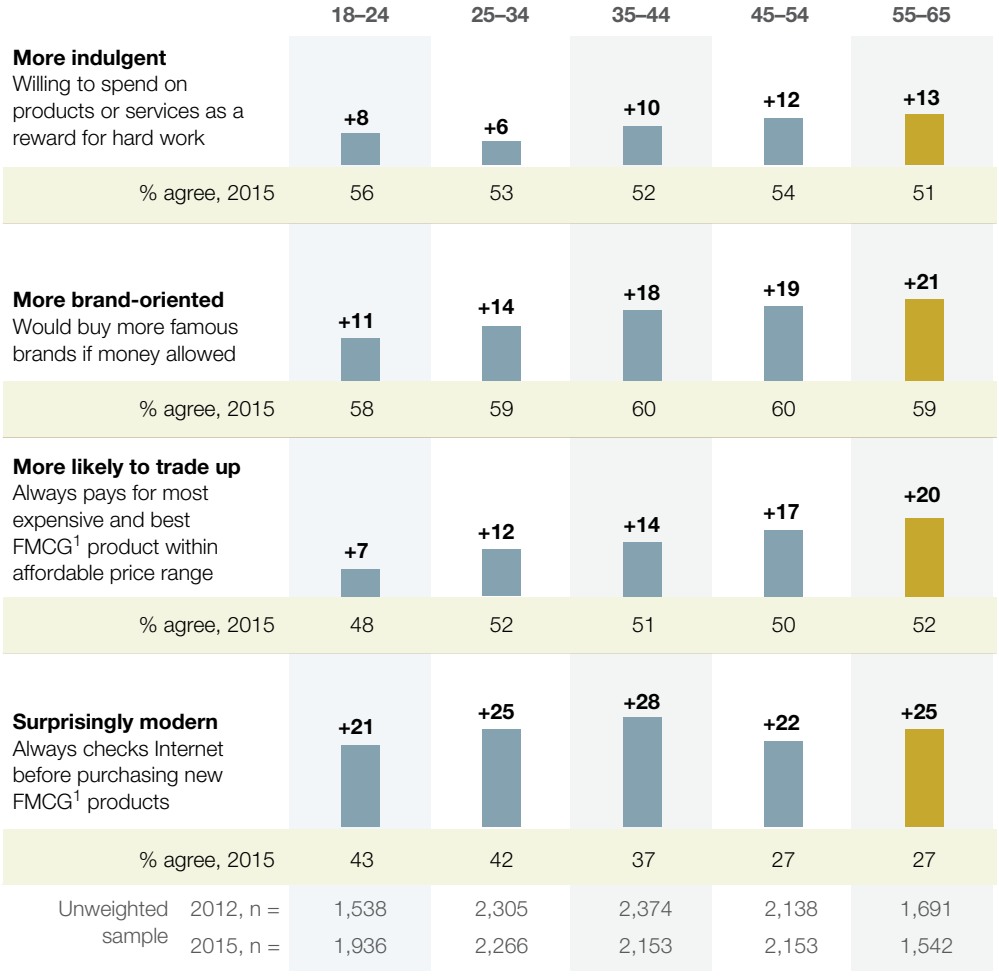
THE STILL-PRAGMATIC CONSUMER

Back in 2011, even as we were predicting changes in the behavior and preferences of Chinese consumers, we also saw ways in which their essential

Exhibit 1

Chinese consumers in their late 50s and early 60s are shifting their buying behavior.

Increase in % of respondents who strongly agree or agree, 2015 vs 2012, by age group, percentage points



[1] Fast-moving consumer goods.

Source: McKinsey 2012 and 2015 China consumer surveys

pragmatism would likely stay the same. For instance, we anticipated that impulse buying would remain lower than in other countries and that value for money would continue to be an important consideration when choosing products and services. Interestingly, Chinese consumers across all age groups have, in some ways, become even more pragmatic. They're now even more likely to compare prices across multiple stores, to be more price aware, and to stock up on promotions. That said, they're now willing to buy more often on impulse (Exhibit 2).

Exhibit 2

The pragmatism of Chinese consumers has increased slightly across all age groups.

Shift in % of respondents who strongly agree or agree, 2015 vs 2012, by age group, percentage points

Pragmatic …	18–24	25–34	35–44	45–54	55–65
"I clearly know the cost of products my family uses every day"	+14	+11	+14	+13	+11
% agree, 2015	43	47	51	54	55
"When I buy a product, I always visit multiple stores to compare prices to make sure that I get the best deal"	+6	+5	+8	+3	+7
% agree, 2015	45	43	48	50	56
"I stock up on products my family uses every day when they are on sale"	+3	+4	+5	+4	+10
% agree, 2015	36	39	44	45	53
… yet open to impulse					
"When purchasing FMCG[1] products, I often buy a different product than originally planned"	+8	+10	+6	+11	+4
% agree, 2015	37	36	32	40	32
Unweighted sample 2012, n =	1,538	2,305	2,374	2,138	1,691
Unweighted sample 2015, n =	1,936	2,266	2,153	2,153	1,542

[1] Fast-moving consumer goods.

Source: McKinsey 2012 and 2015 China consumer surveys

THE INDIVIDUAL CONSUMER

We also predicted that as Chinese consumers aspire to a better life and trade up their purchases, they would become more discerning and gradually more individualistic. This would lead, for example, to a shift toward more healthy choices, more user-friendly products, and products and brands that better fit their personality. This could be a big opportunity for niche brands—and a

threat to the mass-market brands that had won big in previous years by using scale and ubiquitous availability, supported by the trust gained by heavy advertising.

Our latest research certainly shows a decrease in consumption in categories deemed less healthy and a willingness to spend significantly more on health and more environmentally conscious categories. It also shows consumers are more likely to spend more to indulge themselves and more likely to try new technology. While their consumption choices have become more individualistic, though, it is important to note that family values continue to be at the top of their priorities (Exhibit 3).

One area our predictions missed, however, was by anticipating that consumers, as they became more individualistic in their choices, might focus less on basic product reliability and safety. Perhaps in part because of a number of more recent food scandals, however, consumers seemed more concerned with these issues in 2015 than they were before.

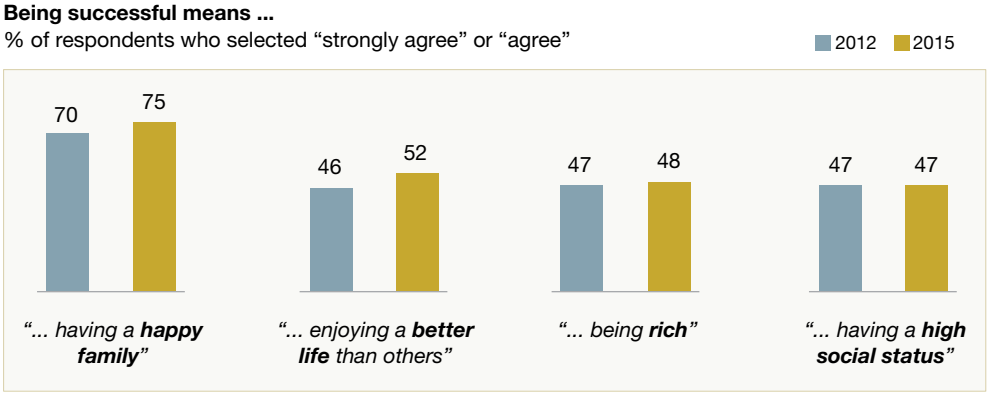
THE INCREASINGLY LOYAL CONSUMER

When our team first started researching Chinese consumers, nearly ten years ago, many of us were surprised by their fickle attitude toward brands. Fewer than half of consumers tended to stick with their favorite brands, compared, for example, with almost three quarters of US consumers.

As we debated this tendency while making our predictions, we wondered if, in the clash between pragmatism and individualism, brand loyalty would

Exhibit 3

Chinese consumers' needs and values continue to center around family.



Source: 2012 and 2015 McKinsey surveys of Chinese consumers

stay low, increase, or even decline. Ultimately, we decided it would increase as the emotional benefits of brands became more important to consumers and as increased choice and availability of branded products (online and off) would allow consumers to optimize for price and convenience without changing choices too often.

Our recent research confirmed the changes we anticipated. Consumers are now significantly less likely to buy a brand that is not already among their favorites, continuing the upward trend we observed in 2011 (Exhibit 4).

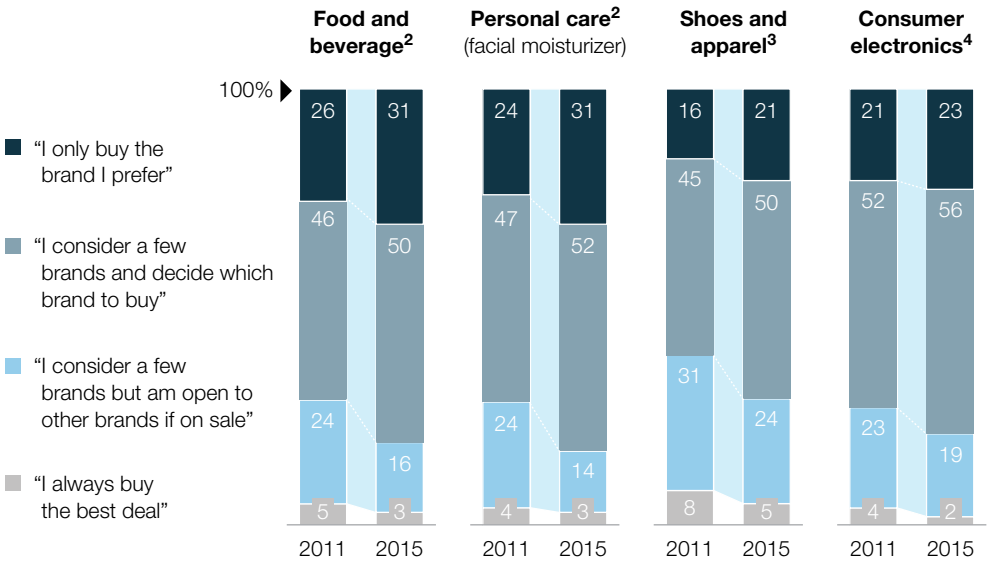
THE MODERN SHOPPER

Our 2011 predictions were bullish on e-commerce, predicting that Chinese consumers would adapt their channel choices even faster than has occurred in developed markets.

Exhibit 4

Chinese consumers are increasingly brand loyal and focused on just a few brands.

Which statement best describes your shopping experience?
% of respondents[1]



[1] Including common products such as beer and chocolate.
[2] Figures do not sum to 100%, because of rounding.
[3] Including sports clothes and shoes, leisure wear, and women's shoes.
[4] Including flat-panel televisions, laptops, and mobile handsets.

Source: McKinsey 2011 and 2015 China consumer surveys

We estimated that by 2020, online consumer-electronics purchases would jump to 40 percent, from about 10 percent. More mainstream categories would rise to 15 percent, and some categories, such as groceries (now below 1 percent), could reach about 10 percent. These changes are occurring even as the enduring pragmatism and diligence of the Chinese consumer continue to be in place. Our latest research shows that consumers of all age groups are much more likely to collect information online, even on fast-moving consumer goods, than they were just three years ago.

In 2015, online food and beverages sales (excluding fresh) reached 7.2 percent: reaching our predicted 10 percent in five years looks very likely. The online share of consumer-electronic purchases, meanwhile, has reached a whopping 39 percent in 2015, and it now looks possible that by 2020 it will be about 50 percent of overall sales.

