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MIT Sloan Management Review

SUSTAINABLE BUSINESS

Creating value while doing right by people and the planet

PAGE 22

Tough Challenges Demand Leaders With Heart

When we planned a special report on sustainability for this issue, it was too early to know that it would follow closely on the heels of the latest — and most alarming — assessment report yet from the UN-sponsored Intergovernmental Panel on Climate Change (IPCC). The news from the IPCC includes the unequivocal scientific consensus that human activity has caused the observed increase in greenhouse gas concentrations in Earth's atmosphere. The extreme weather and wildfires wreaking havoc on communities all over the planet are among the effects of surface temperature increases that will be irreversible for centuries, if not millennia — and that's if we act with urgency to reduce greenhouse gas emissions by half within this decade, and to net zero by 2050. Not doing so will unleash even greater catastrophe.

Humanity has never needed as much creativity and innovation as it does now — nor as much collaboration across all spheres of endeavor. Making headway on this existential crisis will require the majority of business leaders to join governments, policy makers, nonprofits, and ordinary people in contributing to a dramatic reduction in greenhouse gas emissions.

When I think of *MIT Sloan Management Review*'s readers, I think of leaders who thrive on difficult challenges, drive innovation, and hope to make a positive impact on their businesses, the people they serve, and the planet. The articles in our special report on sustainability lay out opportunities where others might see intractable problems and suggest ways to leverage creativity to thrive, not merely survive.

But we will need more than energy, initiative, and new ideas in order to lead efforts to salvage a planet we've pushed out of balance. We will need courageous hearts and wise souls, and a new approach to strategy that is rooted in deeply held values. Exactly such a new prescription for strategy-making is offered in our lead feature article by Ikujiro Nonaka and Hirotaka Takeuchi, "Strategy as a Way of Life." Over the course of their long careers, these authors' groundbreaking work on knowledge creation, innovation, and product development has had wide-reaching influence, including laying the foundation for the Scrum agile software development framework. We hope their article will inspire leaders to think deeply about how to guide organizations that can profit while making a positive difference in the world.

Elizabeth Heichler // @eheichler
Executive Editor
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Editor's note: *Some articles in this issue were originally published online. They have been adapted for print.*

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MIT Sloan Management Review leads the discourse among academic researchers, business executives, and other influential thought leaders about advances in management practice, especially those shaped by technology, that are transforming how people lead and innovate. MIT SMR disseminates new management research and innovative ideas so that thoughtful executives can capitalize on the opportunities generated by rapid organizational, technological, and societal change.

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The 2021 Richard Beckhard Memorial Prize

The editors of *MIT Sloan Management Review* are pleased to announce the winner of this year's Richard Beckhard Memorial Prize, awarded to the most outstanding *MIT SMR* article on planned change and organizational development published in our winter 2020 through fall 2020 issues.

RICHARD BECKHARD

One of the founders and architects of the field of organizational development, professor Richard Beckhard was a member of the MIT Sloan School of Management faculty for more than 20 years. A longtime friend of *MIT Sloan Management Review*, Beckhard was known for his efforts to help organizations function in a more humane and high-performing manner and to empower people to be agents of change.

His books include *Organizational Development: Strategies and Models*; *Organizational Transitions: Managing Complex Change*; *Changing the Essence: The Art of Creating and Leading Fundamental Change in Organizations*; and his autobiography, *Agent of Change: My Life, My Practice.*

The prize was established in 1984 by the faculty of the MIT Sloan School of Management upon professor Beckhard's retirement, and it was renamed the Richard Beckhard Memorial Prize after his death on Dec. 28, 1999.

THIS YEAR'S AWARD goes to Erin L. Kelly and Phyllis Moen for their summer 2020 *MIT Sloan Management Review* article "Fixing the Overload Problem at Work," which tackles an issue that leads to significantly higher levels of employee stress, dissatisfaction, turnover, and burnout — and potentially lower work quality.

Kelly, Distinguished Professor of Work and Organization Studies at the MIT Sloan School, and Moen, who holds the McKnight Endowed Presidential Chair in Sociology at the University of Minnesota, undertook a five-year study at a Fortune 500 company. Half of the 56 teams and their managers chosen for the study were coached and then allowed to redesign their work collectively — without supervisory oversight. The other half, matched with the experimental group in terms of jobs and demographics, continued to work as they had in the past.

The results over a three-year period were compelling: The redesign teams reported that they felt they had more control over when and where they worked and that their managers were more supportive of their personal and family lives. In addition, they reported getting more exercise, sleep, and social time — and they were significantly less likely than their control group counterparts to leave the organization.

The authors identified three actions that managers must take to overcome the problem: Provide employees with greater control over their work; give employees clear direction on their work goals; and, critically, develop managers who genuinely care and support their employees in their personal lives and priorities.

"Such rethinking about work is particularly timely as we slowly emerge from the COVID-19 pandemic with new learning about when, where, and how our work can be accomplished," the judges say. "Moreover, Dick Beckhard would surely approve of this participatory group initiative to work redesign as it played out in Tomo. He was a strong advocate of self-organized work teams as a key component of productive organization change; Dick held that we are not solitary creatures but members of shared communities, accountable to and dependent on one another. Erin Kelly and Phyllis Moen's approach to the overload problem at work takes this powerful principle to heart."

Our panel of judges consisted of the following distinguished members of the MIT Sloan School of Management faculty: retired senior lecturer Cyrus Gibson, David J. McGrath Jr. Professor of Management and Innovation Kate Kellogg, and Erwin H. Schell Professor of Management John Van Maanen.


Fixing the Overload Problem at Work

The Winners:
Erin L. Kelly and Phyllis Moen

Authors of:
"Fixing the Overload Problem at Work,"
MIT Sloan Management Review,
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FRONTIERS

[AGILE ORGANIZATIONS]

Why Companies Must Embrace Microservices and Modular Thinking

Organizations can reduce coordination complexity with modular thinking, microservices, and APIs.

BY MARK J. GREEVEN, HOWARD YU, AND JIALU SHAN

Companies that embrace remote work — which is here to stay — can also drastically reduce their coordination costs through modular organization. Spotify announced earlier this year that it would completely shift to remote work. Salesforce expects its workers to be in the office just one to three days a week. Last fall, Apple CEO Tim Cook said he believed the company would not return to the way people worked pre-pandemic, noting, "There are some things that actually work really well virtually." Ping An — China's largest insurer — took its remote work one step further: It developed a suite of tools that lets its 1.4 million employees and agents work remotely. It's now offering those same tools to other financial service companies.

These companies have one thing in common: They are all moving toward or have already achieved a modular setup. Whereas modular organizations were challenging to implement in the past, they are becoming commonplace today thanks to microservices and application programming interfaces (APIs).

The concept of modular organization is not new. What's new today is the ability to achieve such architectures with relative ease. APIs help codify interactions among departments, which in turn reduces ad hoc communication and minimizes coordination complexity. As a result, traditional business processes — whether financial, legal, or HR-related — can turn

PIETARI POSTI/THEISPOT.COM

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into microservices. That's how a monolithic, highly interdependent organization turns into a modular one.

Note that the converse is also true: A lack of microservices can prevent a company from achieving a modular architecture and keep it stuck in widespread complexity. These types of organizations face no choice but to order their headquarters staff to return to their physical offices.

Our findings are based on a research program at IMD Business School that aims to understand how organizations become future-ready. We have conducted extensive interviews with dozens of forward-looking organizations and have built a database that tracks over 40 ecosystems. We've also ranked companies' readiness based on publicly available information. Our executive education programs essentially serve as a laboratory, allowing us to test out hypotheses with senior executives.

Organizational Complexity Demands Constant Coordination

Consider a task that depends on the input of others. An executive at an established fashion manufacturer explained that every time his company prepared to launch a new product, he would have to dial into a briefing from headquarters, after which he would call his team to parcel out the responsibilities. Each team member, in turn, would communicate with their external counterpart — the freight forwarders, the retail stores, the advertising agents — all the while keeping headquarters updated on every milestone. With Excel spreadsheets flying, everything was done manually — and this was early in 2020, right before the onset of the global pandemic.

This is complexity — a sprawling operation where anything can affect everything else. As a result, managers working in such a company need a lot of face-to-face meetings to coordinate and strategize.

Relying on a slew of meetings or exchanges across communication platforms — whether Zoom, Microsoft Teams, Slack, or email — to connect the dots among your team members quickly becomes overwhelming. Connecting the dots across the organization as a whole becomes nearly impossible. It's this sort of organizational complexity that prevents companies from optimizing remote work.

The solution: a modular and distributed organizational design.

How Microservices Power Modular Organization

A business that is separated into independent operations can be described as having a modular organizational structure. In the late 1970s, Tom Peters of McKinsey pronounced that we should move beyond the matrix organization, a structure he viewed as too slow-moving to cope with the accelerating pace of the business environment. In the 1990s, James Moore discussed the death of competition due to emerging ecosystems. More recently, Gary Hamel declared that bureaucracy needs to be eliminated to attain a more agile way of organizing. These influential thinkers all sensed the importance of reducing internal coordination.

Speed is an advantage. The pandemic rewarded companies that minimized the high cost of coordination. For instance, Qingdao-based Haier Group, one of the world's biggest home appliance manufacturers, had returned to full-capacity production within a month after the COVID-19 outbreak, mainly due to the company's widespread use of intelligent manufacturing and remote-working solutions.

But every fast-moving giant you see today has had a near-death experience at some point. They thrive only because they have simplified. They took pains to rebuild themselves from the ground up to avoid collapsing under the weight of their own complexity.

Amazon started in 1996 as a single-application entity. It ran a web server that talked to a database on the back end. Over time, the single-application entity sprawled into a monolithic architecture of a million lines of code. Observing that Amazon's application developers were in a constant struggle with the hardware server team, CEO Jeff Bezos instructed the developers to create some standard APIs for accessing and allocating computing resources.

Bezos was adamant about reducing coordination complexity. The new directive allowed for vastly fewer face-to-face meetings and emails. Instead, the big functional system — in this case, IT — was broken down into smaller service modules called microservices. Each microservice communicated with others

> Every fast-moving giant you see today has had a near-death experience at some point. They thrive only because they have simplified to avoid collapsing under the weight of their own complexity.

through the APIs. Because the format of the requests sent between app developers and IT operations was made consistent, routine coordination became automated.

The end result is that a small team of software programmers can now launch an additional feature on Amazon.com independently, in a way that's similar to how a small merchant runs a Facebook campaign. These sellers don't call up Facebook customer service to schedule a campaign by phone. It's all self-service, and the execution is automatic.

For the Amazon engineers, launching a new product offering is not so much like coordinating across departments. Rather, it's like assembling Lego bricks, mixing and matching capabilities for new offerings that fit the changing marketplace. That's the complex made simple.

Expanding Microservices Beyond IT

Amazon is turning its entire IT infrastructure into tens of thousands of microservices by standardizing the input and output of each function. These microservices can then exist as independent, decentralized modules that interact with other modules.

But the idea of microservices doesn't need to stay within IT. For years, Haier has organized itself as a swarm of self-managing business units.

Haier has some 4,000 microenterprises (MEs). Each one comprises just 10 to 15 employees and has full autonomy to deliver offerings to other MEs and, oftentimes, the final products to end consumers. Instead of being centrally orchestrated, these MEs independently interact with one another. Certain MEs provide services like HR or product design; others manufacture specific component parts. Coordination is managed through internal platforms in the cloud, as in an app store. Because each team is small and self-contained, an isolated failure won't cause global disruption.

Haier's Access Control Solution

Since the interfaces among these MEs are highly standardized, it's possible to automate information exchanges. One concrete example is the solution Haier developed for access control.

At a large business with many employees, people are constantly joining, leaving, and moving, which makes it difficult to control who has access to which enterprise applications. Under the framework of microservices, Haier designed its adaptive identity governance solution, which frees IT staff members from the repetitive manual tasks of authorizing and de-authorizing business users.

Instead, HR personnel can track all of an employee's access rights from a single platform and modify access with the push of a button. Because identity management is also centralized in one database, Haier enjoys substantial savings on maintenance costs. Individual departments no longer need to run their own management platforms. This centralization is an important feature. For microservices to be effective, data needs to reside in the cloud rather than on local servers. That way, there will be only one "true" version of the data.

Using Externally Created APIs

Smart companies also choose not to write up their own APIs every time and instead deploy some externally developed open source applications that can be found in the cloud. Examples of open repositories include Google Cloud APIs and OpenStack. These APIs are essentially software components that provide common services for cloud infrastructures.

With all of its internal microservices established, Haier found it easier to leverage the open APIs developed by others, including those initially designed by the financial sector. Today, an application developed by Singapore bank DBS is providing digital financing for distributors of Haier's products. Haier's sales and distribution channels are given extra support, and DBS gets the additional business.

Ping An was also an early adopter of financial API technology and has been using it since 2013. At first the company focused on automated retrieval of real-time balance information. Gradually but surely, however, Ping An evolved from being an API receiver into a producer. By 2018, Ping An's OneConnect fintech subsidiary had developed hundreds of interfaces, similar to what DBS had done.

From Remote Work to Business Growth

The urgency of remote work has underscored the advantage of modular organizations. Our research shows that companies that leverage microservices and APIs not only find themselves able to reduce complexity and manual coordination but are better suited to a geographically dispersed workforce that interacts asynchronously.

From a process perspective, executives must embrace these key principles in designing a remote-first organization.

Build a cloud-first operation. Executives may hesitate about bringing their company's valuable data into the cloud, and some view it merely as a tool to store more data efficiently. But a cloud-first operation serves as the basic infrastructure for becoming a modular organization.

Digitize critical business processes. Almost every company these days is in the process of digital transformation. No doubt this has been accelerated by the COVID-19 crisis, but digitizing business processes is necessary anyway. Only with widespread digitization can a company break up interdependent operations into small pieces, thus creating microservices, in an efficient manner.

Develop digital interfaces among microservices. While much focus goes into hiring top talent in areas such as data science

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and machine learning, it's also critical to build up API interfaces. The value of the API exchanges is massive, and no company can afford to ignore it. As the Haier example shows, once you acquire API development capability, you can further leverage other existing, open source APIs.

Embrace the strategic value of microservices beyond IT. The real power of microservices is in reducing coordination and communication costs throughout the organization. Look beyond the IT functions through the lens of broader business operations.

Complexity is independent of the size and scope of a company. Amazon, Apple, and Google are enormous organizations but are elegantly simple in their setups. Haier is an incumbent manufacturer with massive operations around the world, but its organizational setup is remarkably simple. Ping An is organized as a full stack of interdependent businesses with high autonomy.

Each of these modular businesses leverages a wide variety of microservices to create advantages. What was once an aspirational concept of organizational design is today an achievable reality, accelerated by a global crisis.

***Mark J. Greeven** is a professor of innovation and strategy at IMD Business School in Switzerland and the author of* Pioneers, Hidden Champions, Changemakers, and Underdogs *(MIT Press, 2019).* ***Howard Yu** is the author of* Leap: How to Thrive in a World Where Everything Can Be Copied *(PublicAffairs, 2018), the Lego Professor of Management and Innovation at IMD Business School in Switzerland, and director of IMD's Advanced Management Program.* ***Jialu Shan** is a research fellow at the Global Center for Digital Business Transformation, a joint initiative of IMD Business School and Cisco. Comment on this article at https://sloanreview.mit.edu/x/63109.*

[SKILLS DEVELOPMENT]

Workplace Hierarchies Matter in Skill Transformation

While new research suggests that workplace hierarchies can impede learning efforts, there are strategies to bolster the success of training initiatives.

BY KATHERINE C. KELLOGG

With the increasing availability of sophisticated analytics, AI, and robotics, corporate leaders are reconfiguring their workforces to meet changing technical demands. Indeed, by 2022, 54% of all employees will require significant upskilling, according to the World Economic Forum.

But leaders engaged in workforce transformation are running into unexpected roadblocks as they attempt to keep their employees' skills in sync with rapid digitization and automation. The introduction of new technologies into the workplace often upsets existing status hierarchies based on tenure, role, or expertise — factors that dictate the amount of respect, assumed competence, and deference an employee receives from others in the organization. Upsetting fundamental status hierarchies can impede learning, particularly when senior employees perceive that those junior to them are benefiting the most from a workforce transformation.

With co-researchers Jenna Myers from the MIT Sloan School of Management, Lindsay Gainer from Mass General Brigham, and professor Sara Singer from Stanford University School of Medicine, I studied corporate leaders' efforts to transform the technical skills of employees at five different primary care sites over the course of nearly two years. Frictions between digital natives at the junior level and their more senior coworkers initially led employees to struggle to pick up the skills they needed and slowed digital transformation efforts. When junior employees benefited more from transformation than did senior employees, this created backlash, especially among more senior employees who saw their status undermined. But at sites where leaders systematically attended to existing workplace hierarchies during skill transformation, employees were more successful in learning digital, critical thinking, and communication skills.

BRIAN STAUFFER/THEISPOT.COM

Our new study found that corporate leaders who are engaged in skill transformation need to be mindful of workplace hierarchies during three types of skill transformation: upskilling, reskilling, and "newskilling." Here's how.

At sites where leaders systematically attended to existing workplace hierarchies during skill transformation, employees were more successful in learning digital, critical thinking, and communication skills.

1. UPSKILLING. Upskilling initiatives target employees who need additional technical training to remain relevant and continue to deliver value. Leaders can personalize learning for these employees by providing peer-to-peer training in new technologies and related work processes.

Most leaders' first inclination is to choose as trainers those employees who seem best able to grasp new ways of working. Often, these employees are those who have grown up using digital technologies and are on the lower end of the organization's hierarchy — which can ultimately result in senior employees feeling slighted. This trainer-selection strategy might seem to be the most efficient, but it can in fact hinder learning.

Instead, leaders should create peer training programs that rotate both senior and junior employees through the role of trainer. While this may not seem to be the most efficient training method, the alternative is likely a recipe for failure.

2. RESKILLING. As sophisticated analytics, AI, and robotics automate many existing jobs, the workers who formerly did those jobs will need to learn entirely new skills rather than merely add to their current skill sets. Many employers are thus attempting to rapidly retrain employees to enter new roles such as technical customer support or IT support rather than trying to hire new talent in a tight labor market for technical skills.

We found that employees who have held their positions for many years — and have been well rewarded for their efforts — were more concerned about uncertainty around jobs, skills, and future qualifications than were employees who had recently joined the organization. The more junior-level employees often saw reskilling initiatives as opportunities to learn valuable technical skills while keeping their day jobs, rather than as a threat to their authority and control over key resources.

Leaders can more effectively accomplish reskilling when they speak to these different interests and concerns — security versus advancement — when selling employees on the training. Leaders may also need to emphasize to front-line managers how to handle such concerns while encouraging their front-line employees to stretch beyond their comfort zones in order to stay current and competitive in the job market.

3. NEWSKILLING. When corporate leaders adopt new technologies that automate various kinds of work, some jobs and tasks are eliminated while others emerge. Many new roles involve technologies that require considerable work to develop, implement, maintain, and change over time. For instance, digital marketing firms have introduced the role of search engine optimization manager, high-tech companies have introduced the role of data scientist, and professional services firms have introduced the role of AI translator to communicate the value of predictive analytics tools to various groups in the organization.

However, the introduction of new roles that help with technology development and implementation often requires a redesign of existing roles that more experienced employees currently fill. If experienced employees perceive new roles as threatening to the relevance of their hard-won expertise, their desire to maintain their high-status positions may outweigh their acceptance of role redesign.

Leaders can most effectively introduce new roles by establishing separate meeting spaces for supporters of change across status positions to develop new role expectations. Separate meeting spaces can play a critical role in facilitating the experimentation needed for role redesign. When defenders of the status quo are present, supporters of change are often uncomfortable trying out new tasks, discussing nontraditional ideas, or challenging the existing order for fear of retaliation, as defenders of the status quo may try to quash experimental efforts before they get off the ground. Spaces that allow for interaction among less-powerful group members, apart from everyday activities, can better support transformation by facilitating the questioning of traditional activities and the development of new ones.

By attending to existing workplace hierarchies during skill transformation, leaders can best ensure that their organizations and employees gain the skills they need to compete amidst rapid digitization and automation.

Katherine C. Kellogg *is the David J. McGrath Jr. Professor of Management and Innovation and a professor of business administration at the MIT Sloan School of Management. Comment on this article at https://sloanreview.mit.edu/x/63124.*

Reprint 63124. *For ordering information, see page 4.*

[RETAIL ANALYTICS]

Online Shoppers Don't Always Care About Faster Delivery

Analyzing online customer data may reveal that other delivery attributes matter more than how quickly an order is received.

BY PEDRO AMORIM AND NICOLE DEHORATIUS

The COVID-19 pandemic changed how we shop. Soon after the onset of the global pandemic, retailers reported a rapid shift from in-store to online purchases. Online buying accounted for 18% of worldwide retail sales in 2020, up from about half that in 2018. Grocery shoppers stampeded to the web: As of May 2020, 41% of U.S. online grocery shoppers were first-time users of such services. The expectation is that the online shift will persist well beyond the pandemic across most retail subsectors.

Adapting to these changes is no small feat, and doing so profitably — well, that's even harder. In response to the shift in consumer purchasing behavior since the beginning of the pandemic, many of the retail executives with whom we work are rethinking their existing omnichannel strategies. Our conversations with the e-commerce director of a leading European grocery retailer offered evidence of how difficult it is to shift operations to support the online shopper. This director was reexamining where to locate inventory and whether to own or outsource home-delivery capabilities in order to minimize the time between the placement of an online order and its receipt by the customer at home. Each of the proposed changes aimed at shortening the time between order and delivery was going to require investment. He wanted to make the appropriate choice.

We asked this director to question his long-held assumption that speed was the most important online delivery factor. How important is it for a customer to receive the goods fast? Isn't it plausible that some customers prioritize being able to choose the delivery day over speed, and that others might be willing to forgo speed in return for a precise delivery-time window?

Obtaining the answers to these questions is an essential first step toward designing the optimal delivery network for online orders. To succeed, this director needed to know more about customers' delivery preferences. Our research into retailers that offer attended home deliveries (in which a customer is present to receive their goods) suggests that focusing on speed alone may cause a company to overlook opportunities to acquire and retain online customers who prefer delivery attributes other than speed. In fact, we found that customers exhibit differences in their willingness to pay for delivery speed, delivery precision, and delivery day choice. Thus, retailers that can deliver not only on their product promise but also on the delivery attributes that matter most to customers have a competitive advantage. These are the retailers that will convert shoppers new to the channel into loyal, frequent customers.

Identifying Customer Preferences

Today's retailers have a tremendous amount of data that can yield important insights about customer preferences. To assess how online customers value different attributes, such as delivery speed, delivery precision, and delivery day choice, we analyzed the preferences of online customers of a grocery chain across hundreds of thousands of purchasing instances. For each instance, we knew what the customer ordered. More important, we knew the available home-delivery time slots that were shown to the customer and the time slot the customer selected.

By analyzing customers' choices, we discovered that online shoppers do not

JING JING TSONG/THEISPOT.COM

focus solely on speed. Instead, delivery attributes such as time slot precision (the duration of the delivery time window) and day choice (the availability of time slots across days of the week) also matter. In fact, we observed many situations in which customers preferred precision or flexibility over speed. We found that a customer is, on average, willing to wait 10.8 hours longer for a delivery if the delivery window is one hour shorter, and will wait an additional 7.5 hours longer if the delivery can be received on a preferred day of the week, all else being equal. The data also showed that customers tend to prefer to receive orders at the end of the week rather than on weekends.

Customer loyalty and basket sizes are also factors in shoppers' delivery preferences. We found that customers who exhibit different levels of loyalty to the retailer exhibit different delivery preferences. For example, repeat customers are willing to pay more for the same delivery attributes compared with other shoppers. Moreover, customers with very large baskets are willing to pay double the delivery fee to improve delivery-window precision by one hour. Leveraging customers' willingness to pay for the three core home delivery attributes of speed, precision, and day choice will require omnichannel retailers to consider preferences beyond simply delivery speed.

While these findings emerged from research we conducted in partnership with a grocery chain offering attended home delivery, they are likely applicable to other retailers offering that service, such as sellers of furniture, home goods, appliances, and other durable goods. However, the approach we developed for understanding the preferences of customers is relevant to any retailer rethinking its distribution networks. Amazon, Target, and Walmart are three among many assessing objectives other than solely speed and seeking to determine the "right" logistics needed

Online Shoppers Don't Always Care About Faster Delivery (Continued from page 13)

to tailor delivery to the customer — a more nuanced strategy.

Precision Instead of Speed

Executing a strategy dedicated to speed alone can be expensive, particularly for grocery retailers, whose margins are notoriously thin. Retailers competing on speed tend to redesign their networks to bring inventory closer to the customers. This entails using stores as fulfillment centers or acquiring additional warehouse space closer to consumers. Some retailers invest in automatic picking systems to reduce the time required to pick and pack orders, whereas others expand their delivery fleets to shorten routes and decrease transportation lead times. Alternatively, they may partner with delivery providers. Embedded in each of these approaches is the belief that delivery speed drives value.

These moves may indirectly enable the retailer to improve its delivery precision and offer customers more choice across delivery days. But there is a less costly option worth considering: analyzing operational data about delivery patterns. For example, retailers could improve their routing capabilities by capturing and utilizing data about typical traffic patterns or tracking service times at customer delivery points. Based on these analyses, retailers can offer more precise time slots to their delivery customers.

In addition, retailers using third-party logistics providers could review their contracts and use their operational data to negotiate delivery services that better meet customers' needs (such as requiring that they schedule services throughout the evening and weekend). These efforts are less expensive than those inventory and warehousing investments designed to improve mainly speed.

Committing to a speedy delivery seemed particularly important during the early COVID-19 lockdowns, when consumers were panic-buying. Nonetheless, many retailers were unable to offer consumers even a one-week delivery lead time, let alone a same-day option. This recent experience — and the popular press that accompanied these challenges — resulted in even more retailers focusing on speed as the crucial delivery attribute. We caution retailers, however, that this focus on speed may be too myopic once the pandemic ends. Why? As many consumers emerge from the pandemic, they will be more attuned to the trade-offs between speed and their availability to receive a delivery.

Interpreting Delivery Preferences

Instead of competing on delivery speed alone, retailers can assess the preferences of their customers and their corresponding willingness to pay for multiple delivery attributes, such as speed, precision, and flexibility. We have four recommendations for those who are in charge of designing their business's omnichannel strategy.

1. Invest in data and analytics infrastructure. This includes tools that collect and manage data on customer behavior, such as how they navigate through a site. It is also essential to track purchases across both online and offline channels. That, in turn, often requires changes in data management to give cross-functional teams access to data from both channels.

2. Collect and analyze customer-specific time-slot selection data. Retailers just beginning this effort can focus on basic descriptive analytics that highlight what attributes customers prefer, on average, given the options chosen by customers at the moment of checkout. More advanced teams can deploy discrete choice models, as we have done, to understand willingness-to-pay characteristics across customer segments and various order types.

3. Understand what delivery attributes drive loyalty and repeat purchases. This requires the retailer to have some capability in predictive analytics. Questions of interest include whether different customer segments prefer one delivery attribute over another.

4. Work across teams to roll out new delivery strategies. To capitalize on their newfound understanding of customer preferences, operations and marketing teams must collaborate closely. Operations can design the fulfillment strategy that best meets customers' needs. Marketing can promote the improved service and communicate how it differs from competitors' delivery options.

Retailers need to support this new data-driven approach to decision-making by hiring the right talent, including operating and marketing professionals who are analytic and strategic systems thinkers.

In our experience, businesses that were founded as online retailers find this easier to execute than legacy retailers do, but the shift is still possible. Successful retailers tend to have an analytical champion who is willing to develop the capability internally to build the data collection infrastructure and attract the needed talent.

Retailers spend an inordinate amount of time focusing on personalizing their product assortments to meet customers' needs. Focusing on meeting their delivery preferences could be the key differentiator in the extremely competitive retail business. Analytically minded retailers can craft delivery time slots that are unique to each customer based on revealed preferences. Based on our research, we strongly encourage retailers to rethink their operations to optimize not only on speed but also on the most appropriate combination of speed, precision, and flexibility.

Pedro Amorim *is an assistant professor of industrial engineering at Universidade do Porto and a cofounder of LTPlabs.* ***Nicole DeHoratius*** *is an adjunct professor of operations management at the University of Chicago Booth School of Business. Comment on this article at https://sloanreview.mit.edu/x/63120.*

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[EMERGING TECH]

The Digital Twin Opportunity

Developments in enabling technology are opening up more use cases for virtual models of real-world objects.

BY PUSHKAR P. APTE AND COSTAS J. SPANOS

Half a century ago, NASA's moon shot landed Neil Armstrong and Buzz Aldrin on the moon and set fire to our imaginations. Technology innovations from the program went on to seed entire industries, including microelectronics, software, and communications, which now form the backbone of our digital century. Another innovation was that NASA built and maintained a physical twin of the spacecraft on the ground so that it could troubleshoot problems without risk to the mission. This proved crucial during the troubled Apollo 13 mission and helped NASA bring the astronauts home safely. This basic concept has now evolved into the use of *digital twins*, or DTs — still twins, but built and maintained in the digital rather than physical realm. Fundamentally, a DT is a dynamic model of a physical system that enables fast and creative experimentation at very low cost and risk.

DTs have already been used in specialized, complex applications like observing and modeling the operation of an aircraft engine or manufacturing equipment. These initial DT deployments were tactical, mainly for data visualization and product life cycle management. But now, thanks to a confluence of technological advances, DTs are at an intriguing inflection point — transitioning from that specialized, tactical domain to becoming strategic tools with diverse applications.

Leaders now have an inspiring opportunity to harness DTs for today's moon shot: achieving business success while helping our planet and humanity. They can use DTs to strategize new cross-disciplinary opportunities and drive smart digital transformation. And they can use DTs to achieve aggressive sustainability goals and enhance the health and safety of their employees and communities.

How Digital Twins Are Advancing

What makes a DT special is that it is dynamic — it must always mirror the exact state of the physical system. This requires two key parts to work in tandem: a model describing the behavior of its physical twin, and sensors that provide the real-time "coupling" to the model. For example, a DT created to capture the occupant experience inside a building must reflect the temperature, humidity, air quality, and several other attributes of every room. Buildings, like all physical systems, are notoriously difficult to model because they change over time: Pipes rust, heating coils degrade, and beams weaken. Biological systems such as forests, fields, and humans change even more unpredictably. For aircraft or manufacturing operations, such changes are easier to

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The Digital Twin Opportunity
(Continued from page 15)

monitor with ubiquitous sensors, and the cost is justifiable due to the large capital investments already at stake. For most other systems, modeling and measurement have been difficult and unaffordable until recently.

What has changed is that multiple technologies have come of age and can now be combined in unique ways. The internet of things (IoT) has matured, so we have ever-cheaper sensors to measure many new physical parameters accurately. 5G communications networks allow wide-bandwidth data transmission at almost real-time speeds. Advances in augmented reality (AR) and virtual reality (VR) allow us to see a realistic 3D visualization, whether of a bridge, a building, or a human organ. Artificial intelligence (AI) and machine learning techniques help us model how a system functions and sometimes even predict how it might work in future scenarios. Coupling to real-time IoT data anchors these models in reality and transforms the DT into a powerful tool. Now we can do far more than just observe — we can diagnose, control, and sometimes even provide a prognosis for diverse physical systems. So how do we use this new capability?

Where DTs Can Help Target Strategic Priorities

At the Center for Information Technology Research in the Interest of Society (CITRIS) and the Banatao Institute, one of the University of California's research and innovation centers, we are working with partners in industry, government, and academia to develop accurate DTs for diverse applications such as buildings, mines, vehicles, renewable energy assets, dams, forests, and even human tissues and organs.

Based on our experience with Siemens, Komatsu, Kajima, Enel Foundation, Lam Research, SEMI, and the National Research Foundation of Singapore, we see three high-level priorities common among business leaders where there is strong potential for harnessing DTs: sustainability, smart innovation, and health and safety.

Sustainability. Sustainability is an increasingly high-priority strategy for many global corporations and organizations, and many have set aggressive goals to achieve carbon neutrality in the next 10 to 20 years. DTs can be invaluable in achieving these sustainability goals by helping to reduce energy consumption drastically and supporting more efficient development of green alternatives.

Buildings account for almost 40% of the world's energy consumption and a proportionate level of greenhouse gas emissions. In our work, we find that DTs can help lower the energy consumption in commercial buildings by almost half.

It is difficult to experiment on an actual building without disrupting operations, incurring much expense, and adding risk to the occupants. So as a pilot project through our partner program with the Berkeley Educational Alliance for Research in Singapore, we created and applied a DT to a primary school in Singapore, with the goal of minimizing energy consumption while ensuring a healthy and comfortable environment for the children. To create this DT, we developed a portable, easy-to-install sensor suite to measure the actual "state" of the building and coupled this with models based on AI and machine learning to visualize occupancy, air quality, lighting, and ventilation. We could then experiment safely and swiftly with the DT to find an optimal solution. This basic approach can be expanded to any building, and we are now working with Siemens on an advanced implementation.

We also find that DTs can benefit industries like construction, quarrying, and mining, whose basic operations generate greenhouse gases. We have shown that DTs can improve equipment efficiency and reduce emissions significantly. These innovations also help larger global sustainability goals, because ironically, even "green" alternatives require more mining — electric vehicle batteries need lithium, high-efficiency electric motors need rare earth elements, solar panels need aluminum, and so forth.

Smart innovation. Much current innovation focuses on adding "intelligence" to things: Cars, homes, energy, agriculture, infrastructure, and cities, for instance, are all being made "smart." DTs can support the innovation necessary for this digital transformation to smart systems.

For example, we have created DTs to make wind turbines smart by combining fiber-optic sensing techniques with AI and machine learning models. By measuring and modeling every detail of the turbine, we created a DT that reflects the turbine's state at all times. It even predicts when a specific bolt, out of thousands that secure the turbine, is coming loose. This reduces maintenance costs, prevents catastrophic failure, and enhances the reliability of renewable energy. Using similar innovations in sensing and modeling, we are adding smarts to dams so that they can warn of an imminent breach, and to roads so that they can help traffic flow more smoothly. Our DTs for smart agriculture use aerial drones and ground-based agricultural robots to determine the exact requirements of each plant or tree. This ensures the precise delivery of water, fertilizer, and pesticides, with minimal waste. These DT-driven innovations enhance food security and also mitigate the water crisis in drought-prone regions like California.

Health and safety. The pandemic shone a spotlight on remote health care as telehealth visits increased dramatically. This trend will likely endure for reasons of safety and convenience — and in remote locations, where local medical expertise may be limited. However, the quality of a telehealth visit must improve beyond basic audio or video. In two large pilot programs for underserved rural communities, we are exploring real-time sensors to monitor patients, AI to analyze patient data, and AR/VR for better visualization. These DT elements provide physicians with timely data and fast analytical tools so that they can diagnose and treat illnesses quickly.

