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Sparking Breakthrough Ideas

Creativity shouldn't be confined to just the "creative types" in your organization. As technologies and strategies change and customers' demands evolve, companies increasingly expect everyone at every level to contribute ideas. So how can you spark new thinking about products, processes, and problems?

Simple logistical changes in the way you schedule your day or where you sit can be a good place to start. Research by Carnegie Mellon's Sunkee Lee shows that sitting next to unfamiliar colleagues can make you more likely to come up with an innovative solution to a problem: Your new neighbors expose you to new knowledge, which allows you to connect ideas in novel ways ("Why You Should Rotate Office Seating Assignments").

Perhaps for this reason, groups, especially diverse groups, can often generate more creative ideas than individuals—thus, the ubiquitous group brainstorming session. But if you're running one of these sessions, you also need to guard against an opposite problem: the stultifying effects of groupthink. The key, according to Art Markman in "The Problem-Solving Process That Prevents Groupthink," is to move back and forth between individual and group idea generation to get the most out of everyone's voices.

Creativity may seem by definition inherently unmanageable, but you can manage *for* it, write Harvard Business School professors Teresa Amabile and Mukti Khaire in "Creativity and the Role of the Leader." By choosing the right people and perspectives, putting in place a lighter process, and motivating people to participate, a manager can become a "producer" of creativity.

But there are some pitfalls to popular approaches to soliciting creativity. When it comes to creating new products, for example, experimenting with early prototypes and brainstorming ideas with customers can cause more problems than they solve, warn Paul Leonardi in "Early Prototypes Can Hurt a Team's Creativity" and Peter C. Verhoef and his coauthors in "Understand the Perils of Co-Creation." And though we tend to assume that creativity is always a good thing, business psychology professor Tomas Chamorro-Premuzic sounds a note of caution: Research has established a connection between creativity and negative moods, for instance, as well as dishonesty, narcissism, and poor impulse control ("The Dark Side of Creativity").

Creativity may seem like an innate power: Either you have it or you don't. But adopting proven approaches and logistical tweaks can help even the most "stuck in the mud" among us come up with better ideas.

—The Editors

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SPRING 2019

Culled by the editors of *Harvard Business Review* from the magazine's rich archives, these articles are written by some of the world's leading management scholars and practitioners. To help busy leaders apply the concepts, they are accompanied by "Idea in Brief" summaries.

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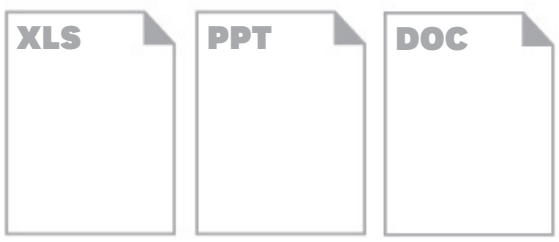

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Reclaim Your Creative Confidence

How to get over the fears that block your best ideas by Tom Kelley and David Kelley

MOST PEOPLE ARE born creative. As children, we revel in imaginary play, ask outlandish questions, draw blobs and call them dinosaurs. But over time, because of socialization and formal education, a lot of us start to stifle those impulses. We learn to be warier of judgment, more cautious, more analytical. The world seems to divide into "creatives" and "noncreatives," and too many people consciously or unconsciously resign themselves to the latter category.

And yet we know that creativity is essential to success in any discipline or industry. According to a recent IBM survey of chief executives around the world, it's the most sought-after trait in leaders today. No one can deny that creative thinking has enabled the rise and continued success of countless companies, from start-ups like Facebook and Google to stalwarts like Procter & Gamble and General Electric.

Students often come to Stanford University's "d.school" (which was founded by one of us—David Kelley—and is formally known as the Hasso Plattner Institute of Design) to develop their creativity. Clients work with IDEO, our design and innovation consultancy, for the same reason. But along the way, we've learned that our job isn't to *teach* them creativity. It's to help them *rediscover* their creative confidence—the natural ability to come up with new ideas and the courage to try them out. We do this by giving them strategies to

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get past four fears that hold most of us back: fear of the messy unknown, fear of being judged, fear of the first step, and fear of losing control.

Easier said than done, you might argue. But we know it's possible for people to overcome even their most deep-seated fears. Consider the work of Albert Bandura, a world-renowned psychologist and Stanford professor. In one series of early experiments, he helped people conquer lifelong snake phobias by guiding them through a series of increasingly demanding interactions. They would start by watching a snake through a two-way mirror. Once comfortable with that, they'd progress to observing it through an open door, then to watching someone else touch the snake, then to touching it themselves through a heavy leather glove, and, finally, in a few hours, to touching it with their own bare hands. Bandura calls this process of experiencing one small success after another "guided mastery." The people who went through it weren't just cured of a crippling fear they had assumed was untreatable. They also had less anxiety and more success in other parts of their lives, taking up new and potentially frightening activities like horseback riding and public speaking. They tried harder, persevered longer, and had more resilience in the face of failure. They had gained a new confidence in their ability to attain what they set out to do.

We've used much the same approach over the past 30 years to help people transcend the fears that block their creativity. You break challenges down into small steps and then build confidence by succeeding on one after another. Creativity is something you practice, not just a talent you're born with. The process may feel a little uncomfortable at first, but—as the snake phobics learned—the discomfort quickly fades away and is replaced with new confidence and capabilities.

Creativity is something you practice, not just a talent you're born with.

Fear of the Messy Unknown

Creative thinking in business begins with having empathy for your customers (whether they're internal or external), and you can't get that sitting behind a desk. Yes, we know it's cozy in your office. Everything is reassuringly familiar; information comes from predictable sources; contradictory data is weeded out and ignored. Out in the world, it's more chaotic. You have to deal with unexpected findings, with uncertainty, and with irrational people who say things you don't want to hear. But that is where you find insights—and creative breakthroughs. Venturing forth in pursuit of learning, even without a hypothesis, can open you up to new information and help you discover nonobvious needs. Otherwise, you risk simply reconfirming ideas you've already had or waiting for others—your customers, your boss, or even your competitors—to tell you what to do.

At the d.school, we routinely assign students to do this sort of anthropological fieldwork—to get out of their comfort zones and into the world—until, suddenly, they start doing it on their own. Consider a computer scientist, two engineers, and an MBA student, all of whom took the Extreme Affordability class taught by Stanford business school professor Jim Patell. They eventually realized that they couldn't complete their group project—to research and design a low-cost incubator for newborn babies in the developing world—while living in safe, suburban California. So they gathered their courage and visited rural Nepal. Talking with families and doctors firsthand, they learned that the babies in gravest danger were those born prematurely in areas far from hospitals. Nepalese villagers didn't need a cheaper incubator at the hospital—they needed a fail-safe way to keep babies warm when they were away from doctors who could do so effectively. Those insights led the team to design a miniature "sleeping bag" with a pouch containing a special heat-storing wax. The Embrace Infant Warmer costs 99% less than a traditional incubator and can maintain the right temperature for up to six hours without an external power source. The innovation has the potential to save millions of low-birth-weight and premature babies every year, and it came about only because the team members were willing to throw themselves into unfamiliar territory.

Another example comes from two students, Akshay Kothari and Ankit Gupta, who took the d.school's Launchpad course. The class required

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them to start a company from scratch by the end of the 10-week academic quarter. Both were self-described "geeks"—technically brilliant, deeply analytical, and definitely shy. But they opted to work on their project—an elegant news reader for the then-newly released iPad—off-campus in a Palo Alto café where they'd be surrounded by potential users. Getting over the awkwardness of approaching strangers, Akshay gathered feedback by asking café patrons to experiment with his prototypes. Ankit coded hundreds of small variations to be tested each day—changing everything from interaction patterns to the size of a button. In a matter of weeks they rapidly iterated their way to a successful product. "We went from people saying, 'This is crap,'" says Akshay, "to 'Is this app preloaded on every iPad?'" The result—Pulse News—received public praise from Steve Jobs at a worldwide developer's conference only a few months later, has been downloaded by 15 million people, and is one of the original 50 apps in Apple's App Store Hall of Fame.

It's not just entrepreneurs and product developers who should get into "the mess." Senior managers also must hear directly from anyone affected by their decisions. For instance, midway through a management off-site IDEO held for ConAgra Foods, the executives broke away from their upscale conference rooms to explore gritty Detroit neighborhoods, where you can go miles without seeing a grocery store. They personally observed how inner-city residents reacted to food products and spoke with an urban farmer who hopes to turn abandoned lots into community gardens. Now, according to Al Bolles, ConAgra's executive vice president of research, quality, and innovation, such behavior is common at the company. "A few years ago, it was hard to pry my executive team away from the office," he says, "but now we venture out and get onto our customers' home turf to get insights about what they really need."

Fear of Being Judged

If the scribbling, singing, dancing kindergartner symbolizes unfettered creative expression, the awkward teenager represents the opposite: someone who cares—*deeply*—about what other people think. It takes only a few years to develop that fear of judgment, but it stays with us throughout our adult lives, often constraining our careers. Most of us accept that when we are learning, say, to ski, others will see us fall down until practice pays off. But we can't risk our business-world ego in the same way. As a result, we self-edit, killing potentially creative ideas because we're afraid our bosses or peers will see us fail. We stick to "safe" solutions or suggestions. We hang back, allowing others to take risks. But you can't be creative if you are constantly censoring yourself.

Half the battle is to resist judging *yourself*. If you can listen to your own intuition and embrace more of your ideas (good and bad), you're already partway to overcoming this fear. So take baby steps, as Bandura's clients did. Instead of letting thoughts run through your head and down the drain, capture them systematically in some form of idea notebook. Keep a whiteboard and marker in the shower. Schedule daily "white space" in your calendar, where your only task is to think or take a walk and daydream. When you try to generate ideas, shoot for 100 instead of 10. Defer your own judgment and you'll be surprised at how many ideas you have—and like—by the end of the week.

Also, try using new language when you give feedback, and encourage your collaborators to do the same. At the d.school, our feedback typically starts with "I like..." and moves on to "I wish..." instead of just passing judgment with put-downs like "That will never work." Opening with the positives and then using the first person for suggestions signals that "This is just my opinion and I want to help," which makes listeners more receptive to your ideas.

We recently worked with Air New Zealand to reinvent the customer experience for its long-distance flights. As a highly regulated industry, airlines tend toward conservatism. To overcome the cultural norm of skepticism and caution, we started with a workshop aimed at generating crazy ideas. Executives brainstormed and prototyped a dozen unconventional (and some seemingly impractical) concepts, including harnesses that hold people standing up, groups of seats facing one another around a table, and even hammocks and bunk beds. Everyone was doing it, so no one was scared he or she would be judged. This willingness to consider wild notions and defer judgment eventually led the Air New Zealand team to a creative breakthrough: the Skycouch, a lie-flat seat for economy class. At first, it seemed impossible that such a seat could be made without enlarging its footprint (seats in business and first-class cabins take up much more space), but the new design

Idea in Brief

THE CHALLENGE

Creativity is essential to success in any discipline or industry. Most people are born creative, but over time many of us become wary of judgment and more cautious and analytical—resigned to the realm of "noncreatives"—and that can stifle innovation.

THE SOLUTION

Rediscover your creative confidence by transcending the fears that block creativity: fear of the messy unknown, of judgment, of taking the first step, of letting go. Get out into the world in pursuit of learning and insights. Avoid judging *yourself*, and allow time and space for unfettered idea generation. Stop focusing on the overall task and find a minor piece you can handle right away. And look for small opportunities to cede control and leverage different perspectives.

THE RESULT

Instead of letting fear block the path to innovation, you can break challenges into small steps and then build confidence by succeeding on one after another—rediscovering your creative confidence and making a difference in your work and your life.

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TACKLING THE MESS, ONE STEP AT A TIME

You can work up the confidence to tackle the big fears that hold most of us back by starting small. Here are a few ways to get comfortable with venturing into the messy unknown. The list gets increasingly challenging, but you can follow the first two suggestions without even leaving your desk.

1. Lurk in online forums. Listen in as potential customers share information, air grievances, and ask questions—it's the virtual equivalent of hanging around a popular café. You're not looking for evaluations of features or cost; you're searching for clues about their concerns and desires.

2. Pick up the phone and call your own company's customer service line. Walk through the experience as if you were a customer, noting how your problem is handled and how you're feeling along the way.

3. Seek out an unexpected expert. What does the receptionist in your building know about your firm's customer experience? If you use a car service for work travel, what insights do the drivers have about your firm? If you're in health care, talk to a medical assistant, not a doctor. If you make a physical product, ask a repair person to tell you about common failure areas.

4. Act like a spy. Take a magazine and a pair of headphones to a store or an industry conference (or, if your customers are internal, a break room or lunch area). Pretend to read while you observe. Watch as if you were a kid, trying to understand what is going on. How are people interacting with your offering? What can you glean from their body language?

5. Casually interview a customer or potential customer. After you've gotten more comfortable venturing out, try this: Write down a few open-ended questions about your product or service. Go to a place where your customers tend to gather, find someone you'd be comfortable approaching, and say you'd like to ask a few questions. If the person refuses? No problem, just try someone else. Eventually you'll find someone who's dying to talk to you. Press for more detail with every question. Even if you think you understand, ask "Why is that?" or "Can you tell me more about that?" Get people to dig into their own underlying assumptions.

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does just that: A heavily padded section swings up like a footrest to transform an airline row into a futonlike platform that a couple can lie down on together. The Skycouch is now featured on a number of Air New Zealand's international flights, and the company has won several industry awards as a result.

Fear of the First Step

Even when we want to embrace our creative ideas, acting on them presents its own challenges. Creative efforts are hardest at the beginning. The writer faces the blank page; the teacher, the start of school; businesspeople, the first day of a new project. In a broader sense, we're also talking about fear of charting a new path or breaking out of your predictable workflow. To overcome this inertia, good ideas are not enough. You need to stop planning and just get started—and the best way to do that is to stop focusing on the huge overall task and find a small piece you can tackle right away.

Best-selling writer Anne Lamott expertly captures this idea in a story from her childhood. Her brother had been assigned a school report about birds, but he waited to start on it until the night before it was due. He was near tears, overwhelmed by the task ahead, until his father gave him some wise advice: "Bird by bird, buddy. Just take it bird by bird." In a business context, you can push yourself to take the first step by asking: What is the low-cost experiment? What's the quickest, cheapest way to make progress toward the larger goal?

Or give yourself a crazy deadline, as John Keefe, a d.school alum and a senior editor at radio station WNYC, did after a colleague complained that her mom had to wait at city bus stops never knowing when the next bus would come. If you worked for New York City Transit and your boss asked you to solve that problem, how soon would you promise to get a system up and running? Six weeks? Ten? John, who *doesn't* work for the transit authority, said, "Give me till the end of the day." He bought an 800 number, figured out how to access real-time bus data, and linked it to text-to-speech technology. Within 24 hours, he had set up a service that allowed bus riders to call in, input their bus stop number, and hear the location of the approaching bus. John applies the same fearless attitude to his work at WNYC. "The most effective way I've found to practice design thinking is by showing, not telling," he explains.

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Another example of the "start simple" strategy comes from an IDEO project to develop a new dashboard feature for a European luxury car. To test their ideas, designers videotaped an existing car and then used digital effects to layer on proposed features. The rapid prototyping process took less than a week. When the team showed the video to our client, he laughed. "Last time we did something like this," he said, "we built a prototype car, which took almost a year and cost over a million dollars. Then we took a video of it. You skipped the car and went straight to the video."

Our mantra is "Don't get ready, get started!" The first step will seem much less daunting if you make it a tiny one and you force yourself to do it *right now*. Rather than stalling and allowing your anxiety to build, just start inching toward the snake.

Fear of Losing Control

Confidence doesn't simply mean believing your ideas are good. It means having the humility to let go of ideas that aren't working and to accept good ideas from other people. When you abandon the status quo and work collaboratively, you sacrifice control over your product, your team, and your business. But the creative gains can more than compensate. Again, you can start small. If you're facing a tough challenge, try calling a meeting with people fresh to the topic. Or break the routine of a weekly meeting by letting the most junior person in the room set the agenda and lead it. Look for opportunities to cede control and leverage different perspectives.

That's exactly what Bonny Simi, director of airport planning at JetBlue Airways, did after an ice storm closed JFK International Airport for a six-hour stretch in 2007—and disrupted the airline's flight service for the next six days. Everyone knew there were operational problems to be fixed, but no one knew exactly what to do. Fresh from a d.school course, Bonny suggested that JetBlue brainstorm solutions from the bottom up rather than the top down. First, she gathered a team of 120 frontline employees together for just one day—pilots, flight attendants, dispatchers, ramp workers, crew schedulers, and other staff members. Then she mapped out their disruption recovery actions (using yellow Post-it notes) and the challenges they faced (using pink ones). By the end of the day, Bonny's grassroots task force had reached new insights—and resolve. The distributed team then spent the next few months working through more than a thousand pink Post-its to creatively solve each problem. By admitting that the answers lay in the collective, Bonny did more than she could ever have done alone. And JetBlue now recovers from major disruptions significantly faster than it did before.

Our own experience with the open innovation platform OpenIDEO is another case in point. Its launch was scary in two ways: First, we were starting a public conversation that could quickly get out of hand; second, we were admitting that we don't have all the answers. But we were ready, like Bandura's phobics, to take a bigger leap—to touch the snake. And we soon discovered the benefits. Today, the OpenIDEO community includes about 30,000 people from 170 countries. They may never meet in person, but together they've already made a difference on dozens of initiatives—from helping revitalize cities in economic decline to prototyping ultrasound services for expectant mothers in Colombia. We've learned that no matter what group you're in or where you work, there are always more ideas outside than inside.

FOR PEOPLE with backgrounds as diverse as those of Akshay, Ankit, John, and Bonny, fear—of the messy unknown, of judgment, of taking the first step, or of letting go—could have blocked the path to innovation. But instead, they worked to overcome their fears, rediscovered their creative confidence, and made a difference. As Hungarian essayist György Konrád once said, "Courage is only the accumulation of small steps." So don't wait at the starting line. Let go of your fears and begin practicing creative confidence today.

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Find Innovation Where You Least Expect It

How to overcome "functional fixedness" and other biases that get in the way of creativity by Tony McCaffrey and Jim Pearson

ON THE EVENING of April 14, 1912, the *RMS Titanic* collided with an iceberg in the north Atlantic and sunk two hours and 40 minutes later. Of its 2,200 passengers and crew, only 705 survived, plucked out of 16 lifeboats by the *Carpathia*. Imagine how many more might have lived if crew members had thought of the iceberg as not just the cause of the disaster but a life-saving solution. The iceberg rose high above the water and stretched some 400 feet in length. The lifeboats might have ferried people there to look for a flat spot. The *Titanic* itself was navigable for a while and might have been able to pull close enough to the iceberg for people to scramble on. Such a rescue operation was not without precedent: Some 60 years before, 127 of 176 passengers emigrating from Ireland to Canada saved themselves in the Gulf of St. Lawrence by climbing aboard an ice floe.

It's impossible to know if this rescue attempt would have worked. At the least it's an intriguing idea—yet surprisingly difficult to envision. If you were to ask a group of executives, even creative product managers and marketers, to come up with innovative scenarios in which all the *Titanic*'s passengers could have been saved, they would very likely have the same blind spot as the crew. The reason is a common psychological bias—called functional fixedness—that limits a person to seeing an object only in the way in which it is traditionally used. In a nautical context, an iceberg is a hazard to be avoided; it's very hard to see it any other way.

When it comes to innovation, businesses are constantly hampered by functional fixedness and other cognitive biases that cause people to overlook elegant solutions hidden in plain sight. We have spent years investigating how innovative designs can be built by harnessing the power of

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ILLUSTRATION BY ROBERTO CIGNA

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the commonly overlooked. We have identified techniques and tools to help overcome cognitive traps and solve problems in innovative ways—whether conceiving new products, finding novel applications for existing products, or anticipating competitive threats. Using the tools doesn't require special talents or heroic degrees of creativity; taken together, they form a simple, low-cost, systematic way to spur innovation.

To understand how the tools work, let's first look at the three cognitive barriers they address.

Functional Fixedness

In the 1930s, the German psychologist Karl Duncker demonstrated the phenomenon of functional fixedness with a famous brainteaser. He gave subjects a candle, a box of thumbtacks, and a book of matches and asked them to find a way to affix the candle to the wall so that when it was lit, wax would not drip onto the floor. Many people had a hard time realizing that the answer was to empty the box of tacks, attach the candle to the inside of the box with melted wax, and then tack the box to the wall. The box acts as a shelf that supports the candle and catches the dripping wax. Because the box had been presented to subjects as a tack holder, they couldn't see it any other way.

In similar puzzles—known by cognitive psychologists as "insight problems"—people have trouble seeing that in a pinch a plastic lawn chair could be used as a paddle (turn it over, grab two legs, and start rowing); that a basketball could be deflated, formed into the shape of a bowl, and used to safely carry hot coals from one campsite to another; or that a candlewick could be used to tie things together (scrape the wax away to free the string).

What causes functional fixedness? When we see a common object, we automatically screen out awareness of features that are not important for its use. This is an efficient neurological tactic for everyday life, but it's the enemy of innovation.

One way to overcome the problem is to change how you describe an object. When told that a candlewick is a string, for instance, almost everyone recognizes that it could be used to tie things together. Our "generic parts technique" is a systematic way to change the way an object is described to avoid unintentionally narrowing people's conception of it, opening them to more ideas for its uses.

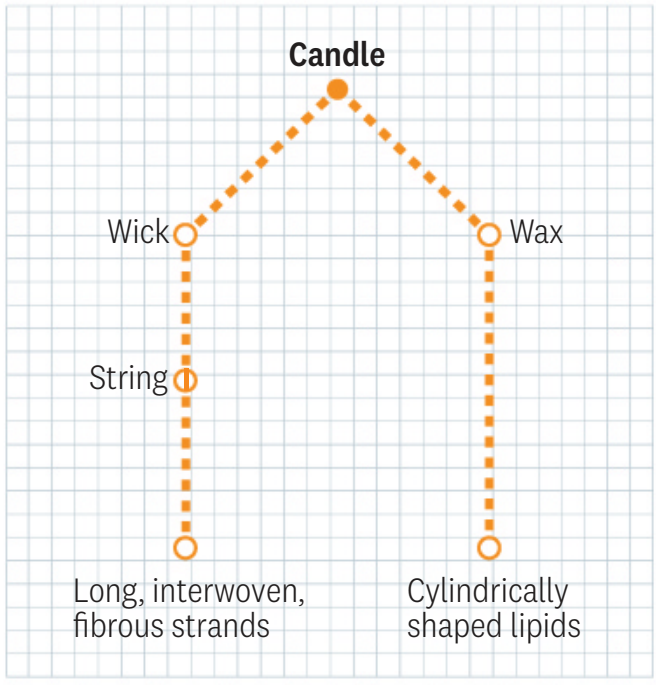
We consider each element of an object in turn and ask two questions: "Can it be broken down further?" and "Does our description imply a particular use?" If the answer to either question is yes, we keep breaking down the elements until they're described in their most general terms, mapping the results on a simple tree. When an iceberg is described generically as a floating surface 200 feet to 400 feet long, its potential as a life-saving platform soon emerges. (See the exhibit "Overcoming Functional Fixedness" for a visualization of the parts of a candle.)

Calling something a "wick" implies its use as a conduit of a flame. Describing it as a "string" strips away a layer of preconceived uses and suggests less common ones. Breaking the string down further into its constituent parts of "fibrous strands" might spark even more uses.

To see if generating generic descriptions bolsters creative thinking, our research team presented two groups of students with eight

Overcoming Functional Fixedness

Breaking an object down into its component parts can reveal new uses.



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insight problems that required overcoming the functional fixedness bias in order to solve. We told the members of one group simply to try their best. We taught the other group the generic parts technique and then asked them to use it on the problems. The people in the first group were able to solve, on average, 49% of the problems (just shy of four of them). Those who systematically engaged in creating generic descriptions of their resources were able to solve, on average, 83% (or 6.64) of them.

Design Fixation

Simple insight problems given in a psychology lab can be solved by focusing on only four types of features—materials, size, shape, and parts. But solutions to real-world engineering problems often depend on noticing unusual aspects of a broader range of features. This, as we noted, is very difficult to do.

We studied this phenomenon by asking 15 people to list as many features and associations as they could for a candle, a broom, and a dozen other common objects. We then classified their responses by the type of feature, including its color, shape, material, designed use, aesthetic properties, along with the emotions it evokes, the type of energy it generates, and the objects it's commonly paired with. On average, participants overlooked almost 21 of the 32 types of features (about 65%) that we had previously identified for each object.

Why? When handed a product and asked to create a new design or variation on it, people tend to fixate on the features of the current design. This obstacle to novelty is called design fixation. To take a real world example, when people are shown a sturdy, resealable pouch full of candy and asked to think of a new design that could lead to new uses, they tend to manipulate the types of features used to create the current design—that is, they focus on the width of the base of the pouch or the rigidity of the plastic that makes it stand. To be truly innovative, however, you need to manipulate the features that everyone else has overlooked.

But how do you do that? Just as airline pilots have long used checklists to make sure they don't skip any necessary steps when preparing for flight, we developed a checklist of types of product features that people tend to overlook. Whether your product is a physical object or an intangible process, we recommend that you develop a checklist of features that were important to your previous and current innovation projects and add to the list with each new project. Teams working on innovation projects can then refer to the list to prompt them to consider features they would probably overlook—thus saving time, effort, and frustration. Examining the pouch of candy with our checklist in mind permitted us to easily uncover many features that could lead to new designs and new uses. First, every pouch sold has something in it. This feature is so obvious that its absence is commonly overlooked. Why not sell empty pouches so that customers can decide what to use them for: jewelry, spare change, nuts and bolts, cosmetics, and so on? Imagine empty pouches next to the sandwich bags, freezer bags, and storage bags in your supermarket. Second, most pouches sold are about the size of your hand. Systematically considering changes to the size triggers new ideas for possible contents. What about selling a gallon of paint in a resealable pouch, for instance? Third, current pouches have one inner compartment. But what might you do with more? You could, say, sell two-compartment pouches for things you want to mix together later: cereal in the top compartment and milk in the bottom, salad in the bottom and dressing in the top, and so on. Fourth, consider the pouch as a container of aroma (or as a guard against it). You could sell a large pouch as a garbage can that reseals to keep in the odor. These are just a few of the new designs that emerge from contemplating a checklist of overlooked features.

Goal Fixedness

Suppose we asked you to think of a way to adhere something to a garbage can. Chances are that like most people, you would think of using glue or tape, both forms of adhesives. But what if we asked you instead to *fasten* something to the can? Just switching a specific verb like "adhere" to a more general one would most likely prompt you to list a wider range of possibilities: binder clip, paper clip, nail, string, Velcro, and so on. That's because the way a goal is phrased often narrows people's thinking. We call this barrier "goal fixedness." Framing a problem in more general terms can help overcome it.

But it can be hard to determine what constitutes a "more general term." Is "fasten" more general than "adhere"? A good resource for mapping terms

Idea in Brief

CONTEXT

The tendency to fixate on the most common use of an object—a bias researchers call "functional fixedness"—is a serious barrier to innovation. The problem is that we see the object's use, rather than the object itself.

KEY IDEA

We can overcome this bias—and similar biases about the object's design and purpose—by changing how we describe the object and how we think about its component parts.

IN PRACTICE

An alternative to brainstorming, which the authors call brainswarming, brings these techniques to life.

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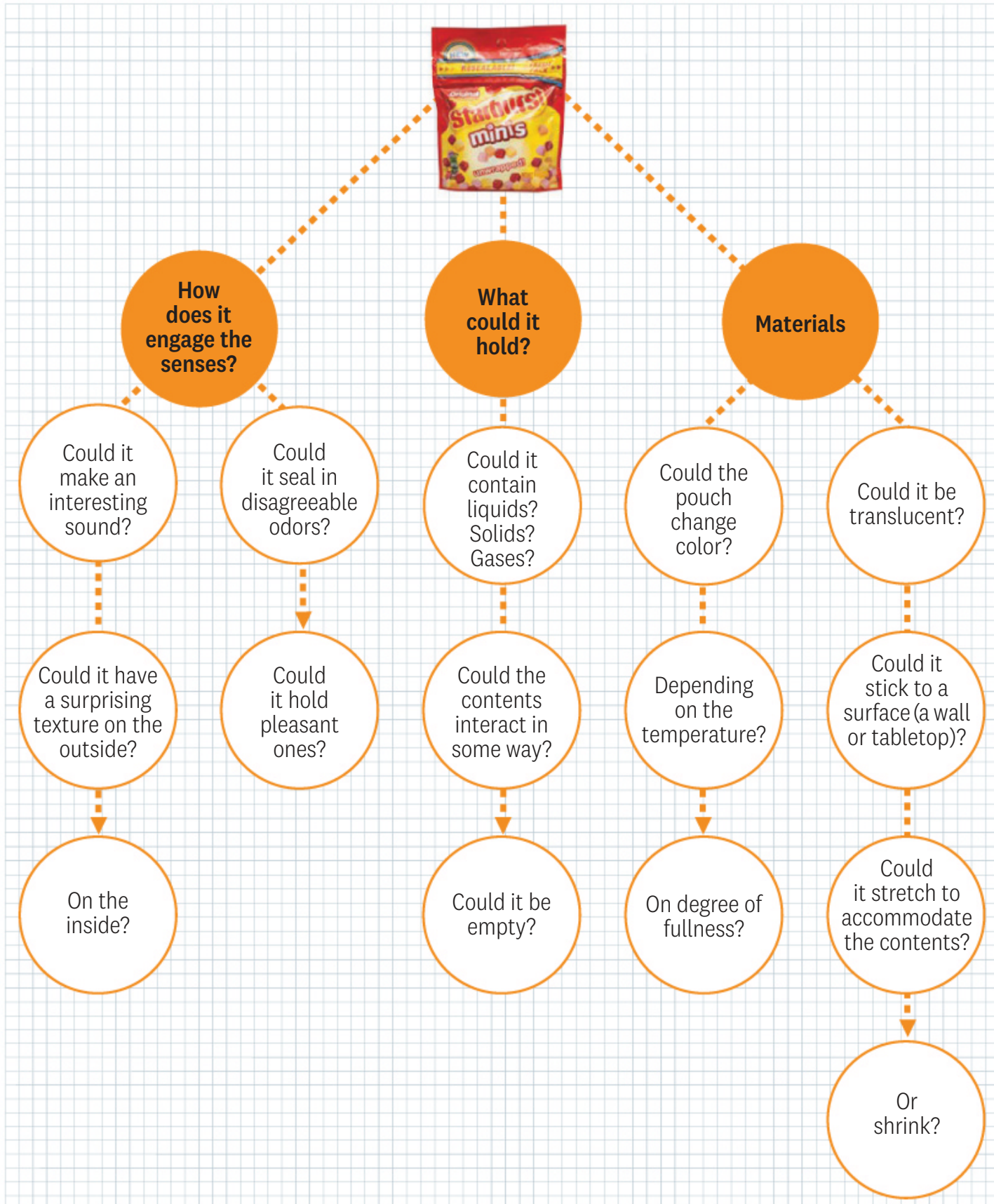
Promising Features For A Pouch

If you consider an object's less obvious characteristics, new purposes may arise. Some features to consider in the case of a candy pouch are:



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is a thesaurus that makes hierarchical structure explicit by identifying hyponyms—more-specific synonyms—for them. For example, the online thesaurus WordNet indicates that there are least 61 ways to fasten things—including sew, clamp, chain, garter, strap, hook, staple, belt, screw, wire, buckle, cement, tack, joggle, button, and rivet. Each describes the concept of fastening one thing to another in a slightly different way and gives rise to diverse solutions. "Adhere," by contrast, has only four hyponyms.

Action words, the centerpiece of most goals, often have hyponyms. Each hyponym hints at a more specific way to achieve the goal. There are 172 for the verb "remove," 50 for "guide," 46 for "transport," 115 terms for "separate," and—perhaps surprisingly—only 24 for the seemingly very general term "mix."