Looking from today's perspective at our 2011 predictions, it is impressive to see the evolution of Chinese consumers—even as their most characteristic traits endure. Certainly, we'll check in on their progress as we get ever closer to the year 2020. Making predictions may be difficult, especially about the future—as US Baseball Hall of Famer Yogi Berra famously observed. But they can still provide valuable foresight for executives. Q

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Illustration by Matt Murphy

Transformation with a capital *T*

Companies must be prepared to tear themselves away from routine thinking and behavior.

by Michael Bucy, Stephen Hall, and Doug Yakola

Imagine. You lead a large basic-resources business. For the past decade, the global commodities supercycle has fueled volume growth and higher prices, shaping your company's processes and culture and defining its outlook. Most of the top team cannot remember a time when the business priorities were different. Then one day it dawns on you that the party is over.

Or imagine again. You run a retail bank with a solid strategy, a strong brand, a well-positioned branch network, and a loyal customer base. But a growing and fast-moving ecosystem of fintech players—microloan sites, peer-to-peer lenders, algorithm-based financial advisers—is starting to nibble at your franchise. The board feels anxious about what no longer seems to be a marginal threat. It worries that management has grown complacent.

In industry after industry, scenarios that once appeared improbable are becoming all too real, prompting boards and CEOs of flagging (or perhaps merely drifting) businesses to embrace the T-word: *transformation*.

Transformation is perhaps the most overused term in business. Often, companies apply it loosely—too loosely—to any form of change, however minor or routine. There are organizational transformations (otherwise known as

org redesigns), when businesses redraw organizational roles and accountabilities. Strategic transformations imply a change in the business model. The term transformation is also increasingly used for a digital reinvention: companies fundamentally reworking the way they're wired and, in particular, how they go to market.

What we're focused on here—and what businesses like the previously mentioned bank and basic-resource companies need—is something different: a transformation with a capital *T*, which we define as an intense, organization-wide program to enhance performance (an earnings improvement of 25 percent or more, for example) *and* to boost organizational health. When such transformations succeed, they radically improve the important business drivers, such as topline growth, capital productivity, cost efficiency, operational effectiveness, customer satisfaction, and sales excellence. Because such transformations instill the importance of internal alignment around a common vision and strategy, increase the capacity for renewal, and develop superior execution skills, they enable companies to go on improving their results in sustainable ways year after year. These sorts of transformations may well involve exploiting new digital opportunities or accompany a strategic rethink. But in essence, they are largely about delivering the full potential of what's already there.

The reported failure rate of large-scale change programs has hovered around 70 percent over many years. In 2010, conscious of the special challenges and disappointed expectations of many businesses embarking on transformations, McKinsey set up a group to focus exclusively on this sort of effort. In six years, our Recovery & Transformation Services (RTS) unit has worked with more than 100 companies, covering almost every geography and industry around the world. These cases—both the successes and the efforts that fell short—helped us distill a set of empirical insights about improving the odds of success. Combined with the right strategic choices, a transformation can turn a mediocre (or good) business into a world-class one.

WHY TRANSFORMATIONS FAIL

Transformations as we define them take up a surprisingly large share of a leadership's and an organization's time and attention. They require enormous energy to realize the necessary degree of change. Herein lie the seeds of disappointment. Our most fundamental lesson from the past half-dozen years is that average companies rarely have the combination of skills, mindsets, and ongoing commitment needed to pull off a large-scale transformation.

It's true that across the economy as a whole, "creative destruction" has been a constant, since at least 1942, when Joseph Schumpeter coined the term. But for individual organizations and their leaders, disruption is episodic and sufficiently infrequent that most CEOs and top-management teams are more accomplished at running businesses in stable environments than in changing ones. Odds are that their training and practical experience predominantly take place in times when extensive, deep-rooted, and rapid changes aren't necessary. For many organizations, this relatively placid experience leads to a "steady state" of stable structures, regular budgeting, incremental targets, quarterly reviews, and modest reward systems. All that makes leaders poorly prepared for the much faster-paced, more bruising work of a transformation. Intensive exposure to such efforts has taught us that many executives struggle to change gears and can be reluctant to lead rather than delegate when they face external disruption, successive quarters of flagging performance, or just an opportunity to up a company's game.

Executives embarking on a transformation can resemble career commercial air pilots thrust into the cockpit of a fighter jet. They are still flying a plane, but they have been trained to prioritize safety, stability, and efficiency and therefore lack the tools and pattern-recognition experience to respond appropriately to the demands of combat. Yet because they are still behind the controls, they do not recognize the different threats and requirements the new situation presents. One manufacturing executive whose company learned that lesson the hard way told us, "I just put my head down and worked harder. But while this had got us out of tight spots in the past, extra effort, on its own, was not enough this time."

TILTING THE ODDS TOWARD SUCCESS

The most important starting point of a transformation, and the best predictor of success, is a CEO who recognizes that only a new approach will dramatically improve the company's performance. No matter how powerful the aspirations, conviction, and sheer determination of the CEO, though, our experience suggests that companies must also get five other important dimensions right if they are to overcome organizational inertia, shed deeply ingrained steady-state habits, and create a new long-term upward momentum. They must identify the company's full potential; set a new pace through a transformation office (TO) that is empowered to make decisions; reinforce the executive team with a chief transformation officer (CTO); change employee and managerial mind-sets that are holding the organization back; and embed a new culture of execution throughout the business to sustain the transformation. The last is in some ways the most difficult task of all.

Stretch for the full potential

Targets in most corporations emerge from negotiations. Leaders and line managers go back and forth: the former invariably push for more, while the latter point out all the reasons why the proposed targets are unachievable. Inevitably, the same dynamic applies during transformation efforts, and this leads to compromises and incremental changes rather than radical improvements. When managers at one company in a highly competitive, asset-intense industry were shown strong external evidence that they could add £250 million in revenue above what they themselves had identified, for example, they immediately talked down the proposed targets. For them, targets meant accountability—and, when missed, adverse consequences for their own compensation. Their default reaction was "let's underpromise and overdeliver."

To counter this natural tendency, CEOs should demand a clear analysis of the company's full value-creation potential: specific revenue and cost goals backed up by well-grounded facts. We have found it helpful for the CEO and top team to assume the mind-set, independence, and tool kit of an activist investor or private-equity acquirer. To do so, they must step outside the self-imposed constraints and define what's truly achievable. The message: it's time to take a single self-confident leap rather than a series of incremental steps that don't lead very far. In our experience, targets that are two to three times a company's initial estimates of its potential are routinely achievable—not the exception.

Change the cadence

Experience has taught us that it's essential to create a hub to oversee the transformation and to drive a cadence markedly different from the normal day-to-day one. We call this hub the transformation office.

What makes a TO work? One company with a program to boost EBITDA[1] by more than $1 billion set up an unusual but highly effective TO. For a start, it was located in a circular room that had no chairs—only standing room. Around the wall was what came to be known, throughout the business, as "the snake": a weekly tracker that marked progress toward the goal. By the end of the process, the snake had eaten its own tail as the company materially exceeded its financial target.

Each Tuesday, at the weekly TO meeting, work-stream leaders and their teams reviewed progress on the tasks they had committed themselves (the

[1] Earnings before interest, taxes, depreciation, and amortization.

previous week) to complete and made measurable commitments for the next week in front of their peers. They used only handwritten whiteboard notes—no PowerPoint presentations—and had just 15 minutes apiece to make their points. Owners of individual initiatives within each work stream reviewed their specific initiatives on a rotating basis, so third- or fourth-level managers met the top leaders, further increasing ownership and accountability. Even the divisional CEO made a point of attending these TO meetings each time he visited the business, an experience that in hindsight convinced him that the TO process was more crucial than anything else to shifting the company's culture.

For senior leaders, distraction is the constant enemy. Most prefer talking about new customers, M&A opportunities, or fresh strategic choices—hence the temptation at the top to delegate responsibility to a steering committee or an old-style program-management office charged with providing periodic updates. When top management's attention is diverted elsewhere, line managers will emulate that behavior when they choose their own priorities.

Given these distractions, many initiatives move too slowly. Parkinson's law states that work expands to fill the time available, and business managers aren't immune: given a month to complete a project requiring a week's worth of effort, they will generally start working on it a week before the deadline. In successful transformations, a week means a week, and the transformation office constantly asks, "how can you move more swiftly?" and "what do you need to make things happen?" This faster clock speed is one of the most defining characteristics of successful transformations.

Collaborating with senior leaders across the entire business, the TO must have the grit, discipline, energy, and focus to drive forward perhaps five to eight major work streams. All of them are further divided into perhaps hundreds (even the low thousands) of separate initiatives, each with a specific owner and a detailed, fully costed bottom-up plan. Above all, the TO must constantly push for decisions so that the organization is conscious of any foot dragging when progress stalls.

Bring on the CTO

Managing a complex enterprise-wide transformation is a full-time executive-level job. It should be filled by someone with the clear authority to push the organization to its full potential, as well as the skills, experience, and even personality of a seasoned fighter pilot, to use our earlier analogy.

The chief transformation officer's job is to question, push, praise, prod, cajole, and otherwise irritate an organization that needs to think and act differently. One CEO introduced a new CTO to his top team by saying, "Bill's job is to make you and me feel uncomfortable. If we aren't feeling uncomfortable, then he's not doing his job." Of course, the CTO shouldn't take the place of the CEO, who (on the contrary) must be front and center, continually reinforcing the idea that this is *my* transformation.

Many leaders of traditional program-management offices are strong on processes but unable or unwilling to push the CEO and top team. The right CTO can sometimes come from within the organization. But one of the biggest mistakes we see companies making in the early stages is to choose the CTO only from an internal slate of candidates. The CTO must be dynamic, respected, unafraid of confrontation, and willing to challenge corporate orthodoxies. These qualities are harder to find among people concerned about protecting their legacy, pursuing their next role, or tiptoeing around long-simmering internal political tensions.

What does a CTO actually do? Consider what happened at one company mounting a billion-dollar productivity program. The new CTO became exasperated as executives focused on individual technical problems rather than the worsening cost and schedule slippage. Although he lacked any background in the program's technical aspects, he called out the facts, warning the members of the operations team that they would lose their jobs—and the whole project would close—unless things got back on track within the next 30 days. The conversation then shifted, resources were reallocated, and the operations team planned and executed a new approach. Within two weeks, the project was indeed back on track. Without the CTO's independent perspective and candor, none of that would have happened.

Remove barriers, create incentives

Many companies perform under their full potential not because of structural disadvantages but rather through a combination of poor leadership, a deficient culture and capabilities, and misaligned incentives. In good or even average times, when businesses can get away with trundling along, these barriers may be manageable. But the transformation will reach full potential only if they are addressed early and explicitly. Common problematic mind-sets we encounter include prioritizing the "tribe" (local unit) over the "nation" (the business as a whole), being too proud to ask for help, and blaming the external world "because it is not under our control."

One public utility we know was paralyzed because its employees were passively "waiting to be told" rather than taking the initiative. Given its history, they had unconsciously decided that there was no advantage in taking action, because if they did and made a mistake, the results would make the front pages of newspapers. A bureaucratic culture had hidden the underlying cause of paralysis. To make progress, the company had to counter this very real and well-founded fear.

McKinsey's influence model, one proven tool for helping to change such mind-sets, emphasizes telling a compelling change story, role modeling by the senior team, building reinforcement mechanisms, and providing employees with the skills to change.[2] While all four of these interventions are important in a transformation, companies must address the change story and reinforcement mechanisms (particularly incentives) at the outset.