DTs can also improve workplace safety. We have shown that they can accurately model and predict the spread of viral pathogens through droplets inside chip production environments. These clean rooms are vital to the $3 trillion electronics ecosystem, and any shutdowns can result in the loss of billions of dollars. The DTs guide facility managers to develop safer practices for workers to operate productively while minimizing the risk of infection.

Best Practices for Implementing DTs

DTs have exciting potential but are challenging to implement because they integrate multiple technology platforms and require significant funding, talent, and expertise. If these technology and organizational elements are not planned and executed effectively, DT projects can end in frustration and disappointment. To help leaders and teams succeed, we offer four succinct recommendations for increasing the probability of success in DT projects.

1. Inspire with a clear goal and solid business case. We find it critical to start with a well-articulated goal that inspires people and translates into an actionable business case for a DT project. For example, in our smart-buildings project, we motivated a global cross-disciplinary team of 200 researchers with a simple but compelling goal: *to reduce building energy consumption by half without compromising its performance*. Translating this into a business case was straightforward, because these energy savings correlate directly with cost savings and a reduction in emissions.

2. Blend physics and AI optimally when designing a DT model. Both AI-based models and physical models have limitations. AI models depend on large amounts of data, and it's not always possible to collect or generate enough for the level of accuracy required. Further, such models lack physical insight. An autonomous car does not "understand" that it is in hilly San Francisco and not flat Dallas — and an AI model may not know what it does not know, which could lead to a catastrophic accident. Meanwhile, pure physics-based models offer great intuitive insight but are limited by what we can measure.

We have determined that a hybrid approach blending physics and AI works best, because it leverages the best of both worlds and overcomes the limitations of each. In our quarrying DT, we use AI to model the autonomous operation of an earthmover but blend it with a physical model of the soil and rocks it is digging. Similarly, for our health DT, we use the technology to model a dexterous robotic hand but blend it with physical models of the skin and tissue it is operating upon.

3. Build cross-disciplinary expertise. Cross-disciplinary opportunities require synergy between technology platforms and application domains. Experts in health, agriculture, mining, and construction must work with AI, IoT, software, and hardware professionals. This is easier said than done, given that any single organization may not have all of this expertise. Leaders must be proactive in forging thoughtful partnerships to ensure that their teams have the right talent mix of technology and domain knowledge.

4. Drive a data strategy from the top down. DTs live or die by the relevance and accuracy of the data being measured and modeled. Data acquisition is often at least as much a business challenge as it is a technical one and cannot be an afterthought. Leaders must ensure that there is a top-down strategy to provide access to the right data, and to guarantee its quality, provenance, and security.

FROM THEIR EARLIER applications in the tactical monitoring of specialized machinery, DTs are now becoming strategic tools for diverse applications because they can increasingly diagnose, control, and even predict the behavior of complex physical systems. The time is ripe for business leaders to consider how they can harness DTs to pursue new growth opportunities. DTs are particularly useful in exploring strategic cross-disciplinary opportunities, where it is risky to experiment on the real thing, whether it is a building, an earthmover, or a person. Especially exciting is the potential to use DTs to create business value while also meeting sustainability targets and improving people's lives.

What if we could stop the next pandemic in its tracks? What if we could cut global energy consumption and greenhouse gas emissions by a third? What if pediatricians could better treat ill or injured children in remote rural clinics? DTs may be able to help us address such grand challenges successfully.

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[MANAGING TECHNOLOGY]

How In-Store Tech Will Transform Retail

Automation and sensors promise a better customer experience — and fuel for improved analytics.

BY SELENA ZHU, MAXIME C. COHEN, AND SAIBAL RAY

Retail stores are being challenged like never before. Not only are consumers buying more goods online (a trend accelerated by the pandemic), but digital-first companies like Amazon are attacking brick-and-mortar retailers' home turf by opening their own physical stores that combine online and offline attributes. To stay competitive, traditional retailers need to consider how adopting digital technology can improve the in-store customer experience, provide access to more data on customer preferences and habits, and potentially improve omnichannel operations.

The so-called frictionless store has become the new gold standard in the retail world. However, the term is a bit of a misnomer. The goal is to use digital technology to meet consumer expectations of flexibility, instant gratification, convenience, immersive shopping, safety, and speed. But early adopters aren't removing all points of friction. Rather, their strategies vary substantially depending on which friction points they want to remove.

Adopting digital technologies that remove friction from the traditional retail model can produce several advantages. The first is an improved customer experience. Customers today expect the same speed and convenience in person that they get online. Stores that can deliver that experience will strengthen customer loyalty, making them more competitive with online sellers and creating an advantage over physical retail competitors that don't offer comparable speed and convenience. The pandemic, which forced social distancing, also led customers to expect more space and less physical contact in stores.

Second, digitizing gives retailers a chance to collect and analyze more — and more granular — data on customer preferences and behavior, leveling the playing field with online sellers and enabling personalized recommendations and promotions. In addition, physical retailers can capture what customers do in stores: the paths they traverse, which products they pick up and put back down, and even how long they hesitate while trying to choose between two products. Stores can use this data to improve operations, including inventory management, pricing, and physical product placement.

Finally, stores can make better use of human capital: By automating routine work like stocking shelves, companies free their employees to do the higher-value work of helping customers. This human touch can provide a competitive advantage over e-commerce.

However, the frictionless store is not without potential pitfalls and risks. Privacy is among the biggest. Consumers are concerned about how retailers might track them, as well as how much and what kind of data companies collect. A data breach, a regulatory fine, or even headlines about a company using data improperly can significantly damage a company's reputation. Similar reputational damage might come if automation displaces large numbers of a retailer's employees. Finally, adopting and deploying digital technology is expensive and time-consuming, and it won't necessarily work as promised. Time and cost can be significant barriers, especially for midsize and small companies.

At the least, large retailers need to consider frictionless stores simply as a defensive strategy — to protect against encroaching competition from digital natives. The pandemic highlighted the advantages of online shopping and accelerated its adoption while decimating foot traffic and physical sales in retail stores. While retailers may be drawn to the benefits listed above, the most compelling reason to adopt these technologies may be to help them hold their own against new competitors.

ALEX NABAUM/THEISPOT.COM

The Industry Landscape of Frictionless Retail

The earliest implementers of frictionless stores are Chinese and U.S. retail giants, specifically Alibaba and JD.com (China) and Amazon and Walmart (United States). They aim to improve the customer experience in significant ways but also have strategic objectives to improve the operation of the business.

- In 2015, Alibaba introduced Hema in China. The strategic goal is to integrate digital, online operations with physical stores. Hema stores serve as both physical supermarkets where people can shop and online order fulfillment centers. Hema promises to deliver online orders within 30 minutes within a radius of 3 kilometers.
- In 2018, Amazon introduced Amazon Go, which uses a cashierless grab-and-go model, in Seattle. The company's strategy enables it to gather data on its Amazon Prime members' physical shopping activities while making shopping experiences quick and easy for them. Amazon expanded the concept with Amazon Go Grocery in February 2020.
- In 2018, JD.com launched its frictionless grocery store, 7Fresh, in China. Similar to Hema, 7Fresh stores operate as both physical supermarkets and online order distribution centers and pledge to deliver online orders within 30 minutes.
- In 2019, Walmart created a 50,000-square-foot store in Levittown, New York, that serves as a retail innovation lab. Walmart's strategy is to improve inventory management and product freshness.

Each of these companies uses technology in different ways, depending on its specific goals. Amazon Go, for example, uses what the company calls "sensor fusion" — a combination of overhead cameras, lidar, RFID (radio-frequency identification), and shelf-weight sensors — to identify customers through their body positioning and detect the products customers pick up and put down. Customers enter the store using a QR code from a mobile phone app, grab their goods (while being tracked), and just walk out. The items are automatically charged to their Amazon Prime accounts.

In contrast, Alibaba's Hema focuses on ultrafast order fulfillment and delivery. It does not use cameras or sensors. Customers place orders from their mobile phones, and then store associates pick and pack orders in shopping bags traveling on overhead conveyor belts. Scooter drivers pick up the bags and deliver them to customers.

Three Key Strategic Considerations

Frictionless retail is poised to become more widespread. CB Insights recently reported that funding for in-store technology quadrupled from the first quarter of 2020 to the first quarter of 2021, reaching $2.2 billion. But for these investments to pay off, retailers' strategies must be tuned to their particular business goals. Grab and go might work well in convenience stores. Luxury stores might use augmented reality to show clients how they would look in a custom suit, but high-touch personal service will remain key to their value proposition.

Here are three important questions retail executives should consider when developing a plan to adopt in-store technology.

1. What do you most want to accomplish? A retailer can reduce friction in any number of areas to increase customer convenience, improve back-end operations, integrate online and physical operations, or collect more data. It's crucial to know which is the primary goal, however. You can have secondary objectives, but be crystal clear about which one is most important. A driving priority is critical because it determines the type of technology to use, how to deploy it, and the return on investment to expect.

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Robert W. Holland Jr.

How In-Store Tech Will Transform Retail (Continued from page 19)

For example, Walmart's goal is to improve inventory management, reducing instances when an item is out of stock or a food item remains on the shelf beyond its freshness date. That focus determined its choice of cameras, sensors, and algorithms. It's more interested in the "grab" than the "go." It reportedly has no plans to change its checkout processes.

While none of the early adopters has emphasized it, another potential objective of adopting frictionless in-store technology is reducing or eliminating theft, which costs U.S. retailers more than $13 billion annually. That can be accomplished by requiring customers to identify themselves via a payment method or their personal account in order to gain entry; subsequently, tracking technologies can record which products they leave with and charge them accordingly.

2. Which technology will you use, and how will you source it? Your strategic goal determines the technology required and how it will be deployed. Amazon Go uses overhead cameras and sensors that sense weight on shelves so that it can track where customers go and what products they select (and put back). Walmart also uses cameras and shelf sensors but deploys them differently to achieve its goal of improved restocking. Companies that use stores as mini warehouses, like Hema and 7Fresh, do not use cameras and sensors. Rather, they use overhead conveyor belts, people, and scooters. The Chinese stores also deploy several technologies aimed at improving the in-store physical shopping experience. For example, interactive displays show customers detailed product information, like country of origin or ingredients — similar to the information available when shopping online. Some stores have autonomous carts that follow customers as they shop and automatically scan product bar codes as items are added.

Most deployments require significant investment, both in the technologies themselves and in the infrastructure to support them. This makes the decision of whether to build or buy key. There are several prepackaged, integrated systems available from third parties. In fact, in 2020 Amazon announced plans to launch a new business selling Amazon Go's technology to other retailers. Other tech players and startups include Standard Cognition, V7 Labs, and AiFi.

3. How will you address concerns about personal data? Some consumers are alarmed at the level of in-store personal surveillance that some retailers are implementing. Facial recognition is the most controversial technology. In the U.S., Amazon Go stores do not use facial recognition, but in China, certain Hema and 7Fresh stores accept payment based on facial recognition technology. A camera scans a shopper's face, matching it to and charging a registered account. The shopper confirms their identity by entering their mobile phone number. Even with no facial recognition, frictionless stores collect vast amounts of data, which can introduce a certain "creepiness" factor. How comfortable will people be as cameras track them moving throughout the store, record "dwell time" — that is, how much time they spend in each section of the store — and collect information on exactly what they picked up or looked at? Retailers can use such data to construct behavioral metrics such as customer attention, distraction, engagement with products, and movement throughout the store.

Consumers worry about how that data is used, and regulators are increasingly stepping in: Europe's General Data Protection Regulation has led a general trend toward better protection of customer data, such as the California Consumer Privacy Act. However, retailers should not only make sure they comply with pertinent regulations but also be transparent with customers about what data they collect and how they use it.

McGill University, where two of us teach, studies such issues at its Retail Innovation Lab, launched in January 2021 as a partnership between the university's Bensadoun School of Retail Management and Alimentation Couche-Tard (Circle K), one of the largest convenience store chains in the world. The goal of the lab — which is a real-world, fully operating frictionless store — is to investigate how to use various frictionless technologies for responsible innovation. We study how retailers can use data to make better operational decisions, and we are looking at ways to balance that data use against privacy concerns. For example, we are experimenting with how to aggregate anonymized data in ways that characterize certain shopper "personas," which would protect personal data and yet be useful to retailers.

FRICTIONLESS STORES ARE still nascent, but we expect the concept to infiltrate the retail world at a daunting pace, as tech giants like Amazon and Alibaba continue to invest in it heavily. Physical retailers will need to meet rising consumer expectations for convenience and speed while collecting and analyzing more data in more useful ways. That doesn't mean their strategies should duplicate Amazon's or Alibaba's. It does mean that each retailer must figure out how to use technology to eliminate the friction points that matter most to its customers and its own bottom line.

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MANY BUSINESSES ARE SEEKING to be better corporate citizens by reducing their environmental impact and improving conditions for workers. While activist consumers have played a role in pushing companies to make positive changes, visionary leaders are themselves considering the growth opportunities that can come from pursuing such agendas.

Executing a business strategy that results in less damage to the environment and is equitable for all stakeholders doesn't have to mean sacrificing margins, say Marco Bertini, John Pineda, Amadeus Petzke, and Jean-Manuel Izaret. They argue that more creative thinking about both pricing mechanisms and cost mitigation can allow a company to do well by doing good.

Supply chain scholars Tim Kraft and Yanchong Zheng see efforts to improve transparency in the supply chain — and root out bad suppliers with poor environmental or labor practices — as a way for companies to stand out from competitors and appeal to customers who prefer to buy from socially responsible businesses. A particularly murky area of the supply chain is unauthorized subcontracting, but myth-busting research by Felipe Caro, Leonard Lane, and Anna Sáez de Tejada Cuenca demonstrates the power of analytics to predict — and curtail — this problem.

Finally, while some are pessimistic about the prospects for large-scale decarbonization of sectors such as industrial heat and heavy transport, Amory Lovins presents an alternative view: He sees a disruptive transformation on the horizon, in which new competitors will seize on the shift away from fossil fuels to renewable electricty to develop new business models — and bring us closer to the promise of a net-zero 2050.

— Elizabeth Heichler

SUSTAIN STRAT

SPECIAL REPORT

ABILITY EGIES

CREATING VALUE WHILE DOING RIGHT BY PEOPLE AND THE PLANET

Can We Afford Sustainable Business?

Taking a creative approach to pricing can benefit society, the environment — and your company.

BY MARCO BERTINI, JOHN PINEDA, AMADEUS PETZKE, AND JEAN-MANUEL IZARET

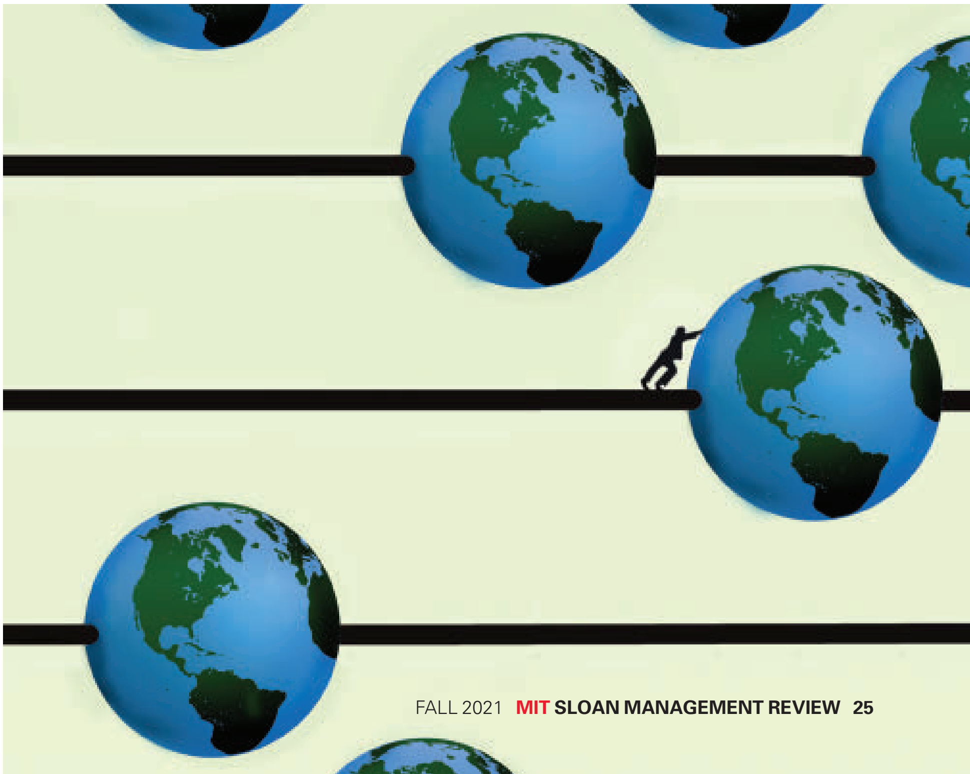
"How are we going to pay for this?"

In that question lies the conundrum faced by the growing ranks of corporate leaders who recognize that business must, at the very least, stop contributing to the most urgent problems facing humanity and ought to, at best, help solve them. In mission statements and strategic plans, many companies are making commitments to improving sustainability and reducing inequity — but when it comes to meeting those goals, they are tripped up by the financial implications.

In reality, we have no shortage of ideas on how to provide greater and more equitable access to goods and services, use them conscientiously and more effectively, and leave the least amount of waste behind. But we are frequently held back in implementing those ideas because of the presumption that any sustainability initiative invariably leads to higher costs, higher taxes, higher fiscal deficits, and, ultimately, higher prices. "How are we going to pay for this?" becomes a killer question seemingly designed to stifle progress.

Overlooked in the debate, however, is one factor that unnecessarily limits the scope that leaders in all spheres — whether business, politics, or nonprofit — need to implement solutions that can scale to meaningful impact.

That factor is the price mechanism. We contend that it's possible to find creative solutions that rally all market actors around responsible behaviors that mitigate the negative externalities of commerce *before* businesses tally them up and price them in. In one sense, we argue that organizations act more as caretakers of markets than as simple producers, using the incentives and information embedded in the price mechanism to allocate the responsibility for broader and fairer access, for conscientious and effective consumption, and for handling waste more efficiently.



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At the root of the problem is the premise that the only way companies can ease the burden of commerce on our society is to account for it properly and find someone to foot the bill. This premise corners businesses into what we call a *taboo trade-off*. A company can try to pass the incremental cost of environmentally or socially responsible practices onto customers, but they may not be willing or able to pay it and thus flee to cheaper competitors or leave the market entirely. Alternatively, the company can absorb this cost by sacrificing margin, cutting corners on quality, or making the supply chain "sweat" until the economics work out. In each case, the financial or reputational risk is such that the organization often sees "Do nothing" as the pragmatic solution. It dodges the trade-off instead of addressing it.

This conundrum is particularly frustrating for leaders who are committed to driving change. Emmanuel Faber led France's Danone for over six years and was widely seen as a prominent advocate for a more responsible capitalism that serves not only shareholders but also the environment, employees, and suppliers.[1] But in March 2021, Faber lost his job as chairman and CEO after activist shareholders voiced their displeasure with Danone's financial performance, strategy, and governance.

The dismissal of someone like Faber reflects an undercurrent of skepticism that still simmers behind the scenes at purpose-oriented businesses. One CEO of a European multinational reportedly said that if he made his company's environmental policy greener, "my profit margin would fall 3% per year, my stock price would fall 15%, and I would get fired."[2] Indeed, a recent study indicates that CEOs who enact greener or more sustainable policies are significantly more likely to get fired for poor performance than CEOs who do not.[3]

Capitalizing on Degrees of Freedom

The good news is that leaders have far more leeway with the price mechanism than they realize. This quickly becomes apparent when they stop thinking that "How are we going to pay for this?" is the only question and "Price in the externalities" is its only answer. In fact, every price decision builds on the answers to three basic questions:

- *What* are customers paying for?
- *Who* is going to pay?
- *When* and *how* do we transact?

Most businesses take these questions for granted and believe the answers to be moot and immutable. However, rejecting that assumption and thinking more expansively about what, who, when, and how can lead to innovative solutions.

Rethinking *what* customers pay for matters because it determines the extent to which organizations generate revenue by delivering outcomes that customers desire rather than providing them with inputs (products and services). The traditional "make and sell" approach can put a financial and physical strain on access, because it forces customers to find a solution and purchase it outright. This approach neither motivates customers to think responsibly about consumption nor guarantees that they will be satisfied with the purchase. Finally, "make and sell" transfers ownership — and therefore the burden of disposal — from suppliers to customers who may not have the drive or expertise to dispose of goods responsibly.

Today, a host of novel commercial arrangements — such as subscriptions and memberships, pay-as-you-go models, collaborative consumption, revenue-sharing agreements, and performance-based contracting — can address these challenges without transferring ownership. Each of these

> Leaders have more leeway with the price mechanism than they realize — if they stop thinking that "How are we going to pay for this?" is the only question and "Price in the externalities" is its only answer.

alternatives can ease the access problem inherent in traditional transactions, because companies earn their revenue only when they provide customers with direct, unencumbered access to their offerings. Similarly, pay-as-you-go and sharing approaches encourage sensible consumption because customers pay at each consumption episode, and performance-based contracts ensure that companies get paid only when they deliver value, not when they promise it.

As they consider *who* pays, business leaders need to question whether it makes sense for all customers to pay the same price, or even to pay at all. This may seem potentially unfair. But whenever universal access is the target in a sector, businesses should consider varying prices based on people's ability or willingness to pay or, in the case of third-party payers, the value that an individual end user derives.

In certain situations, companies might think in terms of interconnected currencies such that customers might pay to satisfy their own basic needs in something other than money. One example is subsidizing the purchase of water filters in order to eliminate the need to boil water on wood fires to make it potable. The reduction in carbon emissions resulting from the decreased use of wood fires has a monetary value on the carbon market, and this can be used to fund the enterprise.[4] The key here is to ensure that the behavior tied to the intermediate currency (such as fewer wood fires) aligns with the benefit pursued by the user (such as access to clean water). Otherwise, focusing on the former to generate revenue can distract from achieving the latter, which is in fact the primary goal.

Likewise, in some sectors, certain behaviors are clearly desirable from a social or environmental perspective, such as purchasing soon-to-expire food to avoid waste or participating in physical activity to improve one's health. In those cases, businesses should consider varying prices not based on customers' ability or willingness to pay, but based on their readiness to act responsibly.

Companies should likewise reconsider *when* and *how* to collect payment. They can turn to micropayments to allow more granular access. If reasonable, they can also defer payments to ease the financial burden on customers or, importantly, to better align the timing of costs and benefits. Finally, one can think creatively about payment as an opportunity to engage people. For example, to fight against low donation rates in 2014, the relief organization Misereor deployed interactive billboards that enabled bystanders to offer 2 euros by swiping their credit cards over the screen. True to its principle of "playful, not pitiful," Misereor deployed technology such that the swipe activated an engaging interactive sequence depicting the credit card slicing a piece of bread to feed the hungry or freeing an imprisoned child.[5]

In the rest of this article, we show how a broader, more creative take on these three questions can alleviate the taboo trade-off and accelerate progress.

Scaling Solar Energy

The battle to mitigate the effects of climate change is widely seen as a race against time. This urgency was recognized by the 196 countries that signed on to the 2015 Paris Agreement, which committed to reaching zero carbon emissions by 2050.[6] Conducting business as usual will doom those efforts.

Making progress against this ticking clock requires a multitude of solutions aimed at improving equitable access to renewable energy sources, combined with more conscientious consumption. The circumstances and challenges vary greatly from market to market, but one common denominator is that traditional views on the price mechanism create a taboo trade-off that hinders the adoption of cleaner solutions. How can the energy sector transition from a profitable carbon-based market to one that is equally profitable but greener?

One of the biggest obstacles inhibiting the adoption of solar energy among households is the upfront investment required to install solar panels. In developed countries, a residential installation can cost tens of thousands of dollars, even though the price per watt for photovoltaic (PV) panels dropped by almost 80% between 2010 and 2020. After making this investment, homeowners must wait many years to break even and start to enjoy the financial benefits that solar energy provides. The discrepancy between the timing of payments and onset of cost savings is so large that no reasonable price concession can bridge it satisfactorily.

However, opportunities emerged when the suppliers of solar energy solutions reexamined the three core questions.

• **What are customers paying for?** Simply put, households want to pay for cleaner energy rather than the inputs to access that energy. Recognizing this, pioneering companies Sunrun and SolarCity (now known as Tesla Energy) began offering customers a power purchase agreement (PPA). Instead of selling panels or establishing a fixed set of loan payments, they sold customers the energy output from the panels installed on their roofs, reflected as a discount to their utility rates. They also guaranteed the system output for 20 to 30 years. This change of focus, from panel sales to the provision of clean energy, enabled PV manufacturers to offer an alternative to the traditional approach predicated on a large upfront payment.

• **Who is going to pay?** Homeowners still pay for energy, but, to a large extent, the U.S. federal government has also paid large amounts of money for the installation of solar panels, through a mixture of subsidies and tax credits. Another alternative to outright purchase, leasing, lessens the need for these extensive government payments as a means to bring down the large upfront cost and create a purchase incentive. Ideally, this shift can take the government (and its taxpayers) out of the equation entirely and change the "who" to the homeowners themselves.

• **When and how do we transact?** Let's assume that the upfront cost of a PV installation by Sunrun in the U.S. is $21,000, before tax benefits.[7] The majority of homeowners are still opting to pay for or finance that expense and draw the "free" solar energy. But around 35% of homeowners now opt to enter into a PPA, which eliminates this upfront expense in exchange for a guaranteed energy supply from day one at monthly payments below prevailing market rates. This agreement creates a dependable revenue stream for the supplier and also offers consumers an appealing alternative to paying or financing a significant upfront cost.

Combined with the overall decline in PV prices, the introduction of PPAs alongside traditional leasing agreements helped fuel exponential growth in the solar market. Take California as an example. Installed capacity increased from 163 megawatts (MW) in 2010 to 1,950 MW in 2015. Leasing accounted for 63% of the installations in 2015, versus just 10% in 2010.[8] For comparison, leasing historically accounts for around 30% of new car registrations in the U.S. each year.

It is interesting to note that the market for direct purchases grew impressively as well in the same period, from 147 MW to 720 MW. In other words, the lower prices for PV panels would have naturally driven growth.[9] The lesson is that products can become even more accessible — and progress toward ambitious environmental, social, and governance goals can be achieved even faster — when companies are willing to reconsider preconceived notions about their prices.

The problem of energy access is universal. In sub-Saharan African countries, it can be prohibitively expensive to extend existing grids to serve remote populations. This includes 22 million displaced people in the region who lack access to electricity. Solar home kits have therefore become an attractive alternative, because they can help most families meet their basic power needs and avoid relying on diesel generators (or going without power). The upfront retail cost of a basic solar home kit is around $180, but that is a large expense for a family that might earn $1 to $2 per day.[10] What has accelerated adoption of the kits is an approach similar to the one used by telcos: a deposit combined with a pay-as-you-go charge. Most people use their cellphones to make the micropayments directly. The overall benefits of the solar home kits are numerous, ranging from less pollution and greater safety to freeing up time for education or work. They also offer a more reliable source of energy, not only because of the abundant sunshine, but also because diesel fuel or other energy sources are subject to disruption.

Lifesaving Treatment for All

The hepatitis C virus (HCV) currently afflicts over 70 million people worldwide. It is a leading cause of cirrhosis and liver cancer; a Centers for Disease Control and Prevention study found that in 2013, it killed more people in the U.S. than the next 60 infectious diseases combined, including HIV and tuberculosis.[11]

What makes disease management challenging is the wide range of symptoms and the respective costs to treat them. It may cost only a few hundred dollars to treat patients with mild symptoms, whereas treatment costs can run as high as $300,000 for the roughly 10% of patients who require a liver transplant.

> Gilead and the state of Louisiana brought new thinking to the price mechanism for a hepatitis C treatment, resolving the taboo trade-off by rethinking what customers pay for, and how they transact.

This reality presented Gilead Sciences, maker of breakthrough HCV therapy Sovaldi, with a significant taboo trade-off. By curing an otherwise chronic disease in just 12 weeks, Sovaldi literally provides a lifetime benefit to patients. But the industry's standard pricing approach — which is to charge a price per treatment at the time of care — makes it prohibitively expensive to treat patients with mild symptoms. At a price tag well north of $50,000 for that 12-week course, Sovaldi makes economic sense only for that small minority of patients with severe complications.

A lower price point would broaden access and hasten the World Health Organization's goal of reducing deaths due to HCV by 65% by 2030.[12] But it would also make the cure far less profitable, creating a quandary for leaders in biopharma companies who have a mandate to recover substantial investments in R&D and yield returns to investors.

A novel approach to the price mechanism offered the health care ecosystem a way to resolve the taboo trade-off. Gilead worked with the state of Louisiana to rethink two of the fundamental questions outlined above:

- **What are customers paying for?** Instead of paying to treat only the most affected patients on the standard per-dose or per-therapy basis, health insurance payers could pay "per population cured." This would allow for a spreading out of total benefits at the population level, regardless of the extent of any individual's symptoms at the time of treatment.
- **When and how do we transact?** The payments are spread out over multiple years, rather than being due when treatment is administered, to better match the timing of the lifetime benefits to patients. This also benefits the Louisiana Medicaid system, which pays for fewer liver transplants and other expensive interventions. This approach allows funding to reach all patients where there is a clear clinical and economic rationale.

Spreading payments over time and benefits across the population yields better economics for all. This arrangement is aptly nicknamed the Netflix model, because it resembles a subscription to a streaming service. The buyer pays a fixed price for access to a catalog of content, rather than paying potentially much more for individual content streams a la carte. This model is similar to the concept of software vendors' enterprise license agreements, under which an entire population of employees gains access to a software catalog. The supplier secures a constant revenue stream and serves many more users than it would on a case-by-case basis. The buyer secures value over time for the entire population in a way that allows everyone to benefit, regardless of their consumption level.

In 2019, Louisiana paid a subsidiary of Gilead a lump sum in exchange for as much of its HCV regimen as warranted to treat patients in its Medicaid program and correction facilities through 2024.[13] The exact terms of the deal are not known, but the amount is estimated to be significantly less than the aggregate sum that would have been necessary to treat all HCV patients at the ongoing per-therapy price. If we assume roughly $35 million per year for the minimum 31,000 HCV patients mentioned in the news release, that amounts to about $1,130 per patient per year for population-level coverage, or approximately $5,600 per patient over the five years of the contract.[14] Later in 2019, the state of Washington entered into a similar deal with the drugmaker AbbVie.[15]

There is some skepticism about the willingness of different players in the health care ecosystem to come to the table on this type of arrangement versus the more familiar pay-per-treatment one. But several new trends are helping all parties become accustomed to aligning prices with the timing of value delivery in a way that boosts efficiency. These trends include the increasing adoption of quality-adjusted life years as a generic measure of disease burden and a means to price treatments based on health outcomes, as evidenced by Roche's recent efforts on personalized reimbursement models.[16]

Driving Efficiency in Education

The cost of higher education in the U.S. is increasingly untenable for both students whose financial futures are hostage to crippling levels of debt and to the federal government, which backs over 90% of the more than $1.7 trillion in outstanding student loans.[17] At issue is how to prevent that pile of debt from rising further and, more broadly, how to ensure that spending on higher education actually leads to desired outcomes such as learning and employment.

One solution addresses the "who" and the "when and how" questions, and in some cases the "what" question as well. Known as an income-share agreement (ISA), the arrangement calls for the student to pay the educational institution only when they are earning an annual salary above a certain threshold. The payment is a percentage of their income until the tuition is paid in full. The difference between an ISA and a conventional loan is that there is no interest rate, nor are any payments required if the student remains unemployed or earns wages below the threshold. These programs may appeal to students in one- or two-year skill-certificate programs, but major universities such as Purdue have also launched ISA programs.[18]

The state of Tennessee has turned the principle of the ISA into a comprehensive program under the umbrella Drive to 55. The "55" refers to the target of having 55% of residents possess a college degree or technical certification by 2025. The program includes the Tennessee Promise, which offers scholarships for qualifying students to attend selected colleges or technical schools for free, and Tennessee Reconnect, which allows adults without a degree or certification to complete one at no out-of-pocket cost. The difference between the Tennessee programs and an ISA is that there is no repayment plan at all.

The program has worked for several years because it aligns the incentives for all parties. Students gain access to an education, while the state derives a return on its investment by creating taxpayers and also making the state more attractive to companies that need a large pool of workers with 21st-century skills. The state also gains because the Tennessee Promise program requires students to fulfill a community service commitment.

Closing the Loop in Fashion

If the fashion industry were a country, it would be the fourth-worst emitter of greenhouse gases in the world, trailing only China, the U.S., and India.[19] One estimate shows that players in the sector consume more energy than aviation and shipping combined.[20] At the same time, the dependence on cotton — and thus the corresponding dependence on irrigation and agrichemicals — has had considerable environmental impact: It can take as much as 2,700 liters of water to make one cotton T-shirt.[21] Even then, each American on average throws away 80 pounds of textiles every year, which adds up to around 12.8 million tons of trash.[22]

Consider a pair of "fast fashion" jeans that retails for, say, 40 euros (roughly $50). The Impact Institute estimates the "true price" of these jeans, or the sticker price factoring in the cost to society and the environment of bringing the product to market, at 73 euros (around $90).[23]

The taboo trade-off here is clear. On the one hand, consumers are likely to balk at paying almost twice as much for something intended to last one

> Income-share agreements are one solution to the crisis of higher education cost and student debt that addresses the "who" and the "when and how" questions, and in some cases the "what" question as well.

> Companies are taking creative steps to reduce the waste inherent in the fashion pipeline. One way is to promote reusing or recycling clothes instead of trashing them, as a means to close the loop.

or two seasons. On the other hand, most producers and retailers do not have nearly enough margin to absorb the spike in costs. Faced with this prospect, turning a blind eye to the environmental impact is almost understandable.

The challenge, then, is to look for ways to mitigate the negative externalities rather than pricing them in. To that end, companies are taking creative steps to reduce the waste inherent in the fashion pipeline. One of the most far-reaching steps is to promote reusing or recycling clothes instead of trashing them, as a means to close the loop. As Karl-Johan Persson, then-CEO of H&M, explained, "We have to change how fashion is made. We have to go from a linear model to a circular model, and we have to do it at scale."[24]

This is exactly where rethinking the "what" question is critically important. The fashion industry's traditional "make and sell" model, where the ownership of an item of clothing transfers from the retailer to the customer at the point of sale, puts the responsibility for closing the loop squarely on the shoulders of each individual. This is not efficient, given that people differ in their desire to do good and, even if sold on the idea of recycling, may not have the means or opportunity to do so.

One way to motivate people to be more responsible is to pay them for it. For example, as part of its Worn Wear program, popular outdoor clothing company Patagonia offers customers store credit when they trade in old items. However, the industry as a whole may not advance on circularity at the speed we need unless it embraces a means of generating revenue that is *not* predicated on the transfer of ownership — one that does not rely on individual customers to do the right thing.