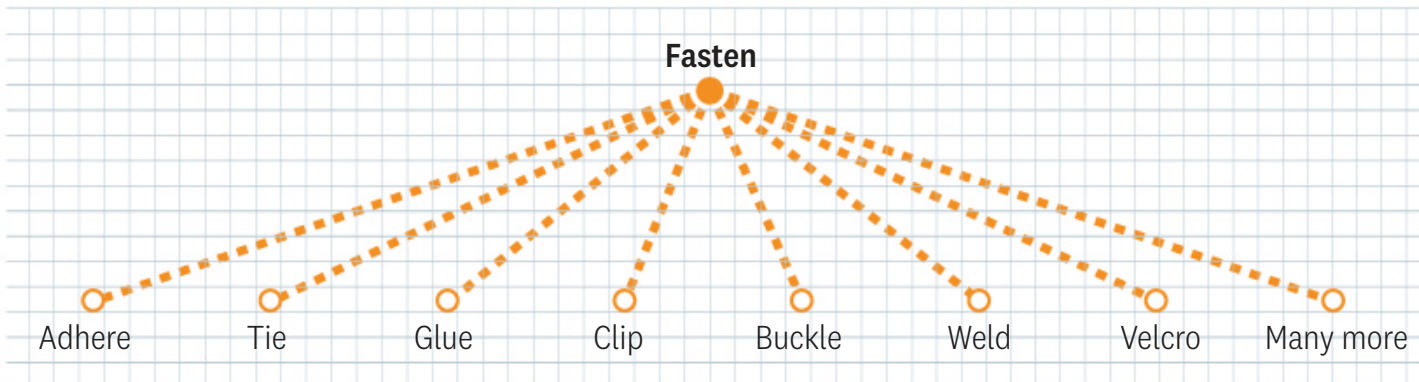
Of course, a goal consists of more than just a verb. The verb expresses what sort of change you're after, but nouns express what needs changing, and prepositional phrases express important constraints and relationships between things. Put them all together, and almost any goal can be expressed as a verb (fasten), a noun (something), and a prepositional phrase (to a garbage can). Try it: Increase sales in Massachusetts, reduce vibrations in skis, and so on. By putting your goal in this format and playing with the hyponyms of each of its parts, you can explore diverse approaches to your problem in a simple and cost-effective way.

Here's how the approach worked when one of us (Jim) applied it to the real-world goal to reduce concussions in football. First he dropped the prepositional phrase "in football" from consideration and focused on the verb and noun: "reduce concussions." To break free of hidden assumptions, he used WordNet to rephrase the goal in as many different ways as possible: lessen trauma, weaken crash, soften jolt, reduce energy, absorb energy, minimize force, exchange forces, substitute energy, oppose energy, repel energy, lessen momentum, and so on. Using Google, he performed searches such as "concussions lessen trauma" to see which ways of phrasing the goal had been heavily explored already and which ones were underexplored.

Jim found that in the context of concussions, the phrase "repel energy" had relatively few search results—a sign that the solution it implied might have been overlooked. One way to repel energy is through magnets, and this suggested a possible approach: Make each helmet magnetic with the same pole so that two helmets would repel each other when in close proximity. Results from initial tests showed that when the helmets were about to collide they decelerated, and because of their circular shape, they tended to glance off each other, as two magnetic billiard balls would, rather than smashing head-on. Several physicists have verified the plausibility of this approach for significantly reducing the force during helmet collisions.

What's in a Name?

How broadly—or narrowly—you phrase a goal affects how you visualize it.



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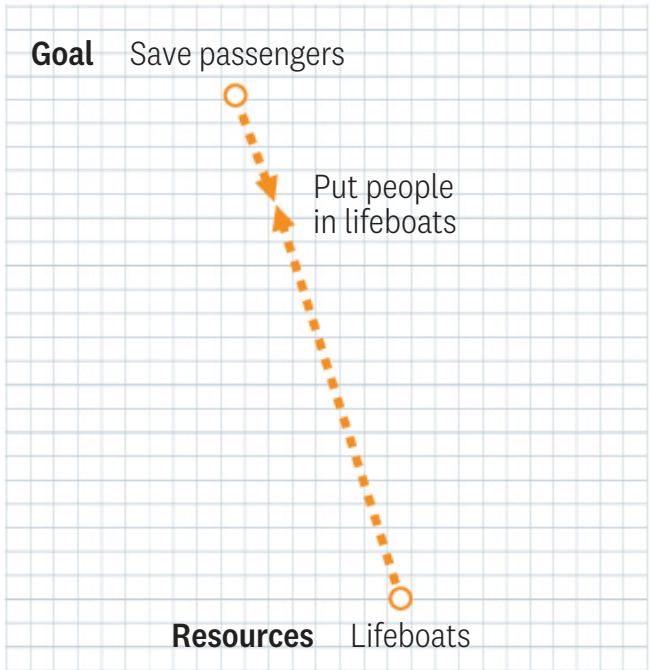
A SMARTER WAY TO BRAINSTORM

When people generate "brainswarming" graphs together, it's best for the group to work initially in silence, write contributions on sticky notes, and place the sticky notes at the proper place on the ever-growing graph. The benefits of silence include the following:

- The talkative few cannot dominate the session.
- There's no need for a facilitator to keep people from hijacking the discussion or judging others.
- People can work in parallel, so ideas are generated faster.
- No one needs to create a summary of the session. Take a picture of the graph and distribute it by e-mail, or just keep the graph up on the wall for later use.
- There's no need to group similar ideas together, as you would in a traditional brainstorming session, because the grouping is done as the graph is built.
- Ideas are concise, since all contributions must fit on a sticky note.
- The silence allows people to move between thinking, writing down ideas, placing them on the graph, and building on one another's ideas.
- Top-down (big-picture) thinkers can work side-by-side with bottom-up (detail-oriented) thinkers.
- Fear of judgment from the boss or colleagues is reduced.
- There's no need for everyone to be present at the same time during the session. The graph can remain on the wall so that people can contribute at different times. Online brainswarming allows groups from around the world to work together remotely.

Dominant Survival Strategy On the *Titanic*

The first step in discovering how resources could be used to reach a goal is to map the most obvious solution.



We began the patenting process for our solution, but our lawyer discovered that someone had submitted the same idea just weeks earlier. We tip our hat to that person.

Visualizing Innovative Thinking

At its most basic level, problem solving consists of two connected activities: framing a goal and combining resources to accomplish it. Each variation of the goal, and every discovery of a "hidden" feature of an available resource, can suggest a different course to take. Our approach involves mapping the relationships among all the possibilities in a simple graph, somewhat analogous to a decision tree.

Starting with the goal at the top, we represent each refinement of the goal as a vector pointing downward. The available resources are placed at the bottom, with their features extending upward. Interactions among the resources and their features extend further toward the top. When the two sets of vectors connect, we have a "solution path." A solution path can be built by working from the top down, from the bottom up, or by switching back and forth between considering the goal and thinking about the resources.

This approach is an effective alternative to traditional brainstorming sessions for group innovation work, because it allows people to play to their strengths: Strategically oriented people can focus on refining the goal, while those more familiar with technologies and production processes can begin with the resources. We call this approach "brainswarming"—a nod to the concept of swarm intelligence. As people contribute to the growing graph, their activity resembles a swarm of insects.

To understand how this works, let's return to the problem facing the passengers on the *Titanic*. We'll start with the goal "save passengers." The most obvious resources are the lifeboats. The simplest application of the resources to achieve the goal is "put people in the lifeboats." Thus, we begin with a straight line (see the exhibit "Dominant Survival Strategy on the *Titanic*").

Next, we find different ways to phrase the goal to bring out different solutions. For instance, slightly different goals would be "keep people warm and breathing" and "keep people out of the water." Let's look more closely at one of the options, keep people out of the water. One way is to place them on floating things—not just lifeboats—which might spark a fuller consideration of the resources at hand. You might remember that wood floats, for instance, suggesting that wooden tables might have been of help. Planks, or perhaps doors, from the ship might have been placed between the lifeboats to hold more people out of the water.

Moving from floating things to even more-general considerations of buoyancy might bring to mind the many steamer trunks on board. Tying a set of trunks together to produce another sort of makeshift floating platform might have been enough to support several people directly or to provide a foundation upon which to build a more secure platform of wooden planks.

It was estimated that as many as 40 cars were on board. That means 160 tires and inner tubes (not to mention spare tires) were at passengers' disposal. Tying together rubber tires and inner tubes might conceivably have created a floating raft on which wooden boards could have been

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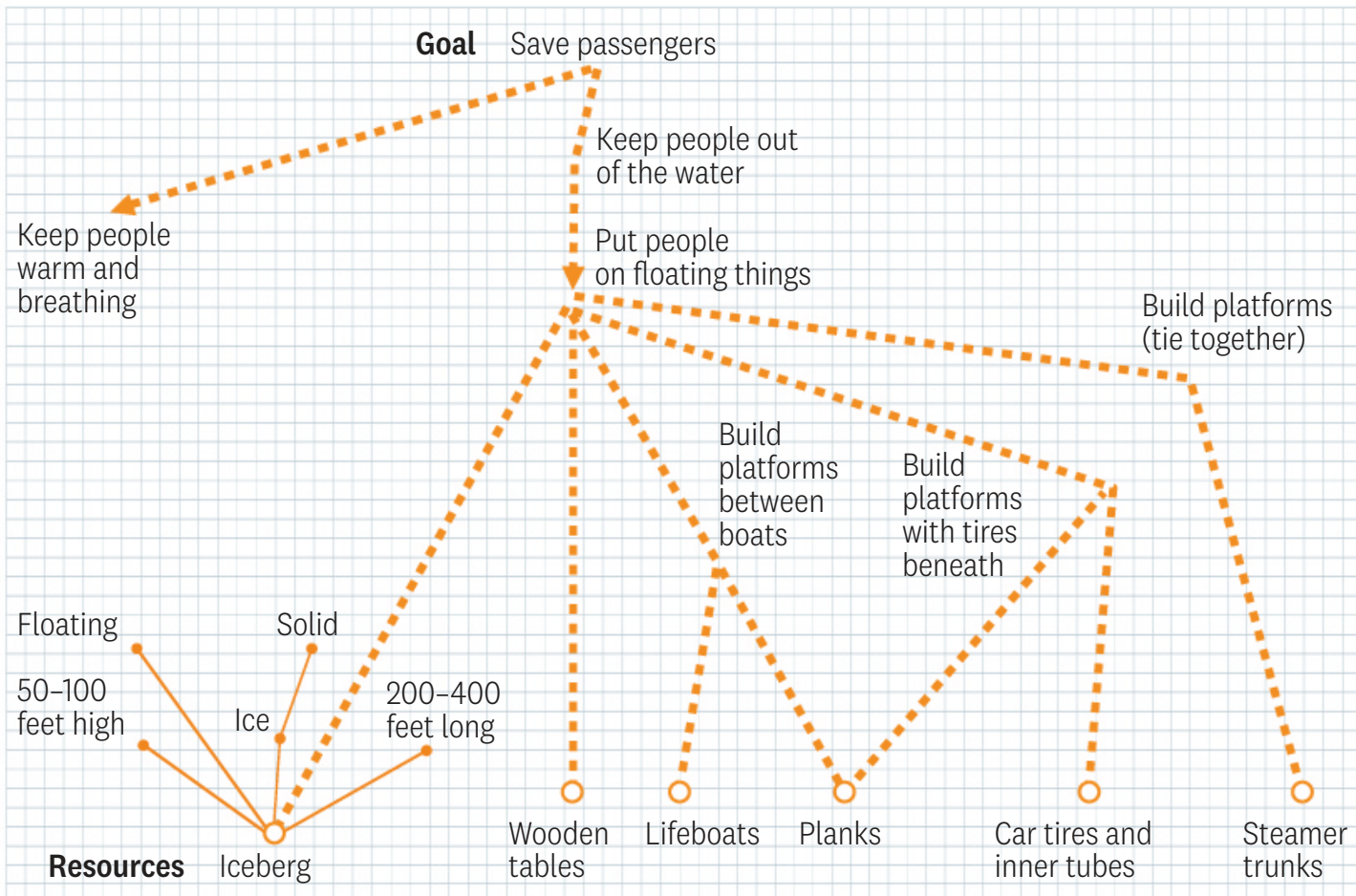
Overlooked Strategies for Saving *Titanic* Passengers

Find new ways to name the goal, and new resources may present themselves.



placed. And of course, the iceberg itself is a giant floating thing.

On that April night in 1912, none of these ideas might have worked, particularly since it took so long for people to understand the peril they were in. But the point of such an exercise is not to discover the "right solution"; it is to uncover as many connections between the goal and the widest view of the features of available resources as possible so that people look beyond the obvious.

The goal of the brainswarming graph, therefore, is to distill the problem-solving process to its most basic components and show how they are all related to one another. People do not have to remember all the components under consideration, because the graph shows them in a glance. This systematic approach takes some of the mystery out of innovation.

IN OUR RESEARCH, we are discovering that barriers to innovation are like gravity—pervasive, predictable, and not all that strong. There are many ways to overcome them, but the simplest and easiest path is to help your innovators notice what they're overlooking. Often it's right in front of their eyes.

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Tony McCaffrey is the chief technology officer of Innovation Accelerator, and **Jim Pearson** is the CEO.

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The study: Professor Andrew Jarosz of Mississippi State University and colleagues served vodka-cranberry cocktails to 20 male subjects until their blood alcohol levels neared legal intoxication and then gave each a series of word association problems to solve. Not only did those who imbibed give more correct answers than a sober control group performing the same task, but they also arrived at solutions more quickly.

Professor Jarosz, defend your research.

DEFEND YOUR RESEARCH

Drunk People Are Better at Creative Problem Solving

Jarosz: You often hear of great writers, artists, and composers who claim that alcohol enhanced their creativity, or people who say their ideas are better after a few drinks. We wanted to see if we could find evidence to back that up, and though this was a small experiment, we did. We gave participants 15 questions from a creative problem-solving assessment called the Remote Associates Test, or RAT—for example, "What word relates to these three: 'duck,' 'dollar,' 'fold'?"; the answer to which is "bill." We found that the tipsy people solved two to three more problems than folks who stayed sober. They also submitted their answers more quickly within the one-minute-per-question time limit, which is maybe even more surprising.

HBR: So alcohol doesn't slow us down mentally after all? It still does, but we think that creative problem solving is one area in which a key effect of drunkenness—loss of focus—is a good thing. In an exercise like the RAT, it's important not to fixate on your first thought, and alcohol seems to help that seemingly irrelevant stuff slip in. When we asked participants how much they relied on strategic thinking versus sudden insights to solve the problems, the intoxicated people reported solving via insight on 10% more problems than their sober counterparts did. You might come to the word "bill" by methodically going through associates for "duck," but when you get to harder problems like "cry, front, and ship," that approach could leave you stuck a little longer on an incorrect word like "baby" before you arrive at the answer, which is "war" or "battle." Of course, in many other areas—from working through a complicated math problem to operating heavy machinery—sober control of attention remains very important.

But our brainstorming sessions should happen in bars, not boardrooms? If you need to think outside the box, a few happy-hour drinks or a martini at lunch could be beneficial. But I wouldn't close the bar out, because if you get your blood alcohol level too much beyond .08, you probably won't be very useful. And you might have trouble screening out terrible ideas.

You brought people up to a blood alcohol level of .075. Is that the magic number?
The idea was to push them toward the legal limit. We chose men ages 21 to 30 who reported roughly the same amount of experience drinking, and we asked them to refrain from alcohol or drugs for 24 hours before the study and from food or caffeine for four hours before. When they came in, we gave them a snack—the portion was based on their weight—and then dosed them with vodka in three drinks over a 30-minute period. The ratio of alcohol to juice was always 1:3, but heavier people got bigger drinks. We then had them blow into Breathalyzers to make sure they were at the target level. However, in a subsequent study by Mathias Benedek and colleagues last year, subjects who drank until they hit a level of .03 also performed better on the RAT than sober peers.

Does it have to be a Cape Codder? I prefer red wine. Vodka-cranberry cocktails are used a lot in these studies because you can easily give people different amounts of alcohol, and the juice masks any taste. But in the Benedek study, people drank beer. So it seems any drink will do.

What about drugs? I couldn't comment on that. But studies have shown that people with specific types of brain damage do better on certain creative tests, as do people who've been woken up in the middle of REM sleep. Those findings make sense to me because they go back to the impairment of focus. Even tea drinking has been shown to enhance creativity, possibly because of

Tipsy subjects solved 13% to 20% more problems than sober subjects did.

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the relaxation that ritual triggers. Researchers at Peking University found that people who drank hot Lipton built more interesting structures with children's blocks and came up with more innovative noodle shop names than people who drank plain hot water.

Going back to booze: Could it be that the people who got tipsy were just brighter than those who didn't? We actually made a point of balancing the groups on one measure of mental acuity: working memory. At the start, when everyone was sober, we exposed participants to a series of words, interspersed with math problems, on a computer and then asked them to list the words in order. We matched people whose scores were within one point of each other and put them in separate groups, so average scores for the groups were roughly equal. At the end of the experiment we administered the same test and found that while the sober people did better the second time around, the intoxicated people did not.

Your subjects were all young men. Might you get different results with women or older people? That's an area for future research, but I suspect that we'd see similar results for young women. It might be the same for older people, but many different things are going on in the brain as you age.

Why did you decide to study this? An attempt to justify your own drinking habits? I am a craft beer fan, but no, I'm not typically drinking on the job, and my research focus isn't alcohol. I was more interested in investigating the potential for improving problem-solving skills. There's the old tale of Archimedes' "Aha!" moment in the bath, and I've always wondered what causes people to have sudden flashes of insight. One day I was talking to my coauthors, Gregory Colflesh, who does study alcohol, and Jennifer Wiley, and thought maybe this avenue was one we should explore.

Have scientists found that alcohol yields any other mental benefits? One paper, "Lost in the Sauce," by Michael Sayette at the University of Pittsburgh and coauthors, reported that people under the influence are more susceptible to mind wandering, which could be helpful in some scenarios but harmful in others. My coauthor Gregory has done some interesting work on change detection, asking subjects to spot the differences between two pictures and finding some improvements in performance when people consume alcohol. The mechanism seems similar to the one we found: Instead of going through each pixel on the screen, the intoxicated people are just sitting back and seeing what pops out at them. And I recently came across new research showing that people speak with more fluency in a foreign language when they've been drinking, which is a bit more counterintuitive, since speaking in a nonnative tongue obviously requires focus.

I might ascribe those foreign-language results to lower inhibitions and greater confidence, though. Could that help explain why drinkers aced the RAT tests, too? Possibly. Studies do show that alcohol can have both those effects. But in this experiment we didn't collect data on those metrics. What we do know is that our intoxicated participants felt they had more "Aha!" moments than their sober peers.

And those moments led to better, faster performance? In this case, yes. Instead of doing a very focused, goal-directed search for the answer, they engaged in what neuroscientists call "spreading activation." If you looked at an fMRI of their brains, you might see different areas lighting up, indicating that they were subconsciously activating all the recesses of their memories for the right words.

So maybe all people in creative jobs should be drinking more? Very few professions require you to be 100% thinking outside the box or 100% focused, so I think it's going to depend on the task you're doing. You know the old saying "Write drunk, edit sober"? Well, there's a reason the "edit" part is in there.

Then maybe I'll write this up over wine tonight and edit it in the morning. That sounds like an excellent plan.

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Andrew Jarosz is a professor of psychology at Mississippi State University. His research focuses on attention and its relation to problem solving and creativity.

People under the influence submitted answers more quickly than people in the control group.

Intoxicated subjects had more "aha!" moments than their sober counterparts.

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Quick Takes

ANIKET PATEL/EYE EM/GETTY IMAGES

Can 10 Minutes of Meditation Make You More Creative?

by Emma Schootstra, Dirk Deichmann, and Evgenia Dolgova

IN MORE and more occupations, creativity is part of the job description. Whether you are trying to reconcile conflicting stakeholder priorities, solving a customer's issue, or launching a new product line, your solution probably won't come out of a textbook. But it's hard to have great ideas day after day. What do you do when your creativity runs out? How do you "get your mojo back"?

One increasingly popular solution is mindfulness meditation. Google, Goldman Sachs, and Medtronic are among the many leading firms that have introduced meditation and other mindfulness practices to their employees. Executives at these and other companies say meditation is not only useful as a stress-reduction tool but can also enhance creativity, opening doors where once there seemed to be only a wall.

To gain a deeper understanding of the effectiveness of short meditation sessions in boosting creativity, we looked first at the literature and then conducted our own experiments. Here's what we found.

Mindfulness meditation enhances creativity and innovation. Many executives meditate because it helps them switch gears when stress piles up. Research shows that mindfulness meditation can have many positive effects on workplace outcomes. Regularly doing it boosts your resilience, enabling you to mitigate stress, regulate emotions, and have a more positive outlook so that you can bounce back from setbacks. It helps you switch off reactive fight-or-flight responses and engage in a more thoughtful mode that's crucial for making balanced decisions.

In his book *Mindfulness for Creativity: Adapt, Create, and Thrive in a Frantic World* (Little Brown, 2015), Danny Penman argues that mindfulness meditation and other mindfulness practices enhance three essential problem-solving skills. First, mindfulness switches on divergent thinking. In other words, meditation opens your mind to new ideas. Second, mindfulness improves attention and makes it easier to register the novelty and usefulness of ideas. And finally, mindfulness nurtures courage and resilience in the face of skepticism and setbacks, which is important because failure is inextricably linked with any innovation process.

Ten to 12 minutes are enough to boost creativity. To further verify that creativity is among the early benefits of mindfulness meditation, and to test how earlier findings could be applied to benefit idea generation in organizations, we set up an experiment at Erasmus University in Rotter-

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dam, Netherlands. Unlike the objectives of earlier research, we were interested in whether a few minutes of mindfulness mediation would be enough to enhance creativity. One hundred twenty-nine participants (all students) were divided into three groups and assigned a creative task: Generate as many business ideas as possible for using drones.

Most participants reported that meditation helped them clear their minds and come up with original solutions.

Before the individual brainstorming began, the first group participated in a 10-minute audio-guided mindfulness meditation, and the second group participated in a 10-minute fake meditation exercise (they were instructed to think freely by letting their minds wander). A third group started to brainstorm immediately.

Each of the three groups generated roughly the same number of ideas, and the lengths of the idea descriptions were similar. But meditators came up with a much wider range of ideas. The ideas of each participant in the two nonmeditator groups were in at least two categories, versus four categories for the meditators. The ideas of each individual in the largest segment of nonmeditators (20% of the two groups) fell into five categories, such as delivering and filming items. By comparison, the ideas of each person in the largest segment of meditators (21% of the group) were in nine categories, which included gardening (cutting trees, watering flowers) and security (extinguishing fires) and ranged from the somewhat plausible (washing windows) to the downright silly (feeding giraffes).

We looked for other reasons besides meditation that could explain the differences. In our regression analyses, we controlled for several variables that could influence idea flexibility, such as whether participants enjoyed the brainstorming task. Even discounting the results of these other factors, the meditators demonstrated a 22% wider range of ideas than the two nonmeditating groups.

We also found that a short meditation, similar to physical exercise, often put people in a more positive and relaxed frame of mind. In the group that had meditated, most people felt less negative. In particular, meditation decreased participants' feeling of restlessness (by 23%), nervousness (by 17%), and irritation (by 24%).

To further corroborate our findings, we conducted a second experiment with a group of 24 senior innovation managers at a large Dutch research organization. In an exercise similar to the one with the students, these executives meditated for 12 minutes and then generated ideas individually on how to create a more inclusive culture in an organization. Subsequently, they worked in groups to develop their ideas further.

Most participants reported that meditation helped them clear their minds, focus more on the task at hand, and come up with original solutions. And they did: One idea was that managers or employees would swap departments for a week (and then report in a company magazine and to their own departments what they observed) in a way that was reminiscent of a Dutch reality program where teenagers swap families. Another idea was to give in-company TED talks to highlight cool ideas and scientists across various divisions.

Better ideas, better decision making, and a better mood—all in the time it takes to drink a cup of coffee? Our study suggests that it's true. As Mirabai Bush, Google's adviser for the company's corporate mindfulness program, Search Inside Yourself, put it, "Mindfulness will make your life work better and your work life better. It's a win-win!"

In the end, the only way to really see whether you like mindfulness meditation is to try it yourself. Download one of the many short mindfulness meditation courses available online (including meditation apps such as Headspace, buddhify, or Calm), or just follow these steps:

1. Find a place where you won't be disturbed.

2. Sit in a comfortable position and set a timer.

3. Gently close your eyes.

4. Ask yourself what you are currently experiencing, and observe your feelings, sensations, and thoughts.

5. Shift your attention to your body and spend a moment or two zooming in on the sensations in places that touch the chair or floor.

6. Shift attention to your belly and observe your sensations. Focus on how it extends and falls with every breath.

7. Observe your breathing some more without changing it.

8. At some moment, your mind will naturally wander away.

9. When you realize that your mind is no longer in the present, recognize it as a moment of awareness and shift your attention back to your breathing.

10. Now focus on your whole body, observing your posture and face. When you are ready—or when the timer reminds you that you should get back to work—open your eyes.

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Why Seclusion Is the Enemy of Creativity

by Eliot Peper

IN 1545, Jacopo da Pontormo scored a major commission from Duke Cosimo I de' Medici to paint the main chapel of Florence's church of San Lorenzo. A contemporary of masters like Michelangelo, Pontormo was a distinguished but aging artist who was eager to secure his legacy.

Pontormo knew he needed to make these frescoes the crowning achievement of his career, so he sealed off the entire chapel. He built walls, erected partitions, and hung blinds so that nobody could steal his ideas or sneak an early peek. Trusting no one, he chased away local youth and kept human contact to a minimum. He spent 11 years holed up, painting Christ on Judgment Day, Noah's ark, and Creation itself.

Pontormo died before his work on the chapel was done, and none of it survives, but the legendary Renaissance writer Vasari visited the site soon after the painter's death. He reported a confused composition and unsettling lack of alignment, scenes that ran into one another every which way. Robert Greene writes, "These frescoes were visual equivalents of the effects of isolation on the human mind: a loss of proportion, an obsession with detail combined with an inability to see the larger picture."

Leadership can be similarly isolating. Pontormo let the consequences of self-imposed solitude undermine his legacy, and if leaders today aren't mindful, they can seclude themselves in ways that are just as destructive.

No one in a leader's orbit is neutral. Board members are shareholders first and mentors second. Direct reports have their own teams to worry about. Employees depend on leaders for their jobs, investors demand they hit milestones, and customers need them to solve problems. Even friends and family struggle to understand the burden of a job they've never had.

It's all too easy for leaders to erect metaphorical walls as impenetrable as Pontormo's chapel, and once built, those walls inevitably begin to close in. Entrepreneurs and executives know the feeling: Lying awake at night with worries barreling through their heads. Splitting attention to cycle through work issues while talking to friends. Burning the candle on both ends even though they know exhaustion makes them react to difficult situations with anger when their team needs someone level-headed. Constantly pushing themselves to improve. There's a tightness in the chest, made worse by the fact that they don't want to admit—even to themselves—that they are part of the problem. They tell themselves it's normal: This is the job; just power through.

Pontormo's ultimate undoing wasn't the chapel he walled off, but the destructive ruminations he couldn't escape. His isolation skewed his perception of the big picture. In his case, that picture was a literal painting. For leaders today, it's self-awareness and clarity—skills they should master to remain a source of inspiration, guidance, and vision for their teams. Understanding the consequences of isolation is the first step to overcoming them.

If leaders aren't mindful, they can seclude themselves in destructive ways.

There is no one-size-fits-all solution. But once we acknowledge that we are the stories we tell ourselves, we realize that we can rewrite the script. When despondency threatens, leading venture capitalist Brad Feld follows a shared set of ground rules with his spouse, including cutting out screen time on weekends and spending one week a quarter off-grid together. Matt Blumberg, CEO at Return Path, invested years into building a company culture that encourages his employees to communicate openly and honestly with one another. After enduring the crushing defeat of a failed startup, David Mandell reeled himself back from depression by agreeing to advise an aspiring entrepreneur

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who needed his help. Minnie Ingersoll, cofounder of Shift and current COO of Code for America, realized she needed to be more open about the psychological hurdles she was facing and stop worrying about what other people thought.

Each of us paints our own chapel. Imagine what Pontormo could have accomplished, who he might have become, and the millions he might have inspired if he had thrown open the doors. He could have cultivated human connections. He could have asked for help. He could have practiced the most effective form of self-care: caring for others. Perhaps Pontormo's most lasting legacy is the story of his fall from grace. Leaders must heed its warning: Don't paint yourself into a corner. The walls we build around ourselves are prisons, not fortifications. Vulnerability is a source of strength. We earn others' trust by extending our trust to them.

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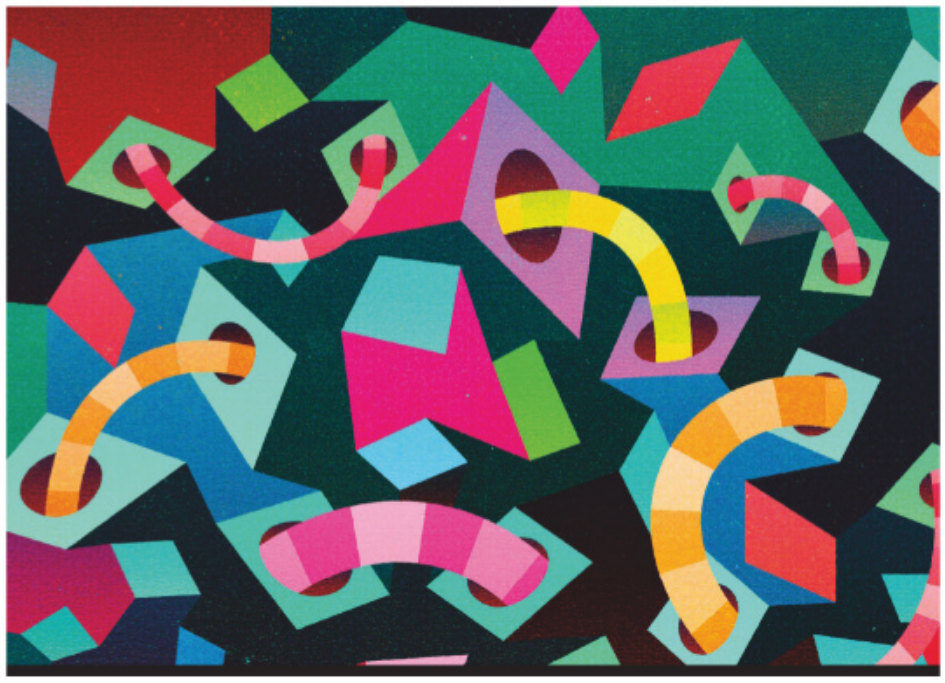

MATT LYON/GETTY IMAGES

How You Define the Problem Determines Whether You Solve It

by Art Markman

TYPICAL STORIES of creativity and invention focus on finding novel ways to solve problems. James Dyson found a way to adapt the industrial cyclone to eliminate the bag in a vacuum cleaner. Pablo Picasso and Georges Braque developed cubism as a technique for including several views of a scene in the same painting. The desktop operating system developed at Xerox PARC replaced computer commands with a spatial user interface.

The brief descriptions of these innovations all focus primarily on the novel solution. The problem they solve seems obvious. But framing innovations in this way makes creativity seem like a mystery. How could so many people have missed the solution to the problem for so long? And how in the world did the first person come up with that solution at all?

In fact, most people who come up with creative solutions to problems rely on a relatively straightforward method: finding a solution inside the collective memory of the people working on the problem. That is, someone working to solve the problem knows something that will help them find a solution—they just haven't realized yet that they know it.

Sure, some people stumble across the answer. When Archimedes stepped into the bath and noticed the water level rise, he lucked into the solution for finding the volume of an ornately decorated crown. And others, such as drug companies, invest decades and millions (or even billions) of dollars into research and development. But tapping into the individual's or group's memory is one of the most cost-effective and repeatable problem-solving approaches.

The key to this method is to get the right information out of memory to solve the problem.

With human memory, encountering a piece of information serves as a cue to retrieve other related things. If I ask you to imagine a birthday party, you can quickly recall information about birthday parties you have attended, such as party hats, cake, and singing "Happy Birthday." You don't have to expend much effort to access this information; it emerges as a result of the initial cue.

If you want to retrieve something else from your memory, you must change the cue. If I now ask you to think about salad, you can probably call to mind information about lettuce, tomatoes, and dressing, even though you were thinking about birthday parties just a minute ago.

When doing creative problem solving, the statement of the problem is the cue—it reaches in to memory and draws out related information. To generate possible solutions to a problem, the problem solver (or group) can change the description of the problem in ways that allow new information to be drawn from memory.

For example, it is hard to see how Dyson would have gotten to industrial cyclones from thinking about vacuum cleaner bags. But an alternative way to describe the problem is that a vacuum takes in a combination of dirt and air and has to separate the dirt from the air. Bags do this by acting as a filter

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that traps the dirt and lets the air pass through pores in the bag. But there are many ways to separate particles from air. Industrial cyclones create a spinning mass of air that throws particles to the edges by centrifugal force.

The most consistently creative people find many different ways to describe the problem being solved.

This way of describing a vacuum generalizes the problem by removing some of the specific components typically used to solve it. The phrase "separating dirt from air" does not mention the bag at all. When you focus on the bag, you'll naturally be reminded of aspects of bags. The large list of patent numbers on most vacuum cleaner bags suggests that many inventors have done just that. A radically new solution to a problem, though, requires a new problem statement.

So how do you create the problem statement you need to find a solution to your business dilemma? Unfortunately, there is no ideal problem statement, but the most consistently creative people and groups find many different ways to describe the problem being solved. Some of those statements will be specific and talk about the objects being acted on (for example, vacuum bags). That leads to retrieval of specific information that is highly related to the problem (for example, different types of vacuum bags). Then, groups should find several ways to describe the essence of the problem being solved that focus on the relationships among the objects or a more abstract description of the goal (for example, separate dirt from air). Each of these descriptions will help people recall knowledge that is more distantly related to the domain in which the problem is stated.