An engaging change story. Most companies underestimate the importance of communicating the "why" of a transformation; too often, they assume that a letter from the CEO and a corporate slide pack will secure organizational engagement. But it's not enough to say "we aren't making our budget plan" or "we must be more competitive." Engagement with employees and managers needs to have a context, a vision, and a call to action that will resonate with each person individually. This kind of personalization is what motivates a workforce.

At one agribusiness, for example, someone not known for speaking out stood up at the launch of its transformation program and talked about growing up on a family farm, suffering the consequences of worsening market conditions, and observing his father's struggle as he had to postpone retirement. The son's vision was to transform the company's performance out of a sense of obligation to those who had come before him and a desire to be a strong partner to farmers. The other workers rallied round his story much more than the financially based argument from the CEO.

Incentives. Incentives are especially important in changing behavior. In our experience, traditional incentive plans, with multiple variables and weightings—say, six to ten objectives with average weights of 10 to 15 percent each—are too complicated. In a transformation, the incentive plan should have no more than three objectives, with an outsized payout for outsized

[2] See Tessa Basford and Bill Schaninger, "The four building blocks of change," *McKinsey Quarterly*, April 2016, McKinsey.com.

performance; the period of transformation, after all, is likely to be one of the most difficult and demanding of any professional career. The usual excuses (such as "our incentive program is already set" or "our people don't need special incentives to give their best") should not deter leaders from revisiting this critical reinforcement tool.

Nonmonetary incentives are also vital.[3] One CEO made a point, each week, of writing a short handwritten note to a different employee involved in the transformation effort. This cost nothing but had an almost magical effect on morale. In another company, an employee went far beyond normal expectations to deliver a particularly challenging initiative. The CEO heard about this and gathered a group, including the employee's wife and two children, for a surprise party. Within 24 hours, the story of this celebration had spread throughout the company.

No going back

Transformations typically degrade rather than visibly fail. Leaders and their employees summon up a huge initial effort; corporate results improve, sometimes dramatically; and those involved pat themselves on the back and declare victory. Then, slowly but surely, the company slips back into its old ways. How many times have frontline managers told us things like "we have undergone three transformations in the last eight years, and each time we were back where we started 18 months later"?

The true test of a transformation, therefore, is what happens when the TO is disbanded and life reverts to a more normal rhythm. What's critical is that leaders try to bottle the lessons of the transformation as it moves along and to ingrain, within the organization, a repeatable process to deliver better and better results long after it formally ends. This often means, for example, applying the TO meetings' cadence and robust style to financial reviews, annual budget cycles, even daily performance meetings—the basic routines of the business. It's no good starting this effort near the end of the program. Embedding the processes and working approaches of the transformation into everyday activities should start much earlier to ensure that the momentum of performance continues to accelerate after the transformation is over.

Companies that create this sort of momentum stand out—so much that we've come to view the interlocking processes, skills, and attitudes needed to achieve it as a distinct source of power, one we call an "execution engine."

[3] See Susie Cranston and Scott Keller, "Increasing the 'meaning quotient' of work," *McKinsey Quarterly*, January 2013, McKinsey.com.

Organizations with an effective execution engine conspicuously continue to challenge everything, using an independent perspective. They act like investors—all employees treat company money as if it were their own. They ensure that accountability remains in the line, not in a central team or external advisers. Their focus on execution remains relentless even as results improve, and they are always seeking new ways to motivate their employees to keep striving for more. By contrast, companies doomed to fail tend to revert to high-level targets assigned to the line, with a minimal focus on execution or on tapping the energy and ideas of employees. They often lose the talented people responsible for the initial achievements to headhunters or other internal jobs before the processes are ingrained. To avoid this, leaders must take care to retain the enthusiasm, commitment, and focus of these key employees until the execution engine is fully embedded.

Consider the experience of one company that had realized a $4 billion (40 percent) bottom-line improvement over several years. The impetus to "go back to the well" for a new round of improvements, far from being a top-leadership initiative, came out of a series of conversations at performance-review meetings where line leaders had become energized about new opportunities previously considered out of reach. The result was an additional billion dollars of savings over the next year.

Nothing about our approach to transformations is especially novel or complex. It is *not* a formula reserved for the most able people and companies, but we know from experience that it works only for the most willing. Our key insight is that to achieve a transformational improvement, companies need to raise their ambitions, develop different skills, challenge existing mind-sets, and commit fully to execution. Doing all this can produce extraordinary *and* sustainable results.

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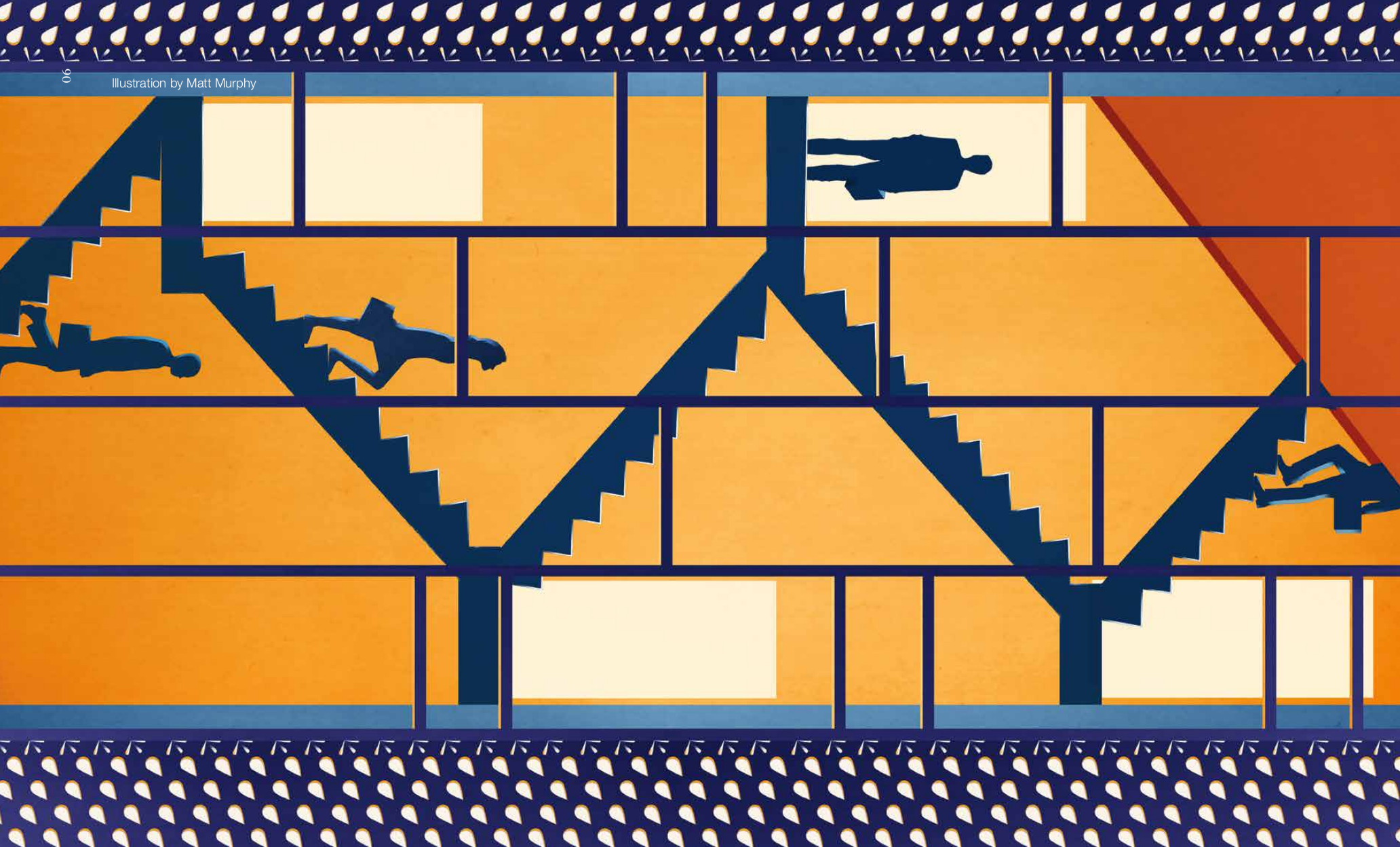
Illustration by Matt Murphy



Reorganization without tears

A corporate reorganization doesn't have to create chaos. But many do when there is no clear plan for communicating with employees and other stakeholders early, often, and over an extended period.

by Rose Beauchamp, Stephen Heidari-Robinson, and Suzanne Heywood

Most executives and their employees dread corporate reorganizations, as we can personally attest. During our combined 35 years of advising companies on organizational matters, we've had to duck a punch, watch as a manager snapped our computer screen during an argument, and seen individuals burst into tears.

There are many causes of the fear, paranoia, uncertainty, and distraction that seemingly accompany any major reorganization (or "reorg," a common shorthand for them in many companies). In our experience, though, one of the biggest and most fundamental mistakes companies make is failing to engage people, or at least forgetting to do so early enough in the process. In this article—based on the new book *ReOrg: How to Get It Right* (Harvard Business Review Press, November 2016), which outlines a step-by-step approach to reorganizations—we concentrate on the lessons we have learned about that evergreen but still frequently mishandled and misunderstood topic: communication.

EMPLOYEES COME FIRST

In our view, it makes sense to think simultaneously about engagement with employees and other stakeholders—unions, customers, suppliers, regulators,

and the board—but employees invariably require the most attention. Leaders of reorgs typically fall into one of two traps when communicating with their employees. We'll call the first one "wait and see" and the second "ivory-tower idealism."

In the first trap, the leader of the reorg thinks everything should be kept secret until the last moment, when he or she has all the answers. The leader makes the reorg team and senior leadership swear to secrecy and is then surprised when news leaks to the wider organization. (In our experience, it always does.) Rumors increase amid comments such as, "They were asking what my team does," "I had to fill in an activity-analysis form," and "I hear that 20 percent of jobs are going to go." Eventually, after the reorg team produces a high-level org chart, the leader announces the new structure and says that some job losses will be necessary, but insists that the changes will help deliver fantastic results.

Employees, hearing this, only hear that their boss's boss's boss is going to change and that some of them are going to lose their jobs. Nothing their leader has said counters the negative impressions they formed at the water cooler.

Ivory-tower idealism is little better. In this version, the leader can barely contain his or her excitement because of the chance to address all the frustrations of the past and achieve all objectives in a single stroke. He or she decides to start the process with a webcast to all staff, telling them about the exciting business opportunities ahead, followed by a series of walk-arounds in major plants and offices. The leader puts a personal blog on the company intranet. Human nature being what it is, however, no one believes what they hear: they still assume the reorg is about job losses and, to them, the leader's enthusiasm feels discordant, even uncaring. A charismatic boss can all too easily become shipwrecked on a shore of cynicism.

So, how to handle this challenge? Through communication that is frequent, clear, and engaging because it involves people in the org-design process itself.

Frequency

First, you need to communicate often, much more than you might think is natural. Iain Conn, the chief executive of Centrica and former chief executive of BP's downstream segment, who has led three major reorgs, told us how important constant communication is: "You need to treat people with real respect and dignity, telling them what is happening and when. The biggest mistake is to communicate once and think you are done. You should keep communicating, even things people have heard already, so they know that

you mean it. You should never forget that you should be communicating to both employees whose jobs may be at risk and the vast number of employees who will stay with your company and make it successful."

Clarity

Second, you need to be clear on what staff want to know. Why is this happening? What will happen when? What does it mean for me, my job, and my working environment? What do you expect me to do differently?