For example, fashion labels should think seriously about introducing leasing and subscriptions, where customers buy access to apparel and accessories rather than the items themselves. This shift in the "what" does away with having to rely on the conscientiousness of individuals and puts reuse and recycling back on the shoulders of manufacturers, which presumably can handle this task more efficiently and at scale. Returning to the example of jeans, MUD Jeans from the Netherlands leases jeans to customers for 12 months, after which they can keep them or return them for recycling. Similarly, Rent the Runway lets people rent high-end clothes that would otherwise be prohibitively expensive to purchase, while Nuuly offers a clothing subscription that starts with six items for $88 per month.

As people grow more accustomed to renting clothes or subscribing to a wardrobe service, suppliers gain degrees of freedom to mitigate the taboo trade-off expressed in the true price of clothing.

Making Smarter Prices

Our own research and work with CEOs and other leaders have convinced us that organizations must rethink the three critical questions we have described if they want to strike a healthier balance between their sustainability goals and their more immediate obligations to customers, employees, and shareholders. The following recommendations — which run from the initial thought process through to implementation — should guide leaders to find creative new answers to the what, who, when, and how questions.

Make the "green premium" transparent and actionable. The root cause of the taboo trade-off is what Bill Gates dubbed the "green premium." When an environmentally friendly product costs twice as much as the conventional "dirty" version, few customers or businesses are willing to foot the bill. But when managers have greater visibility into what is driving higher costs, they can make more informed decisions on where to direct their attention as they reconsider both how prices are set and the decisions in the supply chain that can reduce the footprint of business as usual.

Focus on outcomes, not products. This mind shift forces a broader scope that brings externalities into sharper focus. Some apparel companies, for example, are reorienting from "selling garments" to "clothing people" and are incorporating tailoring, repair, and recycling programs into their consumer engagement. Similarly, shifting from "selling cars" to "providing mobility" may reduce materials consumption and waste while providing vehicle makers and new competitors with new opportunities to meet customer needs. Offering true solutions to customer problems will remain aspirational as long as companies focus too much on the means rather than the end.

Align payments and benefits. For many solutions, the biggest hurdle is the clear misalignment between the timing of payments (usually upfront) and the onset of benefits (usually over time). For example, the sticker price on an electric vehicle such as the Chevrolet Bolt is about 40% higher than a comparable gas-fueled car, but the lifetime operating costs are significantly lower for the former, never mind the environmental benefit from lower emissions.[25] Alternatives to paying upfront, such as subscriptions, leasing, pay-as-you-go models, and even performance-based agreements, shift the timing of payments to align better with the timing of benefits perceived by customers. They also make access to products affordable to more people by spreading expenses over time.

Serve populations, not segments. Population-based pricing agreements make sense when a solution has broad applicability, but individual customers' willingness or ability to pay varies dramatically. In this case, the "what" shifts from a single dose or single product to coverage for an entire population. Optimal pricing based on target segments is exclusionary by definition, while population-based pricing aims to find a way to be inclusive. A salient example is the population-level agreements struck by Pfizer-BioNTech in the U.S. and Europe for its COVID-19 vaccine, which facilitated much lower price points than normal for such a breakthrough treatment.

Activate the ecosystem. Rethinking the company's solution or time-shifting this year's revenues into the future often creates opportunities that a single company cannot pursue on its own. Creative approaches to the price mechanism tend to involve multiple partners, such as financing partners for renewable energy and vehicles, and value-based health partners for migrating to health outcomes. Financing, support, and last-mile delivery are all common puzzle pieces in the ecosystem that require a company to look beyond its core business.

Create a shareholder tailwind. While tension may always exist between sustainability and profitability, more and more stakeholders are seeing the former as part of long-term value creation rather than a threat to it. Turning shareholder headwinds into tailwinds is an important factor. The leverage of powerful investors is now providing support for viable sustainability actions. For example, BlackRock has made a commitment to sustainable investing as a path to long-term value creation, and the California Public Employees' Retirement System has recently pushed for more accountability on climate risk in oil and gas. In our experience, significant changes to the price mechanism requires dedicated communication and engagement with all stakeholders.

THE WAY THAT MOST companies currently understand the price mechanism does not bode well for their ability to help address the world's most pressing social and environmental challenges. The narrow focus on price points — what we can refer to simply as the "How much?" question — imposes constraints on an organization's ability to achieve the scale that its sustainability solutions deserve.

Indeed, the now-popular notion of green premiums is, at its essence, a redefinition of that narrow "How much?" question. But business leaders need to stop thinking about pricing simply as a bar that they can prod up or down to get customers to buy less or more. Every pricing decision comprises additional, more strategic choices that can mitigate the negative externalities of commerce before companies price them in.

The urgency to act is increasing. Businesses are facing growing pressure to translate commitments into action and impact, or they risk jeopardizing their relationships with their increasingly conscientious, dollar-voting customers and investors.

We obviously are not claiming that rethinking the price mechanism is the ultimate answer — but we

> Businesses are facing growing pressure to translate commitments into action and impact, or risk jeopardizing relationships with their increasingly conscientious, dollar-voting customers and investors.

are asserting that a more efficient price mechanism is among the necessary means to accelerate progress. Broader thinking on prices will help catalyze the search for innovative and enduring solutions that are profitable, scalable, and palatable to customers.

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REFERENCES

1. L. Abboud, "Danone Board Ousts Emmanuel Faber as Chief and Chairman," Financial Times, March 15, 2021, www.ft.com.

2. A. Bris, "Danone's CEO Has Been Ousted for Being Progressive — Blame Society Not Activist Shareholders," The Conversation, March 19, 2021, https://theconversation.com.

3. T.D. Hubbard, D.M. Christensen, and S.D. Graffin, "Higher Highs and Lower Lows: The Role of Corporate Social Responsibility in CEO Dismissal," Strategic Management Journal 38, no. 11 (November 2017): 2255-2265.

4. "Carbon for Water," Vestergaard, accessed July 14, 2021, www.vestergaard.com.

5. J. Radovanovic, "Misereor Social Swipe Abolishes Excuses for Not Donating," Brandingmag, May 16, 2014, www.brandingmag.com.

6. "The Paris Agreement," United Nations Climate Change, accessed July 14, 2021, https://unfccc.int.

7. "Cost of Solar in 2021," Sunrun, accessed July 14, 2021, ww.sunrun.com.

8. J. Brady, "The Great Solar Panel Debate: To Lease or to Buy?" NPR, Feb. 10, 2015, www.npr.org; and A. Hobbs, E. Benami, U. Varadarajan, et al., "Improving Solar Policy: Lessons From the Solar Leasing Boom in California," PDF file (San Francisco: Climate Policy Initiative, July 25, 2013), www.climatepolicyinitiative.org.

9. Ibid.

10. This report lays out energy need tiers, with the focus for clean energy in refugee communities on tier 2 needs (around 50 watts): B. Giæver, N. Hjellegjerde, B. Gomez Rojo, et al., "EmPowering Africa's Most Vulnerable: Access to Solar Energy in Complex Crises," (Norcap and Boston Consulting Group, August 2020), www.nrc.no. Prices mentioned in the following policy brief are for a 20-watt solar home kit in 2018: R. Fetter and J. Phillips, "The True Cost of Solar Tariffs in East Africa," policy brief (Durham, North Carolina: Nicholas Institute for Environmental Policy Solutions, Duke University, February 2019), https://energyaccess.duke.edu.

11. "Hepatitis C Kills More Americans Than Any Other Infectious Disease," Centers for Disease Control and Prevention, May 4, 2016, www.cdc.com.

12. "Hepatitis C," World Health Organization, July 27, 2020, www.who.int.

13. "Louisiana Launches Hepatitis C Innovative Payment Model With Asegua Therapeutics, Aiming to Eliminate the Disease," Gilead, June 26, 2019, www.gilead.com.

14. "Methods," Drug Pricing Lab, accessed July 14, 2021, https://drugpricinglab.org.

15. H. Liu and A. Mulcahy, "Why States' 'Netflix Model' Prescription Drug Arrangements Are No Silver Bullet," Health Affairs, July 1, 2020, www.healthaffairs.org.

16. "Innovative Pricing Solutions," Roche, accessed July 14, 2021, www.roche.com.

17. A. Helhoski and R. Lane, "Student Loan Debt Statistics: 2021," NerdWallet, July 15, 2021, www.nerdwallet.com.

18. E. Kerr, "Income Share Agreements: What to Know," U.S. News & World Report, April 13, 2021, www.usnews.com.

19. A. Berg, K.-H. Magnus, S. Kappelmark, et al., "Fashion on Climate" (Copenhagen: McKinsey & Company and Global Fashion Agenda, 2020), www.globalfashion.agenda.com.

20. "UN Helps Fashion Industry Shift to Low Carbon," United Nations Climate Change, Sept. 6, 2018, https://unfccc.int.

21. "The Impact of a Cotton T-Shirt," World Wildlife Fund, Jan. 16, 2013, www.worldwildlife.org.

22. M. Gunther, "Fast Fashion Fills Our Landfills," JSTOR Daily, Sept. 27, 2016, https://daily.jstor.org.

23. "The True Price of Jeans," True Price, May 23, 2019, https://trueprice.org.

24. Gunther, "Fast Fashion."

25. "The Green Premium," Breakthrough Energy, accessed July 15, 2021, www.breakthroughenergy.org.

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How Supply Chain Transparency Boosts Business Value

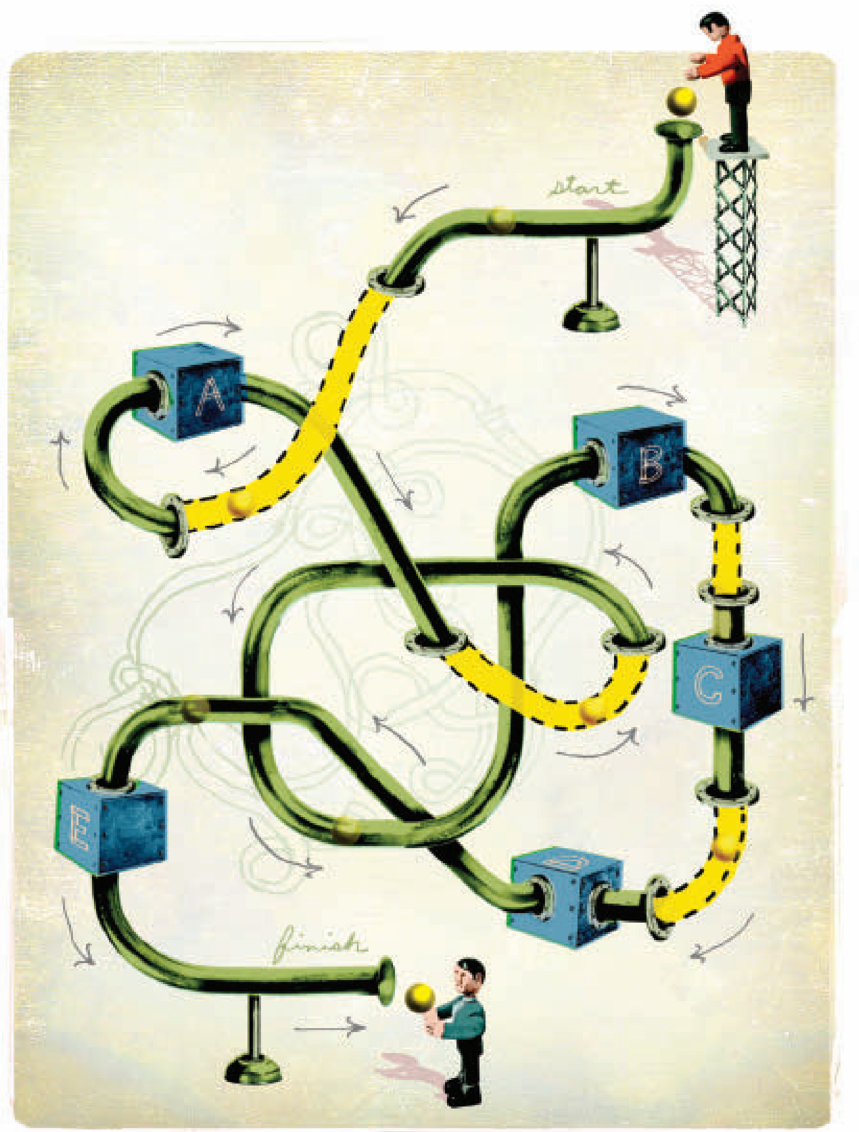
Increasing visibility into suppliers' practices takes work but can lead to new market opportunities.

BY TIM KRAFT AND YANCHONG ZHENG

In November 2020, executives from Amazon, Ikea, Nike, and other high-profile companies were called before the U.K. Parliament to address claims that their suppliers might be using forced labor.[1] Members of the House of Commons' Business, Energy and Industrial Strategy Committee were investigating the potential exploitation of Uyghur Muslims from the Xinjiang region of China.[2] They directly challenged company representatives on how their organizations maintain visibility into and combat modern slavery within their supply chains.

With businesses' sourcing practices under such scrutiny, supply chain transparency has become an imperative in many industries. Emerging regulations such as the U.K. Modern Slavery Act and the California Transparency in Supply Chains Act are not the only drivers of this trend, however. In industries such as apparel, consumer electronics, and food and beverage, companies are facing pressures from all sides to demonstrate better environmental and social practices in their supply chains.

Consumers increasingly want to know more about where and how the products they purchase are being made. They are actively rewarding companies that provide visibility into their



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supply chains and punishing companies that do not. Meanwhile, advocates for reform, such as Fashion Revolution and the Clean Clothes Campaign, are pressuring brands to be more transparent by grading and publicizing their levels of transparency. Investors are also increasingly critical of incidents that violate acceptable environmental, social, and corporate governance practices: In the U.S., it is estimated that such incidents erased almost half a trillion dollars' worth of value from public companies from 2015 to 2019.[3]

In practice, creating a transparent supply chain is not simply a matter of determining what information to disclose to consumers; businesses must first gain visibility into their own supply chains. However, the level of effort and resources needed to monitor first-tier suppliers, let alone upper-tier ones, can be very costly and time consuming. Furthermore, such efforts are often not required by regulation and thus are viewed as necessary only if "something bad" has happened, so getting management buy-in to proactively commit the necessary resources can be difficult.

Companies must find efficient and effective ways to gain visibility into their supply chains, given the increasing demands for greater transparency from regulators, consumers, activists, and investors, and the vast amount of resources such a commitment entails. In this article, we present innovative methods for making such improvements and provide evidence of the business value that greater transparency can enable.

Audits Are Only a Starting Point

Traditionally, companies have relied on audits to monitor their immediate suppliers and ensure that responsible practices are being followed in their supply chains. However, audits alone are not sufficient for truly gaining visibility into one's supply chain. To begin with, audits are only snapshots of supplier practices at the time the audits occur. There is evidence that suppliers often find ways to game audits and hide what they don't want an auditor to see.[4] Furthermore, audits require a significant commitment of time and resources, the cost of which often limits their frequency and narrows their scope to only first-tier or key suppliers. But the reality is that the more severe social and environmental incidents typically occur in the upper tiers of a supply chain. For example, a recent study of 3,922 supplier relationships found that second-tier suppliers committed, on average, 18% more instances of noncompliance per audit than first-tier suppliers, and the third tier committed 27% more.[5]

To increase the effectiveness of audits, companies must find ways to expand their reach for greater impact. For example, to increase oversight of its suppliers, Patagonia reduced its supplier count by 50% in the late 2000s. As a result, the company is able to annually audit 100% of its first-tier suppliers as well as a subset of second-tier suppliers that accounts for 80% of its total material costs. These changes have resulted in stronger and more collaborative relationships with suppliers, which helped the company increase its visibility into its supply chain and enhance its reputation among consumers.

Although many brands and manufacturers may not have the resources or capabilities of a company like Patagonia to extend their auditing influence beyond first-tier suppliers, they can increase their reach in other ways. One approach is to partner with independent auditors, local trade unions, or nongovernmental organizations that work within a supplier's region. For example, as a collaboration between the United Nations' International Labor Organization and the World Bank Group's International Finance Corporation, the Better Work program is actively performing independent, external assessments of 1,700 garment factories employing over 2.4 million workers in nine countries. In addition, it works closely with local governments to improve labor laws and advise unions on how to strengthen workers' voices. Through frequent, unannounced audits and on-the-ground actions such as working with local unions and governments, these efforts can often uncover region-specific issues that overseas brands cannot.

Another approach is to conduct joint audits, where multiple companies pool their resources to audit common suppliers. After the 2013 Rana Plaza collapse in Bangladesh, in which over 1,100 workers died, it became evident that many brands and retailers in the apparel industry lacked visibility into their supply chains. The resulting pressure placed on the industry to improve working conditions helped shift European retailers' compliance focus from self-certification to more collaborative certification efforts. As a result, retailers and brands signed on to the Accord on Fire and Building Safety in Bangladesh, a legally binding five-year agreement that aimed to improve and better monitor the country's working conditions.[6] As part of the accord, retailers collaborated on conducting audits and shared the cost.

Also gaining traction is the practice of sharing audit information through trustworthy third parties. Service providers such as Sedex and nonprofit organizations such as the Fair Factories Clearinghouse are offering online tools and platforms to help buyers and suppliers share audit results more easily and efficiently. Such data sharing can help minimize duplicative efforts and reduce potential audit fatigue for suppliers, which often must satisfy multiple, similar audit requests from their buyers. The ability to demonstrate such efficiency gains is key to motivating brands and suppliers to participate in these innovative platforms.

There are still hurdles to making collaborative efforts such as these work. Manufacturers and brands may be hesitant to fully share audit information due to potential intellectual property (IP) risks and the fear of leaking commercially sensitive information to competitors. Many companies believe that their suppliers give them a competitive advantage and should remain undisclosed. In our conversations with Sedex leaders, they acknowledged that overcoming such resistance remains a challenge and ultimately requires building trust among the participating companies. Having large buyers on board can help demonstrate to others the credibility of collaboration around audits.

Another challenge to collaboration is the fact that audit information is often interpreted and measured differently across companies. To address the lack of a common audit language for assessing social and labor conditions in the apparel industry, brands, government organizations, and nonprofits have come together to form the Social and Labor Convergence Program (SLCP). This multistakeholder initiative is aimed at creating a common framework and language for assessing social and labor conditions. Uniquely, the SLCP's emphasis is on data collection and information sharing, not on interpretation of the data, which is still in each brand's hands. By creating a way to generate and share comparable data at the industry level, the initiative has the potential to move the conversation forward from monitoring and compliance toward factory improvements.

While these new approaches to auditing can provide better insights into supply chain compliance, we believe they are only part of the solution.

Overcoming Barriers to Supply Chain Visibility

Many would argue that technologies like the internet of things and blockchain are key to improving visibility into supply chains. IoT devices and sensors provide a way to collect granular, high-frequency environmental and social performance data throughout a supply chain to monitor key considerations, such as a product's carbon footprint, during each stage of production. Blockchain protects the integrity of data with immutable ledgers so that users of the data can trust it (such as confirming that fair trade certification requirements have been met).

The enhanced collection and sharing of data enabled by these technologies has the potential to offer unprecedented supply chain insights compared with those afforded by infrequent audits. But they cannot ensure transparency on their own. Other obstacles — namely, infrastructure limitations and stakeholder misalignment — must first be addressed.

Infrastructure barriers. Many supply chains originate in underdeveloped regions where technical infrastructure, good management practices, and even awareness of environmental and social issues are lacking or nonexistent. Trying to gain visibility into these regions and improve production practices is a major hurdle for many companies.

Consider Goodio Chocolate, a Finnish craft chocolatier that aims to provide "radical transparency" into the supply chain behind its products. The company experimented with using blockchain technology to trace raw materials and wages in its cacao supply chain but failed for two main reasons. First, the smallholder cacao farmers from whom Goodio sources do not have the knowledge and capabilities to operate a technology as advanced as blockchain. Second, trade deals with these farmers are often on the basis of verbal agreements rather than formal contracts that could be tracked through the blockchain.

Given such constraints, companies are finding innovative ways to extend their supply chain visibility using existing, common technologies such as cellphones. For example, Sedex (in partnership with IT provider &Wider) and Elevate (through its Laborlink mobile platform) are creating solutions to crowdsource insights into potential labor and safety issues on the factory floor by building safe communication channels for workers to call or text to report incidents. These platforms provide workers with a voice while providing suppliers and downstream buyers with a means to quickly gain extensive insights into their supply chains without having to rely solely on resource-intensive audits.

Another powerful but admittedly less simple approach to improving supply chain visibility that is gaining attention is the use of predictive analytics and data triangulation. For example, by partnering with Elevate and using large-scale worker voice data, the Global Fund to End Modern Slavery is creating predictive tools to help buyers detect unauthorized subcontracting and forced labor in informal garment factories in Bangladesh and India. Similarly, Sedex is developing data triangulation methods that integrate multiple data sources (such as audit reports and worker voice data) to help uncover a truer picture of factory practices. Analytics is one of the ways we see the conversation on supply chain monitoring shifting from reactive to more proactive management.

Stakeholder misalignment. Many companies lack a culture of data sharing, and incentives are not well aligned across stakeholders in their supply chains. When supply chain partners' objectives don't align, it creates another major roadblock to supply chain visibility. Large supply chains or ones where the flow of information is poor are particularly susceptible to misalignment. While downstream retailers and brands may feel the need to be more transparent about what is occurring in their supply chains due to regulatory, consumer, activist, and investor pressures, upstream suppliers may not have the same sense of urgency. Many upstream suppliers view their sourcing practices and own supply chains as part of the value proposition that they offer to downstream buyers. From their perspective, being more transparent could decrease their leverage and lead to them being squeezed out of the supply chain. Furthermore, providing the necessary data is often seen as extra work solely for the purpose of fulfilling their buyers' compliance requirements.

A variety of carrots and sticks can be used to encourage supplier transparency. This is especially true for small, informal suppliers that historically may not have paid attention to environmental and social issues. For example, Sourcemap, a provider of supply chain mapping and traceability tools, often relies on the market power of its large, corporate customers (including Hershey and H&M) to influence suppliers to share information. Similarly, many suppliers initially joined the Sedex platform based on requests from their buyers. While such incentives represent important first steps to attaining supplier buy-in, we contend that solely relying on such "sticks" is not a sustainable approach.

To gain suppliers' trust, it's important to show them the "carrots." These can be in the form of granting preferred-supplier status, offering more attractive contract terms, or jointly investing in capacity building. But it's even more effective to educate suppliers to see the long-term benefit of transparency. As Simon McCalla, CEO of Sedex, notes, "Our theory of change is to empower suppliers to change their mentality from seeing transparency as yet another requirement for compliance to viewing it as a way to achieve cost savings and, eventually, an opportunity to create

The practice of sharing audit information through trustworthy third parties can help minimize duplicative efforts and reduce potential audit fatigue for suppliers, which often must satisfy multiple, similar audit requests from their buyers.

business values," such as winning more contracts and attracting new buyers. While the education process can take time due to suppliers' lack of resources and procedures, the long-term benefit is a shift in mindset throughout the supply chain, from risk mitigation to proactive improvement. It's important to note that there is often a need for education on the buyer's side as well, particularly among upper management, given that some intangible and long-term benefits of investments in transparency may not immediately translate to the bottom line.

Interestingly, transparency can sometimes be the carrot itself to improve performance. Studies in health care and energy usage have shown that revealing relative performance against a peer group can be a powerful tool to drive positive behavior change.[7] Relatedly, in our discussions with Sedex leaders, they commented that they are investigating how relative performance transparency may be used to nudge suppliers on its platform to further share information and improve practices. An important consideration in the design of such relative performance schemes is to ensure that the introduction of competition does not lead to unethical practices, with suppliers taking shortcuts to demonstrate certification and win business.

Misalignment can also be caused by IP concerns. Consider GreenBlue, an environmental nonprofit dedicated to increasing visibility into the chemicals and substances used in products and supply chains. Suppliers are often reluctant to disclose their products' chemical and material makeup to buyers, worrying that they will reveal trade secrets and lose their competitive advantage. To overcome such concerns, GreenBlue built an innovative platform called Material IQ (MiQ) that allows upstream suppliers and downstream buyers to share sensitive chemical-toxicity information without divulging closely guarded information. Suppliers submit sample products to Scivera, a GreenBlue partner and third-party chemical safety assessment provider, which then evaluates and scores a product's chemical makeup and the associated risks. This information becomes part of MiQ, so buyers that subscribe to the platform can view the potential hazards of the product but not enough information to reverse engineer it.

Transparency Can Create New Business Opportunities

Gaining visibility into your supply chain enhances your ability to monitor and improve suppliers' environmental and social practices, but the potential benefits don't stop there. Improved visibility can also create new market opportunities. Consider, for example, the number of small businesses and startups whose business models are based on the concept of transparency. In the chocolate and coffee industries, where poor labor practices and low wages in the upper tiers of supply chains are common, companies such as Goodio Chocolate and Moyee Coffee are creating value propositions centered on the idea of end-to-end visibility. Similarly, in the cosmetics industry, which has long been criticized for a lack of transparency regarding products' potential health risks, companies such as Beautycounter are building their brands on the idea of "clean beauty."

For companies such as these, one way to capture the market value of improved supply chain visibility is to better communicate the environmental and social performance of their supply chains to the public. As consumers increasingly consider sustainability to be an integral part of their purchase criteria, better communication can lead to market advantages. Take, for example, Alta Gracia Apparel, a manufacturer of officially licensed collegiate apparel whose products are sold in university bookstores and by online retailers. Alta Gracia guarantees that the workers making its apparel in the Dominican Republic receive wages and benefits to cover the cost of a family's needs — wages that are 340% higher than what is required by law. To test the value of transparency in the market, Alta Gracia and its research partners ran a field experiment at a university bookstore. They found that when video clips describing Alta Gracia's practice of paying living wages to workers were displayed, the company's product sales increased significantly.[8]

In our own research, we consistently observe that companies benefit from providing increased visibility into the social responsibility practices of their supply chains. For example, improved visibility strengthens customers' trust in a company and can result in revenue benefits, especially when customers are generally skeptical of businesses' corporate social responsibility (CSR) claims. Furthermore, greater visibility can induce consumers who are less socially minded to increase their valuations of a company's social responsibility efforts. Companies serving a global market can positively influence consumer preferences by tailoring their CSR communications in a way that best aligns with the cultural values in different market regions. For example, a culture that values competition and personal achievement (such as that in the U.S.) may be more readily persuaded by fact-based statements, whereas a culture that emphasizes caring for others and quality of life (such as Finland) may be more strongly affected by stories from beneficiaries.[9]

One way to capture the market value of improved supply chain visibility is to better communicate the environmental and social benefits to consumers, who increasingly consider sustainability to be an integral part of their purchase criteria.

A second business opportunity comes from enhanced efficiency. Improved visibility helps companies to target their environmental and social responsibility efforts more efficiently and to accurately evaluate the associated outcomes. That is, companies can now direct resources where they are needed most to address environmental and social issues in their expansive supply chains, as well as identify the right set of suppliers with which to forge collaborative relationships. This can then support capacity building, which is important for improving practices, particularly in developing countries. For example, Goodio sources cacao for its chocolates directly from a small number of cacao cooperatives in Peru. By leveraging its close relationships with these cooperatives, Goodio gains visibility into its supply chain and works with these farmers to ensure both the quality of the cacao beans and the responsible treatment of the farmers, including fair pricing. In the long run, strengthening these cooperatives can help improve the farmers' practices and provide them with leverage in the marketplace to receive better prices and access a wider range of buyers.

A third potential benefit arises from creating opportunities to take a leadership position within an industry. Consider, for example, Taylor Guitars. In the early 2010s, high demand and low supply of ebony wood led to widespread illegal logging, which exposed many guitar manufacturers to compliance and reputation risks. Taylor sourced its ebony from the Crelicam mill in Cameroon, which in turn sourced its raw wood from several small suppliers in the region. During a 2011 trip to Cameroon, Taylor executives discovered some disturbing facts about the ebony sourcing process. For example, wood suppliers, on average, had to cut down 10 trees to find one tree with the desired pure black color. Furthermore, they observed poor labor practices at the Crelicam mill. These discoveries motivated Taylor to purchase the mill and vertically integrate its ebony supply chain. The company also established labor practice standards at the mill comparable with those found in the U.S. The mill began to accept wood with stripes of color from the wood suppliers at prices equal to those for pure black wood, and Taylor started to sell wood to its competitors. Using its position as both a supplier and a producer, the company helped reeducate the market — both consumers and competitors — to accept guitars made with striped ebony wood, thus significantly improving the sustainability of ebony forests.

Taylor Guitars is not an isolated example of a company playing a positive role in shaping industry standards and behavior around supply chain transparency. For example, in the apparel industry, Patagonia and Nike have helped set the expectation that large brands should disclose their supplier lists and share public maps of where their products are sourced and made. Similarly, Starbucks launched the Coffee and Farmer Equity (CAFE) Practices in 2004, establishing one of the first sets of ethical sourcing standards in the coffee industry. A central component of CAFE Practices is transparency, requiring suppliers to provide information on where coffee beans are sourced and the prices paid to farmers. CAFE Practices allow Starbucks to develop deep working relationships with coffee suppliers and promote ethical sourcing practices in the industry. While the company sources only about 3% of the world's coffee, over 18% is now grown under CAFE Practices.

The Path Forward

Supply chain transparency has become a critical component in consumers' purchasing criteria, and companies now must decide how transparent they want to be. But they must gain visibility into their own supply chains before they can make them more transparent to consumers and partners. This increased visibility can help mitigate supply chain risks — to workers, the environment, consumers, and a company's production capabilities and reputation — and ensure compliance with social and environmental standards. It's also crucial to the next stages in the evolution of sustainable supply chains, which include increased knowledge sharing, deeper collaboration with partners and competitors, and greater ownership by downstream retailers and brands regarding what occurs in their supply chains.

Although audits are a necessary tool for managing compliance, truly increasing supply chain transparency requires companies to both innovate and expand their toolboxes by introducing new methods for gaining visibility into suppliers' practices. They must also bear in mind that the process is not just about making technology investments — it also requires business innovation that addresses infrastructure and incentive alignment barriers. To realize the true benefits of transparency, however, a change in mindset is needed. By educating supply chain partners on the value of transparency, companies throughout the supply chain can benefit from both improved efficiency and more collaborative relationships and capture potential revenue opportunities. And by leading transparency efforts in their respective industries, companies can place themselves in an advantageous position to proactively address regulatory and activist requirements, shape new market trends, and create new business opportunities for themselves.

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REFERENCES

1. H. Abdulla, "U.K. Holds Hearing on Exploitation of Forced Labour in Xinjiang," Just-Style, Nov. 5, 2020, www.just-style.com.

2. V.X. Xu, D. Cave, J. Leibold, et al., "Uyghurs for Sale," Australian Strategic Policy Institute, March 1, 2020, www.aspi.org.au.

3. C. Flood, "ESG Controversies Wipe $500bn Off Value of U.S. Companies," Financial Times, Dec. 14, 2019, www.ft.com.

4. J. Webb, "Do Supply Chain Audits Work? Dealing With Deviant Suppliers Like a Journalist," Forbes, Oct. 26, 2016, www.forbes.com.

5. "Going Deep: The Case for Multi-Tier Transparency," Sedex, November 2013, www.sedex.com.

6. In 2018, two landmark cases brought against multinational fashion brands under the accord resulted in settlement payments totaling more than $2.3 million for the remediation of unsafe conditions in Bangladesh factories.

7. H. Song, A.L. Tucker, K.L. Murrell, et al., "Closing the Productivity Gap: Improving Worker Productivity Through Public Relative Performance Feedback and Validation of Best Practices," Management Science 64, no. 6 (2018): 2628-2649; and R.W. Buell, S. Mariadassou, and Y. Zheng, "Relative Performance Transparency: Effects on Sustainable Choices," working paper 19-079, Harvard Business School, Boston, January 2019.

8. R.W. Buell and B. Kalkanci, "How Transparency Into Internal and External Responsibility Initiatives Influences Consumer Choice," Management Science 67, no. 2 (2021): 932-950.

9. T. Kraft, L. Valdés, and Y. Zheng, "Supply Chain Visibility and Social Responsibility: Investigating Consumers' Behaviors and Motives," Manufacturing and Service Operations Management 20, no. 4 (fall 2018): 617-636; T. Kraft, L. Valdés, and Y. Zheng, "Consumer Trust in Social Responsibility Communications: The Role of Supply Chain Visibility," SSRN Electronic Journal, Oct. 27, 2020, https://papers.ssrn.com; and M. Hämäläinen, T. Kraft, D. Thomas, et al., "Supply Chain Transparency at Goodio Chocolate," in "Responsible Business Operations: Challenges and Opportunities," eds. J.M. Swaminathan and V. Deshpande (Cham, Switzerland: Springer, 2021), 225-241.

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Four Myths About Unauthorized Subcontracting

Organizations that want to improve supply chain visibility — and reduce diverted orders — must use analytics and think beyond price.

BY FELIPE CARO, LEONARD LANE, AND ANNA SÁEZ DE TEJADA CUENCA

It has never been more important for a brand to know who, exactly, is making its products.

A case in point: A summer 2020 *Sunday Times* investigation revealed that during the COVID-19 pandemic, workers making clothes for "ultrafast" fashion brand Boohoo toiled for less than minimum wage in cramped conditions, with lax safety measures in place.[1] Though Boohoo claimed that the factory was not a direct supplier, it lost more than 1.5 billion euros ($2 billion U.S.) in market value in the immediate aftermath of the *Times* report.[2]

As Boohoo discovered, suppliers can pose serious risks to a company's reputation and finances, and the nature of the modern supply chain — global, complex, and frequently opaque — only increases the dangers. Companies that outsource manufacturing often discover that their suppliers rely in turn on layers of subcontractors, often without the buyer's knowledge or approval. Making matters worse, these unauthorized subcontractors are more likely to operate unsafe workplaces, engage in unfair labor practices, and violate health and environmental laws.

Unauthorized subcontracting is the bane of businesses that are working to improve visibility into their supply chains. The 2013 collapse of Rana Plaza, an eight-story commercial building in Bangladesh, killed more than a thousand apparel workers and drew worldwide attention to the problem. Workshops in the building made clothing for several prominent brands, including Italian fashion company Benetton and Irish retailer Primark, but many of the companies claimed to be unaware that their orders had been farmed out. These problems aren't limited to Bangladesh and go beyond building compliance: Companies have come under fire in many other

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THE RESEARCH

The authors set out to investigate the factors that can lead suppliers to engage in unauthorized subcontracting, using data (provided by a global supply chain manager) on 32,000 orders, of which 36% were subcontracted without authorization.

They identified the key drivers of unauthorized subcontracting and found that it could be predicted correctly for 82% of the orders in out-of-sample tests and for 75% of suppliers.

parts of the world for using subcontractors that employed children and exploited forced labor.[3]

The pandemic has made the need to address supply chain visibility even more urgent by exposing the terrible working conditions in plants producing essential goods. A notorious example is the meatpacking industry. In Germany, 180 workers at one slaughterhouse tested positive for the coronavirus; a senior union official blamed "a sick system" and a meat industry that has long relied on "dubious subcontractors."[4]

In response to the workplace problems in their supply chains, companies have adopted codes of conduct, conducted regular audits, and required that suppliers adhere to international health and safety rules. However, if they want to demonstrate their commitment to the well-being of the people who make their products and to the communities in which they live, they'll need to get a grip on the problem of unauthorized subcontracting.