Most of us have been looking in the wrong place for our creative insights. We ask people to "think outside the box." Instead, we should be asking people to find more descriptions of the box and see what that causes us to remember.

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The Dark Side of Creativity

by Tomas Chamorro-Premuzic

FEW PSYCHOLOGICAL traits are as desirable as creativity—the ability to come up with ideas that are both novel and useful. Yet creativity has also been associated with a wide range of counterproductive, rarely discussed qualities. Being aware of these tendencies is important for anyone trying to better understand their own creativity, or that of other people.

First, research has established a link between creativity and negative moods. You don't have to be depressed to be creative—and it's important to note that crippling depression is more destructive than generative—but there is some empirical backing for the stereotype that artists tend to be depressive or suffer from mood swings. As Nietzsche once noted: "One must have chaos in oneself to be able to give birth to a dancing star." On average, people who are very emotionally stable may be too happy to feel the need to create. After

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all, if the status quo is fine, why change it?

Second, the very thinking patterns that define the creative process and help lead to original thinking can have a maladaptive side. For example, creativity requires the inability to suppress irrelevant thoughts and inappropriate ideas. And creative thinkers also tend to have poorer impulse control.

More recently, creativity has also been associated with dishonesty, presumably because it enables individuals to creatively distort reality. That is not to say that creative people are necessarily unethical. Rather, their lower tolerance for boredom and conventionality, and their more vivid imaginations, equip them with more-sophisticated mental tools to both self-deceive and deceive others.

It should be noted that this ability can often be deployed in the service of others. Outstanding entrepreneurs may be able to use such skills to convince others of their vision. (Remember Steve Jobs's famous "reality distortion field"?) Perhaps entrepreneurial talent requires a certain ability to see something that isn't there—something for which there's no evidence yet—and turn it into a compelling vision, as well as products and services, for others.

Research has also found that creative individuals are often more narcissistic and that narcissism can actually boost creative achievements. This makes intuitive sense. Narcissistic people are focused on themselves and naturally spend more time developing their own ideas and less time worrying about pleasing other people. However, narcissists often think they are more creative than they actually are, and most people are unable to evaluate creativity accurately—so observers could also just be more easily deceived by individuals who seem more confident and enthusiastic about their own ideas. Research shows that even when narcissistic individuals are not more creative, they are better able to sell their ideas to others, creating, in effect, a self-fulfilling prophecy. (This is consistent with the finding that narcissism often correlates with leadership, including when leaders are visionary or entrepreneurial.)

The very thinking patterns that define the creative process can have a maladaptive side.

Even seemingly desirable creative qualities often present more problems than opportunities for the person who incarnates them. For example, take nonconformity—a necessary prerequisite of creativity. We may idolize rebels in popular culture, but in daily life we pressure these disruptive misfits to get with the program. Likewise, although the idea of embracing risk and tolerating failure seems cool and sexy, the natural human tendency is to preserve the status quo and make our environments as predictable and familiar as possible. Truly creative people are therefore often perceived as a threat.

Of course, the bright side of creativity tends to eclipse its dark side. At the individual level, creativity has been linked to positive emotions, such as flow, engagement, and subjective well-being. When people have meaningful jobs with autonomy over their work, they will unleash their creativity and enjoy all its benefits. At the team level, coordinated group behavior and interpersonal synergies turn creativity into actual innovation, the practical side of creativity. And at the organizational and societal levels, creativity provides the seeds of change and progress. Without creativity, we would still be living in the dark ages.

But if creativity were as uniformly desirable and attractive as most writings on the subject suggest, it would happen more often, and without adverse consequences for creative minds. Too many of us simply want to "boost our creativity" without acknowledging the dark places it often comes from—or the challenging places it may take us. The reality is that creativity is both taxing and complicated.

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Why You Should Rotate Office Seating Assignments

Sometimes seating plans really matter.

WHEN CORPORATE workspaces are reorganized, many employees view the process as nothing but a nuisance. Desks are cleared, boxes are packed, daily work is disrupted—for what, exactly?

Design firms have long touted the benefits of such changes, promising that when people are able to circulate more freely and to randomly encounter different sets of colleagues, they're more communicative, collaborative, and creative. Some managers believe that too: When Steve Jobs was planning a new headquarters for Pixar, he famously located the large central bathrooms in the building's atrium, requiring employees to walk some distance to use the facilities—but creating unplanned "collisions" meant to spark innovation. Dozens of research studies have backed up these contentions. But the financial return on investment for office reconfigurations has been hard to prove—until now.

Sunkee Lee, a professor at Carnegie Mellon University, happened upon a "natural experiment" at a large South Korean e-commerce company that was moving into new headquarters. (The company requested anonymity.) In the old building, six teams of "merchandisers," tasked with sourcing and marketing flash deals for various product categories (electronics, baby, fashion, and so on) were seated in one area, while six other merchandiser teams sat in another one; the two groups were separated by a common entrance. Although the company wanted all the teams together in the new location, space constraints meant that nine of them were situated in one open area and three in another, with a common entrance in between. The two spaces were identical in terms of decoration, lighting, equipment, distances between teams and workstations, and proximity to management, and they were very similar to those in the previous headquarters. Employees had no choice about where they sat.

Looking at 38,435 deals executed by 60 merchandisers over 200 days—120 days before the move and 80 days after—Lee found that merchandisers in the area containing more teams sourced 25% more deals from new suppliers, on average, than all merchandisers had sourced before the move. The deals weren't the result of collaboration; they marked a change in the quality of people's work. Lee characterizes that change as a shift from "exploitation" (simply repeating offers that worked in the past) to "exploration" (coming up with new ideas). Perhaps more important, the

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ILLUSTRATION BY ROBERTO CIGNA

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daily deal revenue of each merchandiser sitting with previously unfamiliar colleagues was, on average, 40% higher ($16,510 a day) than the merchandisers' premove average.

The increase in creativity—the shift to exploratory ideas—was statistically significant only for people whose experience sourcing deals at that organization was above the median and who had no previous social ties to at least some of the colleagues in their new workspace. Lee offers this explanation: "Once you've learned enough about the area you specialize in, exposure to new people will make you more creative. In particular, physical proximity promotes trust and the exchange of valuable and novel knowledge between newly met peers. Given the ability to do so, you will recombine this new knowledge with your own to innovate."

Examples of the new products sourced include a rice cooker that plugs into a car (a combination of the living and leisure categories), earmuffs with a built-in Bluetooth function (fashion and electronics), and a training potty that plays music (baby and electronics). The merchandisers didn't work directly with their newly met peers, Lee says; rather, they were inspired by overheard dialogue and informal conversations to shift from "incremental" to "radical" creativity and increased sales as a result.

Interestingly, the change to employees' physical space seemed to boost performance even more than did another switch the company made (which Lee also studied), from individual incentives to fixed wages. In addition, the effect generated by the relocation was quick—the rise in cross-category deals occurred within a month—and it increased throughout the 80 days postmove.

Lee's study is one of the first to use a before-and-after setup to examine how a seating change affects individual innovation and sales performance. But it's part of a long line of research suggesting that where colleagues sit can profoundly affect how they work together. In the 1970s, for instance, MIT professor Thomas Allen studied communication among engineers in the R&D facility of a multinational company. His finding, the Allen curve, depicts the dramatic drop in dialogue between people who sit far apart. Although most of the prior research dealt with businesses, the phenomenon holds in other arenas, too. For example, a 2015 study documented that members of the U.S. Senate who sit in close proximity are more likely to support one another's legislation, regardless of party affiliation.

Lee suspects that had he continued to collect data at the South Korean firm, he would have seen a maturation effect: "When you sit near a new person, there's only a certain amount of knowledge you can absorb from him or her," he explains. "This kind of thing can wear off in time." He also notes that his findings shouldn't be interpreted too broadly; the study involved a relatively small pool of employees at a technology start-up in a country with a collectivist culture.

Still, Lee sees potential for such interventions to get results at other companies and elsewhere in the world. "It depends on your organization's goals," he says. "If you want to maintain productivity, there's certainly a case for keeping your workspaces as they are. Research shows that moves, especially to open areas, can reduce employee motivation, satisfaction, and even health. But if your organization competes on knowledge sharing and innovation, periodic reconfigurations could be worth it"—provided previously disconnected people are brought together and those newer to their jobs are given more training and support.

Although many companies have ditched closed-door offices and even open cubicles in favor of communal, desk-to-desk workspaces in an effort to encourage unplanned interactions (and to save money), fewer go so far as to routinely shake up seating assignments. Some that do: the gaming company Valve, which has put wheels on its workstations so that employees can move wherever their interests and projects take them; the travel website Kayak, where new hires are often used as a reason to move people around; and the marketing-software firm HubSpot, which randomly reassigns desks every few months.

Whether such office reconfigurations can boost revenue in the same way as they did in the South Korean e-commerce company is a question for future research. But they are increasingly common. "The idea is to encourage people from different worlds to mix and match ideas so that you come up with the best from both," Lee says. "That boosts both individual and collective performance."

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ABOUT THE RESEARCH "Can Reconfiguring Spatial Proximity Between Organizational Members Promote Individual-Level Exploration?" by Sunkee Lee (working paper)

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Quick Takes

Get Your Brain Unstuck

by Ron Friedman

IT'S 10:20 PM, and you're still at the office. Any moment now, the cleaning crew will arrive and the vacuuming will start and you'll have to put on your headphones just to hear yourself think. Your wife calls, asking if she should wait up. "Leaving any minute," you tell her, staring at an empty screen. You haven't produced anything substantive for hours. Yet, for reasons you can't understand, it's been impossible to walk away. Even now, the answer seems *so close*.

If your work involves creative thinking, you are bound to encounter times like this—times you feel stuck. Perhaps you're not sure how to start a project, respond to a client e-mail, or structure an upcoming presentation. You're trying to be productive, yet as you turn the problem over in your head again and again, you find yourself running into the same barriers.

When this happens, a common reaction is to redouble your efforts. Who doesn't love a good persistence story? Most of us have been taught that the only thing standing between us and a successful outcome is hard work.

But the research tells us something different. Although grit does have its role, when it comes to creative solutions, dogged persistence can actually backfire. A funny thing happens when you're thinking about a problem. The more time you spend deliberating, the more your focus narrows.

It's an experience familiar to all of us. When you first encounter a problem, certain solutions immediately burst to the fore. Occasionally, none of them seems quite right, so you try to reexamine the issue, giving it a fresh look, and then another. Before you know it, something counterproductive happens. You lose sight of the big picture and become fixated on details. And the harder you try, the less likely it is that unexpected, novel ideas will enter your train of thought.

At this point, you've reached a point of diminishing returns on your efforts.

So what should you do? Research suggests that when you find yourself at an impasse, it's often fruitful to use psychological distance as a tool. By temporarily directing your attention away from a problem, you allow your focus to dissipate, releasing its mental grip. Then loose connections suddenly appear, making creative insights more likely.

While most of us intuitively know that a three-day weekend or an extended vacation can yield a renewed perspective, those options aren't always available, especially when we're facing a deadline.

But that doesn't mean we can't reap the benefits of psychological distance in our day-to-day work. These three practices can help.

1. Struggling for more than 15 minutes? Switch tasks. There are perils to task switching. When we're making good progress, allowing distractions to hijack our attention can derail our focus. But the moment we experience ourselves getting stuck, the rules shift. Here, a well-timed distraction can be a boon to creativity.

When we let go of a problem, our perspective expands. This explains why we discover so many solutions in odd places, like the shower, the commute home, or the gym. Redirecting our attention to an unrelated task also provides room for *incubation,* a term psychologists use to describe nonconscious thinking. Studies show that following a brief distraction, people generate more creative solutions to a problem than those who spend the same period of time focusing on it intently.

The trick is to recognize when you are feeling stuck and resist the temptation to power through. In many cases, it is precisely when we are at our most discouraged that we can derive the greatest benefit from walking away.

2. For tasks requiring creative thinking, schedule multiple sessions over several days. Often, the most productive way of resolving a difficult problem is to alternate between thinking about it very deeply and then strategically shifting your attention elsewhere. Instead of setting aside one continuous block of time to work on a creative project, schedule shorter, more-frequent sessions. By planning multiple periods of deep thinking, you're guaranteed a few transitions away from your task, ensuring that your focus expands.

3. Put mind-wandering periods to good use. Creative solutions rarely emerge when we're in the office, which is why it can be helpful to keep an ongoing list of "thinking problems" that you can access on the go. Glance at your list just before entering mind-wandering periods, like when you're going out for a sandwich or traveling between meetings. A new context can lead to a fresh perspective.

Ultimately, the key to harnessing the power of psychological distance involves accepting that often the best ideas don't appear when we're pushing ourselves to work harder. They prefer sneaking up on us the moment we look away.

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To Be More Creative, Schedule Your Breaks

by Jackson G. Lu, Modupe Akinola, and Malia Mason

IMAGINE THAT on a Friday afternoon, before leaving work to start your weekend, you are asked to solve two problems that require creative thinking. What do you do?

- Spend the first half of your time attempting the first problem and the second half of your time attempting the second.
- Alternate between the two problems at a regular, predetermined interval (for example, switching every five minutes).
- Switch between the problems at your own discretion.

If you are like the hundreds of people to whom we posed this question, you would choose to switch between the two problems at your own discretion. After all, this approach offers maximum autonomy and flexibility, enabling you to change tracks from one problem to the other when you feel stuck.

But if coming up with creative answers is your goal, this approach may not be optimal. Instead, switching between the problems at a regular, predetermined interval will most likely yield the best results, according to research we published in the March 2017 issue of *Organizational Behavior and Human Decision Processes*.

Why is it that switching at your own volition, the approach most participants in our study took, may not generate the most creative outcomes? Because when attempting to solve problems that require creativity, we often reach a dead end without realizing it. We find ourselves circling around the same ineffective ideas and don't recognize when it's time to move on. In contrast, regularly switching back and forth between two tasks at a set interval can reset your thinking, enabling you to approach each task from fresh angles.

In an experiment, we randomly assigned participants to one of the three approaches. Participants who were instructed to continually switch back and forth between two problems at a fixed interval were significantly more likely to find the correct answer to both problems than participants who switched at their own discretion or halfway through the allotted time.

Our second study focused on creative ideation. In this experiment, the problems we posed had no right answers. We wanted to find out whether the benefits of stepping away from a problem at regular intervals transferred to other types of problems warranting creativity, such as brainstorming.

Once again we randomly assigned participants to one of our three task-switching approaches and asked them to generate creative ideas for two different idea-generation tasks. As in the first study, most people believed they would perform best if they switched between the two idea-generation tasks at their own discretion. We again found that participants who were instructed to switch back and forth between the two idea-generation tasks at a fixed interval generated the most novel ideas.

With the other two approaches, people failed to recognize when rigid thinking crept in. Participants who didn't step away from a task at regular intervals were more likely to write "new" ideas that were very similar to ones they had already written. While they might have felt they were on a roll, the reality was that, without the breaks afforded by continual task switching, their actual progress was limited.

The creative benefits of switching tasks have been supported by other research. For example, Steven Smith and his colleagues found that individuals instructed to list items from different categories while continually switching back and forth between the categories listed more novel ideas than individuals who listed items from one category before switching to listing items from the other. In a similar vein, other studies have found that brief breaks during idea generation can increase the variety of ideas generated. These researchers' findings, coupled with ours, suggest that the hustle and bustle of your daily work life may facilitate your creativity if it leads you to step away from a task and refresh your thinking.

When you're working on tasks that would benefit from creative thinking, consciously insert breaks to refresh your approach. Set them at regular intervals—use a timer if you have to. When it goes off, switch tasks—organize your reimbursement receipts, check your e-mail, or clean your desk—and then return to the original task. If you're hesitant to break away because you feel that you're on a roll, be mindful that it might be a false impression. We tend to generate redundant ideas when we don't take regular breaks; ask yourself whether your latest ideas are qualitatively different. Finally, don't skip your lunchtime, and don't feel guilty about taking breaks, especially when you are feeling stuck. Doing so may actually be the best use of your time.

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Better Brainstorming

Focus on questions, not answers, for breakthrough insights. by Hal Gregersen

ABOUT 20 YEARS AGO I was leading a brainstorming session in one of my MBA classes, and it was like wading through oatmeal. We were talking about something that many organizations struggle with: how to build a culture of equality in a male-dominated environment. Though it was an issue the students cared about, they clearly felt uninspired by the ideas they were generating. After a lot of discussion, the energy level in the room was approaching nil. Glancing at the clock, I resolved to at least give us a starting point for the next session.

"Everyone," I improvised, "let's forget about finding answers for today and just come up with some new questions we could be asking about this problem. Let's see how many we can write down in the time we have left." The students dutifully started to throw out questions, and I scribbled them on a chalkboard, redirecting anybody who started to suggest an answer. To my surprise, the room was quickly energized. At the end of the session, people left talking excitedly about a few of the questions that had emerged—those that challenged basic assumptions we had been making. For instance: Were there grassroots efforts we could support, rather than handing down rules

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from the top? And: What could we learn from pockets within our own organization that had achieved equality, instead of automatically looking elsewhere for best practices? Suddenly, there was much more to discuss, because we had opened up unexpected pathways to potential solutions.

Brainstorming for questions, not answers, wasn't something I'd tried before. It just occurred to me in that moment, probably because I had recently been reading sociologist Parker Palmer's early work about creative discovery through open, honest inquiry. But this technique worked so well with the students that I began experimenting with it in consulting engagements, and eventually it evolved into a methodology that I continue to refine. By now I've used it with hundreds of clients, including global teams at Chanel, Danone, Disney, EY, Fidelity, Genentech, Salesforce, and dozens of other companies; nonprofit organizations; and individual leaders I've coached.

Underlying the approach is a broader recognition that fresh questions often beget novel—even transformative—insights. Consider this example from the field of psychology: Before 1998 virtually all well-trained psychologists focused on attacking the roots of mental disorders and deficits, on the assumption that well-being came down to the absence of those negative conditions. But then Martin Seligman became president of the American Psychological Association, and he reframed things for his colleagues. What if, he asked in a speech at the APA's annual meeting, well-being is just as driven by the *presence* of certain *positive* conditions—keys to flourishing that could be recognized, measured, and cultivated? With that question, the positive psychology movement was born.

Brainstorming for questions rather than answers makes it easier to push past biases and venture into uncharted territory.

Brainstorming for questions rather than answers makes it easier to push past cognitive biases and venture into uncharted territory. We've seen this dynamic in academic studies—in social psychologist Adam Galinsky's research on the power of reframing during times of transition, for instance. Yet lingering in a questioning mode doesn't come naturally to most people, because we're conditioned from an early age to just keep the answers coming.

The methodology I've developed is essentially a process for recasting problems in valuable new ways. It helps people adopt a more creative habit of thinking and, when they're looking for breakthroughs, gives them a sense of control. There's actually something they can do other than sit and wait for a bolt from the blue. Here, I'll describe how and why this approach works. You can use it anytime you (in a group or individually) are feeling stuck or trying to imagine new possibilities. And if you make it a regular practice in your organization, it can foster a stronger culture of collective problem solving and truth seeking.

What Process Should We Follow?

Over the years I have tested variations of this brainstorming process—I now call it a "question burst"—and collected and analyzed participant data and feedback to gauge what works best. I've experimented with different group sizes, time allotments, and numbers of questions; impromptu versus scheduled sessions; various modes of capturing ideas; and greater and lesser amounts of coaching (on, for example, what constitutes a "good" question and how to make creative leaps in thinking). I've done temperature checks in sessions and conducted surveys after them, looking for the effects of each variation. Over time the question burst has settled into a standard format, which consists of three steps:

1. Set the stage.

To begin, select a challenge you care deeply about. Perhaps you've suffered a setback or you have a vague sense of an intriguing opportunity. How do you know it's ripe for a breakthrough question? It's probably a good candidate if it "makes your heart beat fast," as Intuit's chairman and CEO, Brad Smith, put it to me. You'll give it your full attention and want to engage others in thinking about it.

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Invite a few people to help you consider that challenge from fresh angles. Though you can do this exercise on your own, bringing others into the process will give you access to a wider knowledge base and help you maintain a constructive mindset. As Ned Hallowell says in *Driven to Distraction at Work* (which was based on his decades of research on how to sustain productive attention), worry "feasts on a solitary victim." When you ask others to participate in a question burst, you're making yourself vulnerable by sharing the problem—but you're also summoning empathy, which fosters idea generation, as we've learned from design thinking. And you engage others in the cause in a nonthreatening way.

It's best to include two or three people who have no direct experience with the problem and whose cognitive style or worldview is starkly different from yours. They will come up with surprising, compelling questions that you would not, because they have no practiced ways of thinking about the problem and no investment in the status quo. They're more likely to ask third-rail questions and point to elephants in the room—they don't know not to.

In traditional brainstorming—the kind that focuses on generating answers—individuals perform better than groups, on average. That's because powerful group dynamics such as "social loafing" (coasting on others' contributions) and social anxiety (fears about how one's ideas will be judged) can hinder original thinking and stifle the voices of introverted members. But the question burst methodology, by design, reverses many of those destructive dynamics by prompting people to depart from their usual habits of social interaction. For one thing, it creates a safe space for anyone, including a quieter person, to offer a different perspective. Because a question burst doesn't demand that anyone instantly assert a point of view, people often feel more comfortable speaking up. The sole focus on questions also suspends the automatic rush to provide an answer—and ultimately helps expand the problem space for deeper exploration.

Once you've gathered your partners for this exercise, give yourself just two minutes to lay out the problem for them. People often believe that their problems require detailed explanations, but quickly sharing the challenge forces you to frame it in a high-level way that doesn't constrain or direct the questioning. So just hit the highlights. Try to convey how things would change for the better if the problem were solved. And briefly say why you are stuck—why it hasn't already been solved.

This approach helped Odessa, a manager at a global financial services company, reframe what she initially viewed as a complex communications challenge: rolling out a new strategy to people performing different tasks at many levels across many geographies. She prefaced her question burst with a simple explanation, sharing her hopes for getting everyone "rowing in the same direction" and her frustration that one set of messages couldn't do the job, given employees' diverse roles and perspectives. By leaving it at that, she created room for a line of questioning that radically altered her understanding. She came to see this as a leadership challenge, not just an internal marketing campaign. If she could find a way to trust others to convey the strategy, she could mobilize a small army of managers in the field to tailor messages for maximum local impact.

Before opening the floor to your group, clearly spell out two critical rules: First, people can contribute only questions. Those who try to suggest solutions—or respond to others' questions—will be redirected by you, the convener of the session. And second, no preambles or justifications that frame a question will be allowed, because they'll guide listeners to see the problem in a certain way—the very thing you're trying to avoid.

You'll also want to do a quick emotion check up front. As the "owner" of the challenge, take a moment to reflect on it: Are your feelings about it positive, neutral, or negative? Jot down a few words that capture your own baseline mood. No need to spend more than 10 seconds on this. You'll do the same thing again after the session is over. These checks are important because emotions affect creative energy. The exercise's objective is not only to spark valuable new questions but also to provide an emotional boost that will make you more likely to follow up on them.

Here I should point out that your creative energy will ebb and flow in the coming days, weeks, and months—and preparing yourself for that is critical. Transformational ideas start out as exhilarating but turn vexing as unforeseen snags reveal themselves. Then they settle into hard work that, with luck, produces moments of hope that will see the change through. If you expect that turbulence from the beginning, you'll be better able to ride it out later.

Idea in Brief

THE PROBLEM

Great innovators have always known that the key to unlocking a better answer is to ask a better question—one that challenges deeply held assumptions. Yet most people don't do that, even when brainstorming, because it doesn't come naturally. As a result, they tend to feel stuck in their search for fresh ideas.

THE SOLUTION

By brainstorming for questions instead of answers, you can create a safe space for deeper exploration and more-powerful problem solving. This brief exercise in reframing—which helps you avoid destructive group dynamics and biases that can thwart breakthrough thinking—often reveals promising new angles and unexpected insights.

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2. Brainstorm the questions.

Now set a timer and spend the next four minutes collectively generating as many questions as possible about the challenge. As in all brainstorming, don't allow pushback on anyone's contributions. The more surprising and provocative the questions are, the better.

When working with large enterprises, I often notice that senior leaders in particular find it excruciatingly difficult to resist offering answers—even for four minutes—when people start throwing out questions. At one manufacturing company, for instance, when questions about supply chain issues started bubbling up, the group's leader couldn't help jumping in to display his knowledge. This impulse is understandable, and not just for senior executives. In a hierarchy, any manager's failure to have ready answers may be perceived as an embarrassing stumble. Questions, especially counterintuitive ones, make many of us feel so uncomfortable that we hasten to utter any default response that buys us time to recover. But when we're feeling blocked on a problem, answering questions this way is a waste of time. After all, the reason we're hung up is that our go-to answers aren't getting us anywhere.

In this exercise the emphasis is on quantity. By asking the group to generate as many questions as possible in the time allotted—try for at least 15—you'll keep them short, simple, and fresh. Write every question down verbatim on paper, a laptop, or a tablet instead of on a whiteboard so that you can capture everything accurately. And ask group members to keep you honest afterward. Otherwise you might commit unconscious censoring that repels lines of inquiry you don't immediately understand or want to hear.

As you're recording, add your own questions to the mix. That will often reveal patterns in how you have habitually framed a problem (and might have unknowingly perpetuated it).

Is there some magic about precisely four minutes and 15 questions? No, but the time pressure helps participants stick to the "questions only" rule. Any effort spent on answers will mean less chance of hitting the goal. People will also be more likely to generate questions that are unburdened by qualifications and assumptions, and they'll find it easier to resist explaining why they're asking any question that might seem to come from left field. Even better, studies show that moderate performance pressures can enhance creative output.

Moreover, perhaps because selective sustained attention places real demands on the human brain, energy often wanes in this exercise after three and a half minutes, especially for beginners. And as a practical matter, transcribing dozens of questions can turn into an onerous task. For both those reasons, it's better to use multiple question bursts to reshape, refine, and ultimately solve a challenge than to cram too much activity into one longer session.

Once the timer goes off, do a second quick emotional check. How do you feel about the challenge now? (And how do others in the group feel about it?) Are you more positive than you were four minutes ago? If not, and if the setting allows, maybe rerun the exercise. Or get some rest and try again tomorrow. Or try it with some different people. Research has established that creative problem solving flourishes when people work in positive emotional states. After poring over survey data from more than 1,500 global leaders, I'm convinced that part of the power of the question burst lies in its ability to alter a person's view of the challenge, by dislodging—for most—that feeling of being stuck.

3. Identify a quest—and commit to it.

On your own, study the questions you jotted down, looking for those that suggest new pathways. About 80% of the time, this exercise produces at least one question that usefully reframes the problem and provides a new angle for solving it. Select a few that intrigue you, strike you as different from how you've been going about things, or even cause you to feel a bit uncomfortable.

Now try expanding those few into their own sets of related or follow-on questions. A classic way of doing this is the "five whys" sequence developed by Toyota Industries' founder, Sakichi Toyoda—or the variation on it suggested by Stanford's Michael Ray in *The Highest Goal*. Ask yourself why the question you chose seemed important or meaningful. Then ask why the reason you just gave is important—or why it's a sticking point. And so on. By better understanding why a question really matters and what obstacles you might face in addressing it, you deepen your resolve and ability to do something about it and further broaden the territory of possible solutions. In the case of Odessa, the manager with a strategy to roll out, one breakthrough question—Could you recruit

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field leaders to communicate it locally?—provoked other questions: Why haven't I done that in the past? Could I trust others to do this well? Why do I have a problem extending that trust?

Finally, commit to pursuing at least one new pathway you've glimpsed—and do so as a *truth seeker*. I steal that term from NASA engineer Adam Steltzner's account of working at the Jet Propulsion Laboratory, where the "right kind of crazy" people manage to accomplish things like landing a robotic rover on Mars. Set aside considerations of what might be more comfortable to conclude or easier to implement, and instead adopt an innovator's focus on the "job to be done" and what it will take to get the problem solved. Devise a near-term action plan: What concrete actions will you personally take in the next three weeks to find potential solutions suggested by your new questions?

After one question burst I helped facilitate, a chief marketing officer from a multidivisional company resolved to track down some facts. He had been wrestling with concerns about hypercompetitive behaviors in his business unit. In a question burst session he led with others, it dawned on him that he had been making a big assumption: that the founders of his division had chosen its unique compensation scheme to create a culture of internal rivalry. His to-do list started with getting on their calendars and asking them about this. Guess what? Not only was this not a culture they had aimed for, but they were dismayed to learn it existed. His meetings with them gave rise to a new emphasis on culture and values in the unit—and created the context in which the CMO could intervene and address toxic behaviors. The point here is that arriving at assumption-challenging questions is essential but never sufficient. An action plan and follow-up can clarify the problem and break open the pathway to change.

How Can We Make It a Habit?

I usually recommend doing at least three rounds of the question burst exercise for a given issue. Although it's valuable as a one-off activity, the more you do it, the deeper you'll go in your thinking. After the leader of a development team at a global software company did the exercise repeatedly, she came to the realization that her original conception of a problem was "superficial." Through persistent questioning, she told me, she "arrived at a much more meaningful challenge to conquer."

Even with three rounds, the time investment is minimal. It's an efficient path to fresh perspectives and creativity. The process will also get easier the more you do it. When people crank up their questioning activity for the first time with this approach, it feels strange because it's out of line with established norms at work and in life. Since childhood, they've been conditioned not to ask questions.

James T. Dillon, an education professor emeritus at the University of California, Riverside, spent a career studying this phenomenon in classrooms. He was shocked by how rarely students asked questions—which are critical to learning. The problem wasn't a lack of curiosity. "Every time that conditions have been provided for them (not by a mere pause, 'Any questions? No? OK, open your books'), a flood of intriguing student questions has poured forth," Dillon writes. When he surveyed other teachers about this, they almost universally agreed that "students indeed have questions but do not go on to ask them in class." Why not? They're afraid to do so, Dillon says, "largely because of their experience with negative reactions from the teacher (and from classmates)." They learn to keep their questions to themselves and to repeat back well-rehearsed answers when quizzed by their teachers, according to Tony Wagner, a senior fellow at the Learning Policy Institute. Other researchers—looking at arenas of human learning and interaction such as community forums, medical consultations, political institutions, and workplaces—have consistently come to the same conclusion: Questioning is an innate human behavior that's actively subverted and systematically shut down.

And power struggles don't help matters. In social groups, dominant individuals inevitably emerge; left unchecked, they find ways to build and perpetuate their power. One common way to do this is to silence questioners—those pesky curious minds whose queries might suggest that the leader hasn't quite figured it all out.

Of course, many business leaders, recognizing the imperative for constant innovation, do try to encourage questions. But their employees have already internalized the habit of not asking them—especially the tough ones. We need to change this habit. That's what my MIT colleague Robert

NOT ALL QUESTIONS ARE CREATED EQUAL

Often, as I'm outlining the rules for a question burst, people ask what kinds of questions they should contribute—or how they can be confident that a question is a good one for further pursuit. While I hesitate to be definitive about this, it's true that not all questions have equal potential to lead to novel solutions. To up your odds, keep these principles in mind:

- Traditional divergent-thinking techniques (for example, making random associations or taking on an alternative persona) can help unlock new questions and, ultimately, new territory.
- Questions are most productive when they are open versus closed, short versus long, and simple versus complex.
- Descriptive questions (what's working? what's not? why?) best precede speculative ones (what if? what might be? why not?).
- Shifting from simple questions that require only recall to more cognitively complex ones that demand creative synthesis produces better breakthrough thinking.
- Questions are annoying and distracting when they don't spring from a deeply held conviction about what the group wants to achieve.
- Questions are toxic when they are posed aggressively, putting people on the spot, casting unwarranted doubt on their ideas, or cultivating a culture of fear.

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Langer, the health care technology innovator who has been called the "Edison of medicine," has been doing with his students and postdocs. In a recent interview he said: "When you're a student, you're judged by how well you answer questions. Somebody else asks the questions, and if you give good answers, you'll get a good grade. But in life, you're judged by how good your questions are." As he mentors people, he explicitly focuses their attention on making this all-important transition, knowing "they'll become great professors, great entrepreneurs—great something—if they ask good questions."

Organizations can raise their questioning quotient in various ways. For example, in my field experience, I've found that people become better questioners in environments where they're encouraged to value creative friction in everyday work. At companies like Amazon, ASOS, IDEO, Patagonia, Pixar, Tesla, and Zappos, for example, people often come together to tackle challenges by asking one another tough questions—in hallways, lunchrooms, or even conference rooms. Research by management professors Andrew Hargadon of UC Davis and Beth Bechky of NYU shows that those volunteering ideas in such companies do not mindlessly spit back answers to the questions posed; they respectfully build on the comments and actions of others, considering "not only the original question but also whether there is a better question to be asked." As they do this over and over, new solutions emerge.