Research shows that employees anxious about their jobs have significantly worse physical and mental health than do those in secure work: one study, published in 2012, of unemployed workers in South Michigan reported almost half experiencing minor to major depression. Leaders can minimize that anxiety by stating in plain language what they know now, what will come later, and when it will come. They can also reassure people by reminding them of what will *not* change—for example, the company's core values, the organization's focus on customer centricity, or simply the existence of this or that department. The task will be infinitely simplified if it is possible to communicate why the company is reorganizing and what the overall plan is. In essence, communications should move from informing people at the beginning to exciting them when—and only when—they know what their new jobs are going to be. That understanding usually comes after the first big strategic announcement, which deals with the concept of the reorg (and as such tends to excite managers much more than the rest of the staff).

Broadcast communication through digital channels as well as two-way communication through town-hall meetings are important tools. Each communication is an opportunity to articulate the one big thought of the reorg (a move from print to digital, for example, or an effort to make local managers accountable for their profits and losses) and the three to five biggest organizational changes needed to make this happen.

Leaders reassure people by reminding them of what will *not* change—for example, the company's core values, the organization's focus on customer centricity, or simply the existence of this or that department.

Engagement

Staff need time to discuss what a reorg means for their own part of the business. So, in addition to the usual approach of developing question-and-answer briefings and cascading information down the organization through managers, direct communications are essential. Anyone with a question about the reorganization, at any stage—but especially when the new organization is being rolled out—should be clear whom to contact on the reorg team or in the individual's own part of the business. It can also be helpful to capture feedback or concerns that staff do not want to raise aloud: for example, by setting up a confidential email address or through regular net-based surveys. It's important to track whether those digital tools are working, of course. During one reorg, three months into the process it was discovered that emails intended for the whole organization had only been sent to senior leaders' email boxes, where the messages remained. The digital dialogue leaders had hoped to stimulate was stopped in its tracks.

Engagement gets more demanding when the context of the reorg is an expanding business. Elon Musk, CEO of Tesla and SpaceX, told us, "As companies grow, one of the biggest challenges is how to maintain cohesion. At the beginning, as companies get bigger, they get more effective through specialization of labor. But when they reach around 1,000 employees and above, you start to see reductions in productivity per person as communication breaks down. If you have a junior person in one department who needs to speak to another department to get something done, he or she should be able to contact the relevant person directly, rather than go through his manager, director, then vice president, then down again, until six bounces later they get to the right person. I am an advocate of 'least path' communication, not 'chain of command' communication."

Design

Some companies extend engagement to involve a cross-section of staff at an early stage of the reorg design. For example, Lawrence Gosden, the wastewater director of Thames Water, the United Kingdom's largest water utility, covering London and much of the southeast of England, engaged 60 members of staff from a cross-section of the company, including the front line, in shaping the organizational design: "We put them in a room with a lot of diagnostic material on the external challenges and some great facilitation, with the idea of stretching thinking on how we should solve the challenges of the future. We then asked this group to come up with a vision for what the new organization needed to do—including savings. The team came up with a simple vision focused on customer service. We then took the material that had been developed and shared it with all 4,000 members of staff in a way that they could explore what it meant to them as well. This generated an extraordinary level of ownership in the vision and the plan we needed to deliver. Despite the fact that a large number of people were losing their jobs, most people in the organization got to understand why the change was happening and got behind it."

Such openness from the beginning is a risk and won't work in every reorg. However, relying on a small team of smart folks to design the details is even more hazardous. When the new organization launches, it will be the employees who determine whether it will deliver value by working (or not working) in new ways and with a different boss (or a different boss's boss's boss).

DON'T IGNORE OTHER STAKEHOLDERS

Given the costs of not having a communications plan for employees, most executives eventually create one, albeit often too late in the day. Fewer leaders, however, devote significant time to other stakeholders. While staff typically demand the most attention, depending on the business context, as many as four other groups will likely need attention:

- *Unions and workforce councils.* In the European Union, legislation requires companies to communicate with representatives of the workforce at an early stage. Ironically, this may make life harder for workers outside the European Union who could end up bearing the brunt of higher savings. In addition, unions in Asia are often important and can be linked to governments, parties, and other power blocs. In general, unions often have clear views of what needs to be changed and can be even tougher than senior management on hollowing out middle layers (though their focus is often on employees who are not their members).

In some cases we know, union representatives have become formal members of a reorg team.

- *Customers and suppliers.* One danger of a reorg is too much navel-gazing. If the business is customer driven or relies heavily on the supply chain, the new organization must work better for these stakeholders than the old one. So, when you think through how the organization will work in the future, make sure you also consider how it will affect customers and suppliers. Don't add additional steps or expect them to navigate the complexity of your new organization by having to speak to several people. When salespeople are friendly with their B2B customers—something most companies would encourage—it's hard to keep the reorg a secret.

- *Regulators and other arms of government.* The concern of this group will be typically around health, quality, and safety, though potential job losses and their impact on local economies will also weigh heavily with politicians and civil servants. They will want reassurance at a senior level about what to expect. An example from the Asian arm of an international business shows what not to do. In a meeting with a senior government official, just after the company's reorg, the country manager of the company was asked for an update on the company's performance in the official's country, a discussion that the pair had had many times before. "Oh, no," the country manager responded, "that isn't my responsibility anymore. You need to speak to our new operations excellence team in the United States." Regulators and government officials—like customers—don't want to have to negotiate the complexities of a company's internal organization, so it is best to make life easy for them by communicating early in the process.

- *Board of directors.* If the reorg is company-wide or likely to have a major impact on company performance, it will be of interest to the board. And reorgs always lead to some short-term penalties. The board should therefore understand what is happening and why, and be aware of the time frame, the benefits, and the risks along the way. At the very least, the CEO or other leader in charge should brief board members individually and collectively on the progress of each step, though some will go further.

Lord John Browne, executive chairman of L1 Energy and former CEO of BP, who has also served on the boards of Goldman Sachs and the UK civil service, has this advice for executives: "The board have to be involved in the design.

You should advise them that the path may be rough but that they should ignore the bumps in the road. The board needs to understand the design and what you are forecasting the outcome will be. You need to set out simple milestones and report back on them on whether you are delivering against these."

Under nearly any circumstance, reorganizations consume a great deal of time and energy, including emotional energy. When proper communication plans are in place, though, leaders can at least reduce unnecessary anxiety and unproductive wheel-spinning. Planning should start long before employees get word of the changes, include constituents well outside the boundaries of the company, and extend far beyond the announcement of the concept design to boost the odds that the reorg will stick.

Rose Beauchamp leads the firm's client communications team in Western Europe and is based in McKinsey's London office. **Stephen Heidari-Robinson** was until recently the advisor on energy and environment to the UK prime minister. **Suzanne Heywood** is the managing director of Exor Group. Both Stephen and Suzanne are alumni of the London office and are the authors of the new book *ReOrg: How to Get It Right* (Harvard Business Review Press, November 2016).

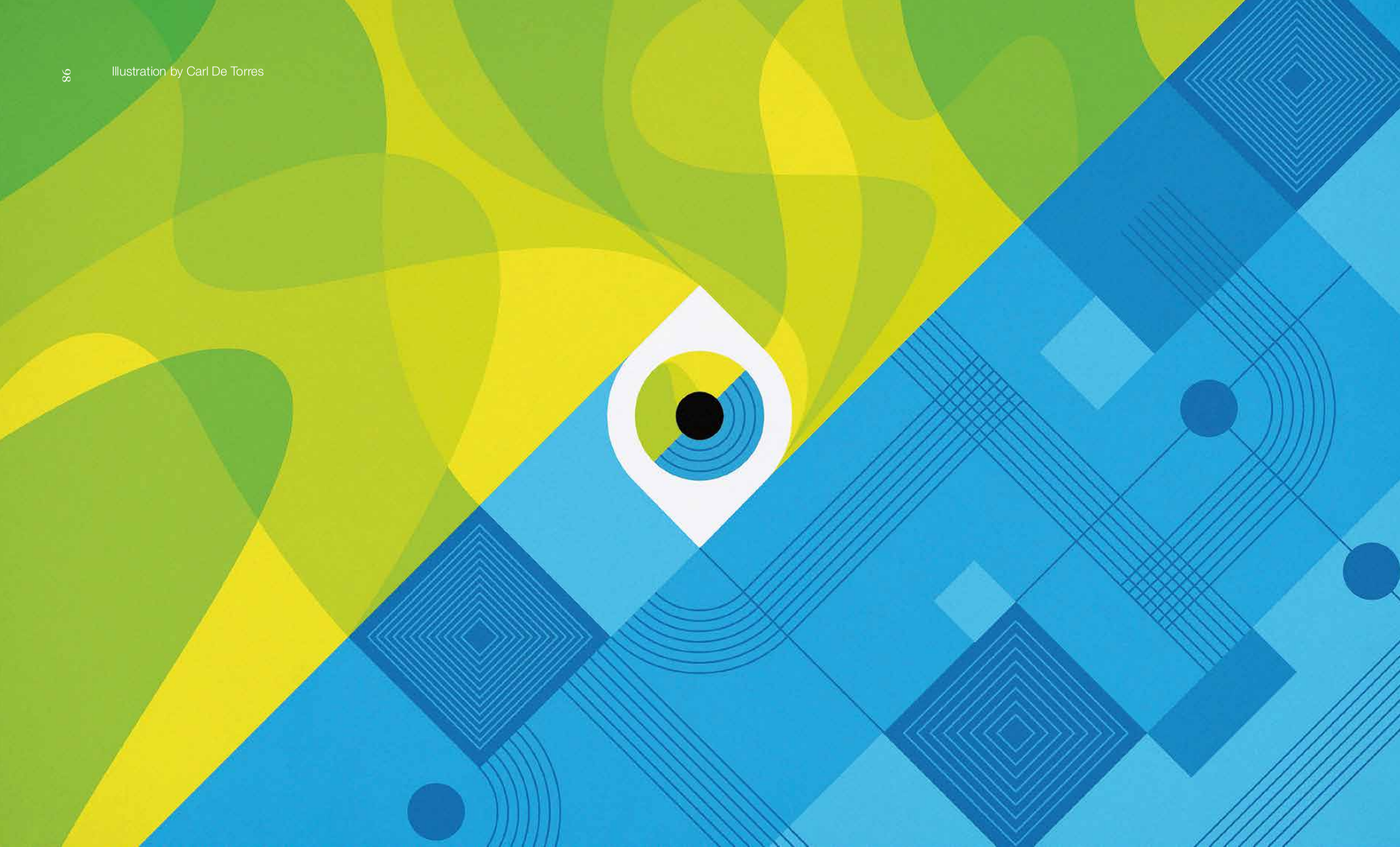


Illustration by Carl De Torres

Leadership and behavior: Mastering the mechanics of reason and emotion

A Nobel Prize winner and a leading behavioral economist offer common sense and counterintuitive insights on performance, collaboration, and innovation.

The confluence of economics, psychology, game theory, and neuroscience has opened new vistas—not just on how people think and behave, but also on how organizations function. Over the past two decades, academic insight and real-world experience have demonstrated, beyond much doubt, that when companies channel their competitive and collaborative instincts, embrace diversity, and recognize the needs and emotions of their employees, they can reap dividends in performance.[1]

The pioneering work of Nobel laureate and Harvard professor Eric Maskin in mechanism design theory represents one powerful application. Combining game theory, behavioral economics, and engineering, his ideas help an organization's leaders choose a desired result and then design game-like rules that can realize it by taking into account how different independently acting, intelligent people will behave. The work of Hebrew University professor Eyal Winter challenges and advances our understanding of what "intelligence" really means. In his latest book, *Feeling Smart: Why Our Emotions Are More*

[1] See Dan Lovallo and Olivier Sibony, "The case for behavioral strategy," *McKinsey Quarterly*, March 2010, McKinsey.com; "Strategic decisions: When can you trust your gut?," *McKinsey Quarterly*, March 2010, McKinsey.com; and "Making great decisions," *McKinsey Quarterly*, April 2013, McKinsey.com.