One major challenge is that data on unauthorized subcontracting is hard to come by. We collaborated with a large supply chain intermediary that, in the aftermath of the Rana Plaza disaster, kept records of orders that went to subcontractors that were not on buyers' authorized lists. In our analysis, more than a third of the 32,000 orders — placed by 30 brands with 226 apparel factories — involved an unauthorized supplier.[5]

Through our research findings, we can debunk four common misunderstandings or myths about the practice of unauthorized subcontracting — and offer specific guidance for companies seeking greater visibility into these opaque links in their supply chains.

MYTH 1: All Factories (in Developing Countries) Are Doing It

Because the problem is so widespread and the practice has been going on for so long, it's easy to imagine that all factories in developing countries have dealings with unauthorized and substandard workshops. But the data suggests that impression is incorrect.

In fact, we found that manufacturers vary widely in their use of unauthorized factories. Only a small fraction (11%) *always* send their orders to a noncompliant subcontractor, while a majority (57%) never engage in the practice. The rest farm out orders occasionally, depending on the circumstances. (See Myth 2.)

What's even more revealing is that the factories that are prone to using unauthorized subcontractors share some common characteristics. For one thing, they tend to be less specialized and make items in a greater number of different product categories — pants, sweaters, and overcoats, for example. (See "More Product Categories, More Problems.")

This suggests that when factories make commitments to deliver products but lack the specialized know-how needed to produce them, they are more likely to turn to unauthorized subcontractors to fill those orders.

Unauthorized subcontracting also varies by country. On average, Vietnam had the highest level of incidence, closely followed by Cambodia and China. This doesn't necessarily mean that all of those subcontractors have substandard operations, however. In fact, many of the unauthorized factories in China meet higher safety standards than the average workshop in Bangladesh. But paradoxically, these plants are not on authorized-subcontractor lists because they lack the resources to complete all the paperwork and obtain the necessary approvals, even though they could successfully do so.

MYTH 2: Unauthorized Subcontracting Is Mostly Driven by Price

Not surprisingly, price pressure — when a buyer offers a price lower than that paid for a similar order in the past — can make it more likely that the supplier will turn to an unauthorized subcontractor. For instance, prices that were 25% lower increased the chance of unauthorized subcontracting by 9%. This fits with the conventional wisdom: Subcontracting is a way for a manufacturer to cut corners and save money. But while price is important, it's not always the main driver.

More important is whether a factory is running close to capacity when a new order comes in. At some point, the factory can't fulfill all of its contracts, and farming them out becomes a way to manage the overflow and keep its customers satisfied.

We found that in periods of high factory utilization, unauthorized subcontracting frequently happens in batches. Once the queue of factory orders exceeds the plant's capacity and is sent to a subcontractor, it's likely that the next order will also exceed the threshold and be farmed out. In fact, when a plant sends one order to an unapproved subcontractor, the chance that it will divert the next order *almost doubles*. Batching had a bigger effect than price or any other driver that we studied.

Factories might have several reasons for running so close to capacity. More orders mean more business and potentially higher earnings, especially if a supplier can subcontract out the work profitably. A supplier might fear, not unreasonably, that rejecting an order will mean that the buyer won't return with future purchases. And some plant managers lack more sophisticated planning tools and instead schedule production on an ad hoc basis.

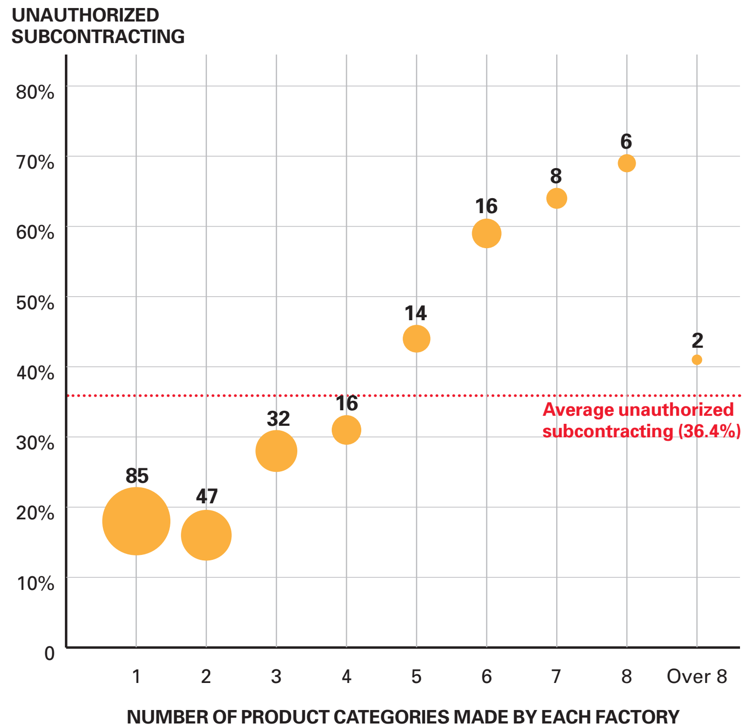
A related misconception is the belief that a supplier is more likely to subcontract out rush orders than those with longer lead times. We found the opposite to be true: While only 24% of rush orders were dispatched to an unapproved contractor, 38% of those with a lead time of more than two months were farmed out.

The reason? Short lead times are more common with orders for fashion items, but it takes more sophisticated operations to make them — something that is lacking in the informal factories that receive the bulk of the subcontracted orders.

In contrast, basic apparel items, such as plain pullovers, typically change less often and can be ordered far in advance. They are also easier to make and can be more easily farmed out to other nearby factories. However, these are often makeshift workshops that may not meet the customer's compliance standards.

MORE PRODUCT CATEGORIES, MORE PROBLEMS

Unauthorized subcontracting is above the average (represented by the dotted line) for most factories that produce more than four product categories. The size of each circle indicates the number of factories.



MYTH 3: Consumer Advocacy Doesn't Work

Fashion consumers are typically far removed from the working conditions in distant, largely invisible, informal factories. Therefore, it's easy to imagine that pressure from those shoppers, when it can be mustered at all, would be largely ineffective. The reality is that global consumers have more power to effect change than might be assumed.

After the Rana Plaza disaster, widespread consumer protests pushed brands and retailers to compensate victims of the building collapse and to crack down on poor workplace conditions in their supply chains. In response, retailers and fashion brands adopted the Bangladesh Accord on Fire and Building Safety and signed on to the Alliance for Bangladesh Worker Safety initiative, which required stepped-up factory inspections and worker safety training. The groups provided grants to pay for plant upgrades and set up worker-safety committees and hotlines to receive complaints about violations.

Consumers are increasingly demanding greater transparency in the apparel supply chain through advocacy groups like Fashion Revolution and the Clean Clothes Campaign, and via social media movements such as #WhoMadeMyClothes, which is aimed at making brands accountable for the working conditions at their factories.

It's frequently the largest, best-known brands that are the focus of these campaigns, and they have proved to be the most sensitive to public pressure. H&M, a Swedish fashion retailer, was the largest exporter of clothing from Bangladesh and received the brunt of attention after the Rana Plaza disaster.[6] It was among the first companies to sign the Bangladesh Accord.

This is consistent with our study results. We found that the chance of unauthorized subcontracting is 22% lower for orders placed by well-known brands. Specialty retailers like H&M are more exposed to consumer backlash than lesser-known, private-label brands. As a result, they are more likely to exercise greater oversight over their suppliers.

MYTH 4: Companies Can't Do Much

The long list of subcontracting horror stories might suggest that there is little companies can do to identify unauthorized suppliers and prevent their abuses. However, based on our research, buyers can use analytics and big data to discover with high levels of accuracy when manufacturers are most likely to use subcontractors. They can even predict which orders will probably be farmed out.

Using our analysis of the supply chain intermediary's orders, we trained a model to do just that. With information already in the hands of an intermediary, the model can predict with more than 82% accuracy when an order will be diverted to a subcontractor. A similar model can identify suppliers that use unapproved factories and those that don't with 75% accuracy.

The model can be plugged into a brand's existing decision support systems to monitor pending orders, the workload at each supplier's factories, and the average price per category and then flag those orders most likely to be farmed out. It could even suggest alternative factories. Brands — working with governments and nongovernmental organizations (NGOs) such as the Sustainable Apparel Coalition — could use this information to put pressure on factories with abusive labor policies and substandard living and working conditions.

Ours is a fairly simple model, and its purpose is mainly to show that such forecasting is possible. With more data, advanced machine learning techniques such as artificial neural networks could deliver even more accurate results.

Lessons for Supply Chain Leaders

Our findings can help businesses increase their visibility into what goes on in their supply chains. There's no silver bullet, but companies can minimize the problem by working with suppliers closely and continuously. We suggest that they take the following actions.

Get rid of the worst actors. The first step is the simplest: Weed out those factories that constantly use unauthorized subcontractors. Only a small fraction of factories are "serial offenders," according to our findings. Industry insiders we talked to described these suppliers as "mock factories" — plants that have passed buyers' audits but don't actually produce anything. Instead, they simply transfer their orders to factories that haven't been approved by the buyer.

One warning sign is if the supplier claims that it can produce essentially anything. Our evidence indicates that factories that produce many different categories of goods are more likely to rely on unauthorized suppliers. When a brand's demand for variety requires more versatile suppliers, it at least needs to have a solid understanding of the supplier's actual skills.

New Balance has on occasion taken this step. When it reported on its 2017 audit of 96% of its first-tier suppliers, the company said that it terminated relationships with three suppliers, two of them for reasons related to sourcing.[7] Gap Inc. explicitly addresses unauthorized subcontracting on its corporate website and warns that the practice is grounds for terminating the supplier relationship.[8]

Help suppliers manage workloads. "Unauthorized subcontracting happens at factories in moments of duress, so you must know your factories' capacity," a former Nike executive told us. The athletic apparel maker holds regular supplier conferences just for that purpose. Other brands could follow suit.

Nike also gains insight into suppliers' perspectives via the Better Buying Institute, which provides a tool for suppliers to anonymously rank companies' purchasing practices. It focuses on seven areas where buyers can help — or hurt — a supplier's ability to meet contractual obligations profitably while providing a safe work environment.

By working jointly with supply chain partners from the beginning of the design process, a business will be able to anticipate demand and plan factory capacity in advance, leading to a sustainable supply chain without resorting to subcontracting. Moreover, data-based models can be used to improve production schedules and reduce costly and time-wasting changes to orders.

Be willing to pay. While low prices aren't the main reason suppliers divert orders, it is a factor; the Ethical Trading Initiative lists aggressive price negotiation among poor purchasing practices that put pressure on supplier capacity, working hours, and labor costs.[9] A brand can reduce unauthorized subcontracting by guaranteeing that its payments are in line with what it has paid in the past. Indeed, companies that value transparency and compliance might be willing to pay a slight premium to ensure that they know where their goods are made. This is especially true for the large specialty brands that can be easy targets for consumer and labor advocates.

Be more diligent. Too often, brands focus only on their first-tier suppliers, but greater attention to those in the second tier can pay big dividends. That should include visits to facilities that aren't on a brand's list of approved suppliers. They should also work toward bringing more of those subcontractors into the authorized fold. We heard of one informal factory in China that was quite advanced but wasn't on the compliant list because the process of becoming certified was too burdensome. Streamlining the certification process can help expand the base of approved suppliers. NGOs can also help nudge buyers and suppliers in the right direction by gathering information and exposing problems.

Patagonia is among those companies going beyond the first tier: It has extended its monitoring to tier 2 of its supply chain, specifically looking at the largest suppliers of raw materials. It employs an audit and remediation process similar to what it uses for tier 1 factories.[10] HP engages its tier 1 suppliers in outreach to the next tier: It trains the first rank directly on its code of conduct and then involves them in jointly training the second tier.[11]

Buyers that prefer having an arm's-length relationship with their suppliers can at least collect data and use predictive analytics to flag which suppliers or orders are risky. One source of tools and services to help with this is Elevate, which provides analytics on unauthorized subcontracting.

CRITICS OF corporate social responsibility initiatives say that they are just window dressing used to adorn annual reports. However, in the case of unauthorized subcontracting, businesses have the means for these efforts to have a real impact. The time is right: The disruption caused by the coronavirus pandemic and the resulting economic shutdowns has accelerated already trending changes, such as shifts to online shopping and remote work. The same should happen with tackling unauthorized subcontracting to increase supply chain visibility.

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REFERENCES

1. C. Wheeler, A. Bassey, and V. Matety, "Boohoo: Fashion Giant Faces 'Slavery' Investigation," The Sunday Times, July 5, 2020, www.thetimes.co.uk.

2. E. Paton, "Why You Should Care That Boohoo Is Making Headlines This Week," The New York Times, July 8, 2020, www.nytimes.com.

3. "Child Refugees in Turkey Making Clothes for U.K. Shops," BBC News, Oct. 24, 2016, www.bbc.com; N. McKenzie and R. Baker, "Surf Clothing Label Rip Curl Using 'Slave Labour' to Manufacture Clothes in North Korea," The Sydney Morning Herald, Feb. 21, 2016, www.smh.com.au; and "Vietnam: Torture, Forced Labor in Drug Detention," Human Rights Watch, Sept. 7, 2011, www.hrw.org.

4. "Coronavirus Flare-Ups in Germany, South Korea Show the Risks in Easing Restrictions," Los Angeles Times, May 9, 2020, www.latimes.com.

5. Further description of the data and a thorough empirical analysis is available in F. Caro, L. Lane, and A. Sáez de Tejada Cuenca, "Can Brands Claim Ignorance? Unauthorized Subcontracting in Apparel Supply Chains," Management Science 67, no. 4 (April 2021): 2010-2028.

6. M. Kerppola, R. Moody, L. Zheng, et al., "H&M's Global Supply Chain Management Sustainability: Factories and Fast Fashion," University of Michigan case no. 1-429-373 (Ann Arbor, Michigan: WDI Publishing, 2014).

7. "Responsible Leadership: Who We Are," New Balance, accessed July 13, 2021, www.newbalance.com.

8. "Unauthorized Subcontracting: Prohibiting Unauthorized Subcontracting," Gap Inc., accessed July 13, 2021, www.gapinc.com.

9. "Guide to Buying Responsibly," Ethical Trading Initiative, Sept. 7, 2017, www.ethicaltrade.org.

10. "Working With Factories," Patagonia, accessed July 13, 2021, www.patagonia.com.

11. "HP 2011 Global Citizenship Report," PDF file (Palo Alto, California: HP Inc., 2011), 91-116, www.hp.com.

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Decarbonizing Our Toughest Sectors — Profitably

Cutting carbon emissions from harder-to-abate sectors like heavy transport and industrial heat will create new strategic opportunities for business.

BY AMORY LOVINS

To avert runaway climate change, we must eliminate global carbon emissions by 2050. While much of the focus has been on the main culprits — power plants, buildings, and cars — more than one-third of emissions come from heavy transport such as trucks and planes and the heat-intensive manufacture of materials such as steel and cement. We can't reach our goal without addressing these sectors, too. But how? They're widely considered hard to abate — stubbornly resistant to decarbonization, which many believe would be slow, costly, and unprofitable.

But abatement is not only feasible — it will be amply rewarded, if done strategically. In this decade, a rich stew of new technologies, materials, design methods, financial techniques, and business models, along with smart policies and aggressive investments, could revitalize, relocate, or displace some of the world's most powerful industries. By the 2030s, trucking, aviation, and shipping could be decoupling from climate. Steel, aluminum, cement, and plastics could take new forms, be used more sparingly, and be made in new ways, in unexpected places, under novel business models.

In this article and a companion technical paper[1], I examine business strategies that can help make all this possible and generate trillions of dollars in the process. While the strategies are distinct, they share a common thread: Increasingly competitive and abundant renewable electricity is undercutting and displacing fossil

 ALEX NABAUM/THEISPOT.COM

fuels. Outpaced and outcompeted, coal and gas plants are being starved of revenue while their fixed costs per kilowatt-hour rise. Electrified heavy transport and industrial manufacturing heat powered by renewables will likewise undercut, devalue, and strand their fossil-fueled rivals, siphoning off the old technologies' revenues to fund their own expansion. The growing arguments for making and using renewable electricity will reinforce one another, accelerating the demise of fossil fuels and propelling one of the greatest disruptions in business history.

Let's now explore the five business innovation strategies that will speed this transformation. Each is described as it applies to key sectors where it can bring early wins. But many of these will apply across sectors and can be even more powerful in synergistic combinations.

1 REPLACE

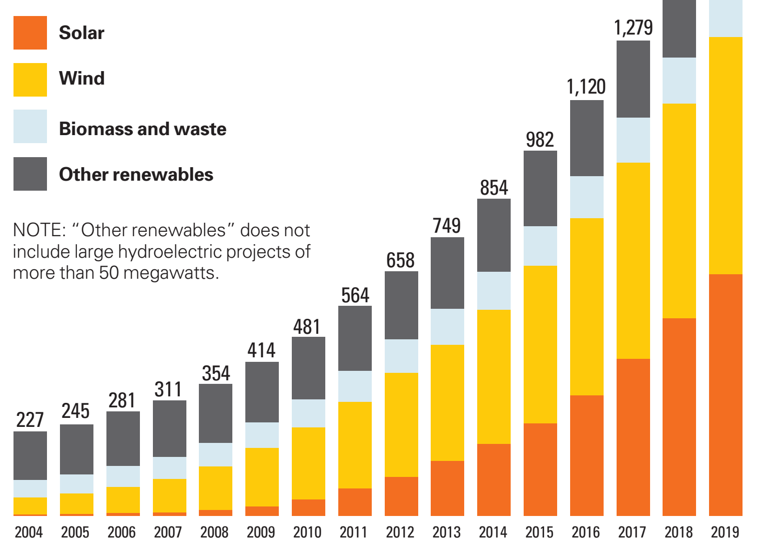
Rapidly scale green technologies to outcompete legacy rivals and supplant obsolete technology assets.

Heavy road vehicles, chiefly 18-wheel class 8 trucks, average just 6 miles per U.S. gallon and emit nearly 4% of global CO_2 — over half of the carbon produced by heavy road transport. This dirty technology is vulnerable to competition, as Elon Musk knew when he unveiled Tesla's all-electric Semi prototype in 2017. The Semi, designed to displace diesel 18-wheelers, gets over 17 miles per gallon equivalent[2] and, if charged with renewable electricity, emits nothing. It can accelerate from 0 to 60 mph in 20 seconds pulling a typical payload (versus diesel trucks' 1 minute or so), climbs a 5% grade 15 to 20 mph faster than a diesel, and with the latest batteries has a range of about 600 miles — comparable to a diesel truck's daily range. After a half-hour recharge, it can then go another 400 miles. Tesla expects to deliver the first units in late 2021. While the Semi will initially cost 50% more than a diesel 18-wheeler, Tesla says owners will recoup that premium from saved operating costs in two years and enjoy a million-mile warranty.[3] And Tesla has company: In the U.S. alone, at least 14 manufacturers expect to be producing electric heavy trucks by 2023.

While there were just over 2,000 electric trucks of all sizes on U.S. roads in 2019, by some estimates that

SOARING RENEWABLE ELECTRIC CAPACITY

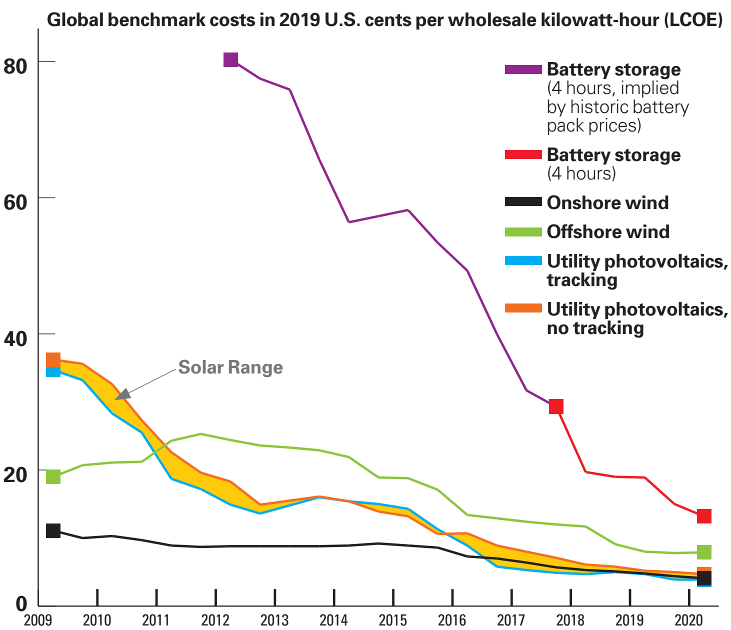
The electricity-generation capacity of modern renewable sources, chiefly wind and solar, now surpasses that of all hydroelectric dams. According to the International Energy Agency, renewables added a record 278 gigawatts of capacity in 2020 (258 without hydropower), representing 90% of all net capacity additions.



SOURCES: Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and BloombergNEF

PLUMMETING RENEWABLE ELECTRICITY COSTS

Solar power costs have fallen as much as 89% in the past decade, onshore wind power costs have dropped by 63%, and battery storage costs have dropped by 89%. Solar and wind costs are now competitive with fossil fuels'. Further innovation will push these costs even lower in the coming decades.



The global benchmark is a country-weighted average using the latest annual capacity additions. The storage levelized cost of energy (LCOE) is reflective of a utility-scale Li-ion battery storage system with four-hour duration running at a daily cycle and includes charging costs. All LCOE calculations are unsubsidized.

SOURCE: BloombergNEF

number could grow to more than 54,000 by 2025. McKinsey forecasts that e-truck demand across China, Europe, and the U.S. could reach 11 million units by 2030. To get a glimpse of electric trucks' future, consider e-cars' recent trajectory: Driven by falling battery prices, low life-cycle costs, high performance, and improvements in range, global sales of plug-in autos rose 43% in 2020, reaching 4.2% market share, while total auto sales fell 14%.

Fueled autos are now in their fourth year of shrinking sales. But because battery costs fall 18% with each doubling of cumulative production, electric autos should soon be as cheap to buy as fueled ones. I expect e-truck sales and prices to track e-cars' trajectory, driven by these same factors. Indeed, Europe's biggest truck makers are so bullish on e-trucks that they plan to deliver their last fueled truck in 2040, 10 years ahead of schedule.

All of this will require an extensive recharging infrastructure. Until that's in place, e-trucks will be limited to major transit corridors or to fixed-base (out-and-back) operations — both important markets. Ultimately, e-trucks' ability to outcompete remaining diesel rigs will depend on a far-flung infrastructure supporting irregular long routes. Although the cost of building it will be high, so is the revenue potential. Truck stops will be motivated to install charging stations to recoup lost diesel revenues, and utility companies will have an incentive to join with (or compete against) truck-stop operators in supporting infrastructure development. Utilities may also chase new revenues by leasing truck batteries separately (with the ripple effect of helping to lower e-truck prices, speeding the trucks' adoption).

E-truck penetration will also be supported by "smart recharging" and other opportunities to cut costs and generate revenues from charging and storage technologies. Solar and wind power operators can accurately predict their output, revealing when electricity is likely to be abundant and cheap — hence when charging parked trucks' batteries can cost the least and when selling stored electricity back to the grid can earn the most. Haulers can then add recharging schedules to the variables they optimize. As long-haul drivers sleep, their trucks can earn money, exploiting the trucks' fast charging and big batteries to sell valuable services back to the grid while preserving the next day's needed range. Proof of concept: For every e-car battery it manages, the European system integrator The Mobility House earns 1,000 euros annually from exchanging electricity and a dozen other services between the battery and the grid. Each Tesla Semi can exploit a storage capacity that is five to 10 times that of an e-car.

Other innovative incentives and financing strategies include automotive "feebates" — fees on high-emission cars, and rebates on low-emission cars — now provided by many countries.[4] Feebates could be effectively extended to trucks. In addition, e-trucks' fuel savings could be used to pay into leases, enabling small, independent diesel-fueled truckers, who haul most U.S. freight, to replace their inefficient rigs promptly with e-trucks rather than wait years for used hand-me-downs. Because e-trucks are cheaper to own and can last far longer than diesel trucks, we can expect them increasingly to supplant dirtier, more costly, and less durable diesel laggards.

2 TRANSFORM

Create novel incentives and business models that reward innovative competitors challenging incumbent industries with breakthrough technologies.

Like trucking, the more complex and risk-averse aviation sector will need clean-energy and efficiency innovations to reduce emissions. Jetliners using 65% to 80% less fuel than today's fleet were designed over a decade ago by the likes of Boeing, NASA, and MIT but would take a lifetime to emerge if efficiency keeps rising just 2% per year. But novel incentives and business models could rapidly bring established-but-underused innovations to the marketplace — and do so even faster if the latest aviation-efficiency advances are applied.

Consider Otto Aviation's 2020 Celera 500L prototype, a super-aerodynamic, multifueled long-range air taxi that can expand from carrying six to seating more than 20 passengers. The company didn't just put a fuel-sipping engine into an existing airframe. It built the 500L from scratch for unprecedented efficiency. The result: The plane has twice the range, eight times better fuel economy, one-sixth the operating cost, and one-fifth the carbon emissions of a comparably fast (but more cramped) business jet. It's a formidable competitor and an ideal candidate for electrification — the greatest aviation innovation since jets appeared in numbers in the 1950s.

The same battery and efficiency improvements that are driving the explosion in e-cars and e-trucks will allow the first electric short-haul commuter planes from over 100 startups to enter the market in the next few years. E-plane prototypes are already being flight-tested, and United Airlines plans to purchase 200 electric planes worth $1 billion that are expected to enter service in 2024. While short-haul electric flights (those under about 900 miles) will establish the business beachhead, mid-haul flights should become possible with continued improvements. Even long-haul flights might become possible, particularly with the advances in electric flight powered by hydrogen fuel cells that some companies are now pursuing.

Currently, fuel is a dominant and volatile aviation cost. Superefficient-and-electric planes will eliminate this cost and uncertainty. With their far lower operating costs, fleets of smaller and more flexible e-planes could offer frequent, convenient, clean, quiet, and economical point-to-point flights serving 5,000 U.S. airports and tens of thousands of international ones. The vertical takeoff and landing capability some startups are developing could enable planes to bypass airports entirely. Thus, we can expect e-planes to challenge traditional airline and commuter-jet business models that are built around less flexible, affordable, and convenient hub-and-spoke route architectures and are dependent on liquid fuels. Electric air taxis could push traditional short-haul planes out of service, stranding the incumbents' assets and — if these legacy carriers don't get on board — hastening their decline.

While investors and some buyers are already putting money into e-plane startups, cash-short airplane buyers and builders are understandably cautious. How do we encourage further radical, seemingly risky efficiency improvements? One approach is to de-risk makers' development investments through "golden carrot" purchase commitments. Long used to elicit efficiency gains for smaller products such as refrigerators, these may work with planes, too (or trucks, trains, or

FIVE BUSINESS STRATEGIES FOR A NET-ZERO 2050

The growing arguments to make and use renewable electricity will reinforce one another. Here are five strategies for businesses to drive and benefit from the transformation.

REPLACE	Rapidly scale green technologies to outcompete legacy rivals and supplant obsolete technology assets.	**Example:** Replace diesel-fueled 18-wheelers with efficient electric trucks such as Tesla's Semi, financed from fuel savings by haulers big and small.
TRANSFORM	Create novel incentives and business models that reward innovative competitors challenging incumbent industries with breakthrough technologies.	**Example:** Fleets of smaller, superefficient, and often electric planes flying point-to-point can offer a more convenient, flexible alternative to planes tied to hub-and-spoke routes, transforming aviation.
REDESIGN	Integrate new design methods, technologies, materials, and manufacturing techniques to disrupt legacy industrial ecosystems.	**Example:** Carbon-fiber composites used for the body of BMW's i3 electric city car reduce its weight, so it requires fewer batteries; this, combined with savings from simplified manufacturing, offsets the cost of its pricier materials.
MIGRATE	Relocate basic materials industries using cheaper production unlocked by clean energy.	**Examples:** Steel producers are co-locating production with iron ore and locally abundant renewable energy rather than shipping ore to fossil-fueled plants far away.
ALIGN	Harmonize customers' and providers' incentives by rewarding frugal structural design and "servitizing" basic materials.	**Example:** An alliance might redesign a bridge to use far fewer tons of materials and get paid for the traffic that the bridge safely carries — not for the physical asset or its materials.

ships, for that matter). In short, big customers collectively commit to buy X units a year for Y years at price Z from whatever vendor first achieves, say, a fourfold efficiency gain while meeting all standard requirements. (The runner-up gets a smaller slice.) Such a big prize isn't just a bigger bulk buy; it provides an incentive for both the development and purchase of innovative vehicles, rewards gutsy innovation over timid incrementalism, and has the potential to transform makers' and buyers' cultures by raising their innovation tempo, performance expectations, and appetite for strategic risk-taking.

3 REDESIGN

Integrate new technologies, materials, and manufacturing methods to disrupt legacy industrial ecosystems.

Energy-efficiency efforts traditionally seek to optimize isolated parts of larger technical devices or systems, like a diesel or jet engine. But optimizing the efficiency of vehicles, buildings, and factories as whole systems can double or triple energy savings at lower cost.[5] Such integrative design, which combines new technologies, materials, manufacturing methods, and business models, will help disrupt vast, slow, overly mature industrial ecosystems.

Let's focus on a key element of many new integrative vehicle designs: advanced materials. Carbon fiber is far stronger and lighter than steel but also costs more per pound. You might conclude, therefore, that replacing a car's or truck's ton or more of steel with carbon fiber would increase its cost. But with integrative design, it needn't. The body of BMW's 2013-22 i3 electric city car is made entirely from carbon-fiber composites. But because this saves weight, the i3 needs fewer batteries, offsetting the carbon-fiber cost. Further, its radically simplified manufacturing process uses two-thirds less capital and space and half the water, energy, and time, and it doesn't require a conventional body or paint shop (where the two hardest and costliest parts of traditional automaking are done). All of this makes the i3's valuable weight reduction approximately free — so the quadrupled-efficiency car was profitable from the first unit made.[6]

Likewise, a radically simplified 95% carbon-fiber fighter plane designed by Lockheed Martin's Skunk Works in the 1990s was one-third lighter and two-thirds cheaper than its 71% metal predecessor. Its lead engineer went on to design a carbon-fiber sport utility vehicle that was half the previous weight and four to six times more efficient. Now China plans to cut its flagship cars' steel use by 80% in this decade by substituting light metals and carbon fiber. Ultimately the average U.S. car could shed over a ton of iron and steel, replaced by lighter but higher-value polymers. Carbon-fiber ships and trains, too, are starting to move beyond prototypes and specialty applications and into the mainstream. These examples foretell other lighter, more fuel-efficient, more easily electrifiable and lower-cost heavy-duty vehicles displacing steel ones. And since carbon fiber doesn't rust and scarcely dents or fatigues, combining it with ultrareliable electronics and electric motors could also make light or heavy vehicles last far longer, favoring leasing over sales and the manufacture of fewer vehicles with greater value.

Other advances in materials, combined with integrative design, hold particular promise for planes, where every pound cut can save $1,000 worth of fuel — and related emissions — over the plane's lifetime. NASA and several universities, for example, have demonstrated a plastic lattice structure for building aircraft. It's as strong and tough as the flexible polymer membrane surrounding it but 98% lighter than a metal structure. Like a bird's wing, its shape can morph in real time to cut drag, boost lift, and save energy. If the air is evacuated from the lattice, such crush-resistant structures could form a "vacuum balloon" whose buoyancy could help offset the weight of electric airplanes' batteries — a promising if, as of yet, only theoretical bit of engineering.

Ultimately, ultralight, superefficient electric cars and even planes could become partly or wholly solar powered. Later this year, two startups aim to begin selling electric Hypercars — vehicles that are so efficient, they need little or no plug-in recharging. Aptera's composite NeverCharge is a two-seat three-wheeler with less air drag than the side mirrors of the most popular pickup truck. Parked outdoors, its topside solar cells can power it for a conservative estimate of up to 11,000 miles per year. Its daily solar-only range is only around 40 miles, but plugging it in recharges the battery for a range

> Australia and Brazil ship iron ore to Chinese coal-fired blast furnaces, which make half the world's steel. Such dirty process heat will give way to clean heat generated by renewables — or clean-heat processes will shift abroad altogether.

of up to 1,000 miles. Dutch startup Lightyear's five-seat sedan similarly blends solar power with efficient operation, gaining 8 miles of range per hour in the sun. Both examples are proofs of concept that superefficient solar-powered or -assisted vehicles, including trucks and even ships and planes, could join our future zero-carbon transportation mix — and complement the faster expansion of a smaller recharging infrastructure.

To ride this wave of change, incumbent automakers must invest in belated asset, technical, and cultural transformation while living on revenues from the obsolete fueled products that their new offerings are meant to squash. Few are well positioned for the upheaval to come: A recent KPMG report on electric-vehicle trends concluded that "old empires may fall" in the transition and "massive structural change" of the industry could doom some major companies. Preparing for the inevitable, several manufacturers have announced plans to build their last fueled vehicles within a decade or two, among them Volvo by 2030 and General Motors by 2035. Next, the integrative design, electrification, lightening, and other efficiency advances coming swiftly to cars will surely reconfigure all of heavy transport, supplanting fueled vehicles. Business model innovations supported by superefficient integrative design, such as Otto Aviation's ambition to leapfrog incumbents with its fuel-efficient point-to-point air taxi, show the way for upstart competitors.

4 MIGRATE

Relocate basic materials industries using cheaper production unlocked by clean energy.

Let's shift gears now (a phrase that will become an anachronism as electrification eliminates transmissions) to innovations that can decarbonize industrial heat — the thermal energy needed to make steel, cement, and other basic materials. Coal-fired steelmaking blast furnaces, coal- or gas-fired cement kilns, ethylene plants, and the like emit one-fourth of global carbon dioxide, including 7% to 8% each for cement and steel, 3% for chemicals (mainly fertilizers and plastics), and 1% for aluminum.

Those emissions from burning fossil fuels could be eliminated by instead generating heat directly from renewable electricity or delivering it via hydrogen, infrared radiation, microwaves, or superhot gaseous plasmas. (Nine percent of the world's heat needs, from low-temperature space heating to high-temperature industrial heating, already are met directly by solar and geothermal sources or burning biomass.) Some existing manufacturing plants will switch to renewable heat. Others will be replaced by purpose-built plants in regions with cheap renewable electricity. That creative destruction could strand trillions of dollars of fossil-fuel-based heavy-industry investments and produce trillions of dollars' worth of new ones.

Making metals was always about location — good ore near cheap energy. From 12th century Song dynasty China and Industrial Revolution England and Germany to 20th century America's Upper Midwest, the proximity of coal to iron ore spawned massive iron and steel industries. Today, ore is often shipped from afar to hungry markets; Australia and Brazil, for example, ship iron ore to Chinese coal-fired blast furnaces, which make half the world's steel. Such dirty process heat will give way to clean heat generated by renewables — elsewhere in China or imported — or clean-heat processes will shift abroad altogether.