People also become better questioners in organizational cultures where they feel safe doggedly pursuing the truth, no matter where it takes them. To create such cultures, MIT's Ed Schein says, leaders must show humility, vulnerability, and trust, and they must empower others and treat them equitably. When those conditions aren't present, questions tend to be constrained or, worse, crushed.

Questioning is an innate human behavior that's actively subverted and systematically shut down.

Interestingly, when I've facilitated question bursts with very large groups (broken down into subgroups of three to six people), I have noticed that the people least likely to engage in the exercise and follow the rules are the folks with the highest positions or greatest technical expertise. Whether they feel they're above the exercise or worry that sharing problems will make them appear incompetent, they cripple the truth-seeking capability of the entire group as others watch them disengage or scoff at contributions. If that's the example and tone leaders are setting in a single microcosmic exercise, imagine the dampening impact they have on inquiry throughout their organizations.

Finally, people must hold themselves accountable for follow-up. Few things are more annoying than a colleague who *only* asks questions. People must take responsibility for exploring the pathways those questions open up and discovering valuable answers. This is especially true for leaders. Everyone else is taking cues from them about when, where, how, and why the status quo should be challenged. They must carve out time to help gather and analyze newer, better, and different information. It's a sign of ownership when leaders go out of their way to do that. It shows others that management is committed to crafting a future where questions count.

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Quick Takes

For Better Brainstorming, Tell an Embarrassing Story

by Leigh Thompson

IT WAS Alex Osborn, an advertising executive in the 1940s and '50s, who coined the term *brainstorming*. He passionately believed in the ability of teams to generate brilliant ideas, provided they follow four rules: Share any idea that comes to mind; build on the ideas of others; avoid criticism; and, most notably, strive for quantity, not quality. Subsequent scientific research confirmed Osborn's instincts: Groups who follow his guidelines show more creativity than those who don't. For example, in one study, brainstorming groups given quantity goals generated both more ideas (an average of 29.88) and significantly higher-quality ideas (20.35) than those given a quality goal alone (averages of 14.24 and 10.5).

One of the men behind that research, Paul Paulus, a professor at the University of Texas at Arlington, wondered whether there might be additional ways for companies and teams to improve brainstorming results and tested four more rules: Stay focused on the task at hand; don't just say an idea, explain it; when ideas run dry, restate the problem and encourage more thinking; and prompt those not talking to contribute. The results of these studies were dramatic: Groups that followed both sets of rules generated nearly 50 significantly more-unique ideas.

My colleagues, Elizabeth Ruth Wilson and Brian Lucas, and I decided to explore whether people could also be primed for better brainstorming before the idea generation even starts. In our first experiment, we asked one set of participants to describe a time they'd felt embarrassed in the previous six months; we asked a second group to describe a time they'd felt proud. We then asked each individual to spend 10 minutes thinking of new uses for a paper clip. We hypothesized that—just as quantity goals paradoxically yield better-quality ideas—telling an embarrassing story would lead people to drop their inhibitions and get more creative.

We scored our study subjects' output using two criteria: fluency (the sheer volume of ideas they generated) and flexibility (how many different kinds of ideas they came up with). For example, one participant suggested an earring, necklace, ring, and bracelet, while another suggested an earring, wound suture, artwork, and screwdriver. Both had four ideas, but the second person suggested a broader range of them, displaying more flexibility. On average, the embarrassing-stories group well outperformed their counterparts, scoring 7.4 for fluency and 5.5 for flexibility, whereas the prideful group scored 5.9 and 4.6.

A discussion of foibles helps people open up and take more risks.

In our second study, we investigated how the same dynamic might play out in a group. We suspected that the effects might be magnified if the recounting of accomplishments caused people to worry more about hierarchy and social comparisons, quelling creativity, and if a discussion of foibles helped people open up and take more risks, boosting brainstorming efficacy.

We randomly assigned 93 managers from a range of companies and industries to three-person teams and gave them one of two group "introduction" and "warm-up" exercises. Half the groups were told to share embarrassing stories; half talked about moments when they had felt pride. The anecdotes had to involve them personally and have happened in the previous six months.

My colleagues and I carefully watched these conversations unfold. The people told

VINCENT TSUI

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to embarrass themselves were initially taken off-guard and even apprehensive. But inevitably someone would jump in (*"OK, I'll go first..."*), and within minutes the trios were laughing uproariously. The people told to boast had, by contrast, no trouble starting their conversations and appeared more composed. However, there was little laughter and only a few polite head nods on the teams.

After 10 minutes, we introduced the brainstorming challenge—this time, to generate as many unusual uses for a cardboard box as possible, also in 10 minutes. Using the same scoring criteria—fluency and flexibility—we found that the "embarrassment" teams generated 26% more ideas spanning 15% more use categories than their counterparts.

Candor led to greater creativity. Thus, we propose a new rule for brainstorming sessions: Tell a self-deprecating story before you start. As uncomfortable as this may seem, especially among colleagues you would typically want to impress, the result will be a broader range of creative ideas, which will surely impress them even more.

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POPPERFOTO/GETTY IMAGES

The Problem-Solving Process That Prevents Groupthink

by Art Markman

MOST OF us aren't very good at creative problem-solving for two reasons: First, few people get training in how to be creative. Second, few people understand group dynamics well enough to harness their power to help groups maximize their creativity.

Resolving the first issue requires getting your employees to learn more about the way they think...a tall order for managers. The second issue, though, is well within your ability to change.

A key element of creativity is bringing existing knowledge to bear on a new problem or goal. The more people who can engage with that problem or goal, the more knowledge that's available to work on it. Unfortunately, quite a bit of research demonstrates that the traditional brainstorming methods first described by Alex Osborn in 1942 fail. When groups simply get together and start throwing out ideas, they actually come up with fewer ideas overall and fewer novel, actionable ideas than they would have come up with had they worked alone.

To fix this problem, it is important to think about the two phases of group problem-solving: *divergence* and *convergence*.

Divergence happens when the group considers as many different potential solutions as possible. For example, a common test of creativity is the "alternative uses" test. People are asked questions like, "How many different uses can you find for a brick?" This test requires strategies for considering as many distinct solutions as possible.

Convergence happens when the variety of proposed solutions are evaluated. In this phase, a large number of ideas are whittled to a smaller set of candidate solutions to the current problem.

The core principle of group creativity is that individuals working alone diverge, whereas group members working together converge. In group settings, as soon as one person states a potential solution, that influences the memory of every person in the group in ways that make them think about the problem more similarly. That is why groups working together diverge less than individuals working alone.

To fix group idea generation, be aware of when you are

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trying to diverge and when you are trying to converge. For example, early in the problem-solving process, think carefully about the problem itself. Have your group members work alone to craft statements describing the problem. Then, get them back together to discuss their descriptions. The individuals are more likely to come up with a variety of distinct problem statements. The group discussion will lead everyone to accept one or a small number of variants of these statements to work on—this is healthy convergence.

Groups working together diverge less than individuals working alone.

When you start to generate solutions, you again want divergence. To start, have people work alone. Then collect people's initial ideas and send them around to other group members and allow the divergence to continue as group members individually build on the ideas of their colleagues. Because people are still working alone, the way they build on other people's ideas is still going to differ from how other group members are building on those ideas.

After this process, you can give the resulting ideas to everyone and let the group discuss them. This discussion will gradually lead the group to converge on a small number of candidate solutions.

This process maximizes the contribution of the group. Everyone gets to engage their knowledge in service of the problem to be solved without having their memories influenced by other people's solutions. Everyone also gets to enhance the ideas generated by their colleagues. Finally, the group gets to work together to build further on the ideas and to evaluate the candidates.

This simple procedure works effectively, because it respects what individuals and groups do best.

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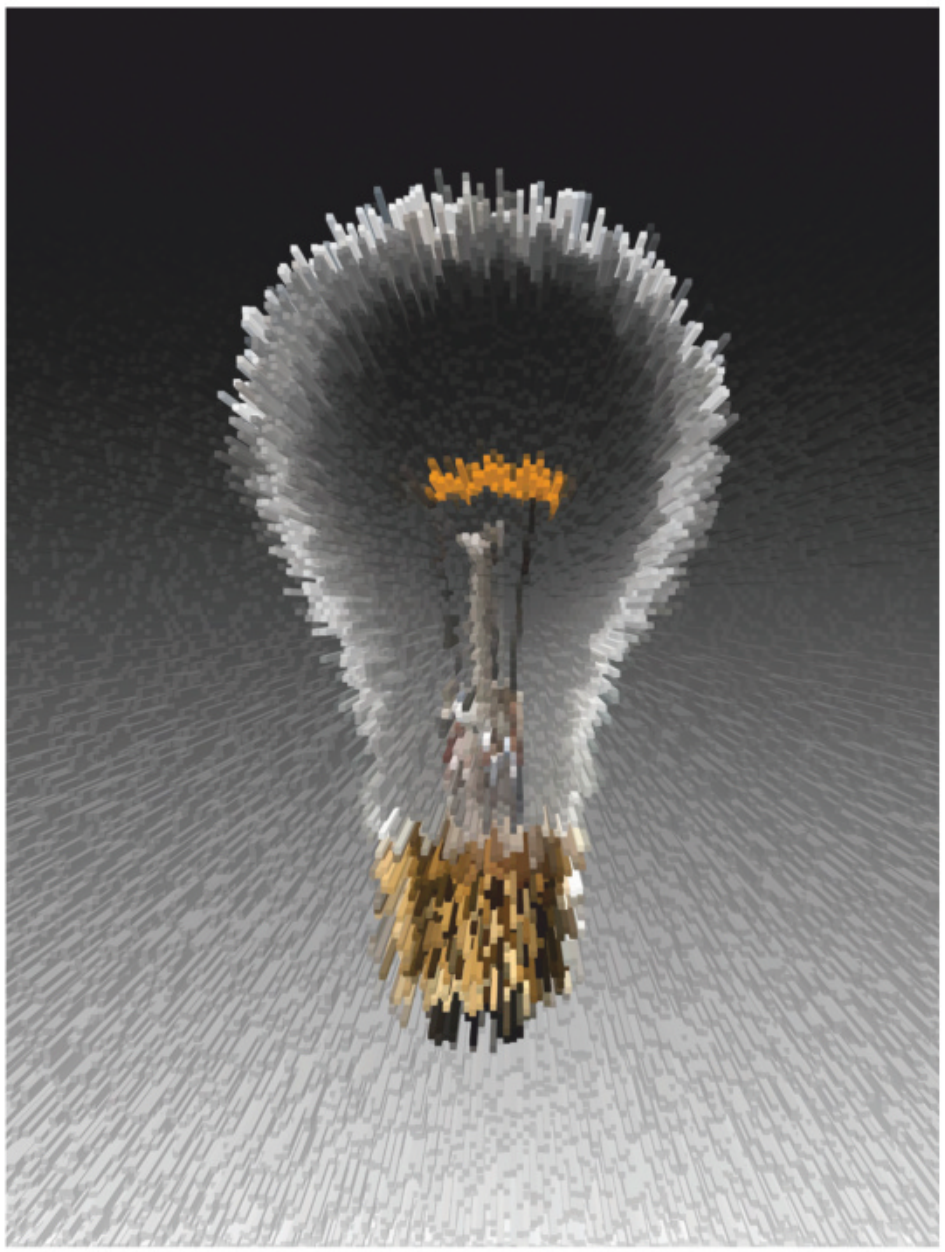

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Why Brainstorming Works Better Online

by Tomas Chamorro-Premuzic

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IN THE LATE 1980S, Peter Drucker predicted that in the near future, technology would play a central role in increasing the effectiveness of teams. Although he was right, teams have yet to experience the full benefits of technology. Yes, there is a great deal of talk about virtual teams and collaborative tools, but our ability to leverage technology so that it consistently and systematically boosts team performance is based mostly on intuition rather than science.

One exception is group brainstorming, a technique that is still widely used in organizations despite the lack of evidence that it works and compelling evidence that it actually leads to a productivity loss. The good news is that technology can make brainstorming more effective by replacing physical and oral sessions with virtual and written ones—a technique also known as *brainwriting* or *electronic brainstorming*.

Indeed, studies comparing the performance of matched groups on physical and virtual sessions indicate that the latter generate more high-quality ideas and have a higher average of creative ideas per person, as well as resulting in higher levels of satisfaction with the ideas. As shown in meta-analyses, virtual brainstorming enhances creative performance—versus in-person brainstorming sessions—by almost 50% of a standard deviation. This means that almost 70% of participants can be expected to perform worse in traditional sessions than in virtual brainstorming sessions.

The advantages of virtual brainstorming have been attributed to three main reasons.

First, virtual brainstorming eliminates production blocking, the process where dominant participants talk too much, taking over the session and eclipsing their colleagues. This leads to cognitive overload and hinders creative idea generation in more-introverted participants. In virtual brainstorming there is a clear positive relationship between group size and performance, whereas in traditional, in-person brainstorming sessions, things tend to get messy with more than six participants. Online, there are no real limits to group size: The cost of having five or 50 participants is nearly the same, and you actually save costs by allowing people to work remotely and in dispersed locations. Thus virtual brainstorming is much more scalable, and each person you add has the potential to contribute a new idea to the mix.

Second, virtual brainstorming enables feelings of anonymity, because ideas cannot be attributed to a specific person. This reduces evaluation apprehension, particularly in less confident individuals who would underperform in traditional brainstorming sessions. Anonymity also means that ideas are judged more objectively. In traditional sessions, the process is as biased and political as in any other physical group interaction—the powerful people take over, and though democratic in theory, in fact decisions are driven by one or two powerful individuals. Conversely, when team members rate ideas anonymously and without knowledge of the author, politics are out of the way. An example of this is textsfromlastnight, a site that allows users to anonymously submit quirky text messages, which are then rated—good or bad—by other anonymous users. Organizations would do well to copy this process: Have a live, real-time, virtual depository of ideas for new products, services, or processes, which can then be rated or evaluated by other employees, and perhaps even clients.

When team members rate ideas anonymously, politics are out of the way.

Third, if designed intelligently, virtual sessions can increase the diversity of ideas. In traditional brainstorming, being exposed to others' ideas causes uniformity and regression to the mean: The most creative people will descend to the level of the group average. But by preventing participants from being exposed to one another's ideas during the idea-generation phase, virtual brainstorming encourages participants to offer a wider variety of ideas. In line with this, studies have shown that individual brainstorming, where people write down a number of ideas on a piece of paper, often produces more and better ideas than group brainstorming. Virtual brainstorming preserves this mechanism while providing a searchable archive of ideas for the team to weigh in on later.

Thus virtual brainstorming retains the original postulate of traditional brainstorming—that teams can crowdsource creativity by curating the ideas they collectively produce in an informal, free-flowing, stream-of-consciousness session—but overcoming the main, originally unforeseen barriers.

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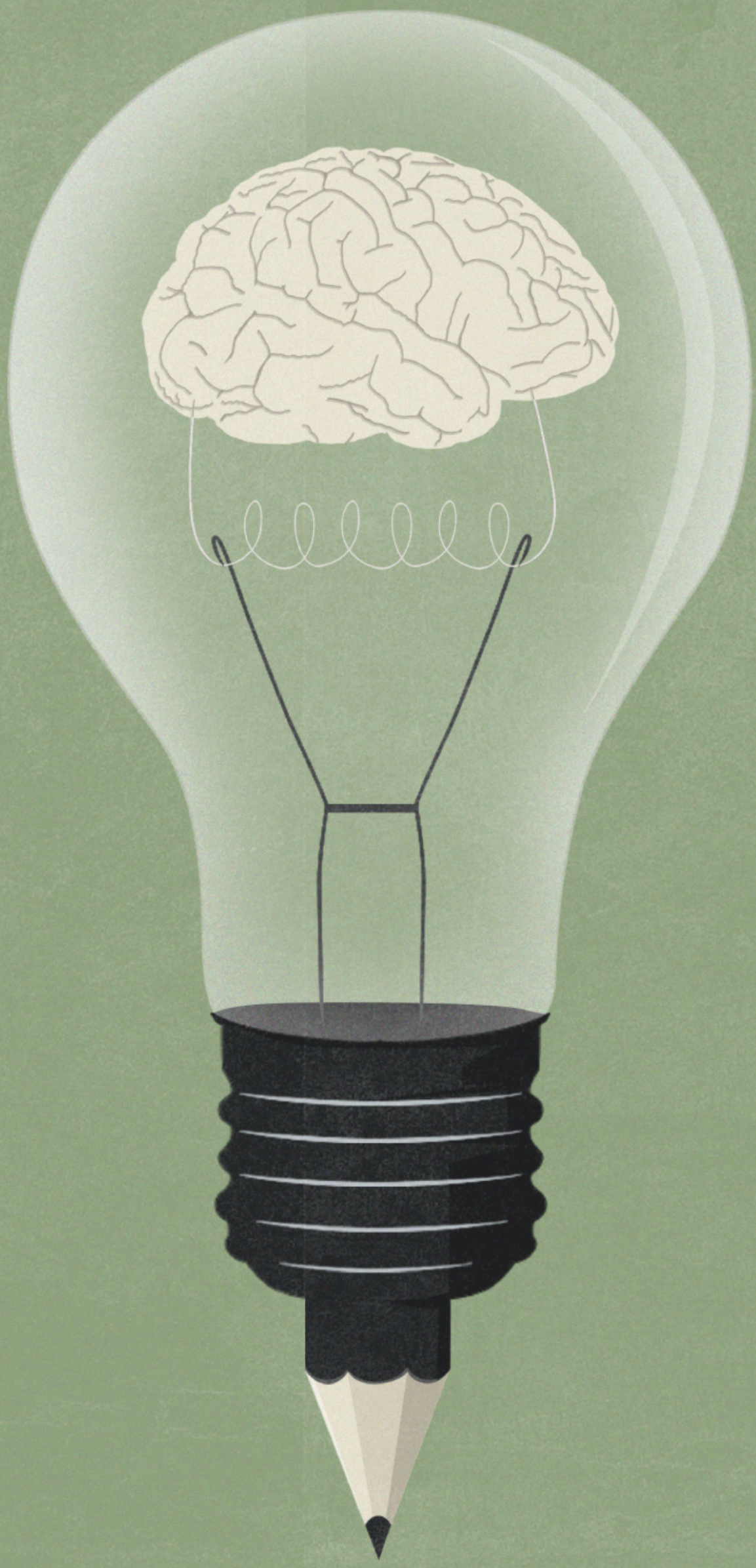

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Design Thinking

Thinking like a designer can transform the way you develop products, services, processes—and even strategy. by Tim Brown

THOMAS EDISON CREATED the electric lightbulb and then wrapped an entire industry around it. The lightbulb is most often thought of as his signature invention, but Edison understood that the bulb was little more than a parlor trick without a system of electric power generation and transmission to make it truly useful. So he created that, too.

Thus Edison's genius lay in his ability to conceive of a fully developed marketplace, not simply a discrete device. He was able to envision how people would want to use what he made, and he engineered toward that insight. He wasn't always prescient (he originally believed the phonograph would be used mainly as a business machine for recording and replaying dictation), but he invariably gave great consideration to users' needs and preferences.

Edison's approach was an early example of what is now called "design thinking"—a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos. By this I mean that innovation is powered by a thorough understanding, through direct observation, of what people want and need in their lives and what they like or dislike about the way particular products are made, packaged, marketed, sold, and supported.

Many people believe that Edison's greatest invention was the modern R&D laboratory and methods of experimental investigation. Edison wasn't a narrowly specialized scientist but a broad generalist with a shrewd business sense. In his

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ILLUSTRATION BY ROBERTO CIGNA

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Menlo Park, New Jersey, laboratory he surrounded himself with gifted tinkerers, improvisers, and experimenters. Indeed, he broke the mold of the "lone genius inventor" by creating a team-based approach to innovation. Although Edison biographers write of the camaraderie enjoyed by this merry band, the process also featured endless rounds of trial and error—the "99% perspiration" in Edison's famous definition of genius. His approach was intended not to validate preconceived hypotheses but to help experimenters learn something new from each iterative stab. Innovation is hard work; Edison made it a profession that blended art, craft, science, business savvy, and an astute understanding of customers and markets.

Design thinking is a lineal descendant of that tradition. Put simply, it is a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity. Like Edison's painstaking innovation process, it often entails a great deal of perspiration.

I believe that design thinking has much to offer a business world in which most management ideas and best practices are freely available to be copied and exploited. Leaders now look to innovation as a principal source of differentiation and competitive advantage; they would do well to incorporate design thinking into all phases of the process.

Getting Beneath the Surface

Historically, design has been treated as a downstream step in the development process—the point where designers, who have played no earlier role in the substantive work of innovation, come along and put a beautiful wrapper around the idea. To be sure, this approach has stimulated market growth in many areas by making new products and technologies aesthetically attractive and therefore more desirable to consumers or by enhancing brand perception through smart, evocative advertising and communication strategies. During the latter half of the twentieth century design became an increasingly valuable competitive asset in, for example, the consumer electronics, automotive, and consumer packaged goods industries. But in most others it remained a late-stage add-on.

Now, however, rather than asking designers to make an already developed idea more attractive to consumers, companies are asking them to cre-

The surgeons described a new device for sinus surgery. One designer grabbed a marker, a film canister, and a clothespin and taped them together. "Do you mean like this?" he asked.

A DESIGN THINKER'S PERSONALITY PROFILE

Contrary to popular opinion, you don't need weird shoes or a black turtleneck to be a design thinker. Nor are design thinkers necessarily created only by design schools, even though most professionals have had some kind of design training. My experience is that many people outside professional design have a natural aptitude for design thinking, which the right development and experiences can unlock. Here, as a starting point, are some of the characteristics to look for in design thinkers:

Empathy. They can imagine the world from multiple perspectives—those of colleagues, clients, end users, and customers (current and prospective). By taking a "people first" approach, design thinkers can imagine solutions that are inherently desirable and meet explicit or latent needs. Great design thinkers observe the world in minute detail. They notice things that others do not and use their insights to inspire innovation.

Integrative thinking. They not only rely on analytical processes (those that produce either/or choices) but also exhibit the ability to see all of the salient—and sometimes contradictory—aspects of a confounding problem and create novel solutions that go beyond and dramatically improve on existing alternatives. (See Roger Martin's *The Opposable Mind: How Successful Leaders Win Through Integrative Thinking*.)

Optimism. They assume that no matter how challenging the constraints of a given problem, at least one potential solution is better than the existing alternatives.

Experimentalism. Significant innovations don't come from incremental tweaks. Design thinkers pose questions and explore constraints in creative ways that proceed in entirely new directions.

Collaboration. The increasing complexity of products, services, and experiences has replaced the myth of the lone creative genius with the reality of the enthusiastic interdisciplinary collaborator. The best design thinkers don't simply work alongside other disciplines; many of them have significant experience in more than one. At IDEO we employ people who are engineers *and* marketers, anthropologists *and* industrial designers, architects *and* psychologists.

PHOTOS COURTESY OF IDEO

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ate ideas that better meet consumers' needs and desires. The former role is tactical, and results in limited value creation; the latter is strategic, and leads to dramatic new forms of value.

Moreover, as economies in the developed world shift from industrial manufacturing to knowledge work and service delivery, innovation's terrain is expanding. Its objectives are no longer just physical products; they are new sorts of processes, services, IT-powered interactions, entertainments, and ways of communicating and collaborating—exactly the kinds of human-centered activities in which design thinking can make a decisive difference. (See the sidebar "A Design Thinker's Personality Profile.")

Consider the large health care provider Kaiser Permanente, which sought to improve the overall quality of both patients' and medical practitioners' experiences. Businesses in the service sector can often make significant innovations on the front lines of service creation and delivery. By teaching design thinking techniques to nurses, doctors, and administrators, Kaiser hoped to inspire its practitioners to contribute new ideas. Over the course of several months Kaiser teams participated in workshops with the help of my firm, IDEO, and a group of Kaiser coaches. These workshops led to a portfolio of innovations, many of which are being rolled out across the company.

One of them—a project to reengineer nursing-staff shift changes at four Kaiser hospitals—perfectly illustrates both the broader nature of innovation "products" and the value of a holistic design approach. The core project team included a strategist (formerly a nurse), an organizational-development specialist, a technology expert, a process designer, a union representative, and designers from IDEO. This group worked with innovation teams of frontline practitioners in each of the four hospitals.

During the earliest phase of the project, the core team collaborated with nurses to identify a number of problems in the way shift changes occurred. Chief among these was the fact that nurses routinely spent the first 45 minutes of each shift at the nurses' station debriefing the departing shift about the status of patients. Their methods of information exchange were different in every hospital, ranging from recorded dictation to face-to-face conversations. And they compiled the information they needed to serve patients in a variety of ways—scrawling quick notes on the back of any available scrap of paper, for example, or even on their scrubs. Despite a significant investment of time, the nurses often failed to learn some of the things that mattered most to patients, such as how they had fared during the previous shift, which family members were with them, and whether or not certain tests or therapies had been administered. For many patients, the team learned, each shift change felt like a hole in their care. Using the insights gleaned from observing these important times of transition, the innovation teams explored potential solutions through brainstorming and rapid prototyping. (Prototypes of a service innovation will of course not be physical, but they must be tangible. Because pictures help us understand what is learned through prototyping, we often videotape the performance of prototyped services, as we did at Kaiser.)

Prototyping doesn't have to be complex and expensive. In another health care project, IDEO helped a group of surgeons develop a new device for sinus surgery. As the surgeons described the ideal physical characteristics of the instrument, one of the designers grabbed a whiteboard marker, a film canister, and a clothespin and taped them together. "Do you mean like this?" he asked. With his rudimentary prototype in hand, the surgeons were able to be much more precise about what the ultimate design should accomplish.

Prototypes should command only as much time, effort, and investment as are needed to generate useful feedback and evolve an idea. The more "finished" a prototype seems, the less likely its creators will be to pay attention to and profit from feedback. The goal of prototyping isn't to finish. It is to learn about the strengths and weaknesses of the idea and to identify new directions that further prototypes might take.

Historically, design has been a downstream step, putting a beautiful wrapper on an innovative idea.

Idea in Brief

THE QUEST

In the past, design has most often occurred downstream in the development process, with a focus on making new products aesthetically attractive or enhancing brand perception. Now companies are asking designers to *create* ideas rather than to simply dress them up.

THE CONCEPT

Design thinking is a method of meeting people's needs and desires in a technologically feasible and strategically viable way. Infusing the range of innovation activities with a human-centered design ethos, projects pass through three spaces: *inspiration*, for the circumstances that motivate the search for solutions; *ideation*, for the process of generating, developing, and testing ideas that may lead to solutions; and *implementation*, for the charting of a path to market.

THE OPPORTUNITY

Using design thinking, companies can conquer problems that can be solved only through innovation—in processes and services, as well as products—with a human-centered, creative, iterative, and practical approach, satisfying customers *and* the bottom line.

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The design that emerged for shift changes had nurses passing on information in front of the patient rather than at the nurses' station. In only a week the team built a working prototype that included new procedures and some simple software with which nurses could call up previous shift-change notes and add new ones. They could input patient information throughout a shift rather than scrambling at the end to pass it on. The software collated the data in a simple format customized for each nurse at the start of a shift. The result was both higher-quality knowledge transfer and reduced prep time, permitting much earlier and better-informed contact with patients.

As Kaiser measured the impact of this change over time, it learned that the mean interval between a nurse's arrival and first interaction with a patient had been more than halved, adding a huge amount of nursing time across the four hospitals. Perhaps just as important was the effect on the quality of the nurses' work experience. One nurse commented, "I'm an hour ahead, and I've only been here 45 minutes." Another said, "[This is the] first time I've ever made it out of here at the end of my shift."

Thus did a group of nurses significantly improve their patients' experience while also improving their own job satisfaction and productivity. By applying a human-centered design methodology, they were able to create a relatively small process innovation that produced an outsize impact. The new shift changes are being rolled out across the Kaiser system, and the capacity to reliably record critical patient information is being integrated into an electronic medical records initiative at the company.

What might happen at Kaiser if every nurse, doctor, and administrator in every hospital felt empowered to tackle problems the way this group did? To find out, Kaiser has created the Garfield Innovation Center, which is run by Kaiser's original core team and acts as a consultancy to the entire organization. The center's mission is to pursue innovation that enhances the patient experience and, more broadly, to envision Kaiser's "hospital of the future." It is introducing tools for design thinking across the Kaiser system.

How Design Thinking Happens

The myth of creative genius is resilient: We believe that great ideas pop fully formed out of brilliant minds, in feats of imagination well beyond the abilities of mere mortals. But what the Kaiser nursing team accomplished was neither a sudden breakthrough nor the lightning strike of genius; it was the result of hard work augmented by a creative human-centered discovery process and followed by iterative cycles of prototyping, testing, and refinement.

The design process is best described metaphorically as a system of spaces rather than a predefined series of orderly steps. The spaces demarcate different sorts of related activities that together form the continuum of innovation. Design thinking can feel chaotic to those experiencing it for the first time. But over the life of a project participants come to see—as they did at Kaiser—that the process makes sense and achieves results, even though its architecture differs from the linear, milestone-based processes typical of other kinds of business activities.

Design projects must ultimately pass through three spaces (see the exhibit at right). We label these "inspiration," for the circumstances (be they a problem, an opportunity, or both) that motivate the search for solutions; "ideation," for the process of generating, developing, and testing ideas that may lead to solutions; and "implementation," for the charting of a path to market. Projects will loop

By applying a human-centered design methodology, the nurses created a relatively small process innovation that produced an outsize impact.

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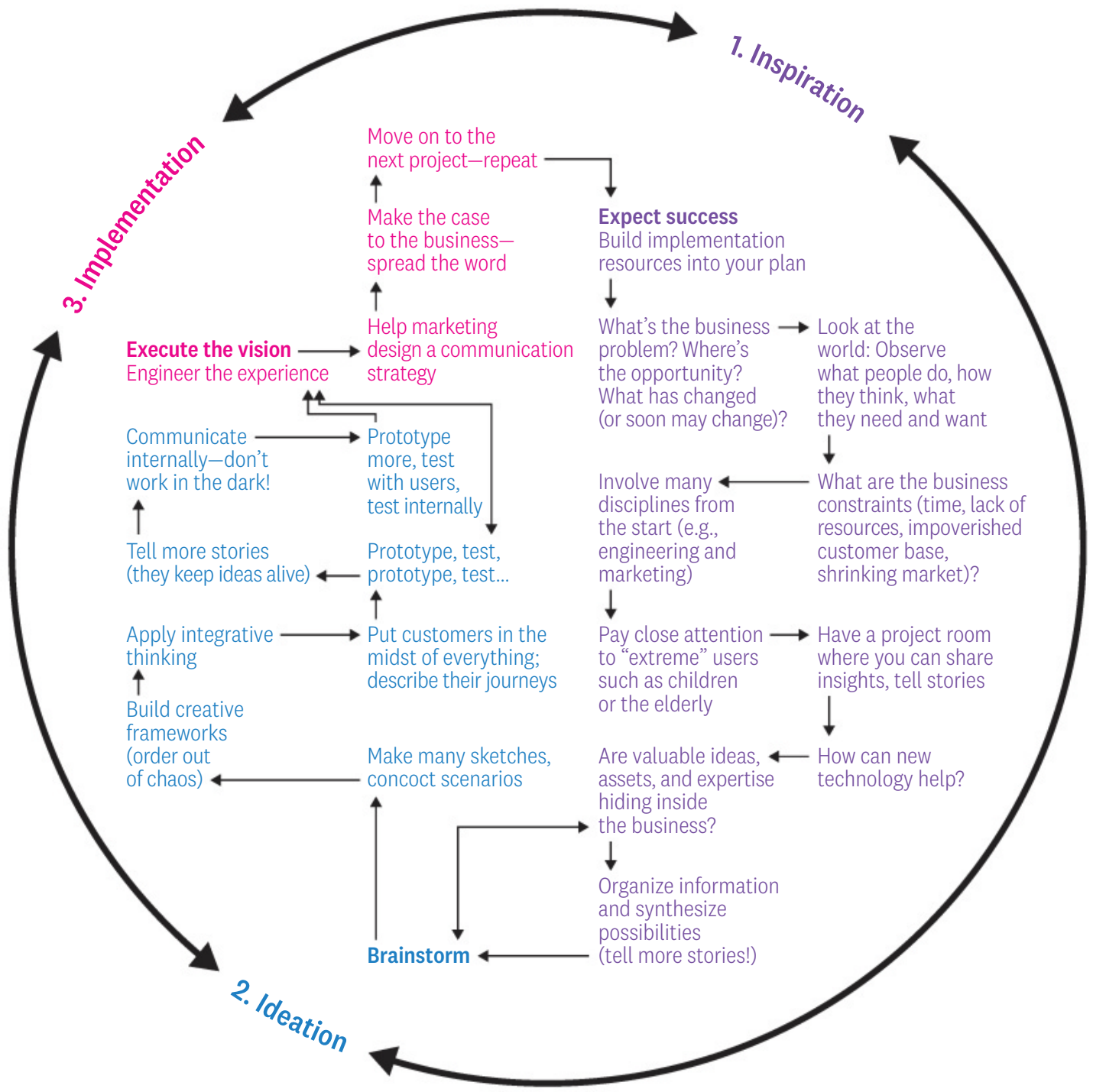

back through these spaces—particularly the first two—more than once as ideas are refined and new directions taken.