Rational Than We Think (PublicAffairs, 2014), Winter shows that although emotions are thought to be at odds with rationality, they're actually a key factor in rational decision making.[2]

In this discussion, led by McKinsey partner Julia Sperling, a medical doctor and neuroscientist by training, and McKinsey Publishing's David Schwartz, Maskin and Winter explore some of the implications of their work for leaders of all stripes.

The *Quarterly*: *Should CEOs feel badly about following their gut or at least listening to their intuition?*

Eyal Winter: A CEO should be aware that whenever we make an important decision, we invoke rationality and emotion at the same time. For instance, when we are affected by empathy, we are more capable of recognizing things that are hidden from us than if we try to use pure rationality. And, of course, understanding the motives and the feelings of other parties is crucial to engaging effectively in strategic and interactive situations.

Eric Maskin: I fully agree with Eyal, but I want to introduce a qualification: our emotions can be a powerful guide to decision making, and in fact they evolved for that purpose. But it's not always the case that the situation that we find ourselves in is well matched to the situation that our emotions have evolved for. For example, we may have a negative emotional reaction on meeting people who, at least superficially, seem very different from us—"fear of the other." This emotion evolved for a good purpose; in a tribal world, other tribes posed a threat. But that kind of emotion can get in the way of interactions today. It introduces immediate hostility when there shouldn't be hostility.

The *Quarterly*: *That really matters for diversity.*

Eyal Winter: One of the most important aspects of this interaction is that rationality allows us to analyze our emotions and gives us answers to the question of why we feel a certain way. And it allows us to be critical when we're judging our own emotions.

People have a perception about decision making, as if we have two boxes in the brain. One is telling the other that it's irrational, these two boxes are fighting over time, one is prevailing—and then we make

[2] Eyal Winter, *Feeling Smart: Why Our Emotions Are More Rational Than We Think*, Philadelphia, PA: PublicAffairs, 2014.

decisions based on the prevailing side, or we shut down one of these boxes and make decisions based on the other one only. This is a very wrong way of describing how people make decisions. There is hardly any decision that we take that does not involve the two things together. Actually, there's a lot of deliberation between rationality and emotion. And we also know that the types of decisions that invoke perhaps the most intensive collaboration between rationality and emotions are ethical or moral considerations. As a neuroscientist, you know that one of the more important pieces of scientific evidence for this is that much of this interaction takes place in the part of the brain called the prefrontal cortex. When we confront people with ethical issues, this part of the brain, the prefrontal cortex, is doing a lot of work.

The *Quarterly*: *Yes, and we can track this with imaging techniques. Indeed, neuroscientists keep fighting back when people try too quickly to take insights from their area of science into business, and come up with this idea of a "left-" and "right-brain" person, and exactly the boxes that you are mentioning. Given your earlier comments, do you believe we are capable in a situation where we are emotional, to actually step back, look at ourselves, realize that we are acting in an emotional way—and that this behavior might be either appropriate or not appropriate?*

Eyal Winter: I think we are capable of doing it, and we are doing it to some extent. Some people do it better, some people have more difficulty. But just imagine what would have happened if we couldn't have done it? We probably wouldn't

DISCUSSION PARTICIPANTS

Eric Maskin

- Specializes in mechanism design theory and its application to social welfare, political systems, and other areas
- Economics professor, Harvard University
- 2007 Nobel laureate

Eyal Winter

- Specializes in game theory and behavioral economics, in particular the academic study of decision making
- Economics professor, the Hebrew University and the University of Leicester
- 2011 Humboldt Prize winner

have managed, in terms of evolution. I think that the mere fact that we still exist, you and me, shows that we have some capability of controlling our emotions.

Eric Maskin: In fact, one interesting empirical trend that we observe through the centuries is a decline of violence, or at least violence on a per capita basis. The world is a much less dangerous place now than it was 100 years ago. The contrast is even bigger when we go back longer periods of time. And this is largely because of our ability over time to develop, first, an awareness of our hostile inclinations, but more important to build in mechanisms which protect us from those inclinations.

The *Quarterly*: *Can you speak more about mechanism design—how important it is that systems help the individual or groups to act in ways that are desirable?*

Eric Maskin: Mechanism design recognizes the fact that there's often a tension between what is good for the individual, that is, an individual's objectives, and what is good for society—society's objectives. And the point of mechanism design is to modify or create institutions that help bring those conflicting objectives into line, even when critical information about the situation is missing.

An example that I like to use is the problem of cutting a cake. A cake is to be divided between two children, Bob and Alice. Bob and Alice's objectives are each to get as much cake as possible. But you, as the parent—as "society"—are interested in making sure that the division is fair, that Bob thinks his piece is at least as big as Alice's, and Alice thinks her piece is at least as big as Bob's. Is there a mechanism, a procedure, you can use that will result in a fair division, even when you have no information about how the children themselves see the cake?

Well, it turns out that there's a very simple and well-known mechanism to solve this problem, called the "divide and choose" procedure. You let one of the children, say, Bob, do the cutting, but then allow the other, Alice, to choose which piece she takes for herself. The reason why this works is that it exploits Bob's objective to get as much cake as possible. When he's cutting the cake, he will make sure that, from his point of view, the two pieces are exactly equal because he knows that if they're not, Alice will take the bigger one. The mechanism is an example of how you can reconcile two seemingly conflicting objectives even when you have no idea what the participants themselves consider to be equal pieces.

The *Quarterly*: *How has mechanism theory been applied by leaders or organizations?*

Eric Maskin: It's found applications in many areas, including within companies. Say that you're a CEO and you want to motivate your employees to work hard for the company, but you're missing some critical information. In particular, you can't actually observe directly what the employees are doing. You can observe the outcomes of their actions—sales or revenues—but the outcomes may not correlate perfectly with the inputs—their efforts—because other factors besides employees' efforts may be involved. The problem for the CEO, then, is how do you reward your employees for performance when you cannot observe inputs directly?

Eyal Winter: Here's an example: Continental Airlines was on the verge of bankruptcy in the mid-'90s. And an important reason was very bad on-time performance—it caused passengers to leave the company. Continental was thinking both about the incentives for the individuals and, more importantly, about on-time performance. It's a "weak link" type of technology. If one worker stalls, the entire process is stopped because it's a sequential process, where everybody's dependent on everybody else.

What they came up with was the "go forward" plan, which offered every employee in the company a $65 bonus for every month in which the company ranking on on-time performance was in the top five. Just $65, from the cleaners up to the CEO. It sounds ridiculous, because $65 a month seems not enough money to incentivize people to work hard, but it worked perfectly.

The main reason was that Continental recognized that there's an aspect to incentives which is not necessarily about money. In this case, shirking would mean that you lose your own bonus of $65, but it would also mean that you will be in a situation in which you will feel you are causing damage to thousands of employees that didn't receive a bonus that month because you stalled. It was the understanding that incentives can be also social, emotional, and moral that made this mechanism design work perfectly.

Eric Maskin: A related technique is to make employees shareholders in the company. You might think that in a very large company an individual employee's effect on the share price might be pretty small—but as Eyal said, there's an emotional impact too. An employee's identity is tied to this company in a way that it wouldn't be if she were receiving a straight salary. And empirical studies by the labor economist Richard Freeman and others

show that even large companies making use of employee ownership have higher productivity.

The *Quarterly*: *How would you advise leaders to facilitate group collaborations, especially in organizations where people feel strong individual ownership?*

Eyal Winter: It's again very much about incentives. One has to find the right balance between joint interest and individual interest. For example, businesses can overemphasize the role of individual bonuses. Bonuses can be counterproductive when they generate aggressive competition in a way which is not healthy to the organization.

There are interesting papers about team behavior, and we know that bonuses for combined individuals, or bonus schemes that combine some individual points with some collective points, or which depend on group behavior as a whole, often work much more effectively than individual bonuses alone. The balance between competition and cooperation is something that CEOs and managers have to think deeply about, by opting for the right mechanism.

The *Quarterly*: *Can mechanisms that encourage collaboration also be used to foster innovation?*

Eric Maskin: Collaboration is a powerful tool for speeding up innovation, because innovation is all about ideas. If you have an idea and I have an idea, then if we're collaborating we can develop the better idea and ignore the worse idea. But if we're working alone, then the worse idea doesn't get discarded, and that slows down innovation.

Collaboration in academic research shows an interesting trend. If you look at the list of papers published in economics journals 30 years ago, you'll find that most of them were single-authored. Now the overwhelming majority of such papers, probably 80 percent or more, are multiauthored. And there's a very good reason for that trend: in collaborative research, the whole is more than the sum of the parts because only the best ideas get used.

Eyal Winter: There's another aspect in the working environment which is conducive to innovation. And that is whether the organization will be open to risk taking by employees. If you're coming with an innovative idea, not a standard idea, there is a much greater risk that nothing will come out of it eventually. If people work in an environment which is not open for taking risks, or alternatively in which they have to fight for survival within their

organization, they will be much less prone to take the risks that will lead to innovation.

The *Quarterly*: *What about innovation in a world of vast amounts of data and advanced analytics at our fingertips? Is there untapped potential here for behavioral economics?*

Eric Maskin: One exciting direction is randomized field experiments. Up until now, most experiments in behavioral economics have been done in the lab. That is, you put people in an artificial setting, the laboratory, and you see how they behave. But when you do that, you always worry about whether your insights apply to the real world.