That's why Sweden's steel industry plans to build a renewably powered mill in the Arctic iron-mining town of Gällivare. Foreseeing demand for "green steel," this year Swedish joint venture Hybrit's pilot plant in Luleå began using hydrogen made from hydroelectricity to turn local ore into CO_2-free steel that Volvo plans to start putting into truck parts next year. Rival H2GreenSteel's industrial-scale production is due to begin in 2024, aiming for 5 million tons of steel per year before 2030.

Australia's Fortescue Metals is likewise planning to build a green-steel pilot plant this year that taps the country's abundant sun and wind to produce hydrogen. It then plans to build a commercial plant in Western Australia's Pilbara region, co-locating production with iron ore and locally abundant renewable energy rather than shipping ore to dirty steel mills far away. Such green steel should beat many fossil-fueled mills' prices and ultimately strand their assets. Combining cheap local renewables with growing demand (and perhaps a price premium) for green steel could bring its production not just to places rich in iron ore, like Australia, India, and South Africa, but also to areas with modest ore deposits, like North Africa and Chile, or none, like the Middle East. Along the same lines, the United Arab Emirates' solar-powered smelter turns Guinean bauxite into green aluminum for German cars.

Renewable energy itself can also be exported: Saudi Arabia is building a $5 billion sun- and wind-powered plant to produce "green hydrogen" and, starting in 2025, ship it in the form of liquid ammonia (NH_3) to join the projected $700 billion annual hydrogen market. BloombergNEF just announced that with solar electricity's 2050 price now predicted to be 40% below 2019's forecasts, green hydrogen will beat natural-gas-based hydrogen in this decade and become stunningly cheap — ideal for use in heavy industries like steel.[7]

Fossil-fueled cement-making is another rich target for renewable industrial heat. Currently, over half the world's cement is made in China using coal for heat. Solar-superheated air could soon become competitive with coal or gas for this purpose (and would also have to compete with green hydrogen). To test the concept, global cement giant Cemex and ETH Zurich spinoff Synhelion are building a solar-heated pilot cement kiln. And U.S. startup 247Solar's prototype concentrators (competing with Heliogen's) can heat air to 1,800 degrees Fahrenheit, at a gas-competitive cost, and provide overnight storage so it can deliver process heat whether the sun is shining or not. Processes that need milder heat, like most chemical plants, can already use solar steam or electric heat pumps at lower cost than burning natural gas.

If run as planned for their lifetimes, just the world's most carbon-intensive $22 trillion worth of 2018 electricity, transport, and industrial assets would break the world's total carbon budget. And just a fourth of those assets will emit three-fourths of that CO_2 if not retired sooner. But if, hypothetically, the world's entire coal power plant fleet were replaced today by renewables plus storage, that swap could be cost-neutral within two years and by 2025 could return over $100 billion annually, even with side benefits to climate and health valued at zero.[8] Energy, transport, and industry are all awash in imminently stranded assets and in opportunities to realign asset portfolios and remobilize trapped capital. As trillions of dollars rush in to fund both "out with the dirty" and "in with the clean" initiatives, Warren Buffett's sage advice applies: When horseless carriages enter the market, don't overanalyze which newcomer will win; short the horses.

5 ALIGN

Harmonize customers' and providers' incentives by rewarding frugal infrastructure design and "servitizing" basic materials.

As we've seen, traditional processes for manufacturing cement, steel, and other energy-intensive materials are expensive and dirty and generate billions of tons of CO_2 annually. Manufacturers and their customers have a common interest in reducing these costs. For both, squeezing waste out of the system represents one of the biggest business opportunities on the planet — and over 99% of the materials the world mines or grows are now wasted.

The giant industries that make and use basic materials are developing low- or no-carbon substitutes, and manufacturers are switching to more efficiently used, milder, or cleaner process heat. All of that is part of the solution. So is providing incentives for materials reuse, remanufacturing, and recycling: A more circular economy could save up to 37% of steel, 34% of cement, 40% of aluminum, and 56% of plastics, cutting materials-related CO_2 by 40%.[9] And making buildings durable in the first place and then maintaining them can help; while cement-intensive Chinese buildings erected in recent decades have average life spans of just 30 years, well-tended concrete buildings can last for centuries. Rome's Pantheon dome, the world's largest unreinforced concrete structure, has stood for nearly 2,000 years.

These approaches to improving materials productivity are important but overlook the vast opportunity presented by reducing the amounts of cement, steel, and other structural materials that buildings need. Authoritative analyses suggest that 11% of cement and 9% of steel could be profitably and practically saved by simply using fewer tons more efficiently.[10] But with new designs that make frugal use of materials, and the transformation of materials into services, the potential savings seem far larger.

These design methods and business models will lead to a reduction in the extraction, processing, and transport of materials, allowing less capital to deliver more profit with less risk. That financial white space, I believe, holds the promise of redefining or displacing much of current extraction and materials-manufacturing industry. Many businesses based on selling tons rather than outcomes must either leap that chasm or vanish into it.

Frugal Design

Certainly, fixing innumerable little wastages across the complex value chain of construction can save gigatons of materials each year. However, novel designs that confer the same structural integrity with less material appear to be able to save at least as many tons and could halve builders' bills for steel and concrete, profitably and without compromise.

For example, airy single-tower suspension bridges and soaring cable-suspended stadium roofs can weigh 80% to 90% less than traditional structures. Pouring concrete not into flat box-like forms but into curving fabric forms, thinner where less strength or stiffness is needed and bulging where more is needed, can save at least half the concrete and steel needed to make traditional beams. The massive design of conventional concrete bridges mostly exists to support their own weight, but 3D printing can make bridges so strong and slender, supported by myriad delicate-looking branches, that their design is mostly directed toward carrying the payload.

Floor slabs account for about half the total weight of a typical mid- or high-rise building, and hefty concrete and steel beams, columns, and foundations to support all that weight make up much of the rest. But folding a thin, carbon-fiber reinforced floor slab into a structure like corrugated cardboard's makes it as stiff and strong as a solid slab six times thicker and four times heavier. Another strength-through-geometry solution, saving up to 70% of materials, is a thin and shallow shell rounded as a curving vault and extended to a flat top by thin stiffening ribs — perhaps making modern civil works as materials-efficient as a 13th century Gothic cathedral.

Servitizing

Such a focus on increasing materials productivity — using less to do more — enables a new business model for cement and steel companies: not selling by the ton, but rather leasing the structural services that these materials provide. When providing a ton of cement becomes a cost in a service model rather than a source of sales revenue, the fewer tons needed to deliver the same or better service, the more money the provider and customer both save. Thus, frugal design combined with a service model can be richly rewarded as both provider and customer profit by doing more and better with less for longer. And providers benefit from a steady stream of lease payments, which replace episodic payments that fluctuate with volatile commodity prices. You want the use, the outcome — not the stuff. You can enjoy a fine meal without owning the restaurant.

Selling services derived from products rather than the products themselves — what lean gurus

“A focus on increasing materials productivity — using less to do more — enables a new business model for cement and steel companies: not selling by the ton, but rather leasing the structural services that these materials provide.

Jim Womack and Dan Jones dubbed the "solutions economy" around 2005 — is now called *servitizing* or *servitization* by the World Economic Forum.[11] The sale of jet-engine thrust as a service, known as Power-by-the-Hour, was pioneered by Bristol Siddley in 1962 and refined by Rolls-Royce in 2002; Xerox started selling copying by the page, not the machine; and Dow and Safety-Kleen switched from selling solvents to delivering "dissolving services." This model has spread across sectors from indoor climate control, lighting, elevators, and roofing to digital media, pallets, truck tires, and personal mobility. Why not structures, too? For example, when smart design can use a ton of concrete and steel at least twice as productively as normal practice, a cement or steel company — or, ideally, both together — could form an alliance to offer "bridge services." Such an alliance could design an advanced bridge using a fraction of the usual materials, pay its structural engineers for elegant frugality, arrange for careful construction and maintenance, and get paid for the traffic that the bridge safely carries — not for the physical asset or its materials. When I proposed this solutions-economy model to the head of a large cement maker years ago, he replied, "Good idea. I have 200 people working on that."

Copper likewise could be servitized. Where is the world's richest copper deposit — under Papua New Guinea? Chile? Or perhaps Manhattan, buried in wires and cables? Had copper miners not sold tons of metal to makers of wire and cable, which was then sold to Con Edison and AT&T (which then buried it), a conductance-services provider — let's call it "ConductCo" — could instead have installed its durable copper retrievably. That way, as it researched and developed alternatives like efficient electricity use, distributed generation, and broadband wireless, ConductCo could readily recover its copper and re-lease its services to new clients. As steel, copper, gold, lithium, and other metals become servitized, mining companies may evolve into metal-services financiers and brokers — and remote ore deposits can keep on quietly holding up the ground.

Despite the vast profit potential in servitizing construction materials industries, there are daunting obstacles, chief among them that these are highly risk-averse, innovation-resistant sectors. In addition, most clients neither request nor reward materials efficiency and in fact tolerate or even extol huge overdesign margins.[12] Progress will depend on the work of outstanding, trusted civil and structural engineers who think differently and prefer brave rigor to timid groupthink. Structural service providers that partner early with these top designers, reward their performance, help grow and apply their talent, and assemble an alliance of suppliers, designers, and builders delivering better, cheaper buildings could beat laggards stuck with inferior designers and commodity businesses. Reforming client and designer cultures will be slow and hard, but the sharpness of both these players' competitive spears should help pierce tough layers of encrusted habit.

THESE FIVE STRATEGIC INNOVATIONS all depend on new business models and financial products to speed the graceful retirement of dirty industrial assets (blast furnaces, diesel fleets, coal-fired power stations, and more), finance their clean replacements, and speed capital flight from obsolete to advantageous assets and industries. I've touched on some of them here — servitization of materials, clean electricity arbitrage, feebates, golden-carrot purchase agreements, and early asset retirement among them. These, combined with focused and comprehensive efforts to improve efficiency — via conventional savings, integrative design savings, materials savings from frugal

> Turning fossil fuels' gentle slide into a mighty avalanche is a worthy goal for a future that makes sense, makes money, proceeds from applied hope, and creates a richer, fairer, cooler, safer world worth being hopeful about.

design, and others — will squeeze fossil fuels out of power generation, buildings, industry, and vehicles. This would more efficiently allocate capital, make more money, do more good, and be more fun (for insurgents, if not incumbents).

Getting this done requires investment in energy and materials efficiency whenever it's cheaper than inefficiency; rewarding utilities for cutting energy bills rather than selling energy; rewarding designers for what they save, not what they spend; prioritizing barrier busting in policy, not only proper energy pricing; and refocusing public policy and private-sector strategies to enable the new, not protect the old. Who won't like that? Corporate socialists masquerading as free marketeers. Who will? Serious conservatives, entrepreneurs, smart investors, and everyone who understands that roasting the planet is bad for business and for all beings.

Don't assume that these changes will wait until after you retire. Visionaries like futurist Tony Seba argue that the world is "on the cusp of the fastest, deepest, most profound disruption of the energy sector in over a century" — a phase change leading to a new system with very different rules and outcomes. BloombergNEF's deeply empirical analyses broadly concur.[13]

Even in the short run, capital flight from fossil fuels to renewables and efficiency is accelerating. Last year, despite the pandemic, the growth of renewables accelerated 45% — briskly enough to meet all future demand growth, condemning fossil fuels to permanent decline from their likely 2019 peak.[14] This triggered a self-reinforcing capital stampede from fossil fuels to their fast-growing replacements, sped by some targeted pandemic recovery investments, including 1 trillion euros in Europe. My five strategies could further pick up the pace. Turning fossil fuels' gentle slide into a mighty avalanche is a worthy goal for a future that makes sense, makes money, proceeds from applied hope[15], and creates a richer, fairer, cooler, safer world worth being hopeful about.

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REFERENCES

1. A. Lovins, "Profitably Decarbonizing Heavy Transport and Industrial Heat," PDF file (Basalt, Colorado: RMI, July 2021), https://rmi.org/profitable-decarb.

2. Hearst Autos Research, "What Is MPGe?" Car and Driver, accessed July 14, 2021, www.caranddriver.com.

3. A.A. Phadke, A. Khandekar, N. Abhyankar, et al., "Why Regional and Long-Haul Trucks Are Primed for Electrification Now," PDF file (Berkeley, California: Lawrence Berkeley National Laboratory, March 2021), https://eta-publications.lbl.gov.

4. Revenue- and size-neutrally, if desired. N. Mims and H. Hauenstein, "Feebates: A Legislative Option to Encourage Continuous Improvements to Automobile Efficiency," PDF file (Basalt, Colorado: RMI, February 2008), https://rmi.org.

5. A. Lovins, "How Big Is the Energy Efficiency Resource?" Environmental Research Letters 13, no. 9 (September 2018): 1-18.

6. A. Lovins, "Reframing Automotive Fuel Efficiency," Society of Automotive Engineers J. STEEP 1, no. 1 (April 16, 2020): 59-84.

7. T. Koch-Blank, "Green Steel: A Multi-Billion Dollar Opportunity," RMI, Sept. 29, 2020, https://rmi.org; and "1H 2021 Hydrogen Levelized Cost Update," BloombergNEF, April 8, 2021, www.bnef.com.

8. P. Bodnar, M. Gray, T. Grbusic, et al., "How to Retire Early," PDF file (Basalt, Colorado: RMI, June 2020), https://rmi.org.

9. "Mission Possible: Reaching Net-Zero Carbon Emissions From Harder-to-Abate Sectors," PDF file (London: Energy Transitions Commission, November 2018), www.energy-transitions.org.

10. Ibid.

11. J.P. Womack and D.T. Jones, "Lean Solutions: How Companies and Customers Can Create Value and Wealth Together" (New York: Free Press, 2005); P. Hawken, A. Lovins, and L.H. Lovins, "Natural Capitalism: Creating the Next Industrial Revolution" (Boston: Little Brown, 1999), ch. 7; D. Karamitsos, T. Motmans, V. Corno, et al., "What Is Servitisation, and How Can It Help Save the Planet?" World Economic Forum, Nov. 20, 2020, www.weforum.org.

12. J. Orr, M. Drewniok, I. Walker, et al., "Minimising Energy in Construction: Practitioners' Views on Material Efficiency," Resources, Conservation, and Recycling 140 (January 2019): 125-136.

13. "New Energy Outlook 2020," BloombergNEF, accessed June 22, 2021, https://about.bnef.com.

14. A. Lovins and K. Bond, "Can a Virus and Viral Ideas Speed the World's Journey Beyond Fossil Fuels?" Environmental Research Letters 16, no. 2 (February 2021): 1-9.

15. A. Lovins, "Applied Hope," PDF file (Needham, Massachusetts: Olin College of Engineering, May 19, 2019), www.olin.edu.

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STRATEGY AS A WAY OF LIFE

Businesses must root strategy in moral purpose to thrive in a complex, rapidly changing world.

BY IKUJIRO NONAKA AND HIROTAKA TAKEUCHI

We live in a world of discontinuity and uncertainty, where norms are rapidly disintegrating and businesses are losing their footing. We live in a time of flux and fluidity, when mandates for growth are driving high-velocity, unrelenting change. We live in a messy world, where boundaries are becoming more porous and unprecedented complexity adds ambiguity and reduces predictability.

Our traditional approach to strategy, based on data and analysis, is at a crossroads in this era of unknown unknowns. The most well-trained AI, built on vast stores of data, information, and knowledge, could not have predicted how the COVID-19 pandemic would affect a world made more open and connected by digital technologies. Can strategy be reframed so that companies can thrive in the face of our current and future challenges?

We believe not only that strategy can be reconceived, but that it must be. In our 50 years of researching companies both in the U.S. and in Japan, our view of the organization has evolved from information processing machine (as influenced by Herbert Simon) to living organism continually creating new knowledge. We argue that to survive in today's world, this living organism must be grounded in moral purpose and guided by the goals of offering value to customers, contributing to society, living in harmony with nature, and creating a better future.

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THE SOUL OF AN ORGANIZATION

Advances in neuroscience research in recent years have shed light on the biological factors driving humans' sense of purpose. We now know that the most basic need we are compelled to meet is social connection — it has a stronger motivational pull than even food, water, and shelter.[1] Neuroscientists have also found that the human brain exhibits a predisposition to seek the common good via egalitarian and altruistic behavior.[2] And it is able to combine data from multiple sources of sensory input to plan future courses of action and to handle unexpected and novel situations.[3]

These findings suggest that our purpose as human beings is rooted in our universal tendencies to relate to and care for one another, that we share the ability to rapidly adapt to changing circumstances, and that we can imagine together how we might create a better world.

The same sense of purpose and set of capabilities exist in the living being that is the company. Kazuo Inamori, who founded Kyocera in 1959, believed that a company, as a collection of human beings, should strive to operate in a way that is good and right, just as individuals strive to work hard, think good thoughts, do the right thing, practice self-reflection and self-discipline, refine their minds, and elevate their character in everyday life. Inamori's 2004 book, *Ikikata* (which translates to "how to live"), describes such conduct as living with the purpose of elevating our souls so that each day they are a little more beautiful, developed, and noble. These principles have guided Inamori, who is also a lay Buddhist monk, as a human being, as a CEO, and as a chairman, when he resurrected Japan Airlines from bankruptcy.

Similarly, Tadashi Yanai, CEO of Fast Retailing, which operates the Uniqlo stores, is guided by 23 management principles that he calls the "soul" of his company, and he believes that a soul is the most important thing we have in life. Influenced by running a single shop in the 1980s, Yanai's first principle is "Meet customer needs and create new customers." This is done a little at a time, he explains, by devoting your life to meeting customer needs a little better every day. Yanai's second principle, "Put good ideas into practice, move the world, and change and contribute to society," reflects his conviction that a company exists to serve society. These principles are integral to his leadership: At a 2010 meeting of his global management team, Yanai spent a day and a half going over the 23 principles so that executives could internalize them and put them into practice globally.

The underlying concept — the soul of an organization — has also shaped the vision of U.S. business leaders such as Microsoft chairman and CEO Satya Nadella and Salesforce cofounder Marc Benioff. Nadella explored the idea in his 2017 book, *Hit Refresh: The Quest to Rediscover Microsoft's Soul and Imagine a Better Future for Everyone*. He identified his company's higher purpose as helping every person and every organization on the planet achieve more. And he connected soul and strategy: Rediscovering the soul of Microsoft, he argued, will lead to getting its strategy right, which in turn will improve life for all customers, employees, partners, and members of society.

Benioff tied purpose even more explicitly to the organization's role in society, writing in his 2019 book *Trailblazer*: "Today's world is so rife with challenging economic, social, and political issues that it's no longer feasible for a company to turn away and conduct business as usual. ... Over time, your employees and customers, not to mention investors, partners, host communities, and other stakeholders, will want to know your philosophy for doing business. They want to know if you have a soul."

STRATEGY AT THE CROSSROADS

As the CEOs of two leading American companies talk openly and passionately about the idea that organizations are living beings with souls — invested in improving everyone's prospects, not just their own — we expect that other business leaders will embrace that message. We believe more and more of them recognize that CEOs must start formulating strategy with their souls and then execute it with their brains. What do we mean by that? Let's examine our terms a little more closely.

We use "soul" to describe the simple truths and principles that guide us to do what is right as human beings, representing a living philosophy born from experience and practice. Soul helps us find our way every day through uncertainty and hardship — it is a way of life.

We use "brain" to refer to the analysis that will help companies operate in a messy world and wend their way through its complexities and ambiguities. Today we have vast amounts of data available, and advanced technologies such as internet-connected sensors and AI allow us to gather, process, and interpret that data in ever more sophisticated ways. This means organizations can develop more complex scenarios and simulations, conduct more experiments, and overall respond much more adaptively to unforeseen events than they used to.

By starting with the soul, companies can crystalize how they are going to achieve their purpose of making a better future for everyone. Drawing on deeply held values, companies can imagine what kind of future they wish to create and then use their brains to make it happen. They have all the analytical tools they need to achieve their goal of generating superior returns. The key question then becomes, "How should companies use both souls and brains so that strategy becomes relevant to the world we live in?"

SIX PRACTICES THAT INFUSE STRATEGY WITH SOUL

Doing the ordinary things in life a little bit better every day elevates individuals. During the COVID-19 pandemic, for instance, small things such as wearing masks, washing hands, and keeping social distance have all helped prevent the spread of the disease. Each small practice that makes our bodies a little healthier, our minds a little more peaceful, the air we breathe a little cleaner, and the places in which we stay a little more beautiful helps us connect to the goal of improving ourselves and our world.

Likewise, doing the ordinary things a little bit better every day in our jobs — such as working hard, making ethical choices, being kind, practicing self-reflection and self-discipline, being humble, and being thankful — elevates our work lives. This builds culture at the organizational level and character at the personal level. These behaviors have to be practiced every day so that they become a way of life — just like Toyota has built daily routines, or *kata*, into its famous Toyota Production System (TPS).

Kata is defined as "a means for keeping your thoughts and actions in sync with dynamic, unpredictable conditions."[4] It includes process-related practices such as "Ask why five times," the *kanban* card that accompanies components sent along the production line, *yokoten* (best-practice sharing), *jidoka* (automation), *mieruka* (visualization), and the A3 reporting process (named after the paper size). It also includes conduct-related practices like OASiS, an acronym for saying *ohayo* (good morning), *arigato* (thank you), *shitsurei-shimashita* (pardon me), and *sumimasen* (excuse me; I'm sorry) on the shop floor. These practices ensure that things get done the right way in any company that follows the TPS.

Similarly, as we have learned over decades of studying organizations, companies can adopt six daily practices to elevate strategy to a way of life:

1. Cope with complexity.
2. Adapt to change.
3. Embrace dynamic duality.
4. Empathize with everyone.
5. Tell stories.
6. Live with nature.

This set of practices helps organizations connect to the goal of building better lives and futures for company stakeholders and other members of society. You may be familiar with each one, but the key lies in doing all of these things habitually, a little better every day; that's how their impact will become greater than the sum of their parts. We will discuss one at a time, describing how each practice infuses strategy with soul and thus helps companies define and pursue business goals that support the common good.

COPE WITH COMPLEXITY. The growing complexity of our world and its many interrelated systems is widely acknowledged. To solve our most pressing problems, we must tap diverse perspectives and sources of expertise across multiple domains — no single approach or field of study will provide the answers. Likewise, we must bring all of our own diverse capabilities to bear: The ability to sit with a complex problem and tap both analytical and intuitive thinking to address it is increasingly crucial to organizations.

An aircraft represents the epitome of complexity at the product level. Take the HondaJet plane, which consists of some 200,000 parts. It took more than nine years and 200 million pages of documentation for North Carolina-based Honda Aircraft to receive U.S. Federal Aviation Administration certification for this plane.

Yet the breakthrough innovation that launched the company's success was a simple idea that came to aircraft designer Michimasa Fujino one night in 1997 as he lay in the dark: Why not put the engine on the wing? He jumped out of bed, turned on the lights, and roughly sketched out his idea on the back of a calendar page because he had no other paper close at hand.

When he showed his sketch to his development team members the next morning, everyone laughed at him. These aviation experts "knew" that mounting the engines on top of the wings was taboo: It would kill the aircraft's aerodynamics. Undeterred, Fujino dug into the complex problem and worked slowly but steadily to prove that the over-the-wing concept would produce less drag. Finding the precise place to mount the engines on the wings was a delicate process; move the engines four inches away from the sweet spot, in any direction, and the plane would not fly. Fujino finally figured out where to position them when he tested a scale model at Boeing's wind tunnel facility. He had overturned conventional wisdom while coping with an extremely high level of complexity.

HondaJet made its maiden flight in 2003 in the U.S. and received rave reviews. However, Fujino was exhausted by his decades-long quest to create an industry-changing small jet: He had been working on the challenge since 1986, when Honda first assigned him to an R&D team working to develop an experimental aircraft. He confided to us that when he took a three-week vacation with his family in the Bahamas after the test flight, he considered quitting the company. Fortunately, an American executive staying in the same hotel told him how cool the jet looked and promised to buy one. According to Fujino, that's when he understood what his superiors in Tokyo had always told him: that he was working for the customer, not for the company. The soul of the company rested in founder Soichiro Honda's Three Joys principle — the joy of buying, the joy of selling, and the joy of creating.

The ability to cope with complexity allowed Fujino to successfully persevere and introduce a transformative innovation. But to keep moving forward long term, he had to be guided by the organization's soul. By recalling the three joys and the idea of making things better for the customer, Fujino also recalled his essential purpose. When Honda finally decided to put the HondaJet into commercial production in 2006, Fujino was named president and CEO of its new Honda Aircraft group — and he went on to become one of the most lauded innovators ever in aeronautical research and design.

ADAPT TO CHANGE. The rapid rate of change that characterizes the modern world — driven largely by accelerated technological progress — demands that leaders and organizations anticipate and adapt to new circumstances at a pace unprecedented in human history.

Microsoft's renaissance under Nadella shows how a leader who begins by establishing a deeper purpose for the organization — and is guided by that purpose rather than a strategy of, for example, market dominance — can more clearly see emerging trends and cultural changes and successfully adapt to them. For example, Nadella understood that the technology world was shifting to ecosystems of partners linked with open systems and the proprietary approach that Microsoft had long favored would no longer confer advantage. He also understood that the company had to move beyond a strategy rooted in trying to preserve the past — that is, Microsoft's dominance of the PC market via the Windows operating system. He recognized that the most important emerging areas in tech were cloud and AI, so he made major investments in both that have kept the company at the forefront in these areas.[5]

Being adaptive involves being humble, and Nadella's leadership has been characterized by a humility rarely displayed by his predecessors. He has been quoted as saying, "From ancient Greece to modern Silicon Valley, the only thing that gets in the way of continued success and relevance, and impact, is hubris."[6] His example shows that grounding strategy in soul is linked to the ideal of servant-leadership, where the focus is on the greater good rather than oneself. Under his guidance, Microsoft has achieved great success while also shedding its reputation as a bully that used questionable tactics to dominate. Internally, he has been credited with overhauling outdated management structures and creating a more collaborative culture, where previously the culture had been shaped by performance management practices that fueled competition among employees and undermined cooperation. And he created internal hackathons that helped break down entrenched silos across the business and got more people working together.

Purpose — soul — has been at the core of Nadella's ability to lead the organization through change. In an email to employees when he took the helm, he wrote, "This starts with clarity of purpose and sense of mission that will lead us to imagine the impossible and deliver it. We need to prioritize innovation that is centered on our core value of empowering users and organizations to 'do more.' … The best work happens when you know that it's not just work, but something that will improve other people's lives. This is the opportunity that drives each of us at this company."[7]

EMBRACE DYNAMIC DUALITY. In the West, an intellectual tradition of dualistic thinking (drawing sharp distinctions between mind and body, self and other, humanity and nature) has led business executives to neatly divide knowledge into two categories: explicit knowledge, which can easily be articulated and shared, and tacit knowledge, which is more intuitive and gained from lived experience. They often value the former more highly than the latter. In contrast, the intellectual tradition in Japan has stressed oneness of body and mind, of self and other, of humanity and nature. This tradition has led Japanese executives to view explicit and tacit knowledge as mutually complementary, with the emphasis placed more on the latter. Tacit and explicit knowledge form a dynamic duality interacting with, and interchanging into, each other to create something new through life experiences.

After a six-year study of Toyota, we concluded that the company actively embraces and cultivates contradiction, opposites, and paradoxes, making dynamic duality an integral part of its culture. In 2008, three of us from Hitotsubashi University in Tokyo wrote a book that focused on how Toyota reinforces the culture of *dynamic duality*, making it a way of life.[8] We identified six traits:

- Toyota moves slowly, a little at a time, but takes big leaps once in a while.
- It is frugal on a daily basis but splurges on key events.
- It is efficient on day-to-day operations but redundant in its use of employees' time.
- It grows surely and steadily yet is constantly paranoid.
- It is hierarchical but gives employees freedom to push back.
- It simplifies internal messaging but builds a complex analog web of human relationships to share knowledge throughout the organization.

The current CEO, Akio Toyoda, sees himself at the center of this analog web, calling himself an *oyaji* (old man) of a small- to medium-sized enterprise (SME). In a 2016 interview, he said about himself: "An *oyaji* in a SME … sees straight into employees' faces, feels their body temperatures, and comes close to empathize with them. I don't want to say that I cannot do these things because I run a big company."[9]

> A leader who begins by establishing a deeper purpose for the organization — and is guided by that purpose rather than a strategy of, say, market dominance — can more clearly see emerging trends and successfully adapt to them.

> Human survival has always depended on our ability to organize in supportive groups for food and protection, which is why social connection is our top priority. At the root of connecting with others is empathizing with them.

That is a duality he embodies. As our interaction with Akio Toyoda and the company that bears his name illustrates, Toyota keeps on pursuing dynamic duality — idealism and reality, analog and digital, unpredictability and stability — as a way of life.

EMPATHIZE WITH EVERYONE. Human survival has always depended on our ability to organize in mutually supportive groups for food and protection — which is why social connection is our top priority. At the root of connecting with others is empathizing with them. Facing today's crises, political and business leaders should unite, using this unique quality that we humans have. To empathize on a deep level, we need to develop a keen understanding of others' perspectives and cultivate compassion in our hearts.

That's exactly what Eisai, a leading Japanese pharmaceutical company, is doing with its 10,000 employees in Japan and abroad. Each employee spends a few days a year with patients in health care facilities, learning about their specific ailments and developing empathy for what they are feeling deep inside. Haruo Naito, who has been CEO since 1988, explained, "We get to know how patients feel by spending time with them, which eventually moves all of us to tears. Our motivation comes from our desire to do something about the true needs we grasped then and there."[10]

This ability of humans to perceive others' feelings and sensitivities, to collaborate and build relationships, will be invaluable in a digital-led, highly automated world. Soulful companies that lead the way will make it part of their purpose to help employees, customers, and others develop a deeper understanding of and respect for one another in a future where a torrent of technology may otherwise dehumanize us.

TELL STORIES. Effective business leaders understand the power of using stories to communicate the essence of their beliefs and ideals and to help the organization internalize strategy.

The recently retired chairman and CEO of Fujifilm, Shigetaka Komori, created two guiding narratives about the company.[11] First, to help people envision a different future for the company at a time when the market was transitioning from photographic film to digital technology, Komori chose to reinterpret a famous quote from German philosopher Georg Wilhelm Friedrich Hegel: "The owl of Minerva spreads its wings only with the falling of the dusk" became "The owl of Minerva spreads its wings at the beginning of a new age." The original quote depicted knowledge (symbolized by the owl) as hindsight, arriving only when the day is done. In the reinterpretation, we see how knowledge can bring us into the future. Komori's strategic narrative identified Fujifilm with the owl of Minerva taking off at the beginning of the new age of digitalization.

Second, Komori used stories to encourage all of his employees to use their "whole body" intelligence — not only their five senses but also the intuition that springs from lived bodily experience. He told this story to make his point: "If you are caught in a fire, which direction and how fast should you run to escape the flames? The difference between the people who escape to safety and those who don't is not based on intelligence; it is a difference of instinct and intuition."[12]

Indeed, Fujifilm escaped the "fire" that has destroyed other analog businesses. In 2018, it generated its highest revenue in its 87-year history. It had transformed itself from a photographic film company into one engaged in six core businesses: health care, graphic systems, highly functional

> The Japanese tradition of 'oneness of humanity and nature' — also found in many indigenous cultures — has taken on new relevance as humankind seeks to repair the damage to our natural environment caused by industrialization.

materials, optical devices, digital imaging, and documentation. According to Komori, Fujifilm achieved that business success by extracting the experiential knowledge of all its employees (what he calls "muscle intelligence") and by sharpening all their human capabilities (using what he calls "the whole body theory of business"). He warned, "If one element is missing, the totality will be reduced, results will not follow, and defeat will ensue. After all, it is through their capabilities as total human beings that top leaders are able to engage each individual employee and lead the company as a whole."[13]

LIVE WITH NATURE. Complex systems in nature — like Earth's climate — predate Homo sapiens by more than 3 billion years, and we humans have been living with them since our species first appeared. Shinto priests at Ise Grand Shrine have been rebuilding the shrine every 20 years for the past 1,300 years, an act of renewal that honors the cyclical quality of nature. Shinto (which most Japanese view not as a distinct religion but as a "way," or practice) teaches that gods (*kami*) dwell in all things in nature. The Japanese tradition of "oneness of humanity and nature" — also practiced by many indigenous cultures around the world — has taken on new relevance as humankind seeks to repair the damage to our natural environment caused by industrialization.

This concept also serves as the foundation of a course that one of us (Takeuchi) has been teaching since 2012. The course has included a visit to the Tohoku region of Japan, which was hit by the 2011 earthquake and tsunami, and by the subsequent nuclear accident at the Fukushima power plant that caused radioactive contamination of the air, land, and water. Local high schoolers who experienced the triple disaster, some of whom lost loved ones, have spoken with our students on the meaning of happiness and the role humans have in living in harmony with nature and preserving it.

Our students have visited the oyster farms in Tohoku to learn about symbiosis, a word derived from the Greek for "living together." At the coastal town of Kesennuma in Miyagi Prefecture, the symbiosis between the forest and the sea was recognized — and restored — through the initiative of one fisherman running an oyster farm. Shigeaki Hatakeyama noticed that his oysters were turning blood-red due to the outbreak of red tide in the mid-1960s. When he realized that the tide was caused by the contaminated river water flowing into the bay, he convinced his fellow fishermen to start planting trees in the forest to protect and preserve the river basin. He was motivated by elders' teachings that essential nutrients for the sea are carried by rivers from the forest.

Hatakeyama established a not-for-profit organization to do this work. Its name, roughly translated, means "The forest is the lover of the sea." The name conveys its purpose, but the tagline makes the symbiotic relationship crystal clear: "The forest is longing for the sea. The sea is longing for the forest." In other words, the people at the sea are saying, "We need the forest to make sure oysters live," and the people on land are saying, "We need the oysters to make sure reforestation continues generation after generation."

When the earthquake and tsunami hit Kesennuma in 2011, Hatakeyama lost his mother and his boats. His only solace came when he found later that there were enough healthy plankton in the bay to feed the oysters, and that is what kept him and his organization going. When we value living with nature, we care for the environment — and in turn preserve our livelihoods.

SURVIVING THE FUTURE

These six practices must become a way of life for companies to survive in this day and age of "unknown unknowns." They must also become the modus operandi in the life of a strategist who seeks to meet the unprecedented challenges facing businesses and humankind. Observing leaders who consistently do these things has taught us the following lessons about strategy.

First, strategy must be driven by human beings. Strategy is as fundamental as thinking good thoughts, doing the right thing, and practicing self-reflection and self-discipline in everyday life. The six practices we discussed represent our philosophy of doing business — what we call soul. Our customers, employees, suppliers, communities, and shareholders want to know whether we have a soul, if we are to build mutual trust and connection.