Sometimes the trigger for a project is leadership's recognition of a serious change in business fortunes. In 2004 Shimano, a Japanese manufacturer of bicycle components, faced flattening growth in its traditional high-end road-racing and mountain-bike segments in the United States. The company had always relied on technology innovations to drive its growth and naturally tried to predict where the next one might come from. This time Shimano thought a high-end casual bike that appealed to boomers would be an interesting area to explore. IDEO was invited to collaborate on the project.

During the inspiration phase, an interdisciplinary team of IDEO and Shimano people—designers, behavioral scientists, marketers, and engineers—worked to identify appropriate constraints for

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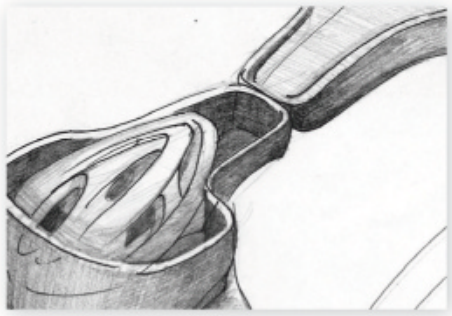

A SKETCH (top, seat plus helmet storage) and a **PROTOTYPE** (middle) show elements of Coasting bicycles. Shimano's Coasting **WEBSITE** (bottom) points users to safe bike paths.

HOW TO MAKE DESIGN THINKING **PART OF THE INNOVATION DRILL**

Begin at the beginning. Involve design thinkers at the very start of the innovation process, before any direction has been set. Design thinking will help you explore more ideas more quickly than you could otherwise.

Take a human-centered approach. Along with business and technology considerations, innovation should factor in human behavior, needs, and preferences. Human-centered design thinking—especially when it includes research based on direct observation—will capture unexpected insights and produce innovation that more precisely reflects what consumers want.

Try early and often. Create an expectation of rapid experimentation and prototyping. Encourage teams to create a prototype in the first week of a project. Measure progress with a metric such as average time to first prototype or number of consumers exposed to prototypes during the life of a program.

Seek outside help. Expand the innovation ecosystem by looking for opportunities to co-create with customers and consumers. Exploit Web 2.0 networks to enlarge the effective scale of your innovation team.

Blend big and small projects. Manage a portfolio of innovation that stretches from shorter-term incremental ideas to longer-term revolutionary ones. Expect business units to drive and fund incremental innovation, but be willing to initiate revolutionary innovation from the top.

Budget to the pace of innovation. Design thinking happens quickly, yet the route to market can be unpredictable. Don't constrain the pace at which you can innovate by relying on cumbersome budgeting cycles. Be prepared to rethink your funding approach as projects proceed and teams learn more about opportunities.

Find talent any way you can. Look to hire from interdisciplinary programs like the new Institute of Design at Stanford and progressive business schools like Rotman, in Toronto. People with more-conventional design backgrounds can push solutions far beyond your expectations. You may even be able to train nondesigners with the right attributes to excel in design-thinking roles.

Design for the cycle. In many businesses people move every 12 to 18 months. But design projects may take longer than that to get from day one through implementation. Plan assignments so that design thinkers go from inspiration to ideation to implementation. Experiencing the full cycle builds better judgment and creates great long-term benefits for the organization.

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the project. The team began with a hunch that it should focus more broadly than on the high-end market, which might prove to be neither the only nor even the best source of new growth. So it set out to learn why 90% of American adults don't ride bikes. Looking for new ways to think about the problem, the team members spent time with all kinds of consumers. They discovered that nearly everyone they met rode a bike as a child and had happy memories of doing so. They also discovered that many Americans are intimidated by cycling today—by the retail experience (including the young, Lycra-clad athletes who serve as sales staff in most independent bike stores); by the complexity and cost of the bikes, accessories, and specialized clothing; by the danger of cycling on roads not designed for bicycles; and by the demands of maintaining a technically sophisticated bike that is ridden infrequently.

This human-centered exploration—which took its insights from people outside Shimano's core customer base—led to the realization that a whole new category of bicycling might be able to reconnect American consumers to their experiences as children while also dealing with the root causes of their feelings of intimidation—thus revealing a large untapped market.

The design team, responsible for every aspect of what was envisioned as a holistic experience, came up with the concept of "Coasting." Coasting would aim to entice lapsed bikers into an activity that was simple, straightforward, and fun. Coasting bikes, built more for pleasure than for sport, would have no controls on the handlebars, no cables snaking along the frame. As on the earliest bikes many of us rode, the brakes would be applied by backpedaling. With the help of an onboard computer, a minimalist three gears would shift automatically as the bicycle gained speed or slowed. The bikes would feature comfortably padded seats, be easy to operate, and require relatively little maintenance.

The team set out to learn why 90% of American adults don't ride bikes.

Three major manufacturers—Trek, Raleigh, and Giant—developed new bikes incorporating innovative components from Shimano. But the design team didn't stop with the bike itself. In-store retailing strategies were created for independent bike dealers, in part to alleviate the discomfort that biking novices felt in stores designed to serve enthusiasts. The team developed a brand that identified Coasting as a way to enjoy life. ("Chill. Explore. Dawdle. Lollygag. First one there's a rotten egg.") And it designed a public relations campaign—in collaboration with local governments and cycling organizations—that identified safe places to ride.

Although many others became involved in the project when it reached the implementation phase, the application of design thinking in the earliest stages of innovation is what led to this complete solution. Indeed, the single thing one would have expected the design team to be responsible for—the look of the bikes—was intentionally deferred to later in the development process, when the team created a reference design to inspire the bike companies' own design teams. After a successful launch in 2007, seven more bicycle manufacturers signed up to produce Coasting bikes in 2008.

Taking a Systems View

Many of the world's most successful brands create breakthrough ideas that are inspired by a deep understanding of consumers' lives and use the principles of design to innovate and build value. Sometimes innovation has to account for vast differences in cultural and socioeconomic conditions. In such cases design thinking can suggest creative alternatives to the assumptions made in developed societies.

India's Aravind Eye Care System is probably the world's largest provider of eye care. From April 2006 to March 2007 Aravind served more than 2.3 million patients and performed more than 270,000 surgeries. Founded in 1976 by Dr. G. Venkataswamy, Aravind has as its mission nothing less than the eradication of needless blindness among India's population, including the rural poor, through the effective delivery of superior ophthalmic care. (One of the company's slogans is "Quality is for everyone.") From 11 beds in Dr. Venkataswamy's home, Aravind has grown to

ARAVIND'S outreach to rural patients frequently brings basic **DIAGNOSTIC TOOLS** (top and center) and an advanced satellite-linked **TELEMEDICINE TRUCK** (bottom) to remote areas of India.

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encompass five hospitals (three others are under Aravind management), a plant that manufactures ophthalmic products, a research foundation, and a training center.

Aravind's execution of its mission and model is in some respects reminiscent of Edison's holistic concept of electric power delivery. The challenge the company faces is logistic: how best to deliver eye care to populations far removed from the urban centers where Aravind's hospitals are located. Aravind calls itself an "eye care system" for a reason: Its business goes beyond ophthalmic care per se to transmit expert practice to populations that have historically lacked access. The company saw its network of hospitals as a beginning rather than an end.

Much of its innovative energy has focused on bringing both preventive care and diagnostic screening to the countryside. Since 1990 Aravind has held "eye camps" in India's rural areas, in an effort to register patients, administer eye exams, teach eye care, and identify people who may require surgery or advanced diagnostic services or who have conditions that warrant monitoring.

In 2006 and early 2007 Aravind eye camps screened more than 500,000 patients, of whom nearly 113,000 required surgery. Access to transportation is a common problem in rural areas, so the company provides buses that take patients needing further treatment to one of its urban facilities and then home again. Over the years it has bolstered its diagnostic capabilities in the field with telemedicine trucks, which enable doctors back at Aravind's hospitals to participate in care decisions. In recent years Aravind's analysis of its screening data has led to specialized eye camps for certain demographic groups, such as school-age children and industrial and government workers; the company also holds camps specifically to screen for eye diseases associated with diabetes. All these services are free for the roughly 60% of patients who cannot afford to pay.

In developing its system of care, Aravind has consistently exhibited many characteristics of design thinking. It has used as a creative springboard two constraints: the poverty and remoteness of its clientele and its own lack of access to expensive solutions. For example, a pair of intraocular lenses made in the West costs $200, which severely limited the number of patients Aravind could help. Rather than try to persuade suppliers to change the way they did things, Aravind built its own solution: a manufacturing plant in the basement of one of its hospitals. It eventually discovered that it could use relatively inexpensive technology to produce lenses for $4 a pair.

Great design satisfies both our needs and desires.

Throughout its history—defined by the constraints of poverty, ignorance, and an enormous unmet need—Aravind has built a systemic solution to a complex social and medical problem.

Getting Back to the Surface

I argued earlier that design thinking can lead to innovation that goes beyond aesthetics, but that doesn't mean that form and aesthetics are unimportant. Magazines like to publish photographs of the newest, coolest products for a reason: They are sexy and appeal to our emotions. Great design satisfies both our needs and our desires. Often the emotional connection to a product or an image is what engages us in the first place. Time and again we see successful products that were not necessarily the first to market but were the first to appeal to us emotionally *and* functionally. In other words, they do the job and we love them. The iPod was not the first MP3 player, but it was the first to be delightful. Target's products appeal emotionally through design and functionally through price—simultaneously.

This idea will grow ever more important in the future. As Daniel Pink writes in his book *A Whole New Mind,* "Abundance has satisfied, and even over-satisfied, the material needs of millions—boosting the significance of beauty and emotion and accelerating individuals' search for meaning." As more of our basic needs are met, we increasingly expect sophisticated experiences that are emotionally satisfying and meaningful. These experiences will not be simple products. They will be complex combinations of products, services, spaces, and information. They will be the ways

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we get educated, the ways we are entertained, the ways we stay healthy, the ways we share and communicate. Design thinking is a tool for imagining these experiences as well as giving them a desirable form.

One example of experiential innovation comes from a financial services company. In late 2005 Bank of America launched a new savings account service called "Keep the Change." IDEO, working with a team from the bank, helped identify a consumer behavior that many people will recognize: After paying cash for something, we put the coins we received in change into a jar at home. Once the jar is full, we take the coins to the bank and deposit them in a savings account. For many people, it's an easy way of saving. Bank of America's innovation was to build this behavior into a debit card account. Customers who use their debit cards to make purchases can now choose to have the total rounded up to the nearest dollar and the difference deposited in their savings accounts.

The success of this innovation lay in its appeal to an instinctive desire we have to put money aside in a painless and invisible way. Keep the Change creates an experience that feels natural because it models behavior that many of us already exhibit. To be sure, Bank of America sweetens the deal by matching 100% of the change saved in the first three months and 5% of annual totals (up to $250) thereafter. This encourages customers to try it out. But the real payoff is emotional: the gratification that comes with monthly statements showing customers they've saved money without even trying.

In less than a year the program attracted 2.5 million customers. It is credited with 700,000 new checking accounts and a million new savings accounts. Enrollment now totals more than 5 million people who together have saved more than $500 million. Keep the Change demonstrates that design thinking can identify an aspect of human behavior and then convert it into both a customer benefit and a business value.

Thomas Edison represents what many of us think of as a golden age of American innovation—a time when new ideas transformed every aspect of our lives. The need for transformation is, if anything, greater now than ever before. No matter where we look, we see problems that can be solved only through innovation: unaffordable or unavailable health care, billions of people trying to live on just a few dollars a day, energy usage that outpaces the planet's ability to support it, education systems that fail many students, companies whose traditional markets are disrupted by new technologies or demographic shifts. These problems all have people at their heart. They require a human-centered, creative, iterative, and practical approach to finding the best ideas and ultimate solutions. Design thinking is just such an approach to innovation.

HBR Reprint R0806E

Tim Brown is the CEO and president of IDEO, an innovation and design firm with headquarters in San Francisco. His designs have won numerous awards and been exhibited at the Museum of Modern Art in New York, the Axis Gallery in Tokyo, and the Design Museum in London.

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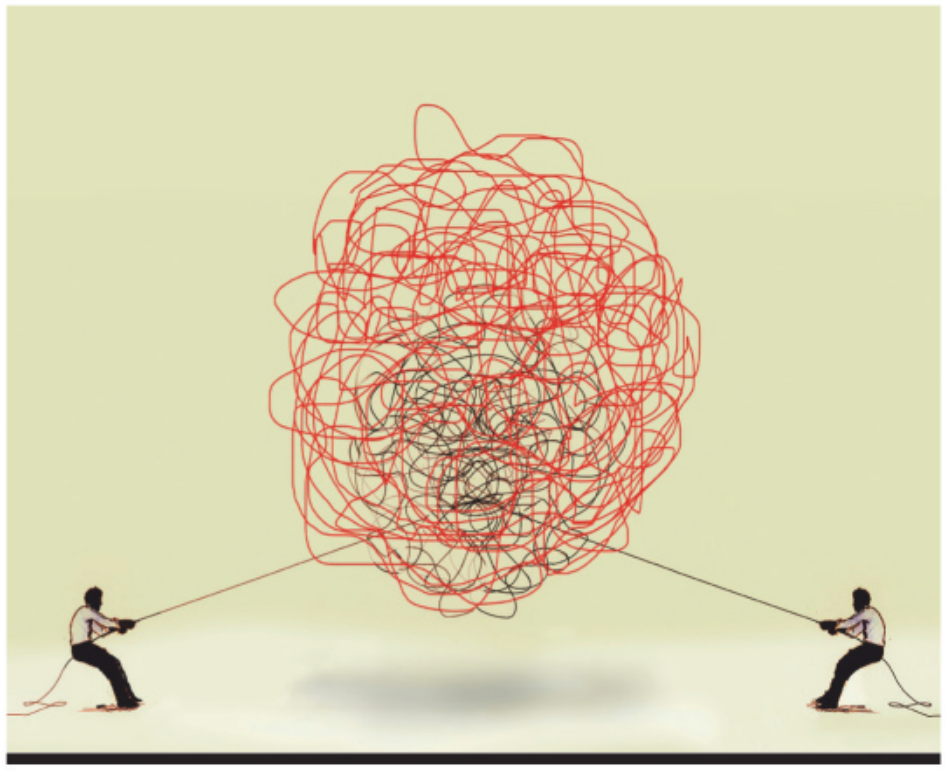
Quick Takes



Understand the Perils of Co-Creation

by Peter C. Verhoef, Sander F.M. Beckers, and Jenny van Doorn

THE RISE OF social media has generated tremendous opportunities for companies to engage with customers. Many allow customers to participate in value-creating activities, such as brainstorming advertising taglines or product ideas—a process often referred to as co-creation. These activities not only help companies innovate at low cost but also engage customers—every marketer's dream.

In practice, however, these programs are hard to run. Some customers "hijack" them—instead of offering real ideas, they seize the chance to ridicule the company. Such hijacking is one of the biggest challenges companies face. Prior research suggests that about half of co-creation campaigns fail.

Consider Henkel, a large German manufacturer of detergent and other products. It ran a contest in which customers could submit innovative packaging suggestions—and was deluged with negative ideas. (One was a label describing the detergent as "Yummi Chicken Flavor.") General Motors invited customers to tweak its advertisements, resulting in a rash of ads criticizing its SUVs as gas-guzzlers that contribute to global warming. McDonald's set up a Twitter campaign to promote positive word of mouth, but the effort became a platform for consumers looking to bash the chain (see examples at right).

Managers considering co-creation initiatives should think carefully about the risks. Our research identifies three areas of particular concern:

Strong brand reputation. Firms with strong brands need to protect them—they have a lot to lose. They must be aware that these initiatives give customers opportunities to tarnish the brand. Strong brand reputations are generally built through consistent, effective marketing, and companies should weigh the potential for misbehaving customers to undo their careful efforts.

High demand uncertainty. Companies are more likely to ask for customer input when market conditions are shifting. But this frequently backfires when demand is highly uncertain, because customers in fast-changing markets often don't know what they want or what they'll like. Porsche got lots of negative feedback when it announced plans to release an SUV, but it proceeded anyway, and the Porsche Cayenne was a great success.

Too many initiatives. Companies ordinarily benefit from working repeatedly with the same suppliers, but that doesn't hold when the "suppliers" are customers. Experience shows that the quality, quantity, and variety of input decrease as the frequency of engagement increases. A study of the Dell IdeaStorm program (in which customers were invited to submit product or service ideas) found that people submitted ideas repeatedly—including many for things the company was already offering. And customers whose ideas were implemented tended to return with additional ones that were quite similar to their first suggestions.

This isn't to say that firms should never try to crowdsource value creation in an attempt to engage customers. It can be a viable strategy—but managers must understand the high probability of misbehavior. They need to monitor engagement activities continuously and intervene if customers begin offering too much comedy and too few genuine ideas.

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Peter C. Verhoef is a professor, **Jenny van Doorn** is an associate professor, and **Sander F.M. Beckers** contributed to this article while pursuing his PhD at the University of Groningen in the Netherlands. He is now a business intelligence specialist at Noordhoff Publishers.

WHEN TWEETS ATTACK

McDonald's introduced the hashtag #McDStories, hoping to attract heart-warming, upbeat posts. Oops...

#McDStories Hospitalized for food poisoning after eating McDonald's in 1989. Never ate there again and became a Vegetarian. Should have sued.

#McDStories Watching my little brother vomit his chicken nuggets into my aunts hand...

#McDStories I lost 50lbs in 6 months after I quit working and eating at Mcdonalds

#McDStories The McRib contains the same chemicals used to make yoga mats, mmmmm

GARY WATERS/GETTY IMAGES

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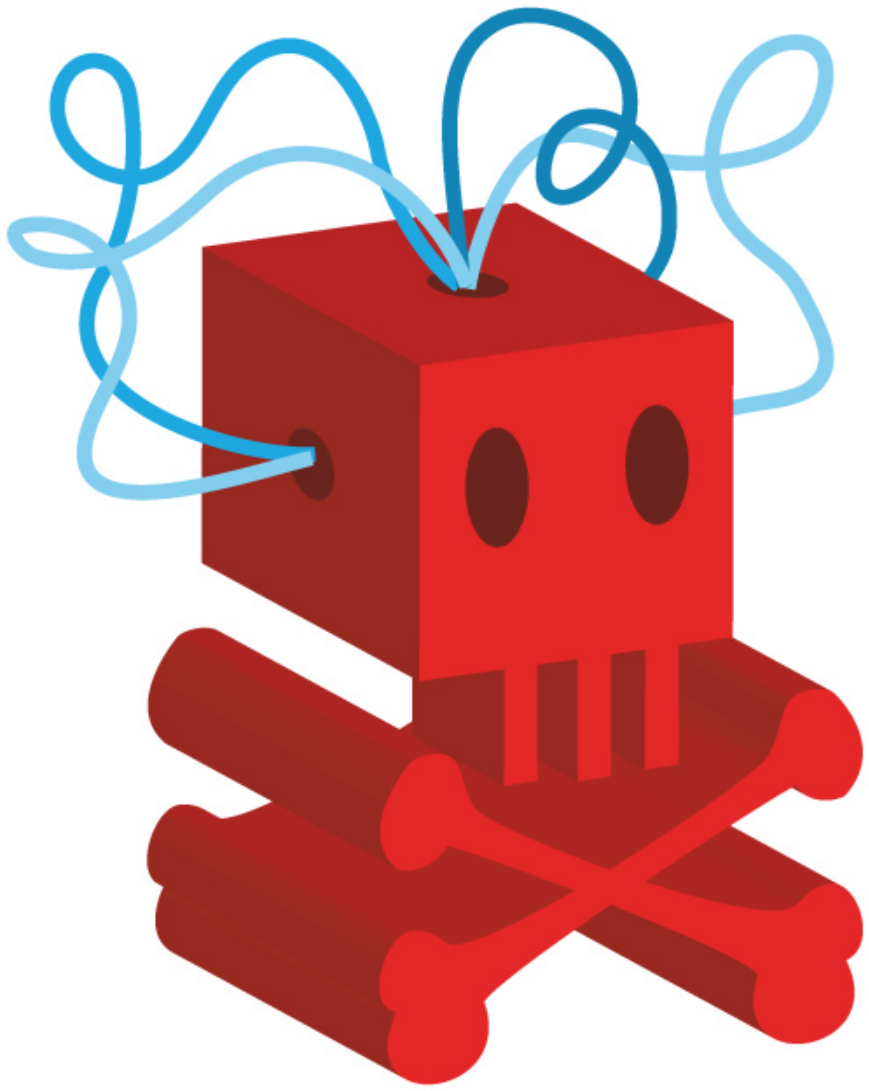

Early Prototypes Can Hurt a Team's Creativity

by Paul M. Leonardi

IN PRODUCT DEVELOPMENT, a popular tool is the quick-and-dirty prototype. Because simple prototypes make the abstract concrete, they can guide innovators' conversations and focus their attention, helping them to move forward.

But many companies rapidly follow them with polished prototypes—and the trouble begins. Research I've conducted in the auto industry shows that when people see a detailed prototype, something odd happens: They concentrate on the prototype's form and function, forgetting to attend to any remaining ambiguities about the problem the product is meant to solve or the obstacles in the way. Instead of clarifying the path ahead, the prototype puts a halt to useful brainstorming.

This occurs because when a complex technological product is under development, the groups involved often try to proceed in unison without realizing that they don't agree about what prompted the project in the first place or what is blocking its completion. This "innovation blindness" causes conflict and delays and may sink a project altogether.

How can organizations avoid this pitfall? In the early phases of development, they should retain the ambiguity inherent in any technological challenge, moving on only after everyone is clear on what problems the product should tackle and how.

At one U.S. automaker I studied, a product that had been shelved because of innovation blindness was resurrected by a return to ambiguity. All the people I met with, from managers to engineers, agreed that crash-simulation analysis—slamming computer representations of vehicles into virtual walls—should play a greater role in product development, in order to improve safety and reduce costs. Many departments, working together, had come up with an idea for a computer-based tool that would increase the accuracy of analyses and help decision makers evaluate designs. But despite apparent agreement on the broad goal, basic disagreements remained. For example, one set of developers thought that what was needed to reach the goal was faster engineering. Another thought it was more-accurate data.

When a detailed prototype was built, the discussion rapidly devolved into arguments. "Everyone kept saying, 'Why doesn't it have this feature or that feature?'" one participant told me. The haggling went on for years. "It was a brutal time," another said.

It took the arrival of a new manager—someone with a fresh perspective—to resurrect the tool. Because the manager saw a problem completely different from what the others had seen, he unwittingly reinjected ambiguity into the thinking. Wrestling with this ambiguity forced people to stop simply defending the prototype's features. The prototype was abandoned, the groups clearly defined what they needed to solve, and the tool was built. It's now helping engineers design safer cars and trucks.

"Innovation blindness" causes conflict and delays and may sink a project altogether.

Although prototypes often make it easier for developers to translate their knowledge for one another, they can stymie progress if they become too detailed too early. Organizations need to retain some ambiguity until groups have agreed not only on goals but also on the fundamental difficulties at hand. Early on, a manager's mantra should be: "I don't want to hear solutions. I want to hear about the problems that our product needs to solve."

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Creativity and the Role of the Leader

Your organization could use a bigger dose of creativity. Here's what to do about it.

by Teresa M. Amabile and Mukti Khaire

Originally published in October 2008

CREATIVITY HAS ALWAYS been at the heart of business, but until now it hasn't been at the top of the management agenda. By definition the ability to create something novel and appropriate, creativity is essential to the entrepreneurship that gets new businesses started and that sustains the best companies after they have reached global scale. But perhaps because creativity was considered unmanageable—too elusive and intangible to pin down—or because concentrating on it produced a less immediate payoff than improving execution, it hasn't been the focus of most managers' attention.

Creativity has, however, long been a focus of academics in fields ranging from anthropology to neuroscience, and has enticed management scholars as well. Therefore, a substantial body of work on creativity has been available to any businessperson inclined to step back from the fray of daily management and engage in its questions. And that's suddenly very fortunate, because what used to be an intellectual interest for some thoughtful executives has now become an urgent concern for many. The shift to a more innovation-driven economy has been abrupt. Today, execution capabilities are widely shared and the life cycles of new offerings are short. As competition turns into a game of who can generate the best and greatest number of ideas, creativity scholars are being asked pointed questions about their research. What does it mean? How relevant is it? Does it offer guidance on the decisions that leaders in creativity-dependent businesses have to make?

To help make the connections between theory and practice, we recently convened a two-day colloquium at Harvard Business School, inviting business leaders from companies whose success depends on creativity—such as design consultancy IDEO, technology innovator E Ink, internet giant Google, and pharmaceutical leader Novartis. At the gathering, leading scholars presented their newest and most important research. In all, we brought together nearly 100 people who were deeply concerned with the workings of creativity in organizations and let the sparks fly.

Over those two days, we saw a new agenda for business leadership begin to take shape. At first, we heard skepticism that creativity should be managed at all. Intuit cofounder Scott Cook, for example, wondered whether management was "a net positive or a net negative" for creativity. "If there is a bottleneck in organizational creativity,"

ILLUSTRATION BY TOM PEAKE

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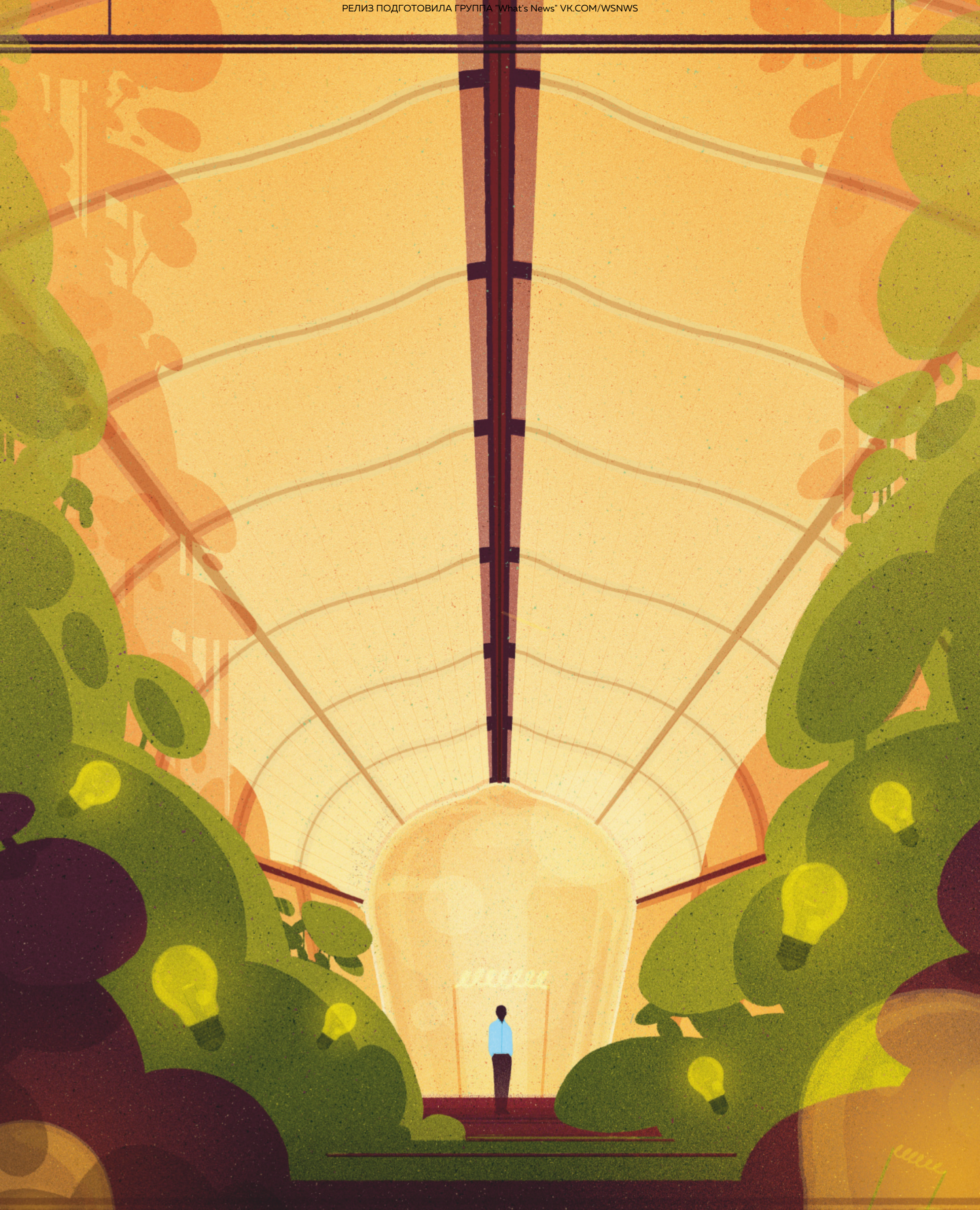

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he asked, "might it be at the top of the bottle?" By the colloquium's end, however, most attendees agreed that there *is* a role for management in the creative process; it is just different from what the traditional work of management might suggest. The leadership imperatives we discussed, which we share in this article, reflect a viewpoint we came to hold in common: One doesn't manage creativity. One manages *for* creativity.

Drawing on the Right Minds

The first priority of leadership is to engage the right people, at the right times, to the right degree in creative work. That engagement starts when the leader recasts the role of employees. Rather than simply roll up their sleeves and execute top-down strategy, employees must contribute imagination. As Cook put it, "Traditional management prioritizes projects and assigns people to them. But increasingly, managers are not the source of the idea."

Tap ideas from all ranks. Cook told the story of an eye-opening analysis of innovations at Google: Its founders tracked the progress of ideas that they had backed versus ideas that had been executed in the ranks without support from above, and discovered a higher success rate in the latter category. Similarly, it was noted that Philip Rosedale, the founder and chairman of Linden Lab, the fast-growing company that manages Second Life, claims to give most workers enormous autonomy, and says the greatest successes come from workers' own initiatives.

Research by Israel Drori, a professor at the College of Management in Israel, and Benson Honig, a professor at Wilfrid Laurier University in Canada, highlights the hazards of not distributing creative responsibilities across the organization. They observed an internet start-up offering a new, sophisticated form of computer graphics from its inception in 1996 until its collapse, seven years later. While the venture enjoyed initial success, it was ultimately unsustainable because it depended too much on the genius of its award-winning artist-founder—and took organizational creativity for granted.

How can organizations foster a culture of creativity?

Encourage and enable collaboration. As leaders look beyond the top ranks for creative direction, they must combat what Diego Rodriguez, a partner at IDEO and the leader of its Palo Alto, California, office, calls the "lone inventor myth." Though past breakthroughs sometimes have come from a single genius, the reality today is that most innovations draw on many contributions. "Consider the examples of InnoCentive, of Mozilla, of Wikipedia," Rodriguez said. "All are contexts that bring in lots of contributors. And the fundamental structure of such networked organizations is not centralized and top-down. People don't do what they do because someone told them to do it. Contributing to an interdependent network is its own reward." Rodriguez argued forcefully that, even in today's highly networked world, organizations fail to take full advantage of internet technologies to tap into the creativity of many smart people working on the same problem. (For Scott Cook's thinking about tapping the input of people outside the organization, see "The Contribution Revolution," HBR October 2008.)

A study by Victor Seidel of the University of Oxford's Saïd Business School identified one practice that leaders would do well to promote: the use of "coordination totems" in the conceptualization of new products. Seidel looked at the problem of how to achieve collaboration on radical innovations; when no obvious antecedent exists, it's difficult for a vision to be shared. His analysis of six award-winning products (from three quite different industries) showed how product development teams used not only prototypes but also metaphors, analogies, and stories to coordinate their thinking.

Robert Sutton, a professor at Stanford University's School of Engineering, noted that most companies have hierarchical structures, and differences in status among people impede the exchange of ideas. How to remedy that? Sutton couldn't resist pointing out the huge inequalities in salaries at today's firms and suggested that if the field were more level, more people might speak up and be listened to. He urged leaders to define "superstars" in their organizations as those who help others succeed. Wryly, he recalled seeing powerful

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people hold forth in meetings even though others in the room had much better ideas for solving problems. It should be management's mission, he suggested, to "figure out how to get people to shut up at the right time."

Open the organization to diverse perspectives. Frans Johansson, author of *The Medici Effect,* described his finding—based on interviews with people doing highly creative work in many fields—that innovation is more likely when people of different disciplines, backgrounds, and areas of expertise share their thinking. Sometimes the complexity of a problem demands diversity; for example, it took a team of mathematicians, medical doctors, neuroscientists, and computer scientists at Brown University's brain science program to create a system in which a monkey could move a computer cursor with only its thoughts. Other times, the application of one field's methods or habits of mind to another field's problem produces the breakthrough.