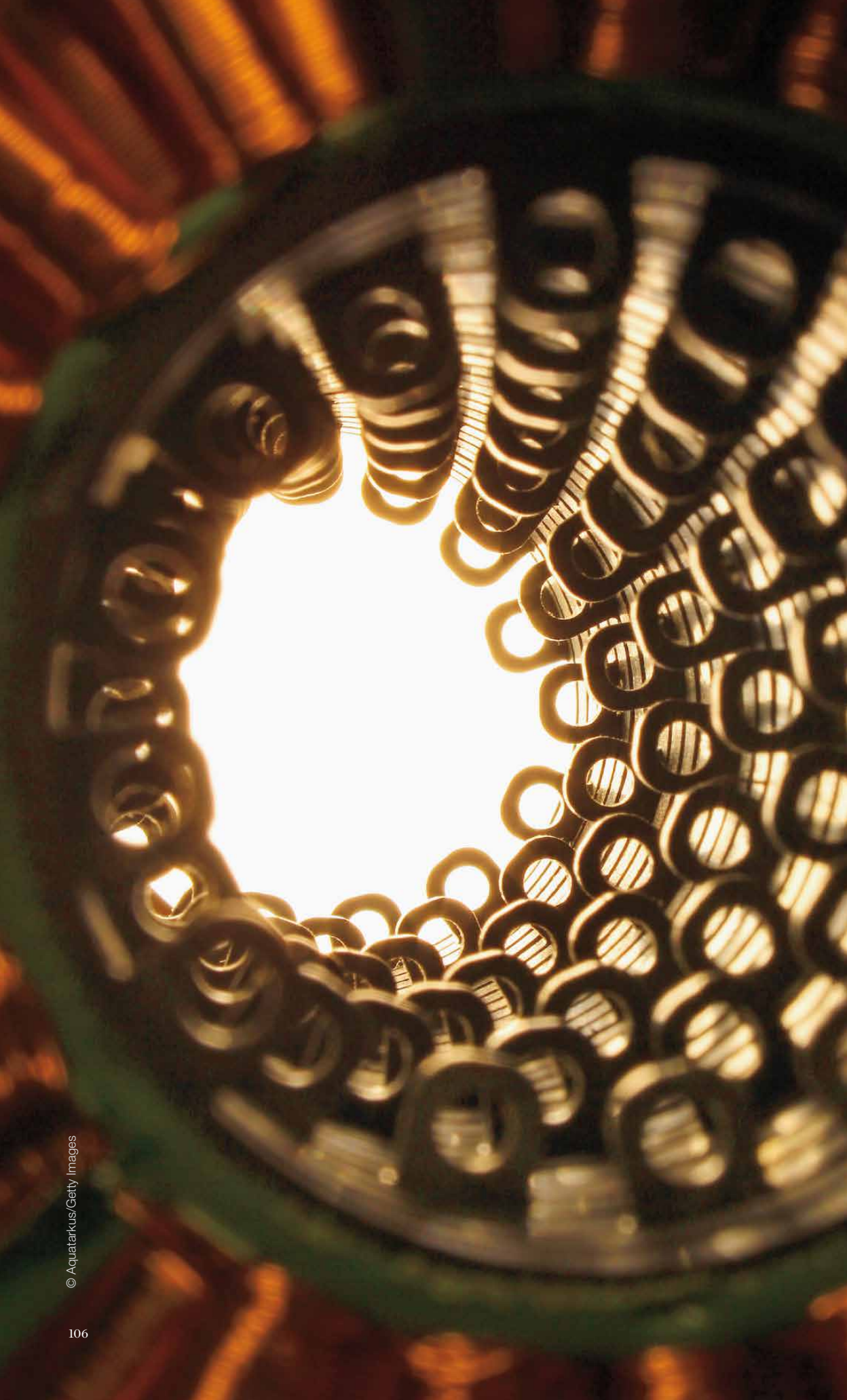
And this is where randomized field experiments come in. Now you follow people in their actual lives, rather than putting them in the lab. That gives you less control over the factors influencing behavior than you have in the lab. But that's where big data help. If you have large enough data sets—millions or billions of pieces of information—then the lack of control is no longer as important a concern. Big data sets help compensate for the messiness of real-life behavior.

The *Quarterly*: *Big data analytics is also tapping into artificial intelligence. But can a computer be programmed to reason morally, as people do—and how might that play out?*

Eyal Winter: I think there will be a huge advancement in AI. But I don't believe that it will replace perfectly or completely the interaction between human beings. People will still have to meet and discuss things, even with machines.

Eric Maskin: Humans are instinctively moral beings and I don't see machines as ever entirely replacing those instincts. Computers are powerful complements to moral reasoning, not substitutes for it. Q

Eric Maskin is a Nobel laureate in economics and the Adams University Professor at Harvard University. **Eyal Winter** is the Silverzweig Professor of Economics at the Hebrew University of Jerusalem and the author of *Feeling Smart: Why Our Emotions Are More Rational Than We Think* (PublicAffairs, 2014). This discussion was moderated by **Julia Sperling,** a partner in McKinsey's Dubai office, and **David Schwartz,** a member of McKinsey Publishing who is based in the Stamford office.



The future is now: How to win the resource revolution

Although resource strains have lessened, new technology will disrupt the commodities market in myriad ways.

by Scott Nyquist, Matt Rogers, and Jonathan Woetzel

A few years ago, resource strains were everywhere: prices of oil, gas, coal, copper, iron ore, and other commodities had risen sharply on the back of high and rising demand from China. For only the second time in a century, in 2008, spending on mineral resources rose above 6 percent of global GDP, more than triple the long-term average. When we looked forward in 2011, we saw a need for more efficient resource use and dramatic increases in supply, with little room for slippage on either side of the equation, as three billion more people were poised to enter the consumer economy.[1]

While our estimates of energy-efficiency opportunities were more or less on target, the overall picture looks quite different today. Technological breakthroughs such as hydraulic fracturing for natural gas have eased resource strains, and slowing growth in China and elsewhere has dampened demand. Since mid-2014, oil and other commodity prices have fallen dramatically, and global spending on many commodities dropped by 50 percent in 2015 alone.

[1] See Richard Dobbs, Jeremy Oppenheim, and Fraser Thompson, "Mobilizing for a resource revolution," *McKinsey Quarterly*, January 2012, McKinsey.com.

Even though the hurricane-like "supercycle" of double-digit annual price increases that prevailed from the early 2000s until recently has hit land and abated, companies in all sectors need to brace for a new gale of disruption. This time, the forces at work are often less visible and may seem smaller-scale than vertiginous cyclical adjustments or discovery breakthroughs. Taken together, though, they are far-reaching in their impact. Technologies, many having little on the surface to do with resources, are combining in new ways to transform the supply-and-demand equation for commodities. Autonomous vehicles, new-generation batteries, drones and sensors that can carry out predictive maintenance, Internet of Things (IoT) connectivity, increased automation, and the growing use of data analytics throughout the corporate world all have significant implications for the future of commodities. At the same time, developed economies, in particular, are becoming ever more oriented toward services that have less need for resources; and in general, the global economy is using resources less intensively.

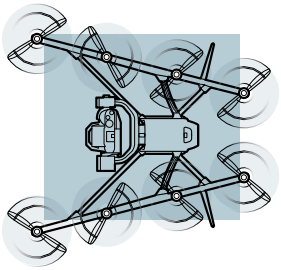
These trends will not have an impact overnight, and some will take longer than others. But understanding the forces at work can help executives seize emerging opportunities and avoid being blindsided. Our aim in this article is to explain these new dynamics and to suggest how business leaders can create new strategies that will help them not only adapt but profit.

A TECHNOLOGY-DRIVEN REVOLUTION

To understand what is going on, consider the way transportation is being roiled by technological change. Vehicle electrification, ride sharing, driverless cars, vehicle-to-vehicle communications, and the use of lightweight materials such as carbon and aluminum are beginning to ripple through the automotive sector. Any of them individually could materially change the demand and supply for oil—and for cars. Together, their first- and second-order effects could be substantial. McKinsey's latest automotive forecast estimates that by 2030, electric vehicles could represent about 30 percent of all new cars sold globally, and close to 50 percent of those sold in China, the European Union, and the United States.

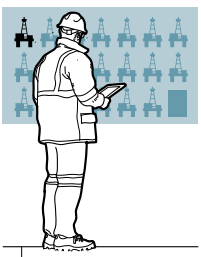
That's just the start, since vehicles for ride-sharing on local roads in urban areas can be engineered to weigh less than half of today's conventional vehicles, much of whose weight results from the demands of highway driving and the potential for high-speed collisions. Lighter vehicles are more fuel efficient, use less steel, and will require less spending on new roads or upkeep of existing ones. More short-haul driving may accelerate the pace of vehicle electrification. And we haven't even mentioned the growth of autonomous vehicles, which would further enhance the operating efficiency of vehicles,

In the oil field of the future, machines will perform the dangerous jobs and boost productivity.



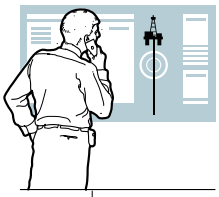
On-site **drones** and robots take over for dangerous activities on platforms and in fields (eg, maintenance and inspections), reducing costs and improving safety.

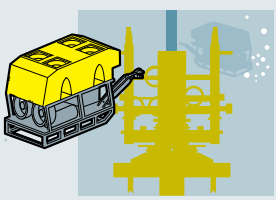
On-site **command center** optimizes production based on data from 20 similar wells, adjusting gas injection and other process parameters to maximize production and total recovery.



On-site **employees using wearables** are tracked across the platform, limiting their exposure to danger. Equipment is shut down if an employee gets dangerously close.

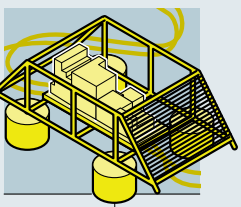
An artificial-lift expert can **remotely operate and troubleshoot** the equipment from a global headquarters, reducing repair time.

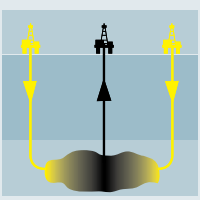




Condition-based maintenance of subsea "Christmas trees" prevent unexpected break-downs that can result in two days of lost production.

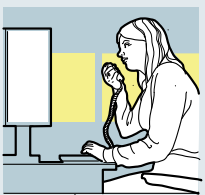
Subsea processing units limit surface infrastructure, reduce capital costs, and avoid the need to lift water and sand to the surface.





Increased use of **enhanced oil recovery** extends the life of fields and increases recovery rates for less capital investment.

The pipeline can be **remotely supported** by the equipment provider. The data collected can be used to improve the design of future pipelines.



as well as increasing road capacity utilization as cars travel more closely together. Several million fewer cars could be in the global car population by 2035 as a result of these factors, with annual car sales by then roughly 10 percent lower—reflecting a combination of reduced need as a result of sharing but also higher utilization and therefore faster turnover in vehicles and fleets.

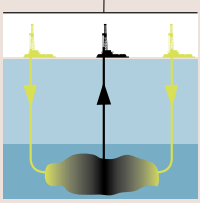
The upshot of all this isn't just massive change for the automotive sector, it's a shift in the resource intensity of transportation, which today accounts for almost half of global oil consumption and more than 20 percent of greenhouse-gas emissions. Oil demand from light vehicles in 2035 could be three million barrels below a business-as-usual case. If you include the accelerated adoption of lighter materials, oil demand could drop by six million barrels. We may see "peak" oil—with respect to demand, not supply—around 2030. (For more, see "The case for peak oil demand," on page 18.)

Many other commodities face similar challenges. Natural-gas demand has been growing strongly as a source of power generation, especially in the United States and emerging economies. We see no signs of electricity demand abating—on the contrary, we expect demand for electricity to outpace the demand for other energy sources by more than two to one. But the electricity-generation mix is changing as solar- and wind-power technology improve and prices fall; wind could become competitive with fossil fuels in 2030, while solar power could become competitive with the marginal cost of natural-gas and coal production by 2025. Fossil fuels will continue to dominate the total energy mix, but renewables will account for about four-fifths of future electricity-generation growth.

Metals will be affected, too. Iron ore, a key raw material for steel production, may already be in structural decline as steel demand in China and elsewhere cools, and as recycling gathers pace. Lighter cars on roads that require less maintenance would only hasten that decline. We estimate that a smaller car

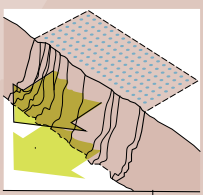
We see no signs of electricity demand abating—on the contrary, we expect demand for electricity to outpace the demand for other energy sources by more than two to one.

Technology will raise productivity and improve safety in all areas of mining operations.



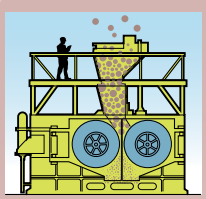
Advanced in-situ leaching will open up difficult-to-reach ore bodies at low ore grades and raise productivity.

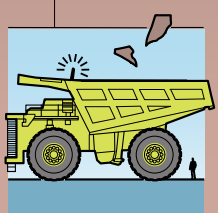
Expanded data collection and analysis of rock fragmentation will inform subsequent blast patterns.



Integrated operating and analytics center remotely monitors site operations, enabling predictive maintenance and real-time collaboration with specialists to reduce downtime.