Second, strategy is driven by wisdom. Mother's wisdom (what elders have taught us) and practical wisdom (what lived experience has taught us) enable us to grasp the essence of a matter intuitively and, at the same time, cope with the fast-changing world. Companies have to continuously change to survive, so they should focus on becoming a little bit better every day rather than fixate on drawing up a precise plan. Practical wisdom enables managers to make judgment calls on how to act at certain times, under specific conditions, and to undertake the best action at each juncture.

Third, strategy is about future-making. The future is hazy and unpredictable, which is why leaders need to tell stories about where they are headed — it allows others in the organization to follow. Narratives illustrate a set of beliefs about what the company stands for and what kind of legacy it wants to leave behind for future generations. These stories bind the organization together and help strategy become a way of life for all employees.

Last but not least, strategy is about making choices. It is about choosing the future we want to make, and that future must extend beyond the narrow interests of the company. Only then will companies start thinking of themselves as social entities that have been charged with a purpose to create lasting benefits for society and to improve the human condition. No company will survive long term if it does not start with a moral purpose and end up offering value to customers, contributing to society, living in harmony with nature, and creating a better future — every day, as a way of life.

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REFERENCES

1. M. Lieberman, "Social: Why Our Brains Are Wired to Connect" (New York: Crown, 2013), 43.

2. For more on recent findings in neuroscience, see I. Nonaka and H. Takeuchi, "The Foundations of Knowledge Practice," chap. 2 in "The Wise Company: How Companies Create Continuous Innovation" (New York: Oxford University Press, 2019); and I. Nonaka and H. Takeuchi, "Humanizing Strategy," Long Range Planning 54, no. 4 (August 2021).

3. C. Koch, "Consciousness: Confessions of a Romantic Reductionist" (Cambridge, Massachusetts: MIT Press, 2012), 129-130.

4. M. Rother, "Toyota Kata: Managing People for Improvement, Adaptiveness, and Superior Results" (New York: McGraw Hill, 2010), 16.

5. As of late May 2021, Microsoft's market capitalization exceeded that of its two biggest rivals in cloud, Google and Amazon.

6. R. Waters, "Satya Nadella Brought Microsoft Back From the Brink of Irrelevance," Los Angeles Times, Dec. 21, 2019, www.latimes.com.

7. S. Nadella, "Satya Nadella Email to Employees on First Day as CEO," Microsoft, Feb. 4, 2014, https://news.microsoft.com.

8. E. Osono, N. Shimizu, and H. Takeuchi, "Extreme Toyota: Radical Contradictions That Drive Success at the World's Best Manufacturer" (Hoboken, New Jersey: John Wiley & Sons, 2008).

9. "Shadowing Akio Toyoda: 72 Hours in Germany," President, Aug. 1, 2016, 109 (in Japanese).

10. Based on an interview with Naito in 2005, when Nonaka started to serve on the Eisai board.

11. Based on interviews with Komori on multiple occasions, from 2012 to 2019, in Tokyo.

12. S. Komori, "Innovating Out of Crisis: How Fujifilm Survived (and Thrived) as Its Core Business Was Vanishing" (Berkeley, California: Stone Bridge Press, 2015), 134-135. The parentheses were added and the paragraphs shortened by the authors.

13. Komori, "Innovating Out of Crisis," 157.

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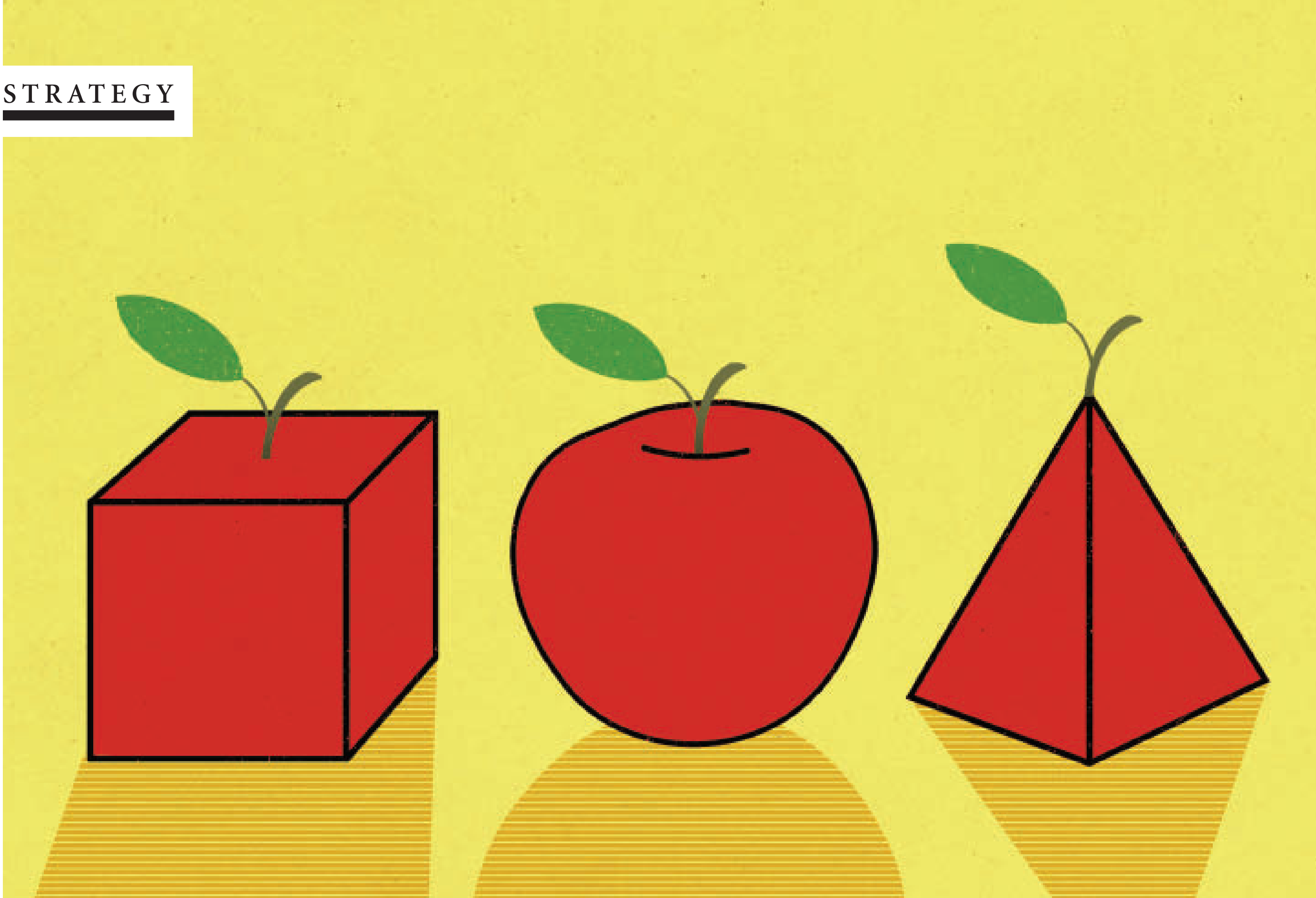
STRATEGY



Three Ways to Sell Value in B2B Markets

Value-based selling can boost margins and competitiveness, but vendors must first advance beyond the prevailing one-size-fits-all approach.

BY JOONA KERÄNEN, HARRI TERHO, AND ANTTI SAURAMA

The ability to quantify and communicate value in business-to-business (B2B) sales is more important than ever. As customers face pressure to reduce costs while maintaining profitability, and more competitors are digitally enhancing or "servitizing" their offerings, value-based selling (VBS) has become critical in B2B markets.[1] Yet when it comes to turning the idea into action, many companies seem to stumble.[2]

The key challenges of VBS often stem from the confusion and uncertainty about the actual value salespeople are supposed to sell, the outcomes they are supposed to price, and the risks and responsibilities the seller and buyer are supposed to share.[3] While current literature considers VBS to be essentially a one-size-fits-all approach to sales, it leaves managers clueless about how to apply it in different situations. This is particularly acute in B2B markets, where vendors need different capabilities depending on whether they are selling high-value products, value-intensive services, or performance-based solutions.[4]

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Based on our decade-plus of field research with more than 70 companies in a wide range of B2B industries, we suggest that rather than viewing VBS as a single strategy, vendors should choose from three different approaches. Our findings suggest that vendors can adopt either a *product-centric*, *customer process-centric,* or *performance-centric* VBS approach. In this article, we highlight the key characteristics, requirements, and challenges of each option and provide guidance on how to choose the right approach based on the circumstances.

The Key Capabilities of VBS

VBS is based on demonstrating and documenting the monetary worth of the economic, technical, service, and social benefits a specific customer receives in exchange for the price that customer pays.[5] This is a powerful marketing approach, because ultimately, B2B customers purchase goods and services to reduce their costs or boost their own revenues.

There is general agreement that VBS requires four core capabilities.[6] First, vendors must have a profound understanding of a customer's business model so that they can move beyond reacting to the customer's articulated needs and identify value drivers that make a substantial impact on a customer's business profits. Second, vendors must build quantified value propositions about the size of the value opportunity compared with the next-best alternative, whether that is the customer's current situation or a competitive offering. Third, VBS requires vendors to clearly communicate their ability to deliver promised value, typically via customer references or value guarantees, to reduce perceived risk. And finally, vendors must monitor, verify, and document that the estimated and promised value has been realized.

However, many vendors face significant challenges when trying to apply these capabilities in practice. This is because the current understanding of VBS reflects a one-size-fits-all mentality and assumes that VBS works the same way in all situations. But what it lacks is more fine-grained insights into how companies should apply VBS with different types of offerings, customers, or usage situations.

In our field research, we have noticed that just deciding to sell value is rarely a sufficient strategy to implement VBS. Instead, successful vendors take a more granular approach and choose a VBS strategy that centers on either product, customer process, or performance. (See "The Transition to Selling Value," p. 66.) In contrast, vendors with less success in implementing VBS often fall back on a price-centric approach, demonstrating competitive prices and product features rather than the value to the customer's business.

Product-centric VBS is the easiest way for many companies to transition to VBS. This approach still builds on most manufacturers' greatest asset — the product — but shifts the sales pitch from product features to customer benefits. In product-centric VBS, the key idea is that, informed by deep customer insights and product expertise, vendors are able to innovate superior offerings that can unlock substantial and measurable cost-reduction or revenue-generation opportunities for customers. As long as the vendor can demonstrate how the estimated business impacts will offset the higher purchasing price compared with the next-best alternatives, it should be able to move into premium pricing. Examples of product-centric VBS offerings are AkzoNobel's paint that enables faster repainting, and SKF's bearings that require less maintenance over their lifetime.

The seller's role is to provide optimized resources for the customer's value creation processes while the customer remains responsible for the actual value creation. This requires customers to make only limited adaptations related to product usage rather than making more disruptive process changes or potentially relinquishing some operational control to the supplier. Still, this approach succeeds only if the customer can understand and evaluate offerings based on their total cost of ownership (TCO) to the whole organization rather than on immediate price and short-term cost savings to the purchasing function. Consequently, product-centric VBS requires sellers to identify purchasing managers who are able to understand and prioritize TCO, or other customer stakeholders (such as production, operations, or finance) who are interested in organizational bottom-line impacts.

Vendors that succeed at product-centric VBS are able to leverage deep customer insights in innovating offerings that can help increase

THE RESEARCH

Since 2010, the authors have collaborated with more than 70 companies in a wide range of B2B industries. Some were already advanced at value-based selling (VBS), while others were just beginning to invest in the approach.

The authors relied primarily on inductive research methods and more than 100 semistructured interviews with senior decision makers to elicit managerial insights into the key strategies, practices, and challenges of VBS.

They supplemented the field interviews with managerial workshops, roundtables, and some longitudinal observations of the outcomes of specific VBS initiatives.

customer revenues or reduce costs in their processes. While this approach is a less drastic departure from traditional price-centric product selling and is usually relatively easy to implement among the vendor's sales force, it is still vulnerable to product imitation. Thus, to sustain product-centric VBS, vendors need to make continuous investments in R&D and customer insights to enhance their offerings' value potential and keep competitors at bay.

Customer process-centric VBS shifts the focus from selling valuable offerings to facilitating valuable improvements in customers' business processes, producing measurable financial benefits. Here, the vendor's role is to educate customers on how to more effectively apply specific resources in their own value creation processes. As with product-centric VBS, as long as vendors can demonstrate how their application expertise can lead to quantified cost savings or productivity gains, they should be able to claim premium prices for their time and resources. Examples of customer process-centric VBS are Kemppi's diagnostics for welding processes, Caterpillar's and Volvo's truck fleet analysis and consultations, and Metso Outotec's smelting and refinery process optimization. All are aimed at increasing process efficiencies, revenues, and/or performance while reducing operating and maintenance costs.

In customer process-centric VBS, value is cocreated by seller and customer: The seller actively facilitates value creation through consultative work. Vendors can rarely achieve this without customer inputs such as access to business parameters, application details, or performance data, as well as customers' willingness to commit to process adaptations in areas that vendors pinpoint as ripe for

THE TRANSITION TO SELLING VALUE

Each approach to value-based selling (VBS) requires a significant shift in thinking relative to price-centric selling — and subsequent shifts in mindset as organizations move from the less complex product-centric view to the more ambitious approaches that focus on customer process and performance.

	PRICE-CENTRIC SELLING	VALUE-BASED SELLING		
		PRODUCT-CENTRIC VIEW	**CUSTOMER PROCESS-CENTRIC VIEW**	**PERFORMANCE-CENTRIC VIEW**
Sales Focus	Sell products that meet customer-specified needs	Sell benefits instead of product features	Sell process improvements instead of product improvements	Sell realized performance outcomes instead of potential value
Value Focus	Estimated value in use not explicitly expressed	Estimated value in use of the offering	Estimated value in use of the process improvements	Realized value in use in the customer processes
Pricing Logic	Cost-/competition-based	Premium pricing based on estimated value in use	Premium pricing based on estimated value in use	Premium pricing based on realized value in use
Seller Role	Providing resources for customer value creation	Providing optimized resources for customer value creation	Facilitating customer's value creation processes	Taking responsibility and bearing the risk for customer's value creation processes
Customer Role	Fully responsible for value creation	Responsible for value creation	Cocreate value with selling party	Cocreate value with selling party
Customer Adaptations	None	Minimal product-usage adaptations	Process adaptations	Governance and business-process adaptations
Suitable Buying Approach	Price-focused product buying	Total cost focus in buying	Long-term business value in buying	Long-term business value in buying
Key Requirements	Cost advantage	Product excellence and value communication	Process expertise and value facilitation	Performance optimization and value realization
Key Challenge	Commoditization	Product imitation	Continuous improvement and contract renewal	Risk assessment and variable control

improvement. This approach is appropriate for customers that not only understand the implications of TCO (beyond individual products) but are also willing to both collaborate with the vendor and enact changes in their wider business processes.

For vendors, the key requirement underlying successful customer process-centric VBS is often accumulated process expertise and a consultative sales force that has a detailed understanding of the customer's business and usage processes. Since customer process-centric VBS relies on application expertise instead of product innovation, it offers relatively good potential for sustained competitive advantage. A key challenge is that once the customer has learned how to run its processes more efficiently, it becomes imperative — yet increasingly difficult — to find further improvement opportunities to ensure contract renewal.

Performance-centric VBS shifts the selling focus from innovating offerings or delivering process improvements to guaranteeing performance outcomes and realized value in use (the net present value of benefits that an asset generates for its owner under a specific use). Here, pricing logic is usually tied to results such as improved productivity, efficiency, or availability, or decreased TCO or total cost per unit. This can sometimes include complex gain-sharing (or pain-sharing) arrangements, where predetermined incentives and penalties are applied if vendors overperform or underperform. Customers may find it attractive to tie payments to business outcomes, since it reduces risk and aligns buyers' and sellers' goals. Rolls-Royce's Power-by-the-Hour agreements for jet and ship engines are a well-known example of this approach; others are Hilti's tool fleet management solutions, Michelin's tire fleet management solutions, and Kemira's total chemical management solutions.

While performance-centric VBS offers the potential to deliver the greatest value and highest margins, this approach is particularly challenging, because vendors not only have to take full responsibility for value creation but also bear the risks related to value realization. This requires that the seller gains sufficient control for value realization, typically by taking responsibility for selected customer processes. And customers need to be willing to cocreate value by giving the seller access to process information and usage data and agreeing on which responsibilities are critical to value realization. Thus, performance-based VBS is suitable for customers that are willing to outsource some of their (usually noncore) business processes and engage in long-term partnerships and that are capable of adapting both processes and governance mechanisms in order to shift some responsibilities to the vendor.

For vendors, successful performance-centric VBS depends on their ability to realize targeted value outcomes and to assess and mitigate potential risk. This involves developing and jointly agreeing on relational governance models that define the seller's and buyer's roles and responsibilities for value creation, and on how the realized opportunities and emergent risks are shared. A key challenge is ensuring that vendors can understand and control all the key variables that can affect value realization; otherwise, they bear unnecessary risks in guaranteeing outcomes they cannot control. Typically, performance-centric VBS is very challenging, and only a few companies have been able to master it. But when successfully executed, it offers strong barriers to entry and lucrative payoffs for both vendors and customers. In many cases, successful vendors start with smaller engagements to build customer trust and understanding and then broaden contracts and increase price levels gradually over time.

Choosing the Right VBS Approach

The three approaches we have discussed describe different ways to sell value in B2B markets. To put these insights into practice, we suggest that vendors pursue the following steps when choosing a suitable VBS approach.

STEP 1: Determine your strengths for VBS. Consider where your unique strengths and key differentiators lie vis-à-vis competitors. Are they in superior technical products, accumulated process expertise and application skills, or the ability to manage customer processes for improved performance outcomes? Put differently, can you deliver quantified monetary value by selling better products, better process efficiencies, or guaranteed performance outcomes? Reflect also on whether

> Customer process-centric VBS requires a deeper consulting capability: Salespeople need a profound understanding of the customer's business, and the consultative selling skills to detect, discuss, and improve the customer's pain points.

you have a realistic chance of advancing your strengths into other areas of VBS. Once you have your strengths figured out, you have a better chance of matching them to potential VBS opportunities in your target market.

For example, when competing in a highly commoditized chemicals market, Kemira realized that customers did not always know how to use chemicals correctly, let alone optimally. Instead of continuing to compete on product features, Kemira trained its sales and application managers to look for opportunities to improve the customers' chemical processes. This enabled Kemira to leverage its accumulated chemical applications expertise and, over time, move into selling total chemical management solutions.

STEP 2: Identify substantial value creation opportunities in your key target markets. Analyze the key value drivers in your customers' profit formulas. Are they related to costs, revenues, or tied-up capital, or do you see underutilized value opportunities in these areas? Importantly, the three VBS approaches offer different potential ways to impact customer profits: The impact of superior products is usually limited to cost savings; process support, however, can extend to revenue-generation enhancements, and taking over customer processes for guaranteed performance can impact customers' tied-up capital. Once you have identified substantial value-creation opportunities in your target markets, you can start charting the right path for implementing the required VBS approach.

For example, when Hilti analyzed how much its customers were spending on purchasing versus owning and maintaining power tools, it quickly realized that tool ownership costs had a much bigger effect on customers' productivity. In response, it shifted its value proposition from selling premium tools to launching its Tool Fleet Management program to optimize customers' overall tool ownership costs.

STEP 3: Understand what kind of internal adaptations specific VBS approaches require. Internal resistance is often a major obstacle to VBS, so it is critical to understand what kind of adaptations and change-management strategies will be needed to implement different VBS approaches.

Product-centric VBS requires mostly *psychological and cultural adaptations* in a salesperson's mindset compared with price-centric selling. While salespeople can still use their product expertise, they need to shift their selling focus from product features to quantifiable benefits and communicate those to wider target audiences that are usually higher up in the customer organization. This can usually be facilitated relatively well by providing sales training, value calculators, and/or new incentive schemes, so that the existing product sales force can move into product-centric VBS without facing overwhelming difficulties.

To accomplish this, Peikko, a steel composite beam manufacturer, has retrained its salespeople to focus on easier installations and reduced construction times for its offerings. They have also been trained to communicate these benefits to stakeholders higher in the value chain, such as investors, architects, and structural designers, who can have a major influence on customers' buying decisions.

Customer process-centric VBS, on the other hand, requires much deeper *consulting capability adaptations* in order to advance customers' own value creation processes. While value communication skills are important, they are no longer enough: Salespeople now need a more profound understanding of the customer's business, along with the consultative selling skills needed to detect, discuss, and improve the customer's pain points. The reality seems to be that usually only a few product salespeople are able to adopt customer-centric VBS with ease. Hence, to facilitate the adoption of customer-centric VBS, vendors often recruit key individuals directly from their customer industries (to gain customer goal, process, and industry understanding), form sales teams that collectively have the required capabilities, and/or roll out major sales training and service transition programs.

For example, IBM acquired the whole consulting arm of PricewaterhouseCoopers to strengthen its capabilities to sell complex and high-value technology and business services. Alternatively, when Kone, an elevator and escalator manufacturer, transformed itself into an intelligent building solutions provider, it had to invest in an extensive companywide sales support program, including training programs, value calculators, solution champions, and modular offerings. This investment provided its existing product sales force with the tools and skills to tailor solutions to customer needs and sell enhanced building performance and user experiences.

Finally, performance-centric VBS requires major *structural and governance adaptations* beyond the sales force. For example, when a vendor is guaranteeing performance outcomes, organizational boundaries become blurred because the vendor needs to be able to manage and optimize customer processes. Consequently, vendors typically assign employees to the customer site or use remote monitoring to better operate customer processes with or on behalf of the customer. In addition, vendors often need to set up joint teams with the customer to evaluate and measure performance improvements, and to design coordination and incentive structures that ensure seamless collaboration between different functions, both internally and externally. Thus, to facilitate the adoption of performance-centric VBS, vendors need to develop organizational structures that enable boundary-spanning activities. They must also design clear contracts that stipulate vendor and buyer responsibilities, individual and organizational compensation schemes, and fair value (and risk) sharing.

When Wärtsilä, a provider of marine and energy life-cycle power solutions, made a shift from selling diesel engines to optimizing cruise fleet performance, it had to establish a new pool of engineers who were trained to take over the engine maintenance work previously done by the customer. The company also needed to train them to use data analytics and internet of things (IoT) software to monitor engine efficiency in real time. In addition, Wärtsilä had to set up a contract where compensation and risk sharing were based on realized engine performance, and it had to measure the results regularly with its customers.

STEP 4: Identify and prioritize customers that are able and willing to buy value. Not all customers are responsive to VBS, and even those that are might find buying value over price challenging. Given that VBS is costly to implement, and the cost to serve increases when moving toward more complex VBS approaches, vendors need to exercise careful customer segmentation and prioritization to ensure that VBS remains profitable. In this regard, vendors should consider target customers' ability and willingness to buy value.

Buying value over products and services requires purchasing expertise, especially when moving into more advanced forms of VBS. At a minimum, buyers need to be able to understand TCO and long-term organizational performance implications, as well as potential risks related to value realization. Thus, sellers should target customers at which they can identify individuals capable of realizing long-term benefits for the whole organization through enhanced productivity gains, rather than just immediate savings for the purchasing function through reduced prices. In addition, sellers need to find customers with a sufficiently powerful buying center that is able to understand and support the required changes by aligning the organization for value realization. If the customer's existing organizational or buying culture is too rigid or inflexible, it might be too difficult and/or costly to make the changes needed to realize the identified value potential. In these cases, it is equally important that vendors understand which customers are not a good fit for VBS, even though they might look promising on paper.

While the characteristics above are not always easy to determine and may depend on the situation, successful vendors tend to look at the size of the value opportunity and access to senior decision makers higher in the customer organization. When access and opportunity are strong, vendors have a better chance of convincing customers of the benefits of VBS and facilitating the changes needed for value realization in customer organizations. In contrast, if either is insufficient, customers have less motivation to consider new approaches.

Finally, vendors should not only focus on targeting customers that understand value but also proactively try to influence buyers' understanding of value. For example, digitalization has given buyers extensive access to information, online tools, and digital platforms they can use to compare and calculate the value of alternative offerings. Thus, vendors should ensure that they share content on the potential value and TCO of their offerings in the channels that buying center members use to search for information on their business problems. For example, companies like Hilti and 3stepIT use value calculators, white papers, and industry case studies on their websites to help customers understand the real (and hidden) costs of owning power tools or IT equipment.

Vendors tend to experience two common pitfalls when approaching and segmenting potential customers. The first occurs when they push overly sophisticated VBS approaches right off the bat. This is not only very expensive and resource-intensive for the vendor but often requires changes from customers that are too drastic for them to accept. Often, a more feasible approach is to start with small improvements that require fewer changes and move into a more complex VBS arrangement gradually over time, as both parties learn how it affects the customer's value creation processes. The second pitfall can occur when vendors target only those customers that have the financial means to pay a premium for VBS while overlooking those with less investment power. Sometimes customers with tight budgets are particularly receptive to value-based pricing schemes, which ask for little or nothing upfront and tie future payments to realized cost savings or additional revenues.

WHILE VENDORS CAN PURSUE more than one approach to VBS at the same time, they usually start from product-centric VBS and gradually transition to more complex approaches. Since the capabilities and required organizational changes for each VBS approach are cumulative in nature, starting from a simpler approach is not only easier and less resource-intensive but enhances subsequent efforts to move to more complex VBS approaches. Only by understanding the key requirements for different VBS approaches can vendors eventually turn the idea into action and apply a strategically suitable VBS approach in different situations.

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REFERENCES

1. A. Hinterhuber and T.C. Snelgrove, eds., "Value First Then Price" (London: Routledge, 2017); M. Bertini and O. Koenigsberg, "Competing on Customer Outcomes," MIT Sloan Management Review 62, no. 1 (fall 2020): 78-84; and J. Keränen, A. Salonen, and H. Terho, "Opportunities for Value-Based Selling in an Economic Crisis: Managerial Insights From Firm Boundary Theory," Industrial Marketing Management 88 (July 2020): 389-395.

2. H. Terho, A. Eggert, W. Ulaga, et al., "Selling Value in Business Markets: Individual and Organizational Factors for Turning the Idea Into Action," Industrial Marketing Management 66 (October 2017): 42-55.

3. W. Ulaga and J.M. Loveland, "Transitioning From Product to Service-Led Growth in Manufacturing Firms: Emergent Challenges in Selecting and Managing the Industrial Sales Force," Industrial Marketing Management 43, no. 1 (January 2014): 113-125.

4. W. Ulaga and W.J. Reinartz, "Hybrid Offerings: How Manufacturing Firms Combine Goods and Services Successfully," Journal of Marketing 75, no. 6 (November 2011): 5-23.

5. J.C. Anderson, J.A. Narus, and W. Van Rossum, "Customer Value Propositions in Business Markets," Harvard Business Review 84, no. 3 (March 2006): 90-99.

6. J.C. Anderson, N. Kumar, and J.A. Narus, "Value Merchants: Demonstrating and Documenting Superior Customer Value in Business Markets" (Boston: Harvard Business School Press, 2007); K. Storbacka, "A Solution Business Model: Capabilities and Management Practices for Integrated Solutions," Industrial Marketing Management 40, no. 5 (July 2011): 699-711; and H. Terho, A. Haas, A. Eggert, et al., "'It's Almost Like Taking the Sales Out of Selling': Towards a Conceptualization of Value-Based Selling in Business Markets," Industrial Marketing Management 41, no. 1 (January 2012): 174-185.

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JOB-HOPPING TOWARD EQUITY

Changing employers can help narrow the gender gap in executive compensation.

BY BORIS GROYSBERG, PAUL HEALY, AND ERIC LIN

Progress on shrinking the gender pay gap has been glacially slow. Though it has narrowed somewhat over the past 40 years, stark inequities persist. In 1980, women earned 64 cents for every dollar that men earned. By the end of the decade, that amount had increased to 74 cents, but since then, gains have been much more modest.[1] As of 2018 (nearly *30 years* later), the pay disparity was 81.6 cents on the dollar.[2]

Movement toward parity has been sluggish in all segments, but it's slowest of all for people at higher earning levels, including managers and executives. Much of the research on this problem examines internal labor markets — that is, who gets promoted within organizations and how equitably they are compensated when they move up.[3] However, the external market is becoming increasingly important in filling senior roles.[4] Between 1970 and the early 2000s, the percentage of CEOs brought in from the outside jumped from 15% to 33% of all CEO hires.[5] Clearly, we need to study the context of external job moves if we want a deeper understanding of current compensation trends.

For managers and executives, changing employers has been linked to larger increases in pay. So we set out to explore whether women — particularly those in senior roles — can use external moves to increase their own compensation and perhaps narrow the gender pay gap.

Existing survey-based studies suggest that gains from switching employers are less pronounced for women than for men.[6] These studies broadly compare leavers versus stayers by gender. However, leavers and stayers may have different attributes that drive pay increases — and those differences may vary by gender.

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THE ANALYSIS

The authors analyzed proprietary data on executive employment from a top-five placement firm that specializes in filling senior roles.

They also examined more than 2,000 individual career histories, publicly available on LinkedIn, and conducted interviews with 11 search firm executives.

For such reasons, we think it's necessary to take a finer-grained look at the issue by asking some pointed questions. For instance, in external labor markets, do executive women primarily get paid less for doing the same job, or does the disparity have more to do with getting barred from job opportunities with higher pay? Recent work suggests that access to those plum opportunities is a critical component. Short-listing practices in external search firms have been shown to disadvantage women.[7] But studies also show that once executive women enter consideration pools, they are as likely to be selected as men with comparable credentials.[8] That finding raises another question: Once women are placed in these competitive roles as external hires, how do their pay increases compare with those of men brought in from the outside?

In our analysis, they actually compare favorably. Using proprietary data from a top-five executive placement firm, interviews with search firm executives, and career history information on LinkedIn, we looked at more than 2,000 senior-level external job switches across a wide variety of industries and functions.[9] Surprisingly, we found that among executives who change jobs, women get higher-percentage increases than men overall. In this article, we quantify these differences and explore contextual factors that appear to be associated with the gains for women, shedding light on when women might fare better financially in changing employers.

To be clear: Higher increases are not the same thing as higher pay. In our sample of executive job switchers, women are paid, on average, less than men both before the move and after. But in some situations, external moves do appear to reduce pay disparities.

Investigating the Gap

Before digging into our findings about pay increases, let's take a closer look at the pay gap itself. When analyzing compensation, it is important to account for human capital factors (like education and experience), employer characteristics (such as organization size and industry), job types (functional roles and reporting levels), and the portion of pay that's performance-based. Isolating these factors — looking at men and women with similar education levels, work experience, roles, and so on — provides a more nuanced picture of disparity.

Such analysis starts with the "raw" pay differences between men and women and then layers on explanatory factors one by one to identify the greatest sources of difference and, ultimately, to see what gap remains after these factors are taken into account. This residual figure, often referred to as the *unexplained* gender gap, is typically taken as direct evidence of discrimination in pay. However, discrimination certainly can (and often does) also affect where people go to school, the experiences they accumulate at work, what they are hired to do, and where they are hired to do it. What's more, other unmeasured attributes can contribute to pay disparity. So, we should note, even a careful analysis controlling for measured factors, while instructive, has its limits.

We compared what executive women and men were paid before they switched employers and in their new jobs and noted three key differences.

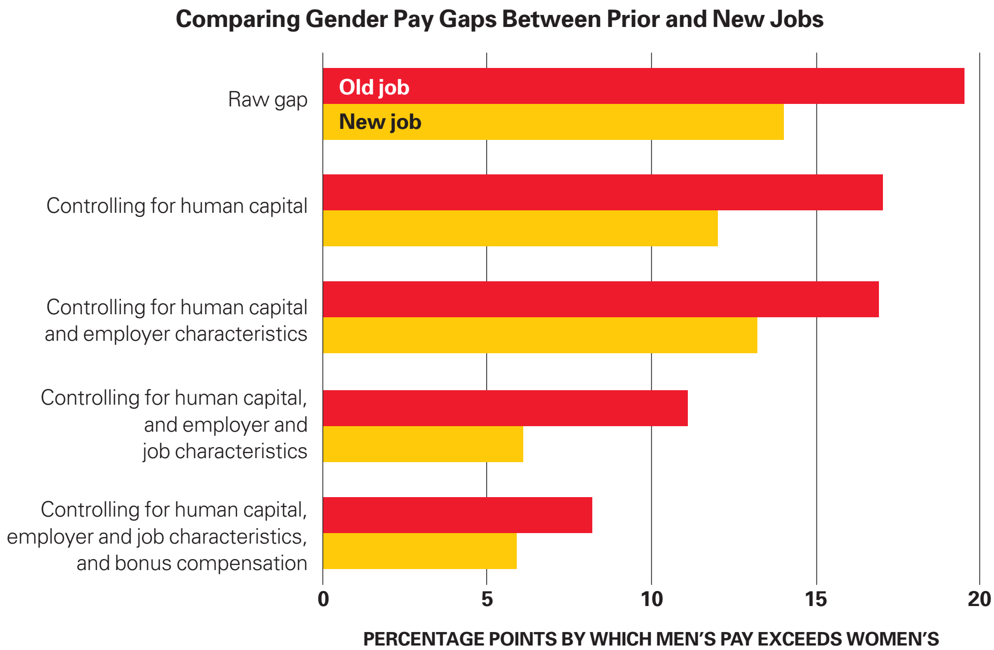
First, as expected, we observed a sizable raw pay gap between women and men both before and after the change. In our sample of executives, not controlling for any other factors, we found that men's compensation was 19.5 percentage points higher than women's in the prior job and 14.0 percentage points higher in the new job.

Second, when we included additional explanatory factors, the unexplained gender pay gap decreased but did not go away. (See "Sizing Up the Gender Pay Gap for Executives.") With controls for experience and education levels and employer attributes, the gap shrank to 16.9 percentage points in the prior job and 13.2 percentage points in the new job. The largest drop in the gender gap occurred when we accounted for function and rank; that brought it down to 11.1 percentage points in the prior job and 6.1 percentage points in the new job. We observed further narrowing of the gap when controlling for the portion of cash compensation that is performance-based. Although a gap persisted with all these factors incorporated, it was 8.2 percentage points in the prior job and 5.9 percentage points in the new job — less than half the magnitude of the raw gap.

Third, no matter what we controlled for, the difference in pay between women and men overall was smaller in the new job. That telling data point suggests that women, on average, are receiving higher increases than men when changing employers.

SIZING UP THE GENDER PAY GAP FOR EXECUTIVES

Among 2,000 executives who changed companies, the average pay difference between men and women decreased but did not disappear when we layered on several explanatory factors. In our analysis, we compared all the job switchers to determine the "raw" gap and then assessed what the gap would look like if they had similar levels of experience and education (human capital characteristics), employer traits, roles and functions, and bonus structures.



Breaking Down the Controls

To dig deeper, we further analyzed the impact of explanatory factors on the gender pay gap by doing what is called an Blinder-Oaxaca decomposition of the pay difference: We first analyzed compensation for men and women separately and then asked two questions:

1. How much would the gap close if women had the same human capital attributes (experience and education) as men and worked in the same kinds of jobs?