Even within the mind of an individual, diversity enhances creativity, according to a study by Jeffrey Sanchez-Burks, a professor at the University of Michigan, his Michigan colleague Fiona Lee, and Chi-Ying Cheng of Columbia University. Their research focuses on people who have multiple social identities, such as people who are both Asian and American, or who are both women and engineers. Social identities often have distinct knowledge associated with them, and to the extent an individual is comfortable integrating multiple identities, his or her knowledge sets can combine productively. Indeed, through two experiments, these researchers found that people with higher levels of "identity integration" display higher levels of creativity when problems require that they draw on their different realms of knowledge. (One experiment asked Asian Americans to invent new forms of Asian American fusion cuisine, and the other asked female engineers to imagine new features for a cell phone for women.) This research sparked a great deal of personal interest and has implications for management. If managers cause people to suppress parts of their identity, they limit a potentially valuable source of creativity. If managers can encourage identity integration—think of female engineers working in an environment where they don't feel they have to dress like men—people may be more innovative.

Managers can also enhance diversity by looking outside the organization for sources of creativity. Collaboration need not be bounded by the walls of the firm, as Rodriguez noted, pointing again to networked organizations such as Wikipedia. Many, in fact, see the recent phenomenon of open-source development as the future of innovation.

For those who may worry that open-source innovation is still unproven and relevant only in software, Peter Meyer, an economist with the U.S. Bureau of Labor Statistics, put the matter in perspective. He analyzed the invention of the airplane, which, by today's definition, could easily be termed an open-source innovation. In the years before the commercial potential of aviation was recognized, the Wright brothers were just two of many enthusiasts who shared their discoveries and ideas freely and frequently in the manner of avid hobbyists. These "tinkerers," as Meyer characterized them, were motivated not by the desire to get rich but by the technical challenges and romance of the quest for human flight.

The openness of the network, Meyer showed, greatly assisted the development of the airplane; the Wright brothers participated actively in it from 1900 through 1902. However, as the Wrights realized how important their breakthroughs were likely to be in creating viable commercial and military aircraft, they focused on securing patents and finding ways to make money from their inventions. Collaborators became potential competitors, and secrecy the new norm among them. The dual implications of this research are intriguing. Open-source innovation, with its ability to tap the passion and ingenuity of tinkerers, offers enormous potential for creative output, and new industries with proprietary or secret technology can arise from it. But open-source processes may work only in certain kinds of endeavors or for limited windows of time.

Bringing Process to Bear—Carefully

Can creativity scale? That question was posed by Kim Scott, who had good reason to ask: She works at Google, where she is director of online sales and operations for AdSense, DoubleClick, and YouTube. She believes that creativity within an organization depends on vibrant, ongoing collaboration and free idea flow—which tend to dry up as a business adds people and projects. A former entrepreneur (Scott was involved in three start-ups before joining Google), she hates the fact that more layers of management often lead to more bureau-

Idea in Brief

In today's innovation-driven economy, managers must understand how to generate great ideas. In a two-day colloquium of leading creativity scholars and executives, the authors learned that you can't manage creativity—you can only manage *for* creativity.

Their research shows that leaders can foster a culture of creativity:

- **Engage the right people, at the right times, to the right degree of creative work:** Tap all ranks, and encourage and enable collaboration. Be open to diverse perspectives.
- **Be careful when bringing process to bear to avoid straitjacketing creativity:** Map the phases of creative work, and carefully manage the commercialization handoff. Provide paths through bureaucracy, and create a mechanism for filtering out losing projects.
- **Find the right motivation for employees:** Provide intellectual challenge, allow people to pursue their passions, and be an appreciative audience. Failure is inevitable and can stimulate growth, so capitalize on it by creating an environment of psychological safety.

Leaders who embrace the role of "facilitator" by following these theories will have a better understanding of creativity in business—and can ultimately increase innovation.

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cracy—and the end of entrepreneurial spirit, risk taking, and learning from mistakes. At the same time, she recognizes that it is not reasonable to have organizations so flat that managers are saddled with dozens of direct reports. "How do you get *lift* out of adding layers," she asked, "instead of *weight*?" One solution she offered is greater investment in infrastructure, whether high-tech or low-tech, that makes collaboration easier.

The classic response to increased scale in an operation is increased reliance on process—a standardization and continuous improvement of "the way we do it." Many at the colloquium, however, rejected the notion that creativity could be so straitjacketed. "If there is one device that has destroyed more innovation than any other, it is Six Sigma," stated Mark Fishman, MD, president of the Novartis Institutes for BioMedical Research. Bob Sutton echoed the sentiment, citing research showing that when organizations focus on process improvements too much, it hampers innovation over the long term. "The poster child here is Kodak, which kept making the process of manufacturing and distributing chemical-based film more efficient instead of devoting attention to making the shift to digital photography," he said. "In other words, it kept getting better and better at doing the wrong thing." For Kim Scott, the problem comes when an emphasis on efficiency causes managers to try to avoid duplication of effort. "In creative work," she noted, "you need to have people approaching a problem from different angles."

Map the phases of creative work. Process management, Mark Fishman explained, is appropriate in some phases of creative work but not others. The leader's job is to map out the stages of innovation and recognize the different processes, skill sets, and technology support that each requires. For instance, efficiency-minded management "has no place in the discovery phase," he said. While recognizing that pharmaceutical firms desire predictable output from their R&D operations, he reminded the group of a remark by Nobel laureate Peter Medawar: "To predict an idea is to have an idea." Because it's impossible to know in advance what the next big breakthrough will be, "you must accept that the discovery phase in pharmaceutical innovation is inherently muddle-headed." Worst of all, models like Six Sigma are geared toward reducing variability and achieving greater conformance to a desirable norm. But in the fuzzy initial stages of innovation, Fishman said, "you want people to work at the ends of the Gaussian distribution. Efficient models make good sense for the middle and end stages of the innovation process, when the game has moved from discovery to control and reliability." He offered three pieces of advice for leaders in creative settings: Know where you are in the game. Appreciate the different creative types among your people—and realize that some are better at certain phases than others. And be very tolerant of the subversive. Creative work must, like Mark Twain's character Huck Finn, avoid all "sivilizing" influences.

Manage the commercialization handoff. Few people have equal capabilities in idea generation and idea commercialization; that's why large corporations normally separate the two functions. The consensus is that, eventually, an innovation reaches a point where it will be best served by people who know how to take it to market. Unfortunately, since the passion for an idea is highest among its originators, projects often lose steam at the handoff. Management's job is to limit the loss of momentum with adroit timing and handling of the transition.

In entrepreneurial settings, idea originators are often forced to engage in commercial activity well beyond their comfort zones. Bob Litan, VP of research and policy at the Kauffman Foundation, which supports American entrepreneurship, noted how great a barrier that constitutes for many inventors. He described a program in which Kauffman links postdoctoral scientists to commercializers, rather than trying to teach inventors to spot market opportunities for their discoveries. Nonetheless, many inventors do successfully grow their businesses (think Google). These opposing models highlight the tension that always exists in the management of creatives: whether to round out their individual skill sets or allow them to run with their unique strengths and then balance them with complementary resources.

Provide paths through the bureaucracy. Colloquium participants were of one mind on the subject of bureaucracy: It stifles creativity. Clay Christensen, a professor at Harvard Business School, offered a useful analogy for understanding why. He likened the life of an idea in a large corporate setting to that of a bill going before the U.S. Congress. The idea is reshaped at various points along the way to suit the agendas of the people whose support is required in order for it to be funded. "You're not into it two weeks before you

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A MANAGER'S GUIDE TO **INCREASING INNOVATION**

If you're trying to enhance creativity...

...remember that you are not the sole fount of ideas.

- Be the appreciative audience.
- Ask the inspiring questions.
- Allow ideas to bubble up from the workforce.

...enable collaboration.

- Combat the lone inventor myth.
- Define "superstar" as someone who helps others succeed.
- Use "coordination totems"—metaphors, analogies, and stories—to help teams conceptualize together.

...enhance diversity.

- Get people with different backgrounds and expertise to work together.
- Encourage individuals to gain diverse experiences that will increase their creativity.
- Open up the organization to outside creative contributors.

...map the stages of creativity and tend to their different needs.

- Avoid process management in the fuzzy front end.
- Provide sufficient time and resources for exploration.
- Manage the handoff to commercialization.

...accept the inevitability and utility of failure.

- Create psychological safety to maximize learning from failure.
- Recognize the different kinds of failure and how they can be useful.
- Create good mechanisms for filtering ideas and killing dead-end projects.

...motivate with intellectual challenge.

- Protect the front end from commercial pressure.
- Clear paths through the bureaucracy for creative ideas.
- Let people do "good work."
- Show the higher purpose of projects whenever possible.
- Grant as much independence as possible.

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hear from sales or finance or engineering that they will block it unless you change it to fit their needs," he said. "These powerful constituencies inside the company collectively beat things into a shape that more closely conforms to the existing business model rather than to the opportunity in the market." What's the solution? Christensen advised managers to recognize what that process does to ideas and deliberately decide to contain it.

Kim Scott added that the manager must act as a shepherd—an analogy also used by Christy Jones, founder of Extend Fertility. Both believe that executives must protect those doing creative work from a hostile environment and clear paths for them around obstacles. In fact, Scott warned the managers in the room that, by creating the necessary new structures to support cross-unit collaboration, they might unwittingly create other forms of bureaucracy. Introduce any set of mandated protocols and checkpoints, she warned, "and Dilbert has entered the room." Other executives and researchers emphasized the need to create a culture in which creativity can thrive, repeatedly returning to the image of a gardener who prepares the creative soil and nurtures the seedlings of ideas.

Create a filtering mechanism. Not surprisingly, some push-back occurred. It all sounds very nice, someone pointed out, but gardens do have weeds; managers must not only water and fertilize, but also kill off the stuff that holds no potential. For every idea with real commercial promise, there are dozens that aren't worth pursuing. At what point and by whom should that determination be made?

One school of thought says that the people closest to the idea are best equipped to make the call—but only if their personal commitment to its success, and the professional ramifications, can be severed. Pharmaceutical giant Merck tries to accomplish this by offering "kill fees." As reported by *BusinessWeek,* Merck's R&D chief, Peter Kim, rewards stock options to "scientists who bail out on losing projects." Without such incentives, it's hard for people to throw in the towel. Indeed, Kim Scott admitted that "we set a goal at Google to cull a percentage of our projects this year, and it was a real challenge."

In a spirited discussion of how ideas should be winnowed, Johansson suggested that the filters must be diverse. Unless the people sitting in judgment represent a variety of disciplines, functions, and viewpoints, they are unlikely to make wise decisions. Russ Wilcox, cofounder and CEO of E Ink, suggested that the filtering might even take place outside the organization. Perhaps the best way to tap the wisdom of the broader market is to give it the power to turn thumbs up or thumbs down on new commercial possibilities. That approach resonated with the company founders present. "The thrill of being an entrepreneur," one said, "is that you get your ideas out in the real world, and they live or die there as opposed to in committee. That committee is death to creativity." Bob Litan described two recent developments that allow for external vetting at an early stage: the increasing use of prediction markets, and the rise of business "accelerators" like Y Combinator and the Foundry, "which are essentially the *American Idol* approach to entrepreneurship."

Fanning the Flames of Motivation

Motivating people to perform at their peak is especially vital in creative work. An employee uninspired to wrap her mind around a problem is unlikely to come up with a novel solution. What spurs creativity, however, has long been a matter of debate.

Provide intellectual challenge. A convincing analysis was put forward by Henry Sauermann, then a doctoral candidate at Duke University (now at Georgia Tech), who presented new research done in collaboration with Duke professor Wesley Cohen. To discover the drivers of creative productivity, they looked at data on more than 11,000 R&D employees in manufacturing and service companies who had been routinely surveyed by the National Science Foundation. The surveys uncovered which workers were more intrinsically motivated—fired up, for example, by intellectual challenge or independence—and which were more extrinsically motivated, by such things as salary, benefits, and job security. The researchers looked at patents filed by each respondent as a reasonable

Is the creativity bottleneck at the top?

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proxy for innovative output. Their finding was clear: Early-stage researchers who were more motivated by intellectual challenge tended to be more productive. (Interestingly, this did not hold true among the group doing later-stage work.) A stronger desire for independence was also associated with somewhat higher productivity. It wasn't that extrinsic motives were unimportant; a person's greater emphasis on salary was also associated with greater productivity. The desire for intellectual challenge was, however, much more strongly linked to it.

Allow people to pursue their passions. If the keys to creative output are indeed intellectual challenge and independence, management must find ways to provide them. In large part, that demands awareness of individuals' interests and skills. Scott Cook pointed out that some people are simply more revolutionary in their thinking than others and therefore more suited to radical projects. "You're most interested in fundamental paradigm changes," he observed, "and yet you tend to staff your new projects with the people who did very well working on version 15 of the last big thing. You're crazy if you think you're going to get a big shift out of the version 15 team."

When people are well matched to a project, granting them independence holds less risk. Ideally, creative workers would be able to set their own agendas, at least in part. The practice of letting researchers spend a significant percentage of their time on projects of their own choosing was famously employed by 3M in its high-growth era. Google's decision to do the same has yielded new offerings like Google Scholar. Fishman told us he encourages scientists at Novartis to spend a portion of their time working on drugs for "niche" diseases, where the intellectual rewards are often high. The screen for such projects consists of two questions—is it scientifically tractable, and does it meet an unmet medical need? Not "What is the market?" but "Is there a patient suffering who could be cured with today's knowledge?"

Be an appreciative audience. The fact that creative workers are intrinsically motivated does not mean that managers' behavior makes no difference. A good leader can do much to challenge and inspire creative work in progress. Mark Addicks, chief marketing officer at General Mills, believes that people are highly attuned to management's engagement with and attitude toward a project. "The way in which a leader asks a question can move a team very positively," he noted. Russ Wilcox of E Ink agrees with this emphasis on the manager's role as appreciative audience. "The greatest inventions in our company," he said, "are always done to impress someone else." Shikhar Ghosh, CEO of software maker Verilytics, reminded the group that the leader's impact cuts both ways; the wrong managerial behaviors, or simply careless neglect, can be tremendously demotivating. In line with research findings reported earlier in HBR (see "Inner Work Life: Understanding the Subtext of Business Performance," by Teresa M. Amabile and Steven J. Kramer, May 2007), Ghosh argued that employees doing creative work are more motivated by managerial behavior, even seemingly little things like a sincere word of public recognition, than by monetary rewards.

Embrace the certainty of failure. Arguably, the managerial reactions that speak loudest to creative workers are reactions to failure. Virtually everyone in the colloquium agreed that managers must decrease fear of failure and that the goal should be to experiment constantly, fail early and often, and learn as much as possible in the process.

Kim Scott observed that, ironically, the firms in Silicon Valley that have the hardest time managing creativity are the ones that have been most successful, because they develop an aversion to failure. How might that aversion develop? Research on firms in an emerging industry by Chad Navis of Emory University and Mary Ann Glynn, a professor at Boston College, suggests that there are particular periods of time when stakeholders become more sensitive to the prospect of failure. Navis and Glynn traced the first 15 years of the satellite radio industry through the stories of the only two U.S. companies in that sector—XM and Sirius. In the early years, both companies fought an uphill battle simply to establish the legitimacy of satellite radio. During that time, both firms focused on making progress toward a viable model, and their individual advantages went more or less unnoticed by outsiders. It was only after satellite radio became "real"—taken seriously by customers, analysts, advertisers, and other players—and the firms shifted their energies to competing against each other that every success or failure was put under the microscope by outsiders. Performance assessments shifted from the sector as a whole to the individual firms. Ironically, then, companies' success at establishing the economic viability of an activity can lead to increased scrutiny and

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therefore to the companies' increased sensitivity to failure—and desire to avoid it.

Fear of failure also seems to rise with the scale of a business. Not only do firms become more conservative as they grow, but fear also makes managers more likely to deny that failure has happened and more eager to erase all memory of it. Amy Edmondson, a professor at Harvard Business School, underscored what a lost opportunity that constitutes. Any business that experiments vigorously will experience failure—which, when it happens, should be mined to improve creative problem solving, team learning, and organizational performance.

How can an organization capitalize on failure? Above all, Edmondson said, its management must create an environment of psychological safety, convincing people that they will not be humiliated, much less punished, if they speak up with ideas, questions, or concerns, or make mistakes. Beyond that, she cautioned against any broad-brush approach. "We need to think about failure in a more fine-grained way," she said. Failures in organizations fall into three quite different types: unsuccessful trials, system breakdowns, and process deviations. All must be analyzed and dealt with, but the first category, which offers the richest potential for creative learning, involves overcoming deeply ingrained norms that stigmatize failure and thereby inhibit experimentation. (For more insight on learning from failure, see "Is Yours a Learning Organization?" by David A. Garvin, Amy C. Edmondson, and Francesca Gino, HBR March 2008.)

Provide the setting for "good work." The potential for passionate engagement in one's work is highest when the work itself is seen as noble, said Howard Gardner, a professor at the Harvard Graduate School of Education who has conducted research on "good work" with professors Mihaly Csikszentmihalyi of Claremont Graduate University and William Damon of Stanford. They define the term as work that is excellent technically, meaningful and engaging to the worker, and carried out in an ethical way. While managers can do much to ensure the first two requirements in a workplace, the third is more problematic—and not because businesspeople are inherently unethical. Ethics usually are upheld best in areas where a type of work has evolved into a profession—when similarly educated people agree to a set of standards above and beyond their enterprise or personal agendas. But even where such "domain principles" are in place, rules tend to be bent in situations where market forces are dominant. Gardner voiced skepticism that any big business, however socially responsible, could make up for the fact that management in general does not constitute a profession. "But maybe at any given time there are certain prototype organizations with an exemplary ethical compass that others want to emulate," he mused. "And perhaps that can set off a kind of contagion."

While Gardner did not name specific organizations, other attendees saw hopeful signs that such model organizations might emerge. Venture capitalist Randy Komisar, a partner at Kleiner Perkins, noted that his firm is now focusing part of its business on sustainability. And the report of an experiment in Peru generated considerable excitement. Peruvian economist Martin Valdivia and Yale economist Dean Karlan, working with a microfinance organization, bundled educational offerings with capital to enhance the commercial skills of the female entrepreneurs it funded. Using a randomized control trial, the researchers showed that the training made a substantial difference to the success of the ventures—and by extension, to the alleviation of poverty.

Pulling It Together

As the colloquium unfolded, most participants seemed to warm to the model of management that was emerging—perhaps because it sounded like just the kind of leadership we, wearing our creative worker hats, would appreciate having. One scholar, however, threw cold water on the proceedings by asking us to look at our model from the perspective of the leader. Theresa Lant of New York University asked, "Where is the glory in being a 'facilitator' as a manager? How do you get a management layer made up of real humans who aspire to that role and will do it?"

A possible answer was presented by Elizabeth Long Lingo of Vanderbilt University, who described her research (a joint project with professor Siobhán O'Mahony of the University of California, Davis) into the production of country music in Nashville. The music business requires the integration of many parties who are not part of the same firm (or even a team), including songwriters, publishers, artists, and label personnel. The person bringing it all together is the producer. He or she

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must exercise leadership in a highly ambiguous context, where there is no clear yardstick for how good the product is and there are no clear rules for who gets to control the output. The more effective producers create a shared purpose in these ambiguous circumstances while still letting others apply their distinctive expertise. For example, in the studio, producers may introduce "bad song" and "good song" samples to create a common aesthetic but still allow the space for experts to experiment with their own sound and forge their contribution to the project. These producers operate at the center of the storm without being the focus of attention and are proactive with a diverse group of experts without being overcontrolling. The glory comes from helping others realize their unique talents and reach a collective goal—a hit record.

Christy Jones noted that her business also depends on the cooperation of diverse players with various agendas to create value for her customers. "It takes inspiration first, and then someone to drive toward that vision with passion—shepherding it and cheerleading to keep it on top of others' priorities," she said.

Marrying Research to Practice

Not every issue relating to the management of creativity was resolved in our two-day colloquium. For example, as Fiona Murray of MIT's Sloan School observed, the group never reached a consensus on the question of market-based incentives. Some saw their encroachment as a problem for creativity and urged managers to shield creative workers from their pressures. IDEO, by contrast, strives to bring market forces to bear on its work by using them as a point of inspiration and then continually exposing prototypes to real-world scrutiny. Other fascinating questions were scarcely touched on. Jing Zhou of Rice University's Jones Graduate School of Management asked, "Are there cultural differences in managing creativity? Would the approaches that work in Western countries, such as the U.S., work as well in Eastern countries, like Korea?"

The group parted, however, with a sense that theory and practice would increasingly come together to advance the understanding of creativity in business. In that vein, participants had the fresh inspiration of a presentation by Jim March, professor emeritus at Stanford University. He pointed out that our understanding of how to manage creativity is impeded by the lack of a theory of novelty, and proposed the beginnings of one. Three conditions seemed to him to be necessary for novelty—slack, hubris, and optimism—which suggest mechanisms that organizations could employ. Slack in an organizational setting means sufficient time and resources for exploration. Increasing hubris means inspiring managers to take risks. Optimism takes hold when a vision of something truly different is made to seem more promising than the status quo.

March is unapologetically a scholar; he prefaced his remarks with the caveat that his theory "is possibly useful, even beautiful and just—but probably has more elements of beauty than usefulness." But those of us listening thought it useful indeed. If research is to inform the practice of management, and if practical challenges are to guide research agendas, then we must have frameworks and theories—call them coordination totems if you will—to collaborate around. And we must continue the shared conversation.

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How to Build a Culture of Originality

Anyone can innovate if given the opportunity and the support. by Adam Grant

IF THERE'S ONE place on earth where originality goes to die, I'd managed to find it. I was charged with unleashing innovation and change in the ultimate bastion of bureaucracy. It was a place where people accepted defaults without question, followed rules without explanation, and clung to traditions and technologies long after they'd become obsolete: the U.S. Navy.

But in a matter of months, the navy was exploding with originality—and not because of anything I'd done. It launched a major innovation task force and helped to form a Department of Defense outpost in Silicon Valley to get up to speed on cutting-edge technology. Surprisingly, these changes didn't come from the top of the navy's command-and-control structure. They were initiated at the bottom, by a group of junior officers in their twenties and thirties.

When I started digging for more details, multiple insiders pointed to a young aviator named Ben Kohlmann. Officers called him a troublemaker, rabble-rouser, disrupter, heretic, and radical. And in direct violation of the military ethos, these were terms of endearment.

Kohlmann lit the match by creating the navy's first rapid-innovation cell—a network of original thinkers who would collaborate to question long-held assumptions and generate new ideas. To start assembling the group, he searched for black sheep: people with a history of nonconformity. One recruit had been fired from a nuclear submarine for disobeying a commander's order. Another had flat-out refused to go to basic training. Others had yelled at senior flag officers and flouted chains of command by writing public blog posts to express their iconoclastic views. "They were lone wolves," Kohlmann says. "Most of them had a track record of insubordination."

Kohlmann realized, however, that to fuel and sustain innovation throughout the navy, he needed more than a few lone wolves. So while working as an instructor and director of flight operations, he set about building a culture of nonconformity. He talked to senior leaders about expanding his network and got their buy-in. He recruited sailors who had never shown a desire to challenge the status quo and exposed them to new ways of thinking. They visited centers of innovation excellence outside the military, from Google to the Rocky Mountain Institute. They devoured a monthly syllabus of readings on innovation and debated ideas during regular happy hours and robust online discussions. Soon they

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ILLUSTRATION BY TOM PEAKE

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pioneered the use of 3-D printers on ships and a robotic fish for stealth underwater missions—and other rapid-innovation cells began springing up around the military. "Culture is king," Kohlmann says. "When people discovered their voice, they became unstoppable."

Empowering the rank and file to innovate is where most leaders fall short. Instead, they try to recruit brash entrepreneurial types to bring fresh ideas and energy into their organizations—and then leave it at that. It's a wrongheaded approach, because it assumes that the best innovators are rare creatures with special gifts. Research shows that entrepreneurs who succeed over the long haul are actually more risk-averse than their peers. The hotshots burn bright for a while but tend to fizzle out. So relying on a few exceptional folks who fit a romanticized creative profile is a short-term move that underestimates everyone else. Most people are in fact quite capable of novel thinking and problem solving, if only their organizations would stop pounding them into conformity.

When everyone thinks in similar ways and sticks to dominant norms, businesses are doomed to stagnate. To fight that inertia and drive innovation and change effectively, leaders need sustained original thinking in their organizations. They get it by building a culture of nonconformity, as Kohlmann did in the navy. I've been studying this for the better part of a decade, and it turns out to be less difficult than I expected.

For starters, leaders must give employees opportunities and incentives to generate—and keep generating—new ideas, so that people across functions and roles get better at pushing past the obvious. However, it's also critical to have the right people vetting those ideas. That part of the process should be much less democratic and more meritocratic, because some votes are simply more meaningful than others. And finally, to continue generating and selecting smart ideas over time, organizations need to strike a balance between cultural cohesion and creative dissent.

Letting a Thousand Flowers Bloom

People often believe that to do better work, they should do fewer things. Yet the evidence flies in the face of that assumption: Being prolific actually increases originality, because sheer volume improves your chances of finding novel solutions. In recent experiments by Northwestern University psychologists Brian Lucas and Loran Nordgren, the initial ideas people generated were the most conventional. Once they had thought of those, they were free to start dreaming up more-unusual possibilities. Their first 20 ideas were significantly less original than their next 15.

Across fields, volume begets quality. This is true for all kinds of creators and thinkers—from composers and painters to scientists and inventors. Even the most eminent innovators do their most original work when they're also cranking out scores of less brilliant ideas. Consider Thomas Edison. In a five-year period, he came up with the lightbulb, the phonograph, and the carbon transmitter used in telephones—while also filing more than 100 patents for inventions that didn't catch the world on fire, including a talking doll that ended up scaring children (and adults).

Of course, in organizations, the challenge lies in knowing when you've drummed up enough possibilities. How many ideas should you generate before deciding which ones to pursue? When I pose this question to executives, most say you're really humming with around 20 ideas. But that answer is off the mark by an order of magnitude. There's evidence that quality often doesn't max out until more than 200 ideas are on the table.

Stanford professor Robert Sutton notes that the Pixar movie *Cars* was chosen from about 500 pitches, and at Skyline, the toy design studio that generates ideas for Fisher-Price and Mattel, employees submitted 4,000 new toy concepts in one year. That set was winnowed down to 230 to be drawn or prototyped, and just 12 were finally developed. The more darts you throw, the better your odds of hitting a bull's-eye.

Though it makes perfect sense, many managers fail to embrace this principle, fearing that time spent conjuring lots of ideas will prevent employees from being focused and efficient. The good news is that there are ways to help employees generate quantity and variety without sacrificing day-to-day productivity or causing burnout.

Think like the enemy. Research suggests that organizations often get stuck in a rut because they're playing defense, trying to stave off the competition. To encourage people to think differently and generate more ideas, put them on offense.

That's what Lisa Bodell of futurethink did when Merck CEO Ken Frazier hired her to help shake up the status quo. Bodell divided Merck's executives

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into groups and asked them to come up with ways to put the company out of business. Instead of being cautious and sticking close to established competencies, the executives started considering bold new directions in strategy and product development that competitors could conceivably take. Energy in the room soared as they explored the possibilities. The offensive mindset, Carnegie Mellon professor Anita Woolley observes, focuses attention on "pursuing opportunities...whereas defenders are more focused on maintaining their market share." That mental shift allowed the Merck executives to imagine competitive threats that didn't yet exist. The result was a fresh set of opportunities for innovation.

Solicit ideas from individuals, not groups. According to decades of research, you get more and better ideas if people are working alone in separate rooms than if they're brainstorming in a group. When people generate ideas together, many of the best ones never get shared. Some members dominate the conversation, others hold back to avoid looking foolish, and the whole group tends to conform to the majority's taste.

Evidence shows that these problems can be managed through "brainwriting." All that's required is asking individuals to think up ideas on their own before the group evaluates them, to get all the possibilities on the table. For instance, at the eyewear retailer Warby Parker, named the world's most innovative company by *Fast Company* in 2015, employees spend a few minutes a week writing down innovation ideas for colleagues to read and comment on. The company also maintains a Google doc where employees can submit requests for new technology to be built, which yields about 400 new ideas in a typical quarter. One major innovation was a revamped retail point of sale, which grew out of an app that allowed customers to bookmark their favorite frames in the store and receive an e-mail about them later.

Since employees often withhold their most unusual suggestions in group settings, another strategy for seeking ideas is to schedule rapid one-on-one idea meetings. When Anita Krohn Traaseth became managing director of Hewlett-Packard Norway, she launched a "speed-date the boss" initiative. She invited every employee to meet with her for five minutes and answer these questions: Who are you and what do you do at HP? Where do you think we should change, and what should we keep focusing on? And what do you want to contribute beyond fulfilling your job responsibilities? She made it clear that she expected people to bring big ideas, and they didn't want to waste their five minutes with a senior leader—it was their chance to show that they could innovate. More than 170 speed dates later, so many good ideas had been generated that other HP leaders implemented the process in Austria and Switzerland.

Bring back the suggestion box. It's a practice that dates back to the early 1700s, when a Japanese shogun put a box at the entrance to his castle. He rewarded good ideas—but punished criticisms with decapitation. Today suggestion boxes are often ridiculed. "I smell a creative idea being formed somewhere in the building," the boss thinks in one *Dilbert* cartoon. "I must find it and crush it." He sets up a suggestion box, and Dilbert is intrigued until a colleague warns him: "It's a trap!!"

But the evidence points to a different conclusion: Suggestion boxes can be quite useful, precisely because they provide a large number of ideas. In one study, psychologist Michael Frese and his colleagues visited a Dutch steel company (now part of Tata Steel) that had been using a suggestion program for 70 years. The company had 11,000 employees and collected between 7,000 and 12,000 suggestions a year. A typical employee would make six or seven suggestions annually and see three or four adopted. One prolific innovator submitted 75 ideas and had 30 adopted. In many companies, those ideas would have been missed altogether. For the Dutch steelmaker, however, the suggestion box regularly led to improvements—saving more than $750,000 in one year alone.

The major benefit of suggestion boxes is that they multiply and diversify the ideas on the horizon, opening up new avenues for innovation. The biggest hurdle is that they create a larger haystack of ideas, making it more difficult to find the needle. You need a system for culling contributions—and rewarding and pursuing the best ones—so that people don't feel their suggestions are falling on deaf ears.

Developing a Nose for Good Ideas

Generating lots of alternatives is important, but so is listening to the right opinions and solutions. How can leaders avoid pursuing bad ideas and rejecting good ones?

Lean on proven evaluators. Although many leaders use a democratic process to select ideas,

Idea in Brief

WHAT'S POSSIBLE

We tend to believe that true innovators are a rare breed. But most people are quite capable of original thinking, and leaders can set them up for success by building a culture of nonconformity.

WHAT GETS IN THE WAY

Unfortunately, leaders often fail to do this because they have trouble moving past their flawed assumptions—for instance, believing that doing fewer things leads to better work, and that strong cultures squash originality.

WHAT TO DO

Give employees ways and reasons to generate lots of new ideas (being prolific actually increases quality). Have fellow innovators evaluate the ideas (they do the best job of predicting success). And strike the right balance between cohesion and dissent in your organization (you need both).

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A SYLLABUS FOR INNOVATORS

When aviator Ben Kohlmann set out to build a culture of nonconformity in the U.S. Navy, he found inspiration in many sources. Here's a sampling of the items he recommends to people who want to think more creatively, along with his comments on how they've influenced his own development.

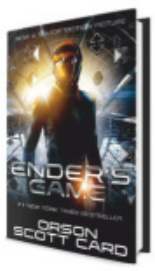
SPEECHES

"Lead Like the Great Conductors"
TED TALK BY ITAY TALGAM

Much can be learned from professions we have no understanding of. People are people—and recognizing the commonalities is useful.

"How Great Leaders Inspire Action"
TED TALK BY SIMON SINEK

Sinek cracks the code of influence: Deep-seated desire is what inspires followers and builds movements.



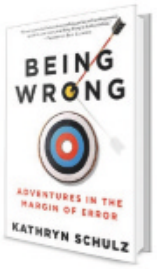
FICTION

Ender's Game
BY ORSON SCOTT CARD

This novel illustrates how tactical and strategic teams can be adaptable—and how genius can emerge at a young age. It's especially apropos reading in the military, where we promote on seniority and not merit.

Dune
BY FRANK HERBERT

A compelling story about insurgency and taking on established powers, *Dune* explores the ambiguous nature of messianic saviors.



NONFICTION

Being Wrong: Adventures in the Margin of Error
BY KATHRYN SCHULZ

We're wrong a lot, and yet we almost never admit it. Schulz helped me critically evaluate my own biases and better understand how people view and portray themselves.

The Hard Thing About Hard Things
BY BEN HOROWITZ

Horowitz doesn't merely talk about how to lead; he's actually lived it. And who doesn't love a guy who starts his chapters with rap lyrics?