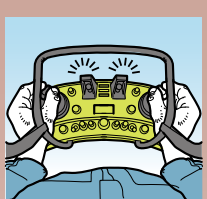
High-pressure grinder rollers will lower electricity consumption and improve recovery rates from ore bodies.

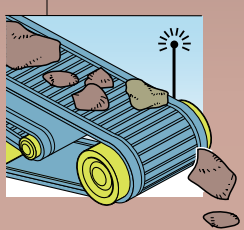




Autonomous vehicles such as trucks and drillers will result in less downtime and greater reliability.

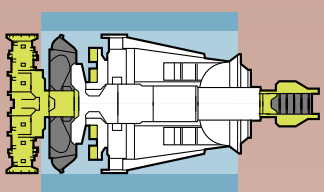
Tele-remote technologies will enable highly skilled operators to work in areas removed from safety risks.





Processing-plant sensors will increase real-time analysis of heat and ore grade, optimizing extraction, lowering energy and consumables costs, and increasing recovery.

Automated continuous hard-rock mining will lead to faster development of underground mines, avoiding the need for drilling and blasting.



fleet alone would potentially reduce global steel consumption by about 5 percent by 2035, compared with a business-as-usual scenario. Copper, on the other hand, is used in many electronics and consumer goods and could see a steady growth spurt—unless substitutes such as aluminum become more competitive in a wider set of applications. Electric vehicles, for example, require four times as much copper as those that use internal-combustion engines.

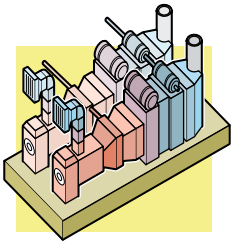
Some of the biggest impact on resource consumption could come from analytics, automation, and Internet of Things advances. These technologies have the potential to improve the efficiency of resource extraction—already, underwater robots on the Norwegian shelf are fixing gas pipelines at a depth of more than 1,000 meters, and some utilities are using drones to inspect wind turbines. Using IoT sensors, oil companies can increase the safety, reliability, and yield in real time of thousands of wells around the globe. These technologies will also reduce the resource intensity of buildings and industry. Cement-grinding plants can cut energy consumption by 5 percent or more with customized controls that predict peak demand. Algorithms that optimize robotic movements in advanced manufacturing can reduce a plant's energy consumption by as much as 30 percent. At home, smart thermostats and lighting controls are already cutting electricity usage.

In the future, the pace of economic growth in emerging economies, the rate at which they seek to industrialize, and the vintage of the technology they adopt will continue to influence resource demand heavily. A key question is, how quickly will these economies adopt the new technology-driven advances? The challenge in part is from regulation and in part a question of access to capital, for example with solar energy in Africa. But the innovations provide new approaches to address age-old issues about resource intensity and the dependency on growth. Above all, they create the potential for dramatic reductions in natural-resource consumption everywhere. And that means there are substantial business opportunities for those with the foresight to seize them.

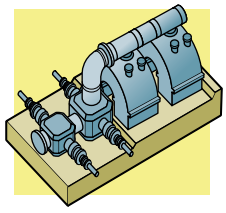
RESETTING OUR RESOURCE INSTINCTS

Many of these developments are new, and they have yet to permeate the mind-sets of most executives. That could be costly. Those who fail to recognize the changing resource dynamics will not only put themselves at a competitive disadvantage but also miss exciting new value-creation opportunities. Here are five ways the future will likely be fundamentally different from the present and past:

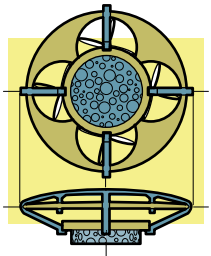
Electrical grids will become more resilient and utilities more responsive and productive.



Drones provide remote surveillance and maintenance, such as solar-panel cleaning, improving safety and increasing labor productivity.



Cogeneration and combined heat and power systems increase value add of thermal-power generation, enabling increased resiliency in microgrid applications.

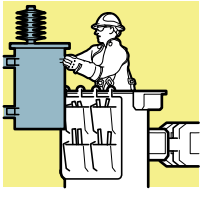


Coal-fired ultra-supercritical plants and closed-cycle natural-gas turbines push power-generation efficiency closer to theoretical limits, reducing fuel consumption.

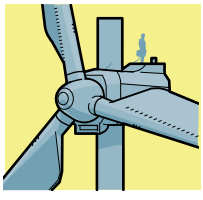
Sensors and real-time data analytics across assets allow for by-the-minute adjustments to maximize power-generation efficiency (eg, automatic tracking of wind conditions).

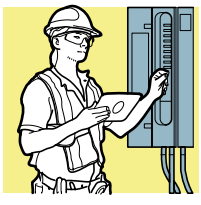
Smart-grid meters report more data and advanced analytics on customer behavior, enabling utilities to offer more services (eg, efficiency measures) to capture additional value.

Smart-grid technologies improve grid management, enable faster identification of grid-outage causes, reduce thefts, and enable better service to customers.



Field workforce receives **real-time network updates** and access to maps and schematics to decrease response times and reduce the impact of outages.





1. Resource prices will be less correlated to one another, and to macroeconomic growth, than they were in the past. During the supercycle, all resource prices moved up almost in unison, as surging demand in China encountered supply constraints that stemmed from years of market weakness and low investment. China's appetite for resources went well beyond just fossil fuels; in 2015, it consumed more than half of the entire global supply of iron ore and about 40 percent of copper.

Today, however, the underlying drivers of demand for each commodity have changed and are subject to factors that can be highly specific. While iron-ore demand could decline by more than 25 percent over the next 20 years as a result of the weakening demand for steel and increased recycling, copper demand could jump by as much as 50 percent. Or take thermal coal. Although it remains a primary energy source in emerging economies, coal faces competition from solar and wind energy, as well as from natural gas, and many economies would like to "decarbonize" for environmental reasons. As these interlocking shifts play out in the years ahead, past supply, demand, and pricing patterns are unlikely to hold.

2. You will have more influence over your resource cost structure. Resource productivity remains a major opportunity. For example, while internal-combustion engines in passenger cars have become about 20 percent more efficient over the past 35 years, there's room for another 40 percent improvement in the next two decades. The automotive sector is in a state of creative ferment trying to realize these opportunities, as partnerships between GM and Lyft, Toyota and Uber, and a plethora of electric-vehicle and other start-ups in the sector illustrate.

Broadly, we estimate that greater energy efficiency and the substitution of some existing resources, such as coal and oil, by alternatives, including wind and solar, could improve the energy productivity of the global economy by almost 75 percent—and the fossil-fuel productivity of the economy by almost 100 percent—over today's levels. That could cut consumer spending on fossil fuels by as much as $600 billion in real terms compared with a business-as-usual scenario under which demand would continue rising to 2035.

Business can capture some of this value through technology, such as deploying automation, data analytics, and Internet of Things connectivity to optimize resource use. Manufacturing plants are already seeing significant reduction in energy demand through retrofit efforts, including sensor installation. Or

consider mechanical chillers: today, most of them are set to run at a constant pressure, which ensures continuous or near-continuous operation. But temperature sensors and automation controls enable condenser pressures to float according to changes in outdoor temperatures, so that the chillers only run when they need to, which can boost efficiency substantially.

Technology is also enabling second-order benefits, such as improving labor productivity by using sensors to more finely tune temperatures and lighting, or predicting compression failures in heating and cooling systems using the same data analyzed to minimize energy consumption. Leading companies are now starting the hard work of building apps and data flows that connect all this information across multiple tiers of their supply chains, giving them both visibility into, and influence on, the vast amounts of resource efficiency embedded deep within their extended network of operations.

3. You may find resource-related business opportunities in unexpected places. This resource revolution is already giving birth to a host of innovative products, solutions, and services, and many more are out there waiting to be seized. Car-sharing services already exist, of course, but there is plenty of room for newcomers wanting to join the disruption of transport. Battery storage still needs to be cracked. New carbon-based materials that are lighter, cheaper, and conduct electricity with limited heat loss could transform numerous industries, including automobiles, aviation, and electronics. Drones are starting to help utilities carry out predictive maintenance of electricity lines, solar panels, and wind turbines. Plastics made from renewable biomass sources could help meet the expected increase in demand from emerging economies. Technologies that enable mining under the sea or on asteroids could help unlock vast new reserves. And, of course, many more down-to-earth applications, such as smartphone apps that help people cut their utility bills, also have a future.

The technologies underlying these opportunities already exist or are being explored. But they are still so nascent that their aggregate impact is difficult to estimate. And that's to say nothing of more speculative technologies—such as hyperloop transportation that could move people at very high speeds or a breakthrough in nuclear fusion—which could have even greater potential.

4. The resource revolution will be a digital one, and vice versa. Responding to technology-driven change on the scale of the resource revolution requires companies to step up their ability to digitize and harness data analytics. Digital and data opportunities have a deep cross-cutting

impact, affecting how companies market, sell, organize, operate, and more. In the factory, of course, data capture is just a beginning: you need to connect the data with your workflows and have a clear understanding of your energy needs in order to identify efficiency opportunities and the levers you must pull to seize them. Indeed, without rethinking processes, energizing people, transforming the way they work, and building new management infrastructure, companies are unlikely to capture much of the value available to them through digital technologies and tools.[2]

Developing a product offering to help customers capture the benefits of better resource management also requires the commodity supplier to become smarter than the operator. All this demands organizational agility and leaders who recognize the need to put resources squarely on the table as they seek to reinvent themselves for the digital age: scrutinizing the entire supply chain with advanced data analytics, for example, or crafting digital strategies with energy, material, and water footprints in mind. This is already happening in the utility sector, where companies like Smart Wires and SolarCity are challenging traditional players and paradigms regarding how much new transmission and distribution needs to be built out.

5. Water may be the new oil. If it's true that in the years ahead we're likely to experience less correlation among prices for different resources and that demand for oil could peak, where, if anywhere, should we watch for future commodity booms? The answer may be water. For the most part, water is still treated as a "free" resource, and unlike oil, water does not yet have a built-out global infrastructure. Not surprisingly, with limited pricing and rising demand in many emerging markets, water is under pressure. Our research indicates that most emerging-market cities experience some degree of water stress.

In a thirsty world, technologies that can extract and recycle water should become increasingly valuable, creating new hotbeds of competition. Advanced water management also will become more important, with a global imperative of zero waste and maximum recycling and regeneration. The returns on water-conservation efforts become more attractive when companies consider the full economic burden of waste, including disposal costs, water-pumping and -heating expenses, and the value of recoverable materials

[2] For more on the broader operating shifts needed to realize resource gains, see Markus Hammer and Ken Somers, *Unlocking Industrial Resource Productivity: 5 core beliefs to increase profits through energy, material, and water efficiency*, McKinsey Publishing, 2016.

carried off by water. Companies including Nestlé, PepsiCo, and SABMiller (which recently merged with Anheuser-Busch InBev) are increasingly focusing on sustainable water management that embeds water-saving opportunities in lean management. In India, for example, PepsiCo now gives back more water to communities where it operates than its facilities consume. Without more efforts like these, water may become the most precious, and most coveted, resource of them all.

The resource revolution that emerged, stealthily, during the supercycle will undoubtedly bring with it some cruelty and dislocation. To some extent, this is already happening: the coal fields of West Virginia, for example, are suffering. On the positive side, the more efficient and thoughtful use of resources could be good for the global environment—and very good for innovative corporate leaders who accept the reality of this revolution and seize the opportunities it will unleash. The new watchword for all, literally, is to be more resourceful. Q

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RETHINKING WORK IN THE DIGITAL AGE

Digitization and automation are upending core assumptions about jobs and employees. Here's a framework for thinking about the new world taking shape.