2. How much would it close if women were compensated at the same level as men for the attributes and roles they currently possess?

Looking at the problem in this way, we found that differences in attributes explained 60% to 70% of the gender pay gap — and that differences in how women are paid for their qualifications accounted for 30% to 40% of the gap.

The degree to which pay is contingent on performance is another important factor to consider. When we controlled for performance bonus as a share of cash compensation, the residual pay difference between women and men dropped considerably in the prior job (by 3 percentage points) but didn't change much in the new job. This is because, on average, women took on more performance-based pay than they previously had when they switched jobs.

Other Factors That Affect the Gap

Picture a long-distance foot race. Lagging runners can catch up with the leaders by improving their relative position in the pack, advancing beyond the middle runners, or the pack can tighten so that everyone is running closer together.

Now let's apply that lens to compensation. When women increase their pay and narrow the gender gap by switching employers, are they moving up in the pay-distribution pack compared with men, or is the variance in pay decreasing overall?

Our analysis suggests the latter explanation. For both men and women, pay differences based on employee attributes and job types are more muted in the new jobs than in the prior jobs. The standard deviation of residual pay differences among men drops by nearly 70% in the new jobs compared with the prior jobs. If not for that drop among men, women would have lost ground (by nearly 4 percentage points) in their relative position on wage distribution when they switched jobs. However, the diminished variance in pay in the new jobs more broadly has tightened the pack.

Unmeasured individual attributes may also have an impact on the gender pay gap. For instance, women who change employers may differ from women who stay, in ways that don't mirror the differences between male movers and stayers.

To allow for such unmeasured differences, we used what's known as a regression model with individual fixed effects. This approach creates a control condition for each person — basically, you measure the difference in pay at the individual level for everyone in the sample, then average those differences over the populations you care about (in our case, women compared with men). All individual differences that do not change over time are accounted for.

Although this technique, too, has its limitations, we were able to use it to gauge the *difference in increases* between women and men who changed jobs, without ignoring the role that individual circumstances can play. We also controlled for the same measurable attributes that we controlled for when we looked at the pay gap itself. When accounting for human capital factors like education and work experience, we found that pay increases for women were 5.5 percentage points higher, on average, than those for men. Also accounting for employer and then job characteristics increased the magnitude of these gains for women over men to 5.9 and 6.2 percentage points, respectively (and the estimates became more precise).

However, the advantages for women disappeared altogether when we factored in the levels of performance-based pay. This finding underscores how underutilized bonuses are as a tool for leveling the compensation playing field.

Why Context Matters

In what situations are women poised to benefit financially from external job moves? Our findings suggest that contextual differences in labor markets matter. Supply and demand effects are tricky to pin down with causal certainty, since each force indirectly affects the other. But patterns in the data do indicate that these forces influence which women stand to gain the most from changing employers.

Demand forces. Amid pressure to address equality concerns, organizations are generally ramping up efforts to hire more women in senior roles. While some of them may be championing equity for equity's sake, research suggests that many employers are focusing on executive hires in particular when trying to meet their diversity goals, at least partly because the representation of women is most visible in senior roles.[10] This is not good news for women at other levels, but women entering executive positions have demand on their side.

For this reason, our interviews suggest, senior-level women are in a better position than women at lower levels to command more substantial pay increases and to narrow the gender compensation gap. As one search firm executive observed, "Virtually all of my clients [looking to fill a senior role] will go out of their way to include a woman on the short list. … If a woman is not initially interested in a role because it is not quite big enough or broad enough for her, they'll often say, 'OK, OK. You can have this other division of the company as well.' And with money, they will absolutely, absolutely happily pay more for women. There is just such a strong push and momentum behind bringing women onto the exec team."

The data we analyzed conveys a similar message. Among senior executives, we found that pay increases for job-switching women were 9.41 percentage points higher than increases for job-switching men; at lower levels, women received the same increases as men when they moved. Given this pattern, the visibility of senior positions may be partly driving women's ability to achieve higher relative increases.

If the visibility of executive roles puts pressure on organizations to hire women, does that mean highly visible *employers* — for instance, public companies with a global presence — would have even greater demand for female executives? In our interviews, we found some hints that they might. As one search firm executive put it, "For an American multinational, if they were working here in my country, would they pay more to hire a female than a male? If all else would stay equal, I'd say so. But I don't see this happening with the local companies."

Our analysis also suggests that companies in the public eye may be more likely than others to give executive women higher increases to diversify their workforces. For job moves to publicly traded companies, we observed that women's average pay increase of 33.2% was 11.5 percentage points higher than men's average increase of 21.7%. For job moves to privately held companies, which undergo less scrutiny, women received the same 15.7% average increase that men did.

Supply forces. What impact might supply forces have on pay increases for women? We hypothesized that the relative scarcity of women in candidate pools could boost prices. In our interviews, that effect came up, though it did not seem to be widely exploited. One search firm executive described it this way: "Some of the female executives who are aware of [the scarcity effect] have negotiated remarkable compensation agreements. I think that the phenomenon is very real, and the few women who've figured it out have monetized it nicely."

To dig a bit deeper, we looked at industries where women are historically underrepresented, such as logistics, manufacturing, and construction. Research shows that executive women in such fields often lack career support, since they have limited access to networks of role models and mentors to fuel their professional development.[11] In our analysis, however, their scarcity seemed to give them financial leverage. We observed that those who switched jobs in industries with fewer women received an average pay increase of 34% — 13.2 percentage points higher than the 20.8% increase received by men in such industries. In industries with more equal representation, pay increases for women who switched jobs were not much higher than those for men.

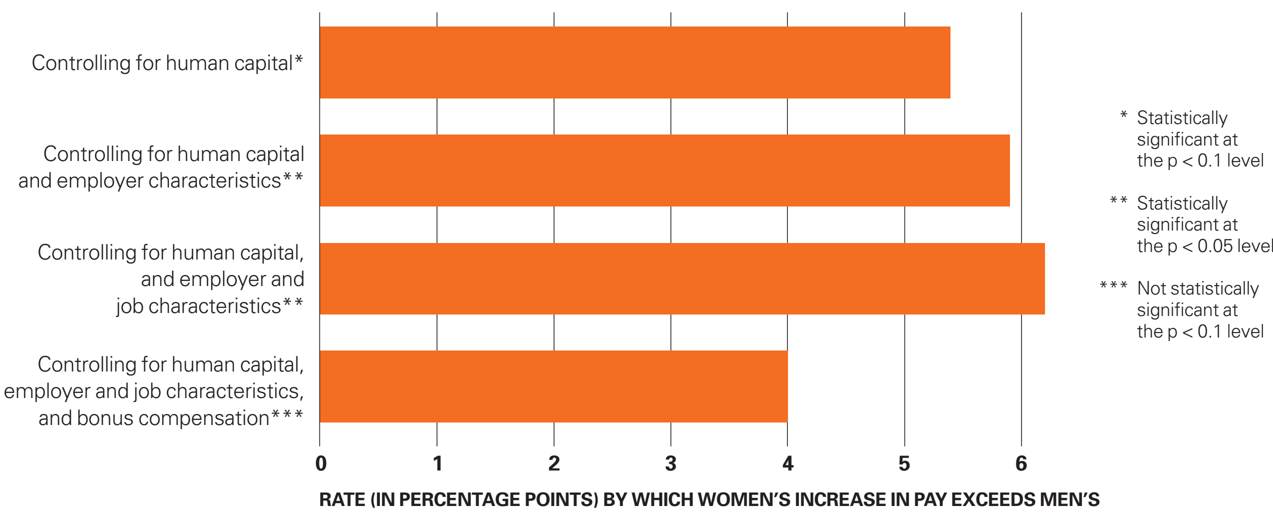
The scarcity effect can also occur in functions where women are traditionally underrepresented, such as R&D, general management, and operations. As one search firm executive commented, "If you've got a woman who is really good at sales or really good as a general manager, then they will command an even bigger premium than the ones in the functions where they're more represented."

In our sample, executive women who changed jobs in functions where they are underrepresented increased their pay by an average of 30.2%, compared with 16.8% for men; however, because these estimates could not be precisely estimated, we could not conclude that raises were different between men and women.

Finally, we considered scarcity-driven labor costs stemming not only from a lower supply of women but also from a higher cost of enticing them to move. Women bear the brunt of family concerns in many

EXECUTIVE WOMEN RECEIVE HIGHER PAY INCREASES THAN EXECUTIVE MEN WHEN SWITCHING EMPLOYERS

When executives switch employers, they tend to make more money across the board — and yet women's pay increases at a higher rate than men's pay. This effect is amplified when we control for employee and organization attributes and types of jobs, but it's reduced when we also control for the portion of compensation that's performance-based.



households, so job switches are often difficult for them. To study this family effect, we compared women's and men's pay increases among two populations: executives who have a partner and/or children and those who have neither. Because family status was captured only in the South American and European regions in our data set (45% of the sample), we examined only these two regions, where the average pay increase for job switchers overall is around 10%. In these regions, women with a partner or children received increases that were 17.9 percentage points higher, on average, than increases for men. For women without a partner or children, increases were not higher than the 10% baseline.

IN CERTAIN CONTEXTS, then, external job moves can lead to higher — and more equitable — compensation for executive women. Since our results appear to contradict prior work that used different methods, this issue deserves more study. Still, we see potential for further progress toward parity.

Even though women do not appear to be moving into more lucrative positions in more lucrative industries or roles than men overall, two mitigating factors can help them gain ground. First, executive women have an underexploited opportunity to narrow the gender gap further by negotiating a greater share of performance-based pay — particularly in contexts where they are highly visible, scarce, or both. And second, the residual, unexplained pay disparity in external job moves is decreasing generally.

Of course, gains are not distributed evenly across women in all situations. Although we're seeing progress for some, compensation remains far from equitable overall. But there's movement — and by understanding where it's happening, both employers and job candidates can build on it.

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REFERENCES

1. F.D. Blau and L.M. Kahn, "The Gender Wage Gap: Extent, Trends, and Explanations," Journal of Economic Literature 55, no. 3 (September 2017): 789-865.

2. M. Leisenring, "Women Still Have to Work Three Months Longer to Equal What Men Earned in a Year," U.S. Census Bureau, March 31, 2020, https://census.gov.

3. One of the few studies that tries to fill the gap in research on external job moves is C. Quintana-García and M.M. Elvira, "The Effect of the External Labor Market on the Gender Pay Gap Among Executives," ILR Review 70, no. 1 (January 2017): 132-159.

4. M. Bidwell, F. Briscoe, I. Fernandez-Mateo, et al., "The Employment Relationship and Inequality: How and Why Changes in Employment Practices Are Reshaping Rewards in Organizations," Academy of Management Annals 7, no. 1 (June 2013): 61-121.

5. K.J. Murphy and J. Zábojník, "Managerial Capital and the Market for CEOs," SSRN, April 2007, https://papers.ssrn.com.

6. For example, see G.F. Dreher and T.H. Cox, "Labor Market Mobility and Cash Compensation: The Moderating Effects of Race and Gender," Academy of Management Journal 43, no. 5 (October 2000): 890-900; and J.M. Brett and L.K. Stroh, "Jumping Ship: Who Benefits From an External Labor Market Career Strategy?" Journal of Applied Psychology 82, no. 3 (June 1997): 331-341.

7. T.L. Botelho and M. Abraham, "Pursuing Quality: How Search Costs and Uncertainty Magnify Gender-Based Double Standards in a Multistage Evaluation Process," Administrative Science Quarterly 62, no. 4 (December 2017): 698-730; and G.F. Dreher, J. Lee, and T.A. Clerkin, "Mobility and Cash Compensation: The Moderating Effects of Gender, Race, and Executive Search Firms," Journal of Management 37, no. 3 (May 2011): 651-681.

8. R.M. Fernandez and M. Abraham, "From Metaphors to Mechanisms: Gender Sorting In(to) an Organizational Hierarchy," research paper 4779-10, MIT Sloan School of Management, Cambridge, Massachusetts, April 2010; and R.M. Fernandez and M. Abraham, "Glass Ceilings and Glass Doors? Internal and External Hiring in an Organizational Hierarchy," research paper 4895-11, MIT Sloan School of Management, Cambridge, Massachusetts, January 2011.

9. B. Groysberg, P. Healy, and E. Lin, "Determinants of Gender Differences in Change in Pay Among Job-Switching Executives," ILR Review, published online June 2020, forthcoming in print.

10. L.M. Leslie, C.F. Manchester, and P.C. Dahm, "Why and When Does the Gender Gap Reverse? Diversity Goals and the Pay Premium for High Potential Women," Academy of Management Journal 60, no. 2 (April 2017): 402-432.

11. K.S. Lyness and D.E. Thompson, "Climbing the Corporate Ladder: Do Female and Male Executives Follow the Same Route?" Journal of Applied Psychology 85, no. 1 (February 2000): 86-101.

Reprint 63104. *For ordering information, see page 4.*

Small Stake, Big Voice

Minority partners in joint ventures can still negotiate substantial rights to have a say in business decisions.

BY LOIS FERNANDES D'COSTA, TRACY BRANDING PYLE, AND JAMES BAMFORD

Taking a minority stake in a joint venture (JV) can make good business sense. What doesn't make sense is ceding more control than you have to. With the post-pandemic surge in partnerships, including those with unequal ownership, executives negotiating the deals should understand that they may hold more cards than they realize.

Nearly half of the world's largest JVs have a minority partner — that is, an owner with an equity interest below 50%.[1] Companies may take minority stakes simply due to comparative asymmetries in their contributions of cash and assets to the venture or because they're selling a majority stake in a previously wholly owned business as the first step in a staged exit. They may want to test the waters before fully committing to a new geography or business, or local regulations may prevent them from having a controlling stake. Regardless of the reason, minority partners often seem to hold an enviable position: They invest less money, have lower reputational risk, and can lean on a majority partner to do much of the heavy lifting.

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THE ANALYSIS

The authors analyzed 55 joint venture agreements involving a minority partner.

They also drew from their own database of 600 of the largest joint ventures announced from 1990-2020, and from their experience over multiple decades serving more than 300 ventures involving a minority partner.

Unfortunately, minority partners in a joint venture can struggle to be heard, with their concerns about risks and opportunities going unanswered by venture partners and with no ability to force resolution of their issues. Perhaps not surprisingly, joint ventures with minority partners have lower success rates than 50-50 ventures, thanks in part to minority partners lacking the clout to get their voices heard.[2] JVs with minority partners also frequently end in a buyout of the minority partner.[3]

However, our analysis of 55 JV agreements with a minority partner, combined with our experience over multiple decades serving more than 300 such ventures, shows that minority positions need not be debilitating, and minority partners need not be silent subjects of actions taken by the majority.

Best Practices for Structuring Deals With Minority Positions

In our experience, there are 10 practices that minority partners can use to more effectively negotiate and structure their rights to amplify their voices and better govern and influence a venture.

1. Don't let your ownership interest define your decision rights. Our analysis of joint venture contracts with a minority partner shows that minority decision rights are not correlated with ownership interests.[4] Instead, a company's ownership interest is determined by its formal contributions to the venture (for instance, capital, assets and intellectual property, and commercial contracts), while its voting rights and protections are driven by its negotiating leverage and informal contributions. Examples of informal contributions include privileged access to technology, brands, financing, government relationships, and customer markets. Companies may also gain negotiating leverage when there is a scarcity of viable alternative partners.

This finding carries profound implications for companies considering a minority position in a JV. Companies should not assume or be willing to accept counterparty assertions that just because the company will have, say, a 20% interest, its voting and veto rights should be limited to a few decisions — and that this somehow represents the market norm in deals with similar equity splits. Rather, companies should aggressively negotiate voting rights using a confident understanding of what leverage and contributions they bring to the JV.

Minority partners should not limit their pursuit of approval rights to decisions that fundamentally alter the joint venture's business or legal agreements, such as admitting new owners. Our analysis shows that minority partners were no less likely to be able to approve fundamental matters, such as termination of the JV or declaration of bankruptcy, than to approve more regularly addressed business matters, such as the declaration of dividends or approval of material contracts with third parties. (See "Minority Partners Can Negotiate to Be Decision Makers.") Therefore, minority partners should push to obtain rights related to more regular decisions, such as approval of the venture's annual plan and budget, in addition to the approval of fundamental events.

2. Be willing to consider exceptions, thresholds, and other terms that limit decision rights. Minority partners often do not have the unhindered ability to exercise their decision rights. These rights might be contingent — that is, either triggered or fall away — only when certain thresholds are crossed or conditions are fulfilled. We believe that the judicious use of contingencies that limit the minority partner's decision rights can, counterintuitively, be a positive for the minority partner. With the minority partner having a vote only under extraordinary situations, the majority partner should be more willing to consider giving the minority stakeholder these decision rights in the first place.

Many decisions in the ventures we looked at were subject to such conditions. For instance, consider Alcoa World Alumina and Chemicals (AWAC), a multibillion-dollar 60-40 joint venture between U.S.-based Alcoa and Australia's Alumina that accounts for roughly one-tenth of the global alumina market. In AWAC, minority partner Alumina has to approve acquisitions and divestitures that are likely to result in a change of mining or refining production above certain levels, or those with a price tag of $50 million or greater.

In other instances, minority decision rights can disappear under specified conditions, such as if a target or milestone is not met. This was the case in Solae, a 72-28 soy ingredients JV between DuPont and Bunge that became a world leader in developing soy-based ingredients and was fully acquired by DuPont in 2012. In that venture, minority partner Bunge's right to appoint the CFO was contingent on the venture operating within 80% of its business plan with respect to operating income and ROI. If this target was not met, the board, by majority vote, could replace the CFO.

3. Allow for a loss of rights upon a drop in ownership. A minority partner might consider agreeing to an automatic reduction in decision rights if its ownership interest falls below a threshold. This reduction can be used to address anticipated future ownership changes — including dilution, the transfer of some of its ownership to a third party or another owner, or the exercise of a right to purchase another partner's interests. Limiting the minority partner's rights if its interest in the venture drops provides comfort to the majority partner that future decisions will not be held hostage by a minority partner with a marginal ownership interest.

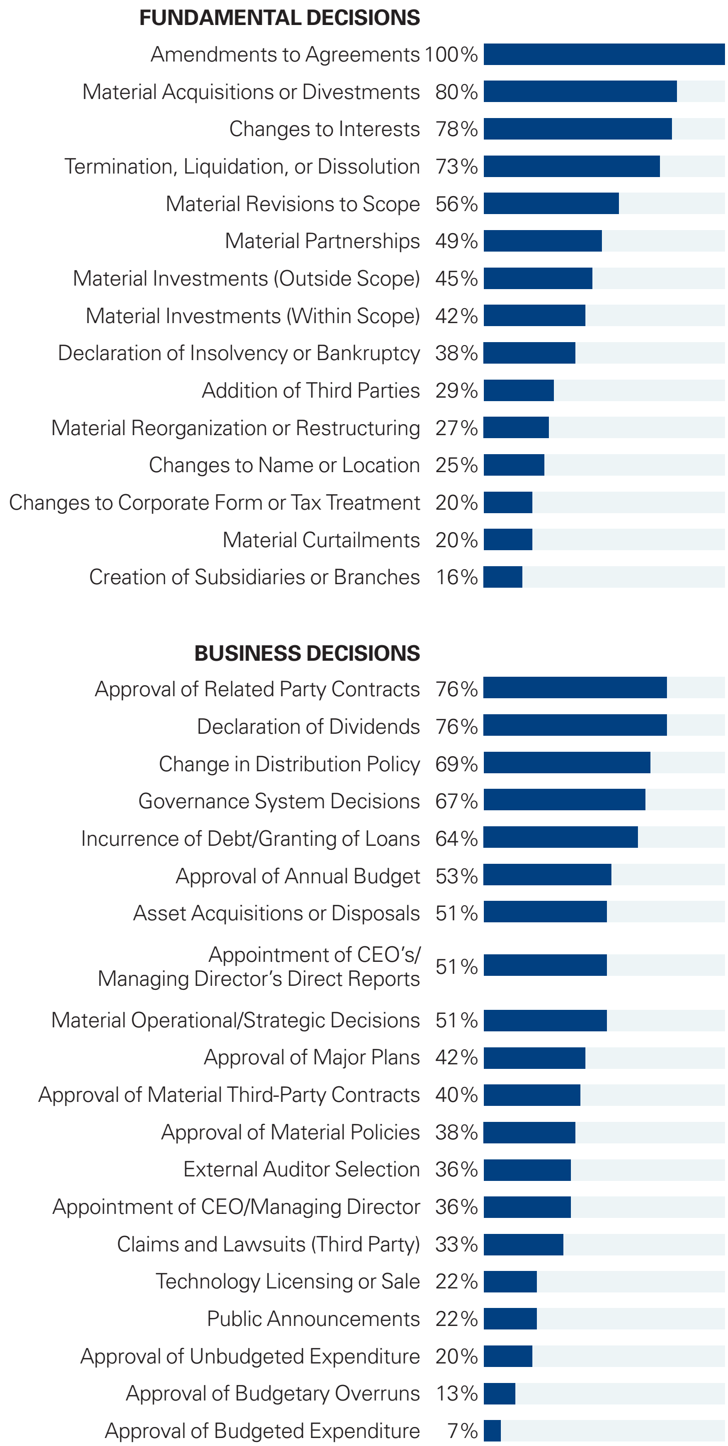
As a practical matter, the loss of rights can be implicit and a logical result of the minority partner's ownership dropping. For example, if the partners must approve the annual budget by a vote of 90%, a minority partner has no meaningful vote or ability to veto the decision when its ownership falls below 10%. In other cases, the loss of rights is explicit, such as when the agreement specifically states that the minority partner will lose some or all rights when its ownership drops below a certain level.

A little less than half (44%) of the ventures we reviewed included an explicit loss-of-rights provision. Of these, 38% had a cutoff of 10% — the most common tipping point we observed. For example, in the case of Cingular Wireless, a joint venture that was majority-owned by SBC Communications, the minority partner BellSouth would lose its representation on the strategic committee that made all JV decisions if its ownership interest fell below 10%. Other common cutoffs were 20%, 15%, and less than 10%.

4. Pre-agree on key decisions. Prospective minority partners should seek to gain pre-agreement on certain matters, such as an initial business plan, a product road map, a year-one budget, a dividend policy, and the initial management team for the venture. Our analysis shows that pre-agreement was

MINORITY PARTNERS CAN NEGOTIATE TO BE DECISION MAKERS

Minority-stake partners have found ways to amplify their voices. An analysis of 55 joint venture agreements shows the variety of issues on which minority-partner approval is required and the percentage of ventures where these rights are part of the deal.



SOURCE: WATER STREET JV DATABASE

most frequent when it came to the venture's dividends policy. More than half of the JVs we reviewed had a pre-agreed-upon distribution policy, such as requiring the venture to distribute 100% of its free cash flow.

Pre-agreement might also be selectively sought for other decisions. For example, in the Pfizer-GlaxoSmithKline joint venture, the parties agreed that up to 25% of the estimated $600 million in annual cost synergies from creating the JV were to be reinvested to support innovation and other growth opportunities. In other instances, especially in JVs in developing countries with state-owned companies as the minority partner, the parties will often pre-agree on the number or percentage of JV employees or suppliers that must be locals as opposed to from abroad.

Pre-agreement on certain plans and decisions establishes the balance of power, at least during the initial partnership period, to a more equal footing for the minority partner.

5. Find creative ways to resolve deadlocks to increase a majority partner's comfort. Majority partners may fear a deadlock if a minority partner has a blocking right on key decisions. Minority partners should consider mitigating this risk, and thus increasing the likelihood that the majority will agree to grant additional rights, by building in deadlock-breaking mechanisms. Some deadlock-breaking mechanisms may favor the majority, while others may protect minority stakeholders in areas of particular importance to them. For example, the majority may be able to cast a deciding vote to break a deadlock, but doing so would trigger a *put right* — that is, the right to sell its interest — for the minority.

For instance, in a bio-based chemicals joint venture with BioAmber, minority partner Mitsui had a right to sell 100% of its interest if BioAmber made certain third-party contractor payments above a dollar threshold despite Mitsui's disapproval. Rosemont Copper, a development-stage open-pit copper mine in the United States that was a joint venture until 2019, had an equally creative deadlock mechanism: The minority partner negotiated the right to prepare an alternative budget if it rejected the budget prepared by the majority partner, with an independent expert choosing between the original and alternative budgets.

6. Seek participation rights to gain voice rather than added vote. Rights to participate in the JV board and committees give minority partners the opportunity for more active involvement in the venture's governance and more strident representation of their interests. Since rights to participate in the venture's governance structures are not necessarily linked to the minority partner's voting rights, they might be easier to negotiate.

Participation rights that minority partners should consider advocating for include board representation disproportionately higher than ownership interest (present in 17% of JVs reviewed); quorum requirements mandating the presence of the minority's representative (present in 38% of JVs reviewed); rights to decide who leads or attends board meetings, such as the right to appoint an independent director or board observers (present in 15% of JVs reviewed); and guaranteed representation on committees (present in 27% of JVs reviewed).[5] Such participation rights can be powerful, potentially swaying conversations and thus decisions.

In the case of Glad, an 80-20 food container and storage products venture between Clorox and Procter & Gamble, minority partner P&G has two nonvoting observer positions on the board in addition to its official board representatives. This gives P&G a larger collective voice beyond its voting representation.

“Rights to participate in the joint venture board and committees give minority partners the opportunity for more active involvement in the venture's governance and more strident representation of their interests.

> Minority partners should look to secure exit rights beyond standard provisions such as a right of first refusal, among others. These rights do not uniquely protect their ability to exit the venture freely and at a fair price.

7. Negotiate terms that reinforce the best interests of the joint venture versus the majority partner's interests. Minority partners should seek to establish contractual terms and practices that promote the collective interests of the partners and thus provide some protection from majority overreach. For example, the JV board may have an independent director (voting or nonvoting) who can provide an objective view on JV decisions rather than one colored by the majority partner's strategic objectives, or the agreements might explicitly affirm the director's duty of loyalty to the JV, reducing the likelihood that decisions will be made solely in the majority partner's interests.[6] The JV may also have an independent management team with significant delegations who can act in the interest of the venture and are better insulated from the pressures and whims of the majority.

8. Secure enhanced information, audit, and compliance rights. Minority partners should evaluate the opportunity to see into and evaluate how a JV is performing beyond baseline expectations, such as the right to receive audit reports and quarterly financials.

One-third of the minority partners in our data set had such enhanced rights. For example, Vodafone — a 45% owner in cellular telecommunications venture Verizon Wireless until it was bought out in 2014 — had the right to a detailed monthly report of operating and financial statistics (including number of subscribers, minutes of use, average revenue per subscriber, and other metrics) even if its equity interest dropped to 5%. In the JV combining the brokerage operations of Wachovia and Prudential Financial, minority partner Prudential had a special right to designate areas for audit, within limits.

9. Build in protections against dilution. Minority partners risk being diluted when they are dragged along into capital investments proposed by the majority partner that they are unwilling or unable to fund. As one layer of added protection, companies should consider securing the right to veto material investments — a right that more than 40% of minority partners in our data set held.

Beyond such veto rights, minority partners might look to additional protections, including the right to opt out of capital investments, limitations on capital contributions (that is, there are caps on the minority partner's required contributions), limitations on dilution (that is, the minority partner cannot be diluted below a specific percentage), and retention of control rights in the event of dilution.[7] Just under a third of the JVs we reviewed (29%) included some form of additional protection against dilution for the minority partner.

In AWAC, minority partner Alumina is not required to contribute to capital calls that are above $1 billion. If Alumina chooses not to contribute, it will not be diluted; instead, the agreements establish that the partners will agree on a mechanism, such as a disproportionate allocation of returns, to compensate majority partner Alcoa for its excess contribution.

10. Protect the value of your investment at exit. Finally, minority partners should look to secure exit rights beyond standard exit provisions such as a right of first refusal, right of first offer, tag-along rights, and drag-along rights. These rights do not uniquely protect the minority partner's ability to exit the JV freely and at a fair price.

Additional protections that a minority partner might consider include pre-agreed-upon pricing methodologies upon exit, favorable minority put rights (for instance, if the JV misses a milestone or if the majority partner is in breach of the JV agreement), a right for the minority to freely transfer its interests to a third party under certain circumstances (for instance, if the JV loses its government license), and a shorter noncompete duration post-exit for the minority partner than for the majority stakeholder.

We found that 56% of minority partners negotiated at least one of these added layers of protection. For instance, in the case of ACNielsen eRatings.com, a JV to develop and maintain audience measurement panels, minority partner NetRatings — which held a 19.9% interest — could require the majority partner to purchase its equity interest at fair market value if the joint venture did not have an initial public offering within five years.

Maintaining Ongoing Influence

Beyond negotiating favorable contractual rights and protections, the most influential minority partners are deliberate about how they approach using their formal and informal powers to influence the majority partner and management. In our experience, translating these powers into influence is built on four essential actions.

1. Put the right people on the board, with a lead director. The most persuasive minority partners organize themselves to enable influence. This starts with placing the right people on the board and ensuring that these company directors have clear expectations for the role, including the ability to dedicate sufficient time (at least 15 to 20 days per year).

Companies often think too narrowly and quickly when selecting directors and would be better off starting with a candidate pool and evaluating potential directors based on set criteria. Such criteria should take into consideration their functional skills mix, passion for the business, prior governance experience, ability to serve for a number of years, communication skills, and informal influencing skills. Companies then need to ensure that directors have the training and incentives to perform the role; this includes assessing their previous performance as members of a board. To drive added accountability, the company should designate a single executive to serve as the company's lead director — essentially, a first among equals — with clear accountability for the venture's strategy, performance, and risks.

2. Establish a sufficiently resourced owner governance team. Influence is also built on an appropriately resourced and configured team to support the company directors. Such non-operating owner governance teams collect and review information received from the JV (for instance, financial information and audit reports), identify trouble spots (such as corporate social responsibility issues, excessive JV risks, or areas for operational improvements), prepare board members for meetings, obtain resources from the parent company for the venture, and seek to influence JV partners and the JV management team.

These teams vary in size based on industry, the complexity of the venture, and the partner's desired level of involvement. We have observed companies that spend little to no time on JV governance to companies with up to 76 full-time equivalents working on a JV.[8] However, each of these is an extreme; the median non-operator governance team size is 7.2 full-time equivalents in large oil and gas ventures and 4.9 full-time equivalents in other large natural-resources ventures, such as mining and chemicals.

3. Understand your sources of leverage, currencies, and tradable goods. To exercise influence, minority partners need to understand what tools are at their disposal. These will include — but likely go well beyond — the company's negotiated contractual rights. Does the company have indirect commercial influence over the venture as a supplier, service provider, technology licensor, or customer of the venture? For example, U.S. agricultural giant ADM recently entered into a 30-70 JV with the Brazilian company Marfrig to create a plant-based proteins company, PlantPlus Foods. ADM will provide key technology to the JV through a technology licensing agreement, potentially securing a level of influence exceeding that of a financial investor with a similar ownership interest. Companies can also use the renewal of such agreements as a source of significant influence and leverage in other areas of the business.

Minority partners should also consider other sources of influence. For instance, a minority partner might possess a close relationship with a key regulator or access to other business opportunities that could be used as a carrot to drive action. And minority partners always have the option of using negative influencing tactics, such as threatening to litigate or to exit the venture over a dispute. These tactics may be detrimental to the long-term health of the relationship but can succeed as a last-ditch effort if other means of influence have failed.

4. Organize work around an annual influencing plan. Minority partners need to be strategic in where they focus. A powerful tool to drive discipline and impact is an annual influencing plan. The idea is simple: The minority partner's governance team accountable for the JV identifies a few areas of high value or risk where it believes the majority partner and management lack sufficient focus or skills and where the minority partner is in a position to influence outcomes.

Having identified, say, three to five such key focus areas, the minority partner then develops an organized plan covering each area, with clear accountabilities, timing, and tactics. This plan, which is internal to the minority partner, is used as the basis for managing the parent company team working on the venture. This plan should leverage formal contractual rights and use other influencing techniques, such as offering to provide expertise in areas where the majority needs help. At its best, an influencing plan in action has a campaignlike quality — that is, a focus on a select set of concrete outcomes over a specific time period.

NEGOTIATING STRONG MINORITY RIGHTS and protections and having ongoing influence over a venture can be critical to a minority partner's ability to steer the venture as it sees fit. However, in reality, this is only half the battle. The other half is in relationships — with both other partners and the JV management team itself — and in the ability to understand the business's strengths, weaknesses, and needs.

So minority partners should indeed seek to have structurally sound rights, but with a caveat: They should not do so at the cost of burning bridges with partners or JV management. Severed relationships can have rippling effects for years. It's crucial to weigh the value of obtaining desired rights with the costs of using hardball tactics. After all, what's the use of having a big voice if no one is listening?

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REFERENCES

1. We define a minority partner in a joint venture as one of the following: a partner holding less than 50% in a bilateral joint venture with a single majority partner, a partner in a multilateral joint venture in which one partner holds greater than 50% interest, or a partner in a multilateral joint venture in which no partner holds a majority interest but where one or more other minority partners holds a significantly larger ownership share (for instance, 40-40-20). Our database of 600 of the largest joint ventures announced from 1990-2020 shows that 42% included a minority partner.

2. J. Bleeke and D. Ernst, "The Way to Win in Cross-Border Alliances," Harvard Business Review 69, no. 6 (November-December 1991): 127-135.

3. Our database of joint venture disposition approaches for 248 ventures that ceased to be JVs as of August 2020 shows that one partner bought out the other in 77% of JVs with a minority partner, compared with in 58% of JVs without a minority partner. These disposition approaches include when one partner buys out the other partners, when the partners sell to a single third party, if the joint venture is dissolved or liquidated, or if JV ownership otherwise changes (for example, the JV goes public or the parent companies merge).

4. We reviewed the percentage ownership of 55 JV minority partners and whether such minority partners were required to approve each of 35 decisions. We then performed a logit regression for each decision to determine whether equity ownership drove whether the minority partner would have such a decision right at a statistically significant level (P value < 0.1).

5. Based on a review of 55 joint venture agreements of JVs with a minority partner in Water Street's joint venture database.

6. See J. Bamford and S. Bhargava, "Independent Directors for Joint Venture Boards," The Corporate Board, (January-February 2020): 21-25; and M. McGovern, T. Branding, and J. Bamford, "JV Directors Duty of Loyalty," Harvard Law School Forum on Corporate Governance, Nov. 16, 2019, https://corpgov.law.harvard.edu.

7. For more information on creative mechanisms for future capital investments, see E. Elliott, L. D'Costa, and J. Bamford, "Agreeing to Disagree: Structuring Future Capital Investment Provisions in Joint Ventures," Journal of World Energy Law & Business 13, no. 1 (May 2020): 12-22.

8. J. Bamford, M. Mogstad, and J. Kwicinski "Non-Operated Joint Venture Asset Teams: Does Size Matter?" Oil & Gas Journal 14, no. 7 (July 17, 2017): 1-7.