The (Mis)behavior of Markets
BY BENOIT MANDELBROT

Mandelbrot is the father of fractal theory, and his insight into how that plays into the stock market transformed my understanding of luck's role in managerial successes and failures.

Boyd: The Fighter Pilot Who Changed the Art of War
BY ROBERT CORAM

When I read this in college, I realized that those who don't toe the party line often have the most impact.

Mindset: The New Psychology of Success
BY CAROL DWECK

Dweck argues that intelligence is not fixed. My world opened up once I discovered that we can grow into what we want to be.

Letters to a Young Contrarian
BY CHRISTOPHER HITCHENS

I'm a person of faith, but I appreciate the way Hitchens incisively questions everything, even faith. I've used his methods many a time to develop contrarian positions and win debates.

TV SHOWS

Sherlock (BBC SERIES)
Each episode is pure fun—but yields lots of learning at the same time.

not every vote is equally valuable. Bowing to the majority's will is not the best policy; a select minority might have a better sense of which ideas have the greatest potential. To figure out whose votes should be amplified, pay attention to employees' track records in evaluation.

At the hedge fund Bridgewater, employees' opinions are weighted by a believability score, which reflects the quality of their past decisions in that domain. In the U.S. intelligence community, analysts demonstrate their credibility by forecasting major political and economic events. In studies by psychologist Philip Tetlock, forecasters are rated on accuracy (did they make the right bets?) and calibration (did they get the probabilities right?). Once the best of these prognosticators are identified, their judgments can be given greater influence than those of their peers.

So, in a company, who's likely to have the strongest track record? Not managers—it's too easy for them to stick to existing prototypes. And not the innovators themselves. Intoxicated by their own "eureka" moments, they tend to be overconfident about their odds of success. They may try to compensate for that by researching customer preferences, but they'll still be susceptible to confirmation bias (looking for information that supports their view and rejecting the rest). Even creative geniuses have trouble predicting with any accuracy when they've come up with a winner.

Research suggests that fellow innovators are the best evaluators of original ideas. They're impartial, because they're not judging their own ideas, and they're more willing than managers to give radical possibilities a chance. For example, Stanford professor Justin Berg found that circus performers who evaluated videos of their peers' new acts were about twice as accurate as managers in predicting popularity with audiences.

Make it a contest. Idea competitions can help leaders separate the wheat from the chaff, whether they're sifting through suggestion-box entries or hosting a live innovation event. At Dow Chemical, for example, employees participate in an annual innovation tournament focused on reducing waste and saving energy. The tournament calls for ideas that require an initial investment of no more than $200,000, and those costs must be recoverable within a year. Peers review the submissions, with monetary rewards going to the winners. Innovation researchers Christian Terwiesch and Karl Ulrich re-

RALPH ORLOWSKI/GETTY IMAGES; BEN PRUCHNIE/GETTY IMAGES

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port that over more than a decade, the resulting 575 projects have produced an average return of 204% and saved the company $110 million a year.

When an innovation tournament is well designed, you get a large pool of initial ideas, but they're clustered around key themes instead of spanning a range of topics. People spend a lot of time preparing their entries, which can boost quality, but the work happens in a discrete window of time, so the contest is not a recurring distraction.

Thorough evaluation helps to filter out the bad ideas. The feedback process typically involves having a group of subject matter experts and fellow innovators review the submissions, rate their novelty and usefulness, and provide suggestions for improvement.

With the right judges in place, an innovation contest not only leverages the wisdom of the crowd but also makes the crowd wiser. Contributors and evaluators get to learn from other people's successes and failures. Over time, the culture can evolve into one where employees feel confident in their ability to contribute ideas—and develop better taste about what constitutes quality. Because successful innovators earn recognition and rewards, everyone has an incentive to participate.

So start by calling for ideas to solve a problem or seize an opportunity, and then introduce a rigorous process for assessment and feedback. The most promising submissions will make it to the next round, and the eventual winners should get the staff and resources necessary to implement their ideas.

Cultivating Both Cohesion and Dissent

Building a culture of nonconformity begins with learning how to generate and vet ideas, but it doesn't end there. To maintain originality over time, leaders need to keep fighting the pressures against it.

We used to blame conformity on strong cultures, believing they were so cultish and chummy that members couldn't consider diverse views and make wise decisions. But that's not true. Studies of decision making in top management teams show that cohesive groups *aren't* more likely than others to seek consensus, dismiss divergent opinions, and fall victim to groupthink. In fact, members of strong cultures often make better decisions, because they communicate well with one another and are secure enough in their roles to feel comfortable challenging one another.

Here's the evidence on how successful high-tech founders in Silicon Valley built their start-ups: They hired primarily for commitment to the mission, looking for people who would help carry out their vision and live by their values. Founders who looked mainly for technical skill or star potential didn't fare nearly as well. In mature industries, too, research shows that when companies place a strong emphasis on culture, their performance remains more stable.

Yet there's a dark side to strong, cohesive cultures: They can become homogeneous if left unchecked. As leaders continue to attract, select, and retain similar people, they sacrifice diversity in thoughts and values. Employees face intense pressure to fit in or get out. This sameness can be advantageous in predictable environments, but it's a problem in volatile industries and dynamic markets. In those settings, strong cultures can be too insular to respond appropriately to shifting conditions. Leaders have a hard time recognizing the need for change, considering different views, and learning and adapting.

Consider BlackBerry: After disrupting the smartphone market, senior leaders clung to the belief that users were primarily interested in efficient, secure e-mail. They dismissed the iPhone as a music player and a consumer toy, hired like-minded insiders who had engineering backgrounds but lacked marketing expertise, and ultimately failed to create a high-quality web browser and an app-friendly operating system. The result? A major downsizing, a billion-dollar write-off, and a colossal collapse of market share.

So to balance out a strong culture, you also need a steady supply of critical opinions. Even when they're wrong, they're useful—they disrupt knee-jerk consensus, stimulate original thought, and help organizations find novel solutions to problems. In the navy's rapid-innovation cell, the norm is "loyal opposition," says Joshua Marcuse, one of Ben Kohlmann's collaborators in the Pentagon. "Agitating against the status quo is how we contribute to the mission."

In short, make dissent one of your organization's core values. Create an environment where people can openly share critical opinions and are respected for doing so. In the early days of Apple, employees were passionately committed to making the Mac a user-friendly household product.

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Make dissent one of your organization's core values. Create an environment where people can openly share critical opinions and are respected for doing so.

But each year, the Mac team also gave an award to somebody who had challenged Steve Jobs. Every one of those award winners was promoted.

Cohesion and dissent sound contradictory, but a combination of the two is what brings novel ideas to the table—and keeps a strong culture from becoming a cult. Here are some ways to hold these principles in productive tension:

Prioritize organizational values. Give people a framework for choosing between conflicting opinions and allowing the best ideas to win out. When companies fail to prioritize values, performance suffers. My colleague Andrew Carton led a study showing that across hospitals, heart attack readmission rates were lower and returns on assets were higher when leaders articulated a compelling vision—but only if they spelled out no more than four organizational values. The more values they emphasized beyond that, the greater the odds that people interpreted them differently or didn't focus on the same ones.

Values need to be rank-ordered so that when employees face choices between competing courses of action, they know what comes first. At the software company Salesforce.com, trust is explicitly defined as the number one value, above growth and innovation. That communicates a clear message to employees: When working on new software, never compromise data privacy. At the online shoe and clothing retailer Zappos.com, CEO Tony Hsieh prioritizes employee happiness over customer happiness. The airline WestJet identifies safety as its most important value. And at GiveForward, a company that helps people raise money for causes, compassion tops the list. Although media coverage is critical to the company's success, cofounder Ethan Austin notes, "We will not push a story in the media unless we are certain that the customer whose story we are sharing will benefit more than we do."

Once you've prioritized the values, keep scrutinizing them. Encourage new hires to challenge "the company way" when they disagree with it. They're the ones with the freshest perspective; they haven't yet gone native. If they familiarize themselves with the culture before speaking up, they'll have already started marching to the same drummer. At Bridgewater, when new employees are trained, they're asked about the company's principles: Do you disagree?

Solicit problems, not just solutions. When working with executives, organizational psychologist David Hofmann likes to ask them to fill in the blanks in this sentence: "Don't bring me ___; bring me ___." Without fail, they shout out, "Don't bring me *problems*; bring me *solutions!*"

Although leaders love it when employees come up with solutions, there's an unintended consequence: Inquiry gets dampened. If you're always expected to have an answer ready, you'll arrive at meetings with your diagnosis complete, missing out on the chance to learn from a range of perspectives. This may be especially common in the United States: In a recent study comparing American and German decision groups, the Germans made twice as many statements about problems and 30% fewer statements about solutions. "Americans are driven to find solutions quickly," the researchers observe, "often without a complete and thorough analysis of the problem."

When individual members of a group have different information, as is usually the case in organizations, it's smarter to get all the problems out there before pursuing solutions. At the digital music company Spotify, instead of working on projects, people organize around long-term business problems. "If they were easy to solve," chief technology officer Oskar Stål notes, "we would have solved them already. When we create a new team, people typically stay together on a business problem for at least a year. If it becomes successful, the team and mission will exist for a long time." Angie's List cofounder Angie Hicks holds weekly office hours to hear concerns from employees.

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And when Anita Krohn Traaseth became the CEO of the Norwegian government's innovation efforts, she again used "speed dates" to give employees a voice. To make sure she had full visibility into problems, she asked people to name their three biggest bottlenecks and what they would like to safeguard or change. Only after gathering problems across a tour of 14 offices did she begin implementing solutions.

Don't appoint devil's advocates—go find them. Research by UC Berkeley psychologist Charlan Nemeth shows that assigning someone to play devil's advocate doesn't overcome confirmation bias. Though people may pay lip service to considering the counterargument, they'll stick to their own views in the end.

To make a difference, the devil's advocate has to actually hold a dissenting view, not just voice it for argument's sake, and the group has to believe that the dissent is authentic. Under those circumstances, groups look at more information *against* the majority view than for it, and they're less confident in their original preferences. It's rare that role-played disagreement is forcefully argued or taken seriously; actual disagreement is what stimulates thought.

Groups with authentic dissenters generate more—and better—solutions to problems. Abraham Lincoln famously asked his political rivals to join his cabinet, knowing they would genuinely hold contrarian views. At a recent Berkshire Hathaway annual meeting, Warren Buffett invited a trader who was shorting the stock to share his criticisms. Of course, this strategy works only if the dissenter's input is clearly valued and respected.

Model receptivity to critical feedback. Many managers end up promoting conformity because their egos are fragile. Research reveals that insecurity prevents managers from seeking ideas and leads them to respond defensively to suggestions. Employees quickly pick up on this and withhold ideas to avoid trouble. One way to overcome this barrier is to encourage people to challenge you out in the open.

Years ago at the software company Index Group, CEO Tom Gerrity gathered his full staff of about 100 people and had a consultant give him negative feedback in front of everyone. When employees saw their CEO listen to critical opinions, they were less worried about speaking up. And managers became more receptive to tough comments themselves.

You can also get people to challenge you by broadcasting your weaknesses. "When you're the leader, it is really hard to get good and honest feedback, no matter how many times you ask for it," Facebook COO Sheryl Sandberg says. "One trick I've discovered is that I try to speak really openly about the things I'm bad at, because that gives people permission to agree with me, which is a lot easier than pointing it out in the first place." For example, Sandberg tells her colleagues that she has a habit of talking too much in meetings. "If I never mentioned it, would anyone walk up to me and say, 'Hey, Sheryl, I think you talked too much today'? I doubt it."

FOR A CULTURE of originality to flourish, employees must feel free to contribute their wildest ideas. But they are often afraid to speak up, even if they've never seen anything bad happen to those who do.

To fight that fear in the navy, Ben Kohlmann rejected the military's traditional emphasis on hierarchy. Everyone communicated on a first-name basis, ignoring rank. "If you have an idea, pitch it to the crowd and run with it," he told members of his rapid-innovation cell. And he introduced them to people who had successfully championed creativity and change in the navy, to show them it was possible.

Other ways to nip fear in the bud include applauding employees for speaking up, even when their suggestions don't get adopted, and sharing your own harebrained ideas. Without some degree of tolerance in the organization for bad ideas, conformity will begin to rear its ugly head. Ultimately, listening to a wider range of insights than you normally hear is the key to promoting great original thinking.

If at first you don't succeed, you'll know you're aiming high enough.

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How Pixar Fosters Collective Creativity

Behind Pixar's string of hit movies, says the studio's president, is a peer-driven process for solving problems.

by Ed Catmull

A FEW YEARS AGO, I had lunch with the head of a major motion picture studio, who declared that his central problem was not finding good people—it was finding good ideas. Since then, when giving talks, I've asked audiences whether they agree with him. Almost always there's a 50/50 split, which has astounded me because I couldn't disagree more with the studio executive. His belief is rooted in a misguided view of creativity that exaggerates the importance of the initial idea in creating an original product. And it reflects a profound misunderstanding of how to manage the large risks inherent in producing breakthroughs.

When it comes to producing breakthroughs, both technological and artistic, Pixar's track record is unique. In the early 1990s, we were known as the leading technological pioneer in the field of

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ILLUSTRATION BY TOM PEAKE

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computer animation. Our years of R&D culminated in the release of *Toy Story* in 1995, the world's first computer-animated feature film. In the following 13 years, we have released eight other films (*A Bug's Life; Toy Story 2; Monsters, Inc.; Finding Nemo; The Incredibles; Cars; Ratatouille;* and *WALL·E*), which also have been blockbusters. Unlike most other studios, we have never bought scripts or movie ideas from the outside. All of our stories, worlds, and characters were created internally by our community of artists. And in making these films, we have continued to push the technological boundaries of computer animation, securing dozens of patents in the process.

While I'm not foolish enough to predict that we will never have a flop, I don't think our success is largely luck. Rather, I believe our adherence to a set of principles and practices for managing creative talent and risk is responsible. Pixar is a community in the true sense of the word. We think that lasting relationships matter, and we share some basic beliefs: Talent is rare. Management's job is not to prevent risk but to build the capability to recover when failures occur. It must be safe to tell the truth. We must constantly challenge all of our assumptions and search for the flaws that could destroy our culture. In the last two years, we've had a chance to test whether our principles and practices are transferable. After Pixar's 2006 merger with the Walt Disney Company, its CEO, Bob Iger, asked me, chief creative officer John Lasseter, and other Pixar senior managers to help him revive Disney Animation Studios. The success of our efforts prompted me to share my thinking on how to build a sustainable creative organization.

What Is Creativity?

People tend to think of creativity as a mysterious solo act, and they typically reduce products to a single idea: This is a movie about toys, or dinosaurs, or love, they'll say. However, in filmmaking and many other kinds of complex product development, creativity involves a large number of people from different disciplines working effectively together to solve a great many problems. The initial idea for the movie—what people in the movie business call "the high concept"—is merely one step in a long, arduous process that takes four to five years.

A movie contains literally tens of thousands of ideas. They're in the form of every sentence; in the performance of each line; in the design of characters, sets, and backgrounds; in the locations of the camera; in the colors, the lighting, the pacing. The director and the other creative leaders of a production do not come up with all the ideas on their own; rather, every single member of the 200- to 250-person production group makes suggestions. Creativity must be present at every level of every artistic and technical part of the organization. The leaders sort through a mass of ideas to find the ones that fit into a coherent whole—that support the story—which is a very difficult task. It's like an archaeological dig where you don't know what you're looking for or whether you will even find anything. The process is downright scary.

Then again, if we aren't always at least a little scared, we're not doing our job. We're in a business whose customers want to see something new every time they go to the theater. This means we have to put ourselves at great risk. Our most recent film, *WALL·E,* is a robot love story set in a post-apocalyptic world full of trash. And our previous movie, *Ratatouille,* is about a French rat who aspires to be a chef. Talk about unexpected ideas! At the outset of making these movies, we simply didn't know if they would work. However, since we're supposed to offer something that isn't obvious, we bought into somebody's initial vision and took a chance.

To act in this fashion, we as executives have to resist our natural tendency to avoid or minimize risks, which, of course, is much easier said than done. In the movie business and plenty of others, this instinct leads executives to choose to copy successes rather than try to create something brand-new. That's why you see so many movies that are so

The view that good ideas are rarer and more valuable than good people is rooted in a misconception of creativity.

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much alike. It also explains why a lot of films aren't very good. If you want to be original, you have to accept the uncertainty, even when it's uncomfortable, and have the capability to recover when your organization takes a big risk and fails. What's the key to being able to recover? Talented people! Contrary to what the studio head asserted at lunch that day, such people are not so easy to find.

What's equally tough, of course, is getting talented people to work effectively with one another. That takes trust and respect, which we as managers can't mandate; they must be earned over time. What we can do is construct an environment that nurtures trusting and respectful relationships and unleashes everyone's creativity. If we get that right, the result is a vibrant community where talented people are loyal to one another and their collective work, everyone feels that they are part of something extraordinary, and their passion and accomplishments make the community a magnet for talented people coming out of schools or working at other places. I know what I'm describing is the antithesis of the free-agency practices that prevail in the movie industry, but that's the point: I believe that community matters.

The Roots of Our Culture

My conviction that smart people are more important than good ideas probably isn't surprising. I've had the good fortune to work alongside amazing people in places that pioneered computer graphics.

At the University of Utah, my fellow graduate students included Jim Clark, who cofounded Silicon Graphics and Netscape; John Warnock, who cofounded Adobe; and Alan Kay, who developed object-oriented programming. We had ample funding (thanks to the U.S. Defense Department's Advanced Research Projects Agency), the professors gave us free rein, and there was an exhilarating and creative exchange of ideas.

At the New York Institute of Technology, where I headed a new computer-animation laboratory, one of my first hires was Alvy Ray Smith, who made breakthroughs in computer painting. That made me realize that it's OK to hire people who are smarter than you are.

Then George Lucas, of *Star Wars* fame, hired me to head a major initiative at Lucasfilm to bring computer graphics and other digital technology into films and, later, games. It was thrilling to do research within a film company that was pushing the boundaries. George didn't try to lock up the technology for himself and allowed us to continue to publish and maintain strong academic contacts. This made it possible to attract some of the best people in the industry, including John Lasseter, then an animator from Disney, who was excited by the new possibilities of computer animation.

Last but not least, there's Pixar, which began its life as an independent company in 1986, when Steve Jobs bought the computer division from Lucasfilm, allowing us to pursue our dream of producing computer-animated movies. Steve gave backbone to our desire for excellence and helped us form a remarkable management team. I'd like to think that Pixar captures what's best about all the places I've worked. A number of us have stuck together for decades, pursuing the dream of making computer-animated films, and we still have the pleasure of working together today.

It was only when Pixar experienced a crisis during the production of *Toy Story 2* that my views on how to structure and operate a creative organization began to crystallize. In 1996, while we were working on *A Bug's Life,* our second movie, we started to make a sequel to *Toy Story*. We had enough technical leaders to start a second production, but all of our proven creative leaders—the people who had made *Toy Story*, including John, who was its director; writer Andrew Stanton; editor Lee Unkrich; and the late Joe Ranft, the movie's head of story—were working on *A Bug's Life.* So we had to form a new creative team of people who had never headed a movie production. We felt this was OK. After all, John, Andrew, Lee, and Joe had never led a full-length animated film production before *Toy Story*.

Disney, which at that time was distributing and cofinancing our films, initially encouraged us to make *Toy Story 2* as a "direct to video"—a movie that would be sold only as home videos and not shown first in theaters. This was Disney's model for keeping alive the characters of successful films, and the expectation was that both the cost and quality would be lower. We realized early on, however, that having two different standards of quality in the same studio was bad for our souls, and Disney readily agreed that the sequel should be a theatrical release. The creative leadership, though, remained the same, which turned out to be a problem.

In the early stage of making a movie, we draw storyboards (a comic-book version of the story)

Idea in Brief

A robot falls in love in a post-apocalyptic world. A French rat sets out to become a chef. A suburban family of superheroes defeats a power-hungry villain. Unexpected ideas, all—yet Pixar Animation Studios is turning these and other novel ideas into blockbuster films.

How? As Catmull explains, Pixar's leaders have discovered potent practices for structuring and operating a creative organization. For example, they give writers, artists, and other creatives enormous leeway to make decisions. They make it safe for people to share unfinished work with peers, who provide candid feedback. And they conduct project postmortems in ways that extract the most valuable lessons for mitigating risk on subsequent projects.

The effort has paid off. Pixar has racked up a unique track record of success: It's the leading pioneer in computer animation. It has never had to buy scripts or movie ideas from outside. And since 1995, it has released nine films—all of which became huge hits.

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and then edit them together with dialogue and temporary music. These are called story reels. The first versions are very rough, but they give a sense of what the problems are, which in the beginning of all productions are many. We then iterate, and each version typically gets better and better. In the case of *Toy Story 2*, we had a good initial idea for a story, but the reels were not where they ought to have been by the time we started animation, and they were not improving. Making matters worse, the directors and producers were not pulling together to rise to the challenge.

Finally *A Bug's Life* was finished, freeing up John, Andrew, Lee, and Joe to take over the creative leadership of *Toy Story 2*. Given where the production was at that point, 18 months would have been an aggressive schedule, but by then we had only eight left to deliver the film. Knowing that the company's future depended on them, crew members worked at an incredible rate. In the end, with the new leadership, they pulled it off.

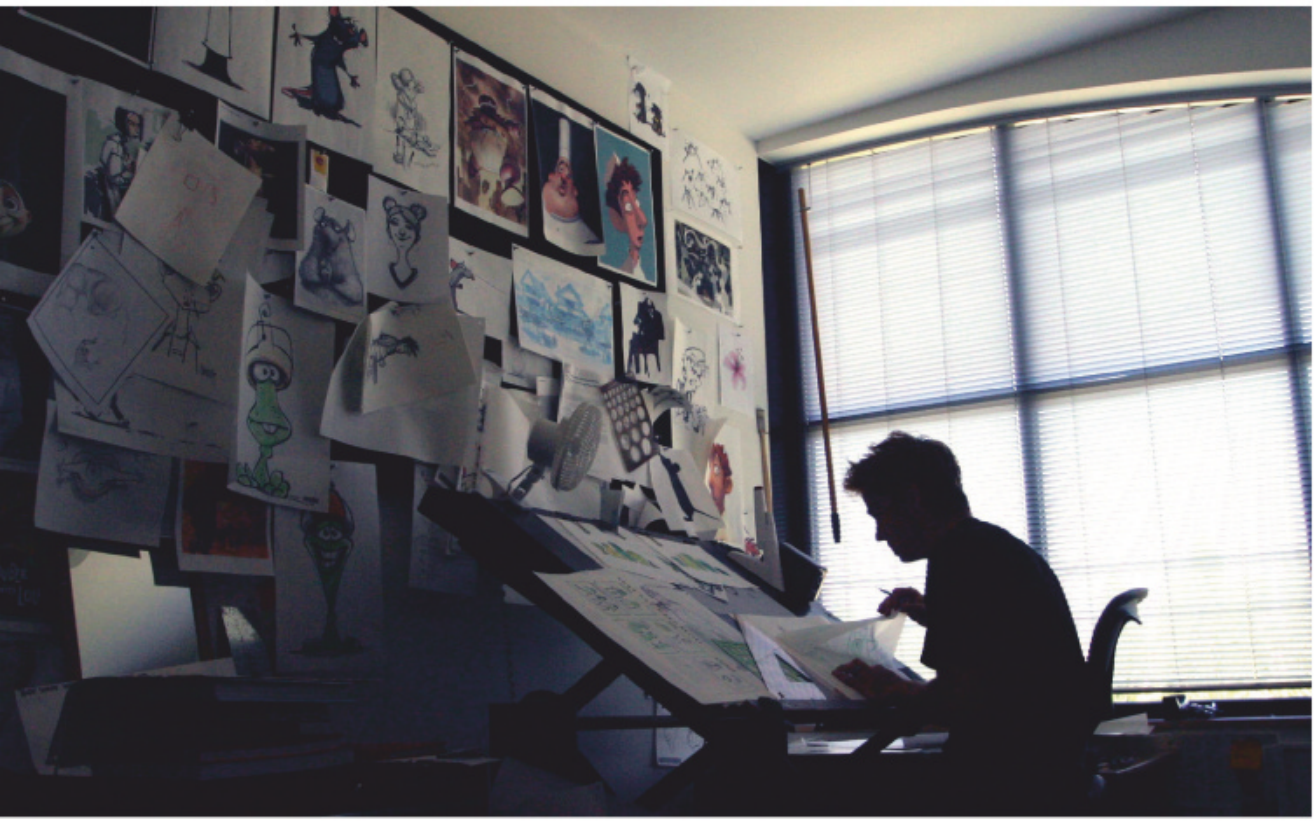
How did John and his team save the movie? The problem was not the original core concept, which they retained. The main character, a cowboy doll named Woody, is kidnapped by a toy collector who intends to ship him to a toy museum in Japan. At a critical point in the story, Woody has to decide whether to go to Japan or try to escape and go back to Andy, the boy who owned him. Well, since the movie is coming from Pixar and Disney, you know he's going to end up back with Andy. And if you can easily predict what's going to happen, you don't have any drama. So the challenge was to get the audience to believe that Woody might make a different choice. The first team couldn't figure out how to do it.

John, Andrew, Lee, and Joe solved that problem by adding several elements to show the fears toys might have that people could relate to. One is a scene they created called "Jessie's story." Jessie is a cowgirl doll who is going to be shipped to Japan with Woody. She wants to go, and she explains why to Woody. The audience hears her story in the emotional song "When She Loved Me": She had been the darling of a little girl, but the girl grew up and discarded her. The reality is kids do grow up, life does change, and sometimes you have to move on. Since the audience members know the truth of this, they can see that Woody has a real choice, and this is what grabs them. It took our "A" team to add the elements that made the story work.

Toy Story 2 was great and became a critical and commercial success—and it was the defining moment for Pixar. It taught us an important lesson about the primacy of people over ideas: If you give a good idea to a mediocre team, they will screw it up; if you give a mediocre idea to a great team, they will either fix it or throw it away and come up with something that works.

Toy Story 2 also taught us another important lesson: There has to be one quality bar for every film we produce. Everyone working at the studio at the time made tremendous personal sacrifices to fix *Toy Story 2*. We shut down all the other productions. We asked our crew to work inhumane hours, and lots of people suffered repetitive stress injuries. But by rejecting mediocrity at great pain and personal sacrifice, we made a loud statement as a community that it was unacceptable to produce some good films and some mediocre films. As a result of *Toy Story 2*, it became deeply ingrained in our culture that everything we touch needs to be excellent. This goes beyond movies to the DVD production and extras, and to the toys and other consumer products associated with our characters.

Of course, most executives would at least pay lip service to the notion that they need to get good people and should set their standards high. But how many understand the importance of creating an environment that supports great people and encourages them to support one another so



PHOTOGRAPHY: DEBORAH COLEMAN

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the whole is far greater than the sum of the parts? That's what we are striving to do. Let me share what we've learned so far about what works.

Power to the Creatives

Creative power in a film has to reside with the film's creative leadership. As obvious as this might seem, it's not true of many companies in the movie industry and, I suspect, a lot of others. We believe the creative vision propelling each movie comes from one or two people and not from either corporate executives or a development department. Our philosophy is: You get great creative people, you bet big on them, you give them enormous leeway and support, and you provide them with an environment in which they can get honest feedback from everyone.

After *Toy Story 2* we changed the mission of our development department. Instead of coming up with new ideas for movies (its role at most studios), the department's job is to assemble small incubation teams to help directors refine their own ideas to a point where they can convince John and our other senior filmmakers that those ideas have the potential to be great films. Each team typically consists of a director, a writer, some artists, and some storyboard people. The development department's goal is to find individuals who will work effectively together. During this incubation stage, you can't judge teams by the material they're producing because it's so rough—there are many problems and open questions. But you can assess whether the teams' social dynamics are healthy and whether the teams are solving problems and making progress. Both the senior management and the development department are responsible for seeing to it that the teams function well.

To emphasize that the creative vision is what matters most, we say we are "filmmaker led." There are really two leaders: the director and the producer. They form a strong partnership. They not only strive to make a great movie but also operate within time, budget, and people constraints. (Good artists understand the value of limits.) During production, we leave the operating decisions to the film's leaders, and we don't second-guess or micromanage them.

Indeed, even when a production runs into a problem, we do everything possible to provide support without undermining their authority. One way we do this is by making it possible for a director to solicit help from our "creative brain trust" of filmmakers. (This group is a pillar of our distinctive peer-based process for making movies—an important topic I'll return to in a moment.) If this advice doesn't suffice, we'll sometimes add reinforcements to the production—such as a writer or codirector—to provide specific skills or improve the creative dynamics of the film's creative leadership.

If you give a good idea to a mediocre team, they'll screw it up. But if you give a mediocre idea to a great team, they'll make it work.

What does it take for a director to be a successful leader in this environment? Of course, our directors have to be masters at knowing how to tell a story that will translate into the medium of film. This means that they must have a unifying vision—one that will give coherence to the thousands of ideas that go into a movie—and they must be able to turn that vision into clear directives that the staff can implement. They must set people up for success by giving them all the information they need to do the job right without telling them how to do it. Each person on a film should be given creative ownership of even the smallest task.

Good directors not only possess strong analytical skills themselves but also can harness the analytical power and life experiences of their staff members. They are superb listeners and strive to understand the thinking behind every suggestion. They appreciate all contributions, regardless of where or from whom they originate, and use the best ones.

A Peer Culture

Of great importance—and something that sets us apart from other studios—is the way people at all levels support one another. Everyone is fully invested in helping everyone else turn out the best

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PIXAR'S OPERATING PRINCIPLES

1. Everyone must have the freedom to communicate with anyone.

2. It must be safe for everyone to offer ideas.

3. We must stay close to innovations happening in the academic community.

work. They really do feel that it's all for one and one for all. Nothing exemplifies this more than our creative brain trust and our daily review process.

The brain trust. This group consists of John and our eight directors (Andrew Stanton, Brad Bird, Pete Docter, Bob Peterson, Brenda Chapman, Lee Unkrich, Gary Rydstrom, and Brad Lewis). When a director and producer feel in need of assistance, they convene the group (and anyone else they think would be valuable) and show the current version of the work in progress. This is followed by a lively two-hour give-and-take discussion, which is all about making the movie better. There's no ego. Nobody pulls any punches to be polite. This works because all the participants have come to trust and respect one another. They know it's far better to learn about problems from colleagues when there's still time to fix them than from the audience after it's too late. The problem-solving powers of this group are immense and inspirational to watch.

After a session, it's up to the director of the movie and his or her team to decide what to do with the advice; there are no mandatory notes, and the brain trust has no authority. This dynamic is crucial. It liberates the trust members, so they can give their unvarnished expert opinions, and it liberates the director to seek help and fully consider the advice. It took us a while to learn this. When we tried to export the brain trust model to our technical area, we found at first that it didn't work. Eventually, I realized why: We had given these other review groups some authority. As soon as we said, "This is purely peers giving feedback to each other," the dynamic changed, and the effectiveness of the review sessions dramatically improved.

The origin of the creative brain trust was *Toy Story*. During a crisis that occurred while making that film, a special relationship developed among John, Andrew, Lee, and Joe, who had remarkable and complementary skills. Since they trusted one another, they could have very intense and heated discussions; they always knew that the passion was about the story and wasn't personal. Over time, as other people from inside and outside joined our directors' ranks, the brain trust expanded to what it is today: a community of master filmmakers who come together when needed to help each other.

The dailies. This practice of working together as peers is core to our culture, and it's not limited to our directors and producers. One example is our daily reviews, or "dailies," a process for giving and getting constant feedback in a positive way that's based on practices John observed at Disney and Industrial Light & Magic (ILM), Lucasfilm's special-effects company.

At Disney, only a small senior group would look at daily animation work. Dennis Muren, ILM's legendary visual-effects supervisor, broadened the participation to include his whole special-effects crew. (John, who joined my computer group at Lucasfilm after leaving Disney, participated in these sessions while we were creating computer-animated effects for *Young Sherlock Holmes*.)

As we built up an animation crew for *Toy Story* in the early 1990s, John used what he had learned from Disney and ILM to develop our daily review process. People show work in an incomplete state to the whole animation crew, and although the director makes decisions, everyone is encouraged to comment.

There are several benefits. First, once people get over the embarrassment of showing work still in progress, they become more creative. Second, the director or creative leads guiding the review process can communicate important points to the entire crew at the same time. Third, people learn from and inspire each other; a highly creative piece of animation will spark others to raise their game. Finally, there are no surprises at the end: When you're done, you're done. People's overwhelming desire to make sure their work is "good" before they show it to others increases the possibility that their finished version won't be what the director wants. The dailies process avoids such wasted efforts.