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Digitization is sending tremors through traditional workplaces and upending ideas about how they function. Almost daily, reports of "humanoid" machines, such as Honda's ASIMO, capture the attention of the media and the imagination of the public at large. They are also stirring existential anxieties about the future of human labor itself and the potential for major job dislocations by automation based on artificial intelligence. More prosaically, companies can harness the new power of global digital platforms, such as Toptal or Upwork, to find external freelance talent as they continue to redefine their corporate boundaries or identify the best internal talent for critical projects.

While automation technologies advance, and hypotheses about their impact multiply, executives are struggling to sort through the implications. We have harnessed our own research and client experience, as well as the insights of others, to define some of the key contours of this change. Our starting place is a set of orthodoxies challenged by automation and digitization, which suggest new principles for organizing the emerging workplace. The landscape is shifting in areas such as career tracks within organizational hierarchies, notions about full-time jobs within companies, and even the core economic trade-offs between capital and labor. As the new workplace takes shape in the years to come, businesses will need to wrestle with the content of existing jobs, prepare for greater agility in the workplace, and learn to identify the early signals of change.

In what follows, we touch on seven orthodoxies in flux and provide further reading for digging deeper into the trends transforming them. These orthodoxies fall into three critical categories: the nature of occupations, the supply of labor, and the demand for it.

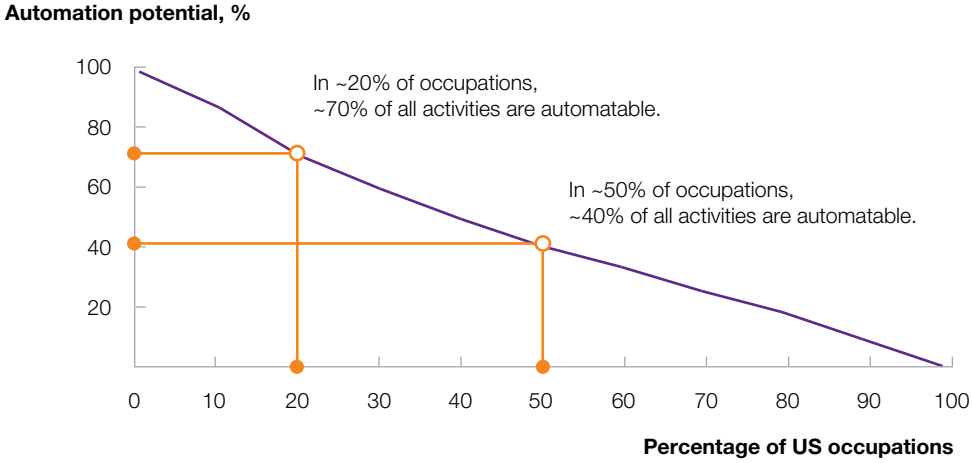
The changing nature of occupations

1. From 'bundled' to 'rebundled.' Digitization transforms occupations by unbundling and rebundling the tasks that traditionally constituted them. Last year, McKinsey research suggested that although fewer than 5 percent of occupations in the United States can now be fully automated, 70 percent of the job activities in 20 percent of occupations could be automated if companies adapted currently available technologies (exhibit).

   Indeed, the rebundling of tasks to form new types of occupations has already begun in a number of economic sectors. Consider how automation has changed the TV-advertising marketplace. Traditionally, ad inventory was sold on "upfront" markets before the start of the season. The orthodox thinking was that program grids offered to TV networks by ad were a proxy for the size and demographic mix of the audience. Today, however, ad purchases are increasingly automated, and high levels of trading frequency are replacing one-off season sales. Moreover, ad sales are no longer just about the TV audience but also involve targeted advertising based on a big data view of audience flows and on exploiting sales opportunities across screens beyond television. Newly rebundled tasks relying on digital technologies have emerged in the industry: analytics specialists and yield-management experts, for example, navigate channels and parse traditional-versus-digital advertising inventories.

Exhibit

If companies adapted currently available technologies, approximately 70 percent of the activities of some 20 percent of all occupations could be automated.



Source: McKinsey Global Institute analysis

2. From well-defined occupations to project-based work. Organizations hire most people for well-defined jobs. The traditional assumption has been that, eventually, these employees might move to other positions within the same organizations but that the nature of the jobs themselves wouldn't change substantially.

That's starting to evolve as work in marketing, finance, R&D, and other functions breaks away from set boundaries and hierarchies, morphing into more on-demand and project-based activity. Media production and IT development are typically project based, and that is likely to become a new norm as the level of digitization increases. Companies that harness this shift effectively have a significant potential upside: for example, 3M's integrated technology workforce-planning platform increased the internal mobility of employees and boosted productivity by 4 percent.

Our research shows that two-thirds of companies with high adoption rates for digital tools expect workflows to become more project- than function-based and that teams in the future will organize themselves. The upshot: organizational structures are starting to look different—new jobs defined by technologies that extend across functions have much shorter, project-oriented time frames.

The new world of labor supply

3. From salaried jobs to independent work. Digitization is not only changing work within organizations but also enabling it to break out beyond them. Our latest research indicates that about 25 percent of the people who hold traditional jobs would prefer to be independent workers, with greater autonomy and control over their hours. Digitization makes the switch to skill-based self-employment or even to hybrid employment (combining traditional and independent work) much easier. TopCoder, one of the largest crowdsourcers of software development, has built a community of more than 750,000 engineers who work on tasks that are often for companies other than those (if any) that employ them.

In retailing, websites provide new avenues for entrepreneurial activity as "business in a box" applications offer global sales-distribution platforms and artificial-intelligence tools to support sales and customer care. Of course, online labor platforms (such as Upwork, Freelancer.com, and apps like Uber and TaskRabbit) have been encouraging freelance work for many years and today connect millions of workers with employers and customers across the globe. In macro terms, the constraining assumption that labor supply is relatively time inelastic (mainly a choice between full- or part-time jobs) will

be challenged as workers opt for—or, in the face of challenging employment prospects, resort to—greater self-determination in employment.

4. From educational credentials to intrinsics reflected in data. Degrees—particularly in the fields of science, technology, engineering, and mathematics (STEM)—have until now acted as "markers" of talent for hiring, even in the digital age. Yet as our colleagues reported in a recent article, when Catalyst DevWorks evaluated hundreds of thousands of IT systems managers, it found no correlation between college degrees and professional success. Digitization and automation seem to be placing a premium on not just technical skills but also creativity and initiative—which, recent research suggests, are becoming less correlated with formal education, even a STEM one.

Online work platforms are entering the breach and leveling the playing field: using job-rating systems and crunching big data to capture information on tasks and performance, they are proving to be a more effective way to measure abilities than educational credentials are. These dynamics have implications for workers, employers, and the economy as a whole. Our research suggests that online platforms not only induce many people to reenter the workforce in flexible employment arrangements but also improve the matching of jobs and workers within and across companies. The upshot could be a drop in the natural unemployment rate in developed economies and a boost to global GDP.

5. From unions to communities. In wage setting, professional training, and the like, unions remain important partners for employers' associations and governments. But union membership has fallen precipitously in recent decades across OECD countries, and digital platforms seem poised to play a growing role in representing workers.

As we have noted, the diversity and multiplicity of work preferences is trending toward independent work and self-employment. In parallel, we see online communities flourishing as social-meeting web spaces for members and users of peer communities, some of which could become new touchpoints for labor organizations. Fruit pickers are a case in point. In the past, they looked for employers, during fruit season, on their own. Now they organize themselves via online communities and present their joint forces directly to employers. Australia's Fruitpickingjobs.com.au, for example, not only enables pickers to band together but also helps with services such as visas and accommodations. The US Freelancers Union is not a union in the traditional sense of negotiating wages on behalf of its members but rather a community of independent freelancers and self-employed professionals. It offers its members networking events and online discussion forums, as well as group-insurance rates.

The changing dynamics of demand

6. From capital substituting for labor to complementary investments in labor and capital. Economic models often assume that capital and labor are substitutes as production factors. With digitization and automation, the economics can cut differently. The companies creating the largest number of jobs are seeking workers with new skills and digital savvy. The proficiencies most in demand on platforms like LinkedIn tend to be in cloud and distributed computing, big data, marketing analytics, and user-interface design. These tend to complement rather than substitute for new forms of digital capital. Returns on investments in big data capital architecture and systems, for example, exceed the cost of capital when companies invest in complementary big data talent—both analytics specialists and businesspeople who can make sense of what they say.

However, the potential benefits from this virtuous cycle are far from being realized. McKinsey research indicates that the United States faces deep talent shortages in these areas, while insufficient levels of digital literacy hobble Europe. Both issues represent roadblocks for companies seeking to invest in new forms of digital capital.

7. Employment engines—from companies to ecosystems. Digitization has given rise to business strategies that lead companies to establish themselves as platforms, with an array of contacts across markets, that manage interactions among multiple organizations. These new business ecosystems amplify hiring beyond the boundaries of the platform owners. Apple's introduction of the iTunes store platform, for example, gave birth to a major mobile-app industry, which has created more than a million jobs in both the United States and in Europe (though Apple employs only a fraction of that number). The YouTube platform has spawned online multichannel networks (known as MCNs) that aggregate microchannels to attract advertisers looking for new ways to target spending.

Those dynamics have in turn created new jobs in content creation, digital production, and more. In e-commerce, major players such as Alibaba, Amazon, eBay, and Rakuten provide distribution and hosting platforms that help millions of small and midsize enterprises (as well as individuals) sell their products and services around the world. These ecosystems aren't direct employers. But the livelihoods of digital-age workers depend upon them

to a degree that seems to depart from the 20th-century norm of individual companies (and sometimes their supplier networks) as the dominant engines of employment.

How work will evolve in the second machine age is a complex and unsettled question, but old orthodoxies are already starting to fall. Companies need to become more agile so they can embrace emerging new forms of labor flexibility. Workers need to have the skills and adaptability that would help make a more flexible job environment an opportunity to shape their careers in satisfying ways—perhaps with a better work–life balance—instead of a threat to their livelihoods and well-being. To acquire new skills that automation can't readily replace, employees will need help from companies and policy makers. And understanding how workplace orthodoxies are changing is a first step for everyone. Q

Further reading

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For a full list of citations, see the online version of this article, on McKinsey.com.

RETHINKING RESOURCES: FIVE TIPS FOR THE TOP TEAM

A diverse set of technologies—from autonomous vehicles to new-generation batteries, drones that carry out predictive maintenance, and the connectivity of the Internet of Things—are coming together to change supply, demand, and pricing dynamics for a wide range of resources. Here's a checklist to help you reshape the resource conversation in the C-suite:

The resource revolution: Time to hit reset

Resource prices will be less correlated to one another, and to macroeconomic growth, than they were in the past

You will have more influence over your resource cost structure

You may find resource-related business opportunities in unexpected places

The resource revolution will be a digital one, and vice-versa

Water may be the new oil

For more, see "The future is now: How to win the resource revolution," on page 106.

Highlights

Making data analytics work for you—instead of the other way around

Straight talk about big data

The CEO's guide to China's future—plus, Kone's China head on coping with the country's slowdown, as well as new insights into Chinese consumer behavior

Two leading economists discuss the mechanics of reason and emotion

The art of transforming organizations: How to improve your odds of success and avoid chaos

The future is now: How to win the resource revolution

Rethinking work in the digital age

Research snapshots: fintechs, oil and gas, car data sharing, Chinese Internet finance, and more