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The Outsider Edge

The success of managers hired for temporary roles shows that sometimes loose ties and cultural distance can help a leader be effective.

BY TRACY ANDERSON AND PETER CAPPELLI

Scholars have been examining the role of relationships in managerial work for decades. Managers are not individual contributors, after all. They lead projects, operate business units, and coordinate activity — in short, they get things done through others.

Back when social theorist Max Weber explained how bureaucracies function, managers did all this largely by relying on formal authority over subordinates.[1] Since then, they've expanded their toolkits to include other forms of influence, such as calling in favors, drawing on shared values and experiences, and offering (or at least implying) reciprocal back-scratching.[2] Such exercises in social power are rooted in the relationships managers have with others in the organization — their bosses, direct reports, and peers.[3]

Does being an effective manager *require* these relationships? Modern observers tend to assume that it does — and that the broader and deeper the relationships a manager maintains, the better. But is that really true? Existing research provides limited insight, because it focuses mainly on

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THE RESEARCH

The authors conducted exploratory interviews with managers hired as contractors and with the employee-managers who worked alongside them in client companies.

They then conducted two surveys, collecting data from 673 contractors in the U.S., Europe, and Asia.

Approximately 95% of survey respondents had worked as a contractor-manager for more than one year, and 90% reported at least eight years of experience.

traditional managers — employees who have developed or will develop relationships within their organizations — and excludes people who do the same work without having established those connections. So we took a different approach. We looked at an atypical but long-standing practice in Europe that has now spread to the U.S. and elsewhere: giving independent contractors temporary management roles within companies.[4] While this sort of arrangement isn't the norm, it also isn't rare. Survey data suggests that as many as 14% of independent contractors in the U.S. are doing work that is labeled managerial (although it's not clear whether some of that is manager-level work done in individual contributor roles).[5] And a number of companies are in the business of placing contractor-managers, with each reporting tens of thousands of placements.[6]

To be clear, these are not consultants acting as occasional advisers (something that is reasonably common), nor are they individuals brought in as contractors who later become employees or who are angling for a permanent job. They are true contractors, working under the terms of an agreement set out in advance, with a defined end point that is known to their client's employees. And they are doing real, core management tasks: supervising employees, managing resources, and leading initiatives to achieve desired outcomes for the business.

As nonemployees, contractor-managers do not have a history in their client organization, and they do not have a future there beyond the end of their contract. For those reasons, you might not expect them to succeed in their roles. But we find that despite the challenges they face, most of them do succeed — by making use of their outsider status.

We were granted access to a global pool of contractor-managers by a-Connect, one of the largest intermediary companies placing people in such roles. A typical engagement for these contractors would be as a program lead or project manager, which involves planning, directing, and/or coordinating the activities of others to implement strategy. For instance, they might create and execute marketing and communication plans for new products, establish and monitor work streams across units for post-merger integration, or usher new drugs through clinical trials and the regulatory process.

After conducting exploratory interviews and surveying hundreds of contractor-managers in various industries (including pharmaceuticals, finance, agribusiness, and food manufacturing), we found that the leading reason they were hired was to supply a type of expertise the client didn't have. The second most common reason was a lack of short-term capacity — meaning the client organization had some coverage in a given area, but not a sufficient amount to handle current needs. In these situations, clients needed to fill a temporary gap between role requirements and existing capabilities and didn't want to create a permanent position to do so.[7]

Here, we'll discuss the challenges that contractor-managers face as organizational outsiders, the somewhat surprising advantages they enjoy, and how organizations might expand their notion of what it means to be a good manager.

The Drawbacks of Being an Outsider

As you'd expect, being a contractor-manager has some real challenges. Evidence of five key drawbacks emerged from our qualitative interviews with contractor-managers and the employee-managers who worked alongside them in client organizations. (See "The Trade-Offs of Hiring Contractors as Managers.")

First, given their lack of history in an organization and their short-term commitment to it, contractor-managers don't acquire much social capital. (Employee-managers hired from the outside are in a similar position at first but soon start acquiring social capital that they can use down the road. Contractors generally aren't around long enough to build much of a "bank.") The employee-managers we spoke with appreciated the role that personal relationships played in getting *their* work done — particularly, calling in favors to obtain resources or getting information on the underlying situation — and recognized that contractors were at a disadvantage in this regard. Clients spoke about how not having relationships made it difficult for contractor-managers to overcome pushback they encountered, because they could not leverage the influence of colleagues.

The second and third challenges relate to organization-specific knowledge. Contractor-managers were inhibited by not understanding cultural norms — for instance, when and how it

THE TRADE-OFFS OF HIRING CONTRACTORS AS MANAGERS

Managers who are brought on as contractors, with clear end points to their engagements, experience distinct drawbacks and advantages.

CONTRACTOR ATTRIBUTES	DRAWBACKS	ADVANTAGES
No history within the organization	• Lack of social capital • Lack of cultural knowledge • Lack of context about how the organization functions and how decisions are made	• Greater breadth of experience • Novel expertise not available internally
Not an employee (not part of formal organization)	• Reduced influence over rewards • Reduced access to internal information	• Greater objectivity due to having no vested interests in status quo • Less constrained by organizational norms and politics
Time-limited engagement	• Reduced influence over rewards	• Greater objectivity because not seeking own progression within organization • Less constrained by organizational politics because less concerned about long-term reputation

was acceptable to express an opinion in the organization. As a result, they sometimes violated unspoken rules and failed to connect with employees. Contractor-managers also lacked other important contextual knowledge. In particular, they did not always know who it was they needed to influence in a given situation, because the reality of the organizational functioning and decision-making was often poorly represented by formal reporting structures.

The fourth challenge stems from not being part of the formal organization and from the time-limited nature of their engagements. Most contractor-managers played a small role, if any, in making decisions about employee appraisals, rewards, recognition, and compensation. (About half of our survey respondents said they had some input, but it was limited.) Employees did not expect them to be influential in future assessments of their performance, which meant that they were less likely to simply do what the contractor-managers wanted in order to avoid negative consequences.

And finally, contractor-managers' status as nonemployees also meant that they did not always have access to the same systems and information as employee-managers. They might not have access to corporatewide information systems, for example, or the ability to research company records, especially in organizations where intellectual property is closely guarded.

Of course, these disadvantages for contractors, culled from our interviews, also highlight the benefits of managing as an employee. In our surveys, respondents recognized some of the same trade-offs. When asked what helped them succeed in their last contract assignment *and* in past employee-manager roles, they said that strong relationships with peers and with subordinates, and knowledge about organizational functioning, were important in their work as employees but did not contribute to their success as contractor-managers. (See "When Expertise Matters More Than Relationships," p. 88.)

The Unexpected Leverage

In light of the challenges they face, how do contractor-managers do their jobs effectively? In both of our surveys and in interviews, they reported relying on their personal expertise and credibility — enhanced by their experiences working elsewhere — to a much greater extent than they had in previous employee-manager roles.[8] The next most important factor, and perhaps the most interesting, was their ability to connect with employees and create trust thanks to the objectivity and independence that come from not being an employee. So, as we further explain below, some of the apparent limitations of being an outsider can actually be used to create opportunities.

Outside experience and expertise. While the contractor-managers we studied lacked organization-specific experience, they typically had greater breadth of experience and more recent external experience than even the more senior employees at client companies. Having something that others in the organization did not gave the contractors an important source of social power and legitimacy.

After all, the clients we spoke with often cited internal gaps in skills or experience as their main reason for bringing in outsiders to do managerial work.

Still, the expertise of the contractor-manager, and its value, was not immediately accepted as a given. Because of their lack of history within the company, the contractors needed to quickly prove that they knew their stuff upon starting an assignment. One of them pointed out that even though clients want to bring in a manager with a strong profile, "the minute you're there and the contract is signed … they don't want you to just call the shots, either." Before they'll really trust you, he said, you have to deliver "insights or materials or access to research … which the company before didn't have," and do so in a humble, respectful way.

The tension between quickly demonstrating valuable expertise and demonstrating humility was also raised by clients who highlighted the need for contractors to respect internal expertise while proving their own. For example, one client said, "They also need to understand, 'Where are the pockets of internal expertise that I could tap into?' The more these folks actively look for that and actively engage internal capabilities, the more acceptance they will find." Displaying humility and respect was also suggested as a way in which contractors could themselves earn respect in the absence of an existing reputation.

Contractor-managers also used their positions as outside experts to create opportunities for employees to develop and shine — for example, by bringing them into projects they're running, mentoring them as they contribute, and allowing them to take the lead in making presentations that report project successes to senior executives. As one contractor-manager told us, "We're basically there to support them and make them look good. We're not there to make ourselves look good. ... I try to really emphasize that when I'm working with them."

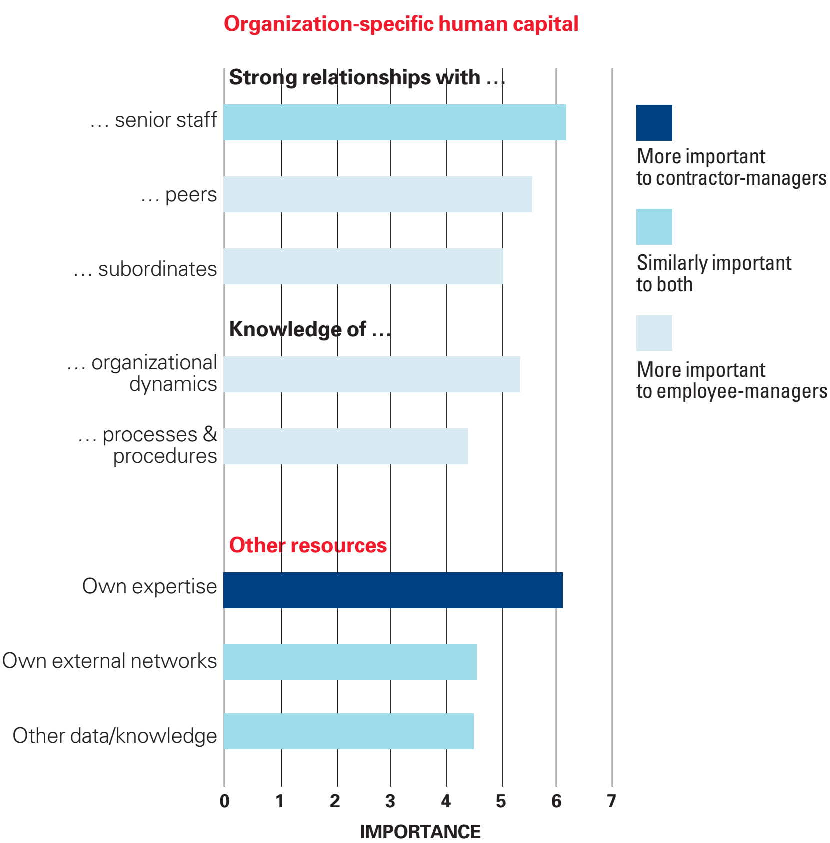
One client was particularly aware of this potential for mentoring and sponsorship: "These are individuals who bring a wave of experience. There's a great appetite, I think, [for employees] … to learn and to embrace some new thinking. I've seen some great relationships develop between consultants that we've had on board and employees."

Such relationships were mutually beneficial, of course. While they gave employees opportunities for growth, they also created avenues for the contractor-manager to engage employees and secure their buy-in and commitment.

Relative freedom from organizational politics and constraints. The contractors we spoke with also used the time-limited nature of their engagements to gain the respect of employees and create connections. Because they could operate relatively unencumbered by organizational norms, politics, and reputational concerns, others tended to view them as direct, apolitical, and objective. That same freedom also gave the contractors some leeway (after they'd proved themselves early on) to make mistakes and ask for forgiveness. It can be harder for employees to be that straightforward, because they are aware that anything they say or do may affect their future in the

WHEN EXPERTISE MATTERS MORE THAN RELATIONSHIPS

We asked people to think about all the management work they had ever undertaken as a contractor and as an employee and to rate the factors below in terms of importance to success on projects. Strong relationships with peers and subordinates and knowledge of organizational dynamics, processes, and procedures mattered a great deal in their work as employee-managers but not as contractor-managers, where they benefited more from their own expertise.



SURVEY SCALE: 1 = not at all important; 7 = extremely important organization. As one contractor told us, "[As an employee,] you think, 'What's best for me: to make my career go well, or make me look good, or make my department look good?' or, 'How can I get my promotion?' and it's actually a very different agenda."

Being able to speak candidly, unconcerned about building a future at the client company, helped contractors earn respect, which they could then draw upon to work constructively with others. This outsider advantage highlights a common truth about organizations: Employees often have an incentive to please current leadership rather than look after the longer-term interests of the organization.

Some contractors also talked about how a time-limited work arrangement can facilitate personal connections, because workers feel they can be less guarded with an outsider who has no stake in the status quo and no social network in the company through which sensitive conversations could be revealed. In other words, an outsider can be trusted.

You might imagine that calling in the contractor-manager's corporate sponsor to help clear organizational roadblocks would be useful, but the contractor-managers reported that doing so undercut their other sources of power, particularly their independence.

New Possibilities for Organizations

Seeing contractors tackle the core functions of managing people and resources to execute strategy is new to many of us. It broadens our notion of what management is — and what it takes to be effective.

Contractors do not have the relationships that people tend to assume are essential to good management. And yet, as we've shown, their independence can bestow credibility, objectivity, and candor that may be lacking among those within the formal structure. Their distance from organizational politics can help them build trust, making others more receptive to their instructions, support, and advice — and more willing to share their own ideas. Having developed a breadth of knowledge and experience through various short-term engagements, contractor-managers can also command respect in a client organization and share their expertise as a reward to employees who are eager for growth. These tools can be used to boost workers' engagement, commitment, and performance.

Such insights deepen our understanding of "helping behaviors" inside organizations. Short-term relationships can yield long-term benefits on both sides: Employees learn and grow by working with the contractor, and the contractor's experience and knowledge become even richer in the process. And status difference becomes less of a barrier (for both accepting and giving help) when you remove political risk and angst from the equation.[9] Turning this idea around, we can also see how an organization's formal hierarchy, culture, and social structures might *limit* trust in employee-managers, who, as organizational insiders, may be driven by a desire to protect their own long-term interests within the company.

While our findings can help individual managers think more deeply about their roles and more creatively about their careers, the insights also have immediate practical value for organizations seeking greater flexibility. The idea of creating time-limited management roles may be particularly attractive to fast-growing companies where managerial needs evolve quickly, rendering longer-term placements undesirable, or to companies considering how to adapt to an uncertain future. Indeed, contractors may sometimes be better suited than employees to manage projects that challenge existing norms and processes — in organizations where substantial change is sought, for instance, or where internal politics are an obstacle to progress. Or they might flourish in startups, where norms and processes have yet to be established and everyone is new to one another. Someone who has operated only as an established employee-manager, especially in larger organizations full of formal procedures and cultural norms, may struggle in such an environment.

Conversely, contractor-managers may be less successful in organizations where cultural transformations are necessary, because they have fewer tools to change behavior than do competent employee-managers. More generally, they have relatively little to contribute to such change efforts. The perception that executives bring in contractors to perform layoffs and other unpleasant tasks simply to avoid having to do those tasks themselves may well be true, but that is quite different from working effectively with the remaining employees to change fundamental mindsets and behaviors.

Whether there are limits to the managerial tasks that contractors can perform for their clients and where those limits might be are interesting questions that cut to the heart of what it means to be a company and where the boundaries lie. The fact that clients cannot tell contractors how to perform their tasks without turning them into employees could be a substantial barrier for projects that are likely to change a lot and that might require a fair amount of redirection along the way. The contracts themselves — highly specific, legally binding documents — would become moving targets: They would need to be redone each time the desired tasks and outcomes changed. For that reason, it may be that contractor-managers, like other contractors, are best brought in when the tasks and desired outcomes are well defined and can be clearly articulated in advance. Otherwise, the work of writing, enforcing, and continually rewriting the contract could become all-consuming.

Other considerations about using contractor-managers may come from the supply side. The independent contractors in our study were not very interested in becoming employees.[10] They preferred having independence: Their top three reasons for being a contractor-manager were control over the work they did, flexibility in hours worked, and the ability to take time off when they wanted to, none of which typical employees have. If more and more experienced and skilled managers start to feel this way, organizations wanting just-in-time talent will be pushed further in the contractor direction.

WHILE MANAGING AS an organizational insider has its advantages, our findings suggest that contractors have a different kind of leverage. In many situations, their outside perspective and capabilities are exactly what's needed.

These days, employee-managers are being advised and coached to build relationships with people in their teams to engage them and develop them more effectively. That approach tends to pay off for those who are sticking around long term — and for management challenges that require many deep and broad connections in the organization — but it's not the only way. Sometimes there are benefits to being one step removed and having an end point in sight.

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REFERENCES

1. See M. Weber, "Bureaucracy," in "Max Weber: Economy and Society," eds. G. Roth and C. Wittich (Berkeley, California: University of California Press, 1978).

2. Classic studies include H. Mintzberg, "The Nature of Managerial Work" (New York: Harper & Row, 1973); and R.M. Kanter, "Men and Women of the Corporation" (New York: Basic Books, 1977). For more recent studies, see L.A. Hill, "Becoming a Manager: Mastery of a New Identity" (Boston: Harvard Business School Press, 1992); H. Mintzberg, "Managing" (San Francisco: Berrett-Koehler Publishers, 2009); and P. Osterman, "The Truth About Middle Managers: Who They Are, How They Work, Why They Matter" (Boston: Harvard Business Review Press, 2008).

3. J.R.P. French and B. Raven, "The Bases of Social Power," in "Studies in Social Power," ed. D. Cartwright (Ann Arbor, Michigan: Institute for Social Research, 1959); and P.M. Blau, "Exchange and Power in Social Life" (New York: John Wiley & Sons, 1964).

4. R. Feltham and D. Hughes, "Interim Managers: Distinguishing Personality Characteristics of Managers on Short-Term Contracts," International Journal of Selection and Assessment 7, no. 4 (December 1999): 209-214.

5. T. Anderson and M.J. Bidwell, "Outside Insiders: Understanding the Role of Contracting in the Careers of Managerial Workers," Organization Science 30, no. 5 (September 2019): 869-1123.

6. InterimExecs, Cerius Executives, and Globalise are examples of such companies.

7. Our survey instruments are available upon request.

8. In our second survey, we made use of an adapted scale to measure the French and Raven bases of social power, drawing on the following work: T.R. Hinkin and C.A. Schriesheim, "Development and Application of New Scales to Measure the French and Raven (1959) Bases of Social Power," Journal of Applied Psychology 74, no. 4 (August 1989): 561-567.

9. See, for example, S.P. Doyle, R.B. Lount, S.L. Wilk, et al., "Helping Others Most When They Are Not Too Close: Status Distance as a Determinant of Interpersonal Helping in Organizations," Academy of Management Discoveries 2, no. 2 (June 2016): 155-174.

10. Other researchers have similar findings. See Anderson and Bidwell, "Outside Insiders"; and S.J. Barley and G. Kunda, "Gurus, Hired Guns, and Warm Bodies: Itinerant Experts in a Knowledge Economy" (Princeton, New Jersey: Princeton University Press, 2004).

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The Brand Advantage That Will Lure Shoppers Back to Stores

New research finds that when consumers value a brand's cultural richness, they prefer in-store shopping to online.

BY JONATHAN Z. ZHANG

Retail stores are in dramatic decline, undercut by e-commerce giants like Amazon and the convenience of online shopping.[1] The COVID-19 pandemic has only accelerated this shift, with e-commerce now accounting for more than 1 in 5 retail purchases — a significant jump from online sales in 2019.[2]

Is there a future for physical stores and experiential retail when e-commerce has become so convenient and is gaining in popularity? If physical stores do offer customer value, is this more important for some kinds of brands than others? Amid the heightened uncertainty about the future of in-person retail channels, I investigated what brand attributes affect customer preferences for shopping online versus in stores.

When Do Customers Prefer Brick-and-Mortar Retailers?

We know that consumers are uncomfortable buying big-ticket items online without first seeing and interacting with them in stores — an attitude surprisingly prevalent among younger consumers.[3] Studies also show that customers visit stores to answer questions about the fit and quality of some products (sweaters and eyeglasses, for example), but once they have answered these questions, people will migrate online for convenience.[4] What research hadn't addressed is how brand characteristics, beyond fit, quality, and price, affect which sales channels consumers choose and whether (and why) customers would continually

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visit physical stores once they knew about a product's quality.

With those questions in mind, I looked at three ways in which customers experience brand value: brand performance (functionality and quality), purchase experience, and brand culture. The third of these value dimensions, brand culture, arises from a brand's traditions and history and signifies ideals that are more abstract than product functionality or quality.[5]

Brand culture is typically associated with venerable luxury brands — for example, Breguet, a luxury European watchmaker with a history that stretches back to 1775, has a strong brand culture. But then so does watchmaker Shinola, founded in 2010. In a short time, this Detroit-based company has come to stand for pride and resilience, which it associates with American manufacturing culture. This kind of branding resonates deeply with younger consumers, who, research shows, crave meaning and experiences when shopping.[6]

I suspected that the brands customers experience as having a strong brand culture would also be ones for which they preferred in-store shopping. Culture may be best communicated in a traditional retail store: In this richer sensory environment, consumers can see products up close and engage with staff members, who are representatives of the culture. I expected that such interactions would deepen customers' ties to brands and build loyalty.

To test this hypothesis, I conducted large-scale longitudinal market surveys (both before and during the pandemic) of more than 2,000 consumers across several product categories. I asked respondents to consider their three most recent purchases and rate the quality of the brand's performance, their purchasing experience, and the strength of the brand's culture. For each brand, I then asked them to indicate how important each value dimension was to them by allocating 100 points across the three, with the most points going to the most important value dimension. And finally, I asked them how happy they would be if online were the only purchasing channel available to them for that brand for the next two years.

THE RESEARCH

In collaboration with several large multichannel retail partners, the author surveyed 2,098 retail customers who had purchased clothing, clothing accessories, perfume, watches, jewelry, or wine, in store or online.

Respondents ranged in age from 24 to 75; about 86% were in the U.S., and the remaining 14% were mostly in Europe. The group had a median income of $83,000.

To determine the strength of brand culture, the author asked respondents to rate how well a brand embodied a set of humanistic values and ideals, whether it provided a strong cultural experience, and whether it reflected either strong historical culture or contemporary culture.

Culture Matters Most

Analysis of the survey results showed that consumers prefer physical stores for engaging with culturally rich brands and that stores matter less to consumers purchasing culturally lean brands. This view remained consistent in surveys fielded both before and during the pandemic. I also discovered that the richer the brand culture — and the more strongly a person identifies with a brand — the more likely they are to prefer visiting stores.

This research counters a widely held assumption that consumers prefer to shop first at a store to learn about a brand and then migrate online. On the contrary, people told me that with culturally rich brands, they would like to return to a store from time to time. I also found, contrary to prevailing wisdom, that younger consumers are more likely than older consumers to prefer an in-store experience when shopping for culturally rich brands. And these findings also do not support the long-held theory that people are wary of buying big-ticket items online and that this is the main reason they visit shops.

Most people expressed displeasure with the idea that they could shop only online — even for goods they were currently purchasing online. For example, 74% of consumers surveyed have bought fine wines online, yet they expressed unhappiness about e-commerce being the only option in the future. Similarly, even though respondents said they made 57% of watch purchases and 49% of jewelry purchases online over the past two years, they still would prefer to have the option of going to shops occasionally. Respondents were less dismayed with the prospect of buying items of lesser cultural value —

> Culture may be best communicated in a traditional retail store: In this richer sensory environment, consumers can see products up close and interact with staff, building loyalty.

> If consumers perceive a brand's value to be primarily based on performance and functionality, then abandoning the storefront and increasing the brand's e-commerce capabilities may be a sound strategy.

including some types of clothing and lower-priced wines — only online.

In interviews, people explained that although they are comfortable purchasing brands with a high cultural value online due to convenience and variety, they get more pleasure from experiencing them in a physical store and don't want that option to be eliminated. A customer who has purchased many watches and pieces of jewelry online over the years said, "In a world without stores, it would depreciate the value of these watch brands and make them more commoditized, less inspirational, and less unique."

For culturally rich products, 56% of knowledgeable consumers — that is, those who are highly familiar with a category — prefer in-store browsing. This finding runs counter to the accepted wisdom that customers who know products well prefer online shopping because they require less information. People told me that they enjoy talking with staff members. And the more knowledgeable consumers are, the more pleasure they get from being at a store and learning from conversations. These interactions tie them even closer to the brand. I found this to be true only with culturally rich categories. For culturally lean categories, the effect was the opposite: The more consumers know, the higher the chance that they will prefer buying online.

Physical Stores Better Convey Brand Culture

It stands to reason that physical stores are better than online stores at portraying brand nuances to customers and improving their opinion of the brand. Being physically present in a store is a much more immersive sensory experience than engaging through a digital interface. As a result, customers spend more time in the store than they might engaging with a brand online, and leave with a better understanding of the brand and a stronger connection to it.[7]

To test this, I asked a random group of 185 respondents from my sample, all of whom had made both online and offline purchases in my selected categories, to rate on a scale of 1 to 7 how much brand culture and meaning can be conveyed in each channel. Their responses overwhelmingly indicated that brand culture is far better conveyed offline than online — the average rating was 6.2 for offline versus 3.7 for online for the same category. Further, I measured how consumers identify with brands they buy, which is an indication of their brand loyalty.[8] The results showed that with culturally rich brands, an in-store experience leads to a stronger connection.

Interviews with people surveyed helped explain why. One respondent told me that he had been shopping online for a particular brand of watch but felt that he hadn't fully understood the brand until he visited a store in New York and learned more about its products. "The manager explained how the current watch design pays homage to the deck chronometers on ships from the 18th century, and he showed me documents that highlighted the brand's historical contribution to maritime timekeeping," he said. "He also introduced me to other, dressier lines that I never paid attention to before. The hour that I spent in the store gave me a much better understanding of the brand, and as a result, I bought two more watches from this brand later on."

Another respondent said he often bought wine online because of convenience and price. But after visiting a local wine store and talking with the staff, he became more engaged. "I've visited my local wine store and was surprised by the staff's wealth of knowledge. Not only did this wine specialist introduce me to regions and varietals that I would've never tried, he told me background stories about some of my favorite Burgundy producers and regions and what made these wines special. This kind of education broadened my horizon and made my wine hobby far more enjoyable. It also supports my local economy. So nowadays, instead of buying wines online from a warehouse in California and then having them shipped here, I prefer to go visit this wine store and talk to the people there."

Summed up, the research suggests that culturally rich brands have a big opportunity: They can leverage physical stores to develop a more engaged and loyal customer following.

Manage Multiple Value Dimensions

These findings have implications for how brands should invest in and manage their retail channels, and how physical stores can remain relevant by delivering brand culture and meaning to consumers. First, brands must understand how consumers perceive their three value dimensions. If consumers perceive the brand value to be primarily based on performance and functionality, then abandoning the storefront and increasing the brand's e-commerce capabilities may be a sound strategy. Likewise, culturally rich brands should beware of committing to e-commerce too heavily and decreasing investments in stores. Not only will this approach fail to capitalize on a strong brand culture, which takes a long time to build, but interacting with consumers only in an online setting could distance and erode consumers' relationships with the brand and risk commoditizing it.

Culturally rich brands should invest in in-store design to create experiences that are consistent with the brand culture. They should ensure that employees are well versed not only in the brand's heritage and image but also in the broader cultural and historical context in which the brand operates. Brands should appreciate that younger consumers and knowledgeable consumers are particularly open to cultural immersion, and this should affect their thinking about how they migrate customers like these online.

THIS STUDY INDICATES that the online-versus-offline shopping debate has evolved beyond product fit, purchase experience, returns, and even customer service and must include discussion of curating high cultural value brands. As retail experiences continued turbulence, I expect a clear demarcation to emerge based on brand culture: Culturally lean brands will be more efficiently sold online, while culturally rich brands will benefit from having physical stores in addition to e-commerce.

While e-commerce is likely to grow and physical retail will have a decreasing footprint, brand owners should focus on effectively curating brand culture online and at stores. The better customers understand a brand, the more likely they are to appreciate its cultural value, which translates into a stronger bond between customers and products and greater pleasure for shoppers. Indeed, retail stores could be designed as "brand cultural centers," with a clear mandate to convey brand meanings and cement loyalty.

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REFERENCES

1. A. Bhattarai, "'Retail Apocalypse' Now: Analysts Say 75,000 More U.S. Stores Could Be Doomed," The Washington Post, April 10, 2019, www.washingtonpost.com.

2. F. Ali, "A Decade in Review: Ecommerce Sales vs. Retail Sales 2007-2020," Digital Commerce 360, Jan. 29, 2021, www.digitalcommerce360.com.

3. S. Wharton, "Webrooming vs. Showrooming," PDF file (Manchester, England: PushON, 2018), www.pushon.co.uk; and S. Skrovan, Retail Dive, "Why Many Shoppers Go to Stores Before Buying Online," April 26, 2017, www.retaildive.com.

4. J.Z. Zhang, C.-W. Chang, and S.A. Neslin, "How Physical Stores Enhance Customer Value: The Importance of Product Inspection Depth," Journal of Marketing, April 7, 2021. doi: 10.1177/00222429211012106.

5. J.E. Schroeder, "The Cultural Codes of Branding," Marketing Theory 9, no. 1 (March 2009): 123-126.

6. J. Stilson, "Why Younger Consumers Are Hitting Retail Locations Rather Than Shopping Digitally," Adweek, Sept. 30, 2019, www.adweek.com.

7. J.M. Ackerman, C.C. Nocera, and J.A. Bargh, "Incidental Haptic Sensations Influence Social Judgments and Decisions," Science 328, no. 5986 (June 25, 2010): 1712-1715; A. Krishna, "An Integrative Review of Sensory Marketing: Engaging the Senses to Affect Perception, Judgment, and Behavior," Journal of Consumer Psychology 22, no. 3 (July 2012): 332-351; and J. Peck, V.A. Barger, and A. Webb, "In Search of a Surrogate for Touch: The Effect of Haptic Imagery on Perceived Ownership," Journal of Consumer Psychology 23, no. 2 (April 2013): 189-196.

8. J.E. Escalas, "Narrative Processing: Building Consumer Connections to Brands," Journal of Consumer Psychology 14, nos. 1-2 (2004): 168-180.

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consequent anxieties that this likely instills in them — at the workplace and in the (often public) transportation routes required for them to get to work.

The past pandemic year has magnified inequalities. In many cases, it has been the most vulnerable and marginalized — particularly Black and Brown people and women working in the service sectors — who have continued to do the essential face-to-face work that those of us working from home have been able to safely avoid. We've benefited from the very work that has put others at risk. We've safely retreated while others have carried on. In this sense, immobility has become a form of privilege as mobility has become one of risk.

Of course, racial and gender inequality aren't new stories. What is new is how our spatial awareness has changed as a result of spending the past year negotiating altered spaces. Also new is the growing awareness that one group's "new normal" is another group's "business as usual," with all the inequities it entails.

What will business as usual look like in the post-pandemic office? Will some of us continue to use our private spaces as workspaces? Do we need to be in the same place as our colleagues to take advantage of the creative frictions that physical colocation is known to encourage? Or can we get by with a curated combination of remote work and in-person work, as the popularity of hybrid arrangements suggests?

Prioritizing Human Connection

In the January 2021 report "Shaping the Future of Work for a Better World," global commercial real estate company JLL predicted that accelerated digital workplace transformation, coupled with an emphasis on the worker, will "address both the rising expectations of the workforce and the growing importance of human connection." Future workspaces will need to be more flexible, less centralized, and more *people-centric* to both attract and retain the best talent while ensuring that these workers are energized and creative both when working remotely and in person.

In fact, in conversations about what we've missed most about the offices we left behind last year, a persistent theme has emerged: We've missed our colleagues. We miss the opportunities for chance interactions with people we know well and those from other teams we may know less well.

Serendipity, while not a new concept in workplace design, will become a more pressing one as hybrid approaches limit workers' opportunities for in-person interactions.

Especially for people new to a company, the ability to network and connect in person is critical to building what Mark Granovetter, a sociology professor at Stanford University, identified in 1973 as weak ties — those casual acquaintances who move us outside our established and familiar "strong tie" networks. *Weak ties* offer us the opportunity to learn and expand, and in fact most people learn about and get their next job through such connections.

Reshaping Boundaries

Physical boundaries between work and domestic life have shifted radically for many; so too has our perception of what's needed for productivity and collaboration, as has the meaning of "the office" itself. These shifts necessitate a rethinking of what kinds of activities are most suited to colocation and which ones are best left to more private venues, whether a home office or a third space. A simple reset to prepandemic policies based on outmoded notions of face time and presentism are no longer assumed nor, in many cases, desired or sustainable.

The time has come for more-nuanced approaches to workplaces as ecosystems rather than discrete physical locations. We need to be asking ourselves and, more important, asking our employees what kinds of experiences benefit from what kinds of spaces — a question that can no longer be treated as though "one size fits all."

The process of reimagining office spaces introduces critical, overarching questions: How will our imaginations around the concept of workspaces and the evolving use of technology support our work practices? What do today's transformations suggest about what it means to be human at work?

Within this flux, one fact remains: People are social animals. Personality traits of introversion or extroversion aside, people need people. Advances in digital tools as intermediaries for enabling connection are not enough. Serendipity, while not a new concept in workplace architectural design and planning, will become a more pressing one as hybrid approaches limit workers' opportunities for in-person interactions. Leaders will need to anticipate and shape the kinds of social moments that enable richer, more meaningful human connections in our offices and work lives.

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Remaking the Workspace to Boost Social Connection

BY MARTHA BIRD

OUR RELATIONSHIP TO space is a complicated one. *Space* is one of those terms that many of us sense we grasp but struggle to describe with any precision. It is often imagined in terms of an imprecise *distance*, as in the space between objects and people, or a *quantity*, as in, "How much space is left on my hard drive?" or "Is there space in the living room for a desk?" Space is the subject of scientific practice as well as an opportunity for galactic travel and exploration. Our definitions of space really depend on where we're coming from. And, let's face it, most of us simply take space for granted — something that surrounds us and to which we generally pay little notice.

As a number of social scientists have convincingly argued, space is not merely a static, inert dimension in which "stuff" is placed and organized. Space is known to us by virtue of the social interactions that make it visible: Space is both deeply political and unquestionably social. Keeping six feet apart while practicing social distancing brings the relational, interpersonal quality of space front and center. It is also a reminder that our space is shared; my air is your air, and what I do affects your space, and vice versa.

For those of us fortunate enough to have been able to conduct our work within the relative safety of our domestic spaces over the past year, there has been a general sense of disorientation and a blurring of work and home life.

Many other people, however, have had no choice but to get up every day and go to a place of work. Think for a moment about the kinds of proximities that onsite caregivers, teachers, health care providers, delivery people, transit workers, and store clerks face daily due to the necessary density of their workspaces. They must contend with their inability to distance much from other people and the (Continued on page 95)

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