Technology + Art = Magic

Getting people in different disciplines to treat one another as peers is just as important as getting people within disciplines to do so. But it's much harder. Barriers include the natural class structures that arise in organizations: There always seems to be one function that considers itself and is perceived by others to be the one the organization values the most. Then there's the different languages spoken by different disciplines and even the physical distance between offices. In a creative business like ours, these barriers are impediments to producing great work, and therefore we must do everything we can to tear them down.

Walt Disney understood this. He believed that when continual change, or reinvention, is

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the norm in an organization and technology and art are together, magical things happen. A lot of people look back at Disney's early days and say, "Look at the artists!" They don't pay attention to his technological innovations. But he did the first sound in animation, the first color, the first compositing of animation with live action, and the first applications of xerography in animation production. He was always excited by science and technology.

At Pixar, we believe in this swirling interplay between art and technology and constantly try to use better technology at every stage of production. John coined a saying that captures this dynamic: "Technology inspires art, and art challenges the technology." To us, those aren't just words; they are a way of life that had to be established and still has to be constantly reinforced. Although we are a director- and producer-led meritocracy, which recognizes that talent is not spread equally among all people, we adhere to the following principles:

Everyone must have the freedom to communicate with anyone. This means recognizing that the decision-making hierarchy and communication structure in organizations are two different things. Members of any department should be able to approach anyone in another department to solve problems without having to go through "proper" channels. It also means that managers need to learn that they don't always have to be the first to know about something going on in their realm, and it's OK to walk into a meeting and be surprised. The impulse to tightly control the process is understandable given the complex nature of moviemaking, but problems are almost by definition unforeseen. The most efficient way to deal with numerous problems is to trust people to work out the difficulties directly with each other without having to check for permission.

It must be safe for everyone to offer ideas. We're constantly showing works in progress internally. We try to stagger who goes to which viewing to ensure that there are always fresh eyes, and everyone in the company, regardless of discipline or position, gets to go at some point. We make a concerted effort to make it safe to criticize by inviting everyone attending these showings to e-mail notes to the creative leaders that detail what they liked and didn't like and explain why.

We must stay close to innovations happening in the academic community. We strongly encourage our technical artists to publish their

GETTING REAL HELP
Pixar's brain trust of directors offers advice on works in progress. But the production's leaders decide what to use and what to ignore.

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research and participate in industry conferences. Publishing may give away ideas, but it keeps us connected with the academic community. This connection is worth far more than any ideas we may have revealed: It helps us attract exceptional talent and reinforces the belief throughout the company that people are more important than ideas.

We try to break down the walls between disciplines in other ways, as well. One is a collection of in-house courses we offer, which we call Pixar University. It is responsible for training and cross-training people as they develop in their careers. But it also offers an array of optional classes—many of which I've taken—that give people from different disciplines the opportunity to mix and appreciate what everyone does. Some (screenplay writing, drawing, and sculpting) are directly related to our business; some (Pilates and yoga) are not. In a sculpting class will be rank novices as well as world-class sculptors who want to refine their skills. Pixar University helps reinforce the mindset that we're all learning and it's fun to learn together.

Our building, which is Steve Jobs's brainchild, is another way we try to get people from different departments to interact. Most buildings are designed for some functional purpose, but ours is structured to maximize inadvertent encounters. At its center is a large atrium, which contains the cafeteria, meeting rooms, bathrooms, and mailboxes. As a result, everyone has strong reasons to go there repeatedly during the course of the workday. It's hard to describe just how valuable the resulting chance encounters are.

OVERCOMING INHIBITIONS
Showing unfinished work each day liberates people to take risks and try new things because it doesn't have to be perfect the first time.

Staying on the Rails

Observing the rise and fall of computer companies during my career has affected me deeply. Many companies put together a phenomenal group of people who produced great products. They had the best engineers, exposure to the needs of customers, access to changing technology, and experienced management. Yet many made decisions at the height of their powers that were stunningly wrongheaded, and they faded into irrelevance. How could really smart people completely miss something so crucial to their survival? I remember asking myself more than once: "If we are ever successful, will we be equally blind?"

Many of the people I knew in those companies that failed were not very introspective. When Pixar became an independent company, I vowed we would be different. I realized that it's extremely difficult for an organization to analyze itself. It is uncomfortable and hard to be objective. Systematically fighting complacency and uncovering problems when your company is successful have got to be two of the toughest management challenges there are. Clear values, constant communication, routine postmortems, and the regular injection of outsiders who will challenge the status quo aren't enough. Strong leadership is also essential—to make sure people don't pay lip service to the values, tune out the communications, game the processes, and automatically discount newcomers' observations and suggestions. Here's a sampling of what we do:

Postmortems. The first we performed—at the end of *A Bug's Life*—was successful. But the success of those that followed varied enormously. This caused me to reflect on how to get more out of them. One thing I observed was that although people learn from the postmortems, they don't like to do them. Leaders naturally want to use the occasion to give kudos to their team members. People in general would rather talk about what went right than what went wrong. And after spending years on a film, everybody just wants to move on. Left to their own devices, people will game the system to avoid confronting the unpleasant.

There are some simple techniques for overcoming these problems. One is to try to vary the way

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Managers need to learn that it's OK to walk into a meeting and be surprised.

you do the postmortems. By definition, they're supposed to be about lessons learned, so if you repeat the same format, you tend to find the same lessons, which isn't productive. Another is to ask each group to list the top five things they would do again and the top five things they wouldn't do. The balance between the positive and the negative helps make it a safer environment. In any event, employ lots of data in the review. Because we're a creative organization, people tend to assume that much of what we do can't be measured or analyzed. That's wrong. Most of our processes involve activities and deliverables that can be quantified. We keep track of the rates at which things happen, how often something has to be reworked, whether a piece of work was completely finished or not when it was sent to another department, and so on. Data can show things in a neutral way, which can stimulate discussion and challenge assumptions arising from personal impressions.

Fresh blood. Successful organizations face two challenges when bringing in new people with fresh perspectives. One is well-known—the not-invented-here syndrome. The other—the awe-of-the-institution syndrome (an issue with young new hires)—is often overlooked.

The former has not been a problem for us, thank goodness, because we have an open culture: Continually embracing change the way we do makes newcomers less threatening. Several prominent outsiders who have had a big impact on us (in terms of the exciting ideas they introduced and the strong people they attracted) were readily accepted. They include Brad Bird, who directed *The Incredibles* and *Ratatouille*; Jim Morris, who headed Industrial Light & Magic for years before joining Pixar as the producer of *WALL·E* and executive vice president of production; and Richard Hollander, a former executive of the special-effects studio Rhythm & Hues, who is leading an effort to improve our production processes.

The bigger issue for us has been getting young new hires to have the confidence to speak up. To try to remedy this, I make it a practice to speak at the orientation sessions for new hires, where I talk about the mistakes we've made and the lessons we've learned. My intent is to persuade them that we haven't gotten it all figured out and that we want everyone to question why we're doing something that doesn't seem to make sense to them. We do not want people to assume that because we are successful, everything we do is right.

FOR 20 YEARS, I pursued a dream of making the first computer-animated film. To be honest, after that goal was realized—when we finished *Toy Story*—I was a bit lost. But then I realized the most exciting thing I had ever done was to help create the unique environment that allowed that film to be made. My new goal became, with John, to build a studio that had the depth, robustness, and will to keep searching for the hard truths that preserve the confluence of forces necessary to create magic. In the two years since Pixar's merger with Disney, we've had the good fortune to expand that goal to include the revival of Disney Animation Studios. It has been extremely gratifying to see the principles and approaches we developed at Pixar transform this studio. But the ultimate test of whether John and I have achieved our goals is if Pixar and Disney are still producing animated films that touch world culture in a positive way long after we two, and our friends who founded and built Pixar with us, are gone.

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Ed Catmull is a cofounder of Pixar, the former president of both Pixar and Walt Disney Animation Studios, and the author, with Amy Wallace, of *Creativity, Inc.* (Random House, 2014).

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The Business Case for Curiosity

by Francesca Gino

MOST OF THE breakthrough discoveries and remarkable inventions throughout history, from flints for starting a fire to self-driving cars, have something in common: They are the result of curiosity. The impulse to seek new information and experiences and explore novel possibilities is a basic human attribute. New research points to three important insights about curiosity as it relates to business. First, curiosity is much more important to an enterprise's performance than was previously thought. That's because cultivating it at all levels helps leaders and their employees adapt to uncertain market conditions and external pressures: When our curiosity is triggered, we think more deeply and rationally about decisions and come up with more-creative solutions. In addition, curiosity allows leaders to gain more respect from their followers and inspires employees to develop more-trusting and more-collaborative relationships with colleagues.

Second, by making small changes to the design of their organizations and the ways they manage their employees, leaders can encourage curiosity—and improve their companies. This is true in every industry and for creative and routine work alike.

Third, although leaders might *say* they treasure inquisitive minds, in fact most stifle curiosity, fearing it will increase risk and inefficiency. In a survey I conducted of more than 3,000 employees from a wide range of firms and industries, only about 24% reported feeling curious in their jobs on a regular basis, and about 70% said they face barriers to asking more questions at work.

In this article I'll elaborate on the benefits of and common barriers to curiosity in the workplace and then offer five strategies that can help leaders get high returns on investments in employees' curiosity and in their own.

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The Benefits of Curiosity

New research reveals a wide range of benefits for organizations, leaders, and employees.

Fewer decision-making errors. In my research I found that when our curiosity is triggered, we are less likely to fall prey to confirmation bias (looking for information that supports our beliefs rather than for evidence suggesting we are wrong) and to stereotyping people (making broad judgments, such as that women or minorities don't make good leaders). Curiosity has these positive effects because it leads us to generate alternatives.

More innovation and positive changes in both creative and noncreative jobs. Consider this example: In a field study INSEAD's Spencer Harrison and colleagues asked artisans selling their goods through an e-commerce website several questions aimed at assessing the curiosity they experience at work. After that, the participants' creativity was measured by the number of items they created and listed over a two-week period. A one-unit increase in curiosity (for instance, a score of 6 rather than 5 on a 7-point scale) was associated with 34% greater creativity.

ILLUSTRATION BY TOM PEAKE

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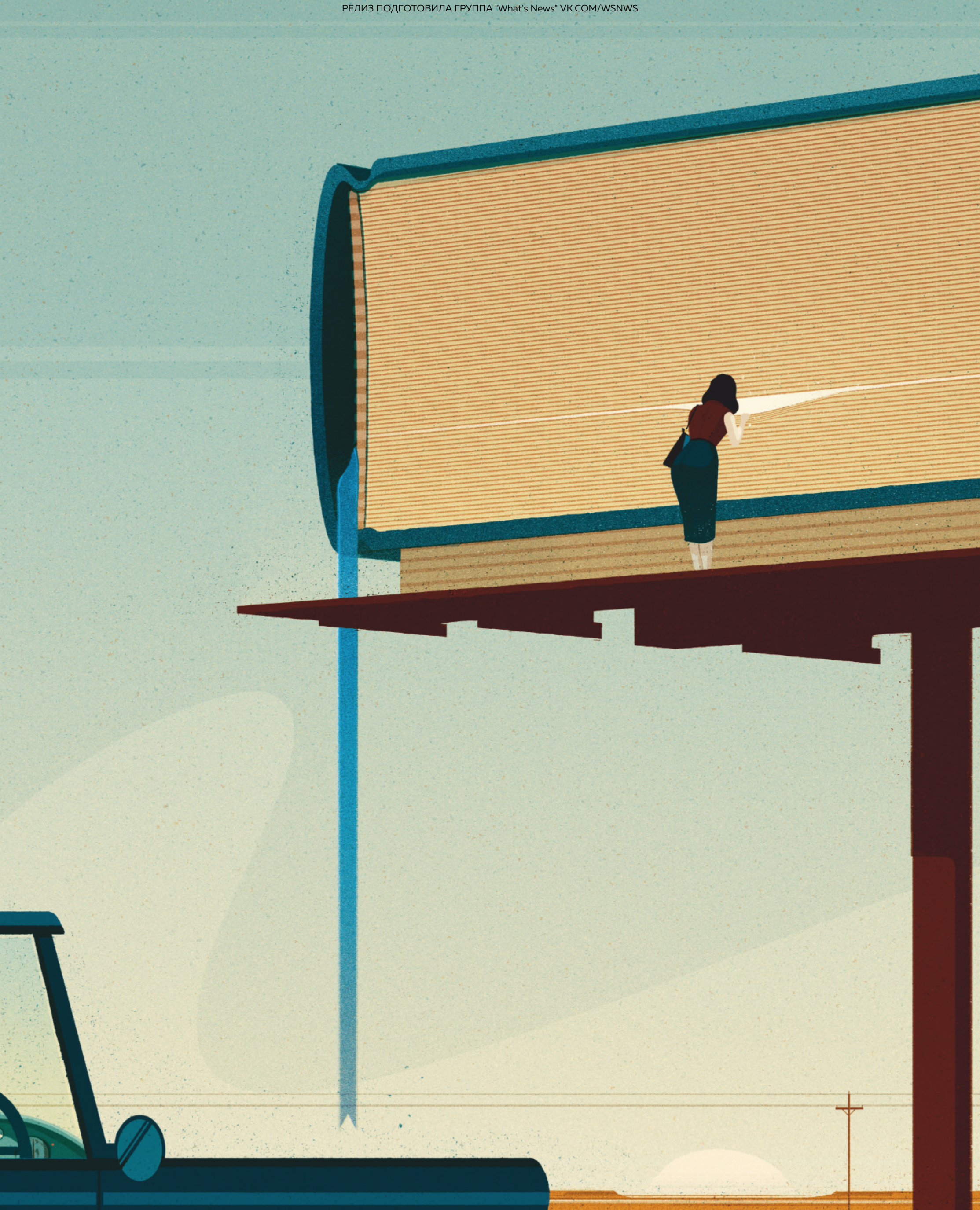

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In a separate study, Harrison and his colleagues focused on call centers, where jobs tend to be highly structured and turnover is generally high. They asked incoming hires at 10 organizations to complete a survey that, among other things, measured their curiosity before they began their new jobs. Four weeks in, the employees were surveyed about various aspects of their work. The results showed that the most curious employees sought the most information from coworkers, and the information helped them in their jobs—for instance, it boosted their creativity in addressing customers' concerns.

My own research confirms that encouraging people to be curious generates workplace improvements. For one study I recruited about 200 employees working in various companies and industries. Twice a week for four weeks, half of them received a text message at the start of their workday that read, "What is one topic or activity you are curious about today? What is one thing you usually take for granted that you want to ask about? Please make sure you ask a few 'Why questions' as you engage in your work throughout the day. Please set aside a few minutes to identify how you'll approach your work today with these questions in mind."

The other half (the control group) received a message designed to trigger reflection but not raise their curiosity: "What is one topic or activity you'll engage in today? What is one thing you usually work on or do that you'll also complete today? Please make sure you think about this as you engage in your work throughout the day. Please set aside a few minutes to identify how you'll approach your work today with these questions in mind."

After four weeks, the participants in the first group scored higher than the others on questions assessing their innovative behaviors at work, such as whether they had made constructive suggestions for implementing solutions to pressing organizational problems.

When we are curious, we view tough situations more creatively. Studies have found that curiosity is associated with less defensive reactions to stress and less aggressive reactions to provocation. We also perform better when we're curious. In a study of 120 employees I found that natural curiosity was associated with better job performance, as evaluated by their direct bosses.

Reduced group conflict. My research found that curiosity encourages members of a group to put themselves in one another's shoes and take an interest in one another's ideas rather than focus only on their own perspective. That causes them to work together more effectively and smoothly: Conflicts are less heated, and groups achieve better results.

More-open communication and better team performance. Working with executives in a leadership program at Harvard Kennedy School, my colleagues and I divided participants into groups of five or six, had some groups participate in a task that heightened their curiosity, and then asked all the groups to engage in a simulation that tracked performance. The groups whose curiosity had been heightened performed better than the control groups because they shared information more openly and listened more carefully.

Two Barriers to Curiosity

Despite the well-established benefits of curiosity, organizations often discourage it. This is not because leaders don't see its value. On the contrary, both leaders and employees understand that curiosity creates positive outcomes for their companies. In the survey of more than 3,000 employees mentioned earlier, 92% credited curious people with bringing new ideas into teams and organizations and viewed curiosity as a catalyst for job satisfaction, motivation, innovation, and high performance.

Yet executives' actions often tell a different story. True, some organizations, including 3M and Facebook, give employees free time to pursue their interests, but they are rare. And even in such organizations, employees often have challenging short-term performance goals (such as meeting a quarterly sales target or launching a new product by a certain date) that consume the "free time" they could have spent exploring alternative approaches to their work or coming up with innovative ideas.

Two tendencies restrain leaders from encouraging curiosity:

They have the wrong mindset about exploration. Leaders often think that letting employees follow their curiosity will lead to a costly mess. In a recent survey I conducted of 520 chief learning officers and chief talent development officers, I found that they often shy away from encouraging curiosity because they believe the company would be harder to manage if people were allowed to explore their own interests. They also believe that disagreements would arise and making and exe-

Exploration often involves questioning the status quo and doesn't always produce useful information. But it also means not settling for the first possible solution—and so it often yields better remedies.

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cuting decisions would slow down, raising the cost of doing business. Research finds that although people list creativity as a goal, they frequently reject creative ideas when actually presented with them. That's understandable: Exploration often involves questioning the status quo and doesn't always produce useful information. But it also means not settling for the first possible solution—and so it often yields better remedies.

They seek efficiency to the detriment of exploration. In the early 1900s Henry Ford focused all his efforts on one goal: reducing production costs to create a car for the masses. By 1908 he had realized that vision with the introduction of the Model T. Demand grew so high that by 1921 the company was producing 56% of all passenger cars in the United States—a remarkable success made possible primarily by the firm's efficiency-centered model of work. But in the late 1920s, as the U.S. economy rose to new heights, consumers started wanting greater variety in their cars. While Ford remained fixated on improving the Model T, competitors such as General Motors started producing an array of models and soon captured the main share of the market. Owing to its single-minded focus on efficiency, Ford stopped experimenting and innovating and fell behind.

These leadership tendencies help explain why our curiosity usually declines the longer we're in a job. In one survey, I asked about 250 people who had recently started working for various companies a series of questions designed to measure curiosity; six months later I administered a follow-up survey. Although initial levels of curiosity varied, after six months everyone's curiosity had dropped, with the average decline exceeding 20%. Because people were under pressure to complete their work quickly, they had little time to ask questions about broad processes or overall goals.

Five Ways to Bolster Curiosity

It takes thought and discipline to stop stifling curiosity and start fostering it. Here are five strategies leaders can employ.

1. Hire for Curiosity

In 2004 an anonymous billboard appeared on Highway 101, in the heart of Silicon Valley, posing this puzzle: "{first 10-digit prime found in consecutive digits of e}.com." The answer, 7427466391.com, led the curious online, where they found another equation to solve. The handful of people who did so were invited to submit a résumé to Google. The company took this unusual approach to finding job candidates because it places a premium on curiosity. (People didn't even need to be engineers!) As Eric Schmidt, Google's CEO from 2001 to 2011, has said, "We run this company on questions, not answers."

Google also identifies naturally curious people through interview questions such as these: "Have you ever found yourself unable to stop learning something you've never encountered before? Why? What kept you persistent?" The answers usually highlight either a specific purpose driving the candidate's inquiry ("It was my job to find the answer") or genuine curiosity ("I just had to figure out the answer").

IDEO, the design and consulting company, seeks to hire "T-shaped" employees: people with deep skills that allow them to contribute to the creative process (the vertical stroke of the T) and a predisposition for collaboration across disciplines, a quality requiring empathy and curiosity (the horizontal stroke of the T). The firm understands that empathy and curiosity are related: Empathy allows employees to listen thoughtfully and see problems or decisions from another person's perspective, while curiosity extends to interest in other people's disciplines, so much so that one may start to practice them. And it recognizes that most people perform at their best not because they're specialists but because their deep skill is accompanied by an intellectual curiosity that leads them to ask questions, explore, and collaborate.

To identify potential employees who are T-shaped, IDEO pays attention to how candidates talk about past projects. Someone who focuses only on his or her own contributions may lack the breadth to appreciate collaboration. T-shaped candidates are more likely to talk about how they succeeded with the help of others and to express interest in working collaboratively on future projects.

To assess curiosity, employers can also ask candidates about their interests outside of work. Reading books unrelated to one's own field and exploring questions just for the sake of knowing the answers are indications of curiosity. And companies can administer curiosity assessments, which have been validated in a myriad of studies. These generally measure whether people explore things they don't know, analyze data to uncover

Idea in Brief

THE PROBLEM

Leaders say they value employees who question or explore things, but research shows that they largely suppress curiosity, out of fear that it will increase risk and undermine efficiency.

WHY THIS MATTERS

Curiosity improves engagement and collaboration. Curious people make better choices, improve their company's performance, and help their company adapt to uncertain market conditions and external pressures.

THE REMEDY

Leaders should encourage curiosity in themselves and others by making small changes to the design of their organization and the ways they manage their employees. Five strategies can guide them.

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new ideas, read widely beyond their field, have diverse interests outside work, and are excited by learning opportunities.

It's also important to remember that the questions candidates ask—not just the answers they provide—can signal curiosity. For instance, people who want to know about aspects of the organization that aren't directly related to the job at hand probably have more natural curiosity than people who ask only about the role they would perform.

2. Model Inquisitiveness

Leaders can encourage curiosity throughout their organizations by being inquisitive themselves. In 2000, when Greg Dyke had been named director general of the BBC but hadn't yet assumed the position, he spent five months visiting the BBC's major locations, assembling the staff at each stop. Employees expected a long presentation but instead got a simple question: "What is the one thing I should do to make things better for you?" Dyke would listen carefully and then ask, "What is the one thing I should do to make things better for our viewers and listeners?"

The BBC's employees respected their new boss for taking the time to ask questions and listen. Dyke used their responses to inform his thinking about the changes needed to solve problems facing the BBC and to identify what to work on first. After officially taking the reins, he gave a speech to the staff that reflected what he had learned and showed employees that he had been truly interested in what they said.

By asking questions and genuinely listening to the responses, Dyke modeled the importance of those behaviors. He also highlighted the fact that when we are exploring new terrain, listening is as important as talking: It helps us fill gaps in our knowledge and identify other questions to investigate.

That may seem intuitive, but my research shows that we often prefer to talk rather than to listen with curiosity. For instance, when I asked some 230 high-level leaders in executive education classes what they would do if confronted with an organizational crisis stemming from both financial and cultural issues, most said they would take action: move to stop the financial bleeding and introduce initiatives to refresh the culture. Only a few said they would ask questions rather than simply impose their ideas on others. Management books commonly encourage leaders assuming new positions to communicate their vision from the start rather than ask employees how they can be most helpful. It's bad advice.

Why do we refrain from asking questions? Because we fear we'll be judged incompetent, indecisive, or unintelligent. Plus, time is precious, and we don't want to bother people. Experience and expertise exacerbate the problem: As people climb the organizational ladder, they think they have less to learn. Leaders also tend to believe they're expected to talk and provide answers, not ask questions.

Such fears and beliefs are misplaced, my recent research shows. When we demonstrate curiosity about others by asking questions, people like us *more* and view us as *more* competent, and the heightened trust makes our relationships more interesting and intimate. By asking questions, we promote more-meaningful connections and more-creative outcomes.

Another way leaders can model curiosity is by acknowledging when they don't know the answer; that makes it clear that it's OK to be guided by curiosity. Patricia Fili-Krushel told me that when she joined WebMD Health as chief executive, she met with a group of male engineers in Silicon Valley. They were doubtful that she could add value to their work and, right off the bat, asked what she knew about engineering. Without hesitation, Fili-Krushel made a zero with her fingers. "This is how much I know about engineering," she told them. "However, I do know how to run businesses, and I'm hoping you can teach me what I need to know about your world." When leaders concede that they don't have the answer to a question, they show that they value the process of looking for answers and motivate others to explore as well.

New hires at Pixar Animation Studios are often hesitant to question the status quo, given the company's track record of hit movies and the brilliant work of those who have been there for years. To combat that tendency, Ed Catmull, the cofounder and president, makes a point of talking about times when Pixar made bad choices. Like all other organizations, he says, Pixar is not perfect, and it needs fresh eyes to spot opportunities for improvement (see "How Pixar Fosters Collective Creativity," HBR, September 2008). In this way Catmull gives new recruits license to question existing practices. Recognizing the limits of our

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own knowledge and skills sends a powerful signal to others.

Tenelle Porter, a postdoctoral scholar in psychology at the University of California, Davis, describes intellectual humility as the ability to acknowledge that what we know is sharply limited. As her research demonstrates, higher levels of intellectual humility are associated with a greater willingness to consider views other than our own. People with more intellectual humility also do better in school and at work. Why? When we accept that our own knowledge is finite, we are more apt to see that the world is always changing and that the future will diverge from the present. By embracing this insight, leaders and employees can begin to recognize the power of exploration.

Finally, leaders can model inquisitiveness by approaching the unknown with curiosity rather than judgment. Bob Langer, who heads one of MIT's most productive laboratories, told me recently that this principle guides how he manages his staff. As human beings, we all feel an urge to evaluate others—often not positively. We're quick to judge their ideas, behaviors, and perspectives, even when those relate to things that haven't been tried before. Langer avoids this trap by raising questions about others' ideas, which leads people to think more deeply about their perspective and to remain curious about the tough problems they are trying to tackle. In doing so, he is modeling behavior that he expects of others in the lab.

3. Emphasize Learning Goals

When I asked Captain Chesley "Sully" Sullenberger how he was able to land a commercial aircraft safely in the Hudson River, he described his passion for continuous learning. Although commercial flights are almost always routine, every time his plane pushed back from the gate he would remind himself that he needed to be prepared for the unexpected. "What can I learn?" he would think. When the unexpected came to pass, on a cold January day in 2009, Sully was able to ask himself what he *could* do, given the available options, and come up with a creative solution. He successfully fought the tendency to grasp for the most obvious option (landing at the nearest airport). Especially when under pressure, we narrow in on what immediately seems the best course of action. But those who are passionate about continuous learning contemplate a wide range of options and perspectives. As the accident report shows, Sully carefully considered several alternatives in the 208 seconds between his discovery that the aircraft's engines lacked thrust and his landing of the plane in the Hudson.

It's natural to concentrate on results, especially in the face of tough challenges. But focusing on learning is generally more beneficial to us and our organizations, as some landmark studies show. For example, when U.S. Air Force personnel were given a demanding goal for the number of planes to be landed in a set time frame, their performance *decreased*. Similarly, in a study led by Southern Methodist University's Don VandeWalle, sales professionals who were naturally focused on performance goals, such as meeting their targets and being seen by colleagues as good at their jobs, did worse during a promotion of a product (a piece of medical equipment priced at about $5,400) than reps who were naturally focused on learning goals, such as exploring how to be a better salesperson. That cost them, because the company awarded a bonus of $300 for each unit sold.

A body of research demonstrates that framing work around learning goals (developing competence, acquiring skills, mastering new situations, and so on) rather than performance goals (hitting targets, proving our competence, impressing others) boosts motivation. And when motivated by learning goals, we acquire more-diverse skills, do better at work, get higher grades in college, do better on problem-solving tasks, and receive higher ratings after training. Unfortunately, organizations often prioritize performance goals.

Leaders can help employees adopt a learning mindset by communicating the importance of learning and by rewarding people not only for their performance but for the learning needed to get there. Deloitte took this path: In 2013 it replaced its performance management system with one that tracks both learning and performance. Employees meet regularly with a coach to discuss their development and learning along with the support they need to continually grow.

Leaders can also stress the value of learning by reacting positively to ideas that may be mediocre in themselves but could be springboards to better ones. Writers and directors at Pixar are trained in a technique called "plussing," which involves building on ideas without using judgmental language. Instead of rejecting a sketch, for example, a director might find a starting point by saying, "I like

When we are curious, we view tough situations more creatively and have less defensive reactions to stress.

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Woody's eyes, and what if we...?" Someone else might jump in with another "plus." This technique allows people to remain curious, listen actively, respect the ideas of others, and contribute their own. By promoting a process that allows all sorts of ideas to be explored, leaders send a clear message that learning is a key goal even if it doesn't always lead to success.

4. Let Employees Explore and Broaden Their interests

Organizations can foster curiosity by giving employees time and resources to explore their interests. One of my favorite examples comes from my native country. It involves Italy's first typewriter factory, Olivetti, founded in 1908 in the foothills of the Italian Alps. In the 1930s some employees caught a coworker leaving the factory with a bag full of iron pieces and machinery. They accused him of stealing and asked the company to fire him. The worker told the CEO, Adriano Olivetti, that he was taking the parts home to work on a new machine over the weekend because he didn't have time while performing his regular job. Instead of firing him, Olivetti gave him time to create the machine and charged him with overseeing its production. The result was Divisumma, the first electronic calculator. Divisumma sold well worldwide in the 1950s and 1960s, and Olivetti promoted the worker to technical director. Unlike leaders who would have shown him the door, Olivetti gave him the space to explore his curiosity, with remarkable results.

Some organizations provide resources to support employees' outside interests. Since 1996 the manufacturing conglomerate United Technologies (UTC) has given as much as $12,000 in tuition annually to any employee seeking a degree part-time—no strings attached. Leaders often don't want to invest in training employees for fear that they will jump to a competitor and take their expensively acquired skills with them. Even though UTC hasn't tried to quantify the benefits of its tuition reimbursement program, Gail Jackson, the vice president of human resources when we spoke, believes in the importance of curious employees. "It's better to train and have them leave than not to train and have them stay," she told me. But according to the Society for Human Resource Management's 2017 employee benefits report, only 44% of organizations provide or support cross-training to develop skills not directly related to workers' jobs.

Leaders might provide opportunities for employees to travel to unfamiliar locales. When we have chances to expand our interests, research has found, we not only remain curious but also become more confident about what we can accomplish and more successful at work. Employees can "travel" to other roles and areas of the organization to gain a broader perspective. At Pixar, employees across the organization can provide "notes"—questions and advice—that help directors consider all sorts of possibilities for the movies they are working on.

Employees can also broaden their interests by broadening their networks. Curious people often end up being star performers thanks to their diverse networks, my research with the University of Toronto's Tiziana Casciaro, Bill McEvily, and Evelyn Zhang finds. Because they're more comfortable than others asking questions, such people more easily create and nurture ties at work—and those ties are critical to their career development and success. The organization benefits when employees are connected to people who can help them with challenges and motivate them to go the extra mile. MIT's Bob Langer works to raise curiosity in his students by introducing them to experts in his network. Similarly, by connecting people across organizational departments and units, leaders can encourage employees to be curious about their colleagues' work and ways of doing business.

Deliberate thinking about workspaces can broaden networks and encourage the cross-pollination of ideas. In the 1990s, when Pixar was designing a new home for itself in Emeryville, across the bay from San Francisco, the initial plans called for a separate building for each department. But then-owner Steve Jobs had concerns about isolating the various departments and decided to build a single structure with a large atrium in the center, containing employee mailboxes, a café, a gift shop, and screening rooms. Forcing employees to interact, he reasoned, would expose them to one another's work and ideas.

Leaders can also boost employees' curiosity by carefully designing their teams. Consider Massimo Bottura, the owner of Osteria Francescana, a three-Michelin-star restaurant in Modena, Italy, that was rated the Best Restaurant in the World in 2016 and 2018. His sous chefs are Davide di Fabio, from Italy, and Kondo Takahiko, from Japan. The two

Leaders can stress the value of learning by reacting positively to mediocre ideas that could be springboards to better ones.

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differ not only in their origins but also in their strengths: Di Fabio is more comfortable with improvisation, while Takahiko is obsessed with precision. Such "collisions" make the kitchen more innovative, Bottura believes, and inspire curiosity in other workers.

5. Have "Why?" "What If...?" and "How Might We...?" Days

The inspiration for the Polaroid instant camera was a three-year-old's question. Inventor Edwin Land's daughter was impatient to see a photo her father had just snapped. When he explained that the film had to be processed, she wondered aloud, "Why do we have to wait for the picture?"

As every parent knows, *Why?* is ubiquitous in the vocabulary of young children, who have an insatiable need to understand the world around them. They aren't afraid to ask questions, and they don't worry about whether others believe they should already know the answers. But as children grow older, self-consciousness creeps in, along with the desire to appear confident and demonstrate expertise. By the time we're adults, we often suppress our curiosity.

Leaders can help draw out our innate curiosity. One company I visited asked all employees for "What if...?" and "How might we...?" questions about the firm's goals and plans. They came up with all sorts of things, which were discussed and evaluated. As a concrete sign that questioning was supported and rewarded, the best questions were displayed on banners hung on the walls. Some of the questions led employees to suggest ideas for how to work more effectively. (For more on the importance of asking good questions before seeking solutions, see "Better Brainstorming," HBR, March–April 2018.)

In one study, my colleagues and I asked adults working in a wide range of jobs and industries to read one of two sets of materials on three organizational elements: goals, roles, and how organizations as a whole work together. For half the workers, the information was presented as the "grow method"—our version of a control condition. We encouraged that group to view those elements as immutable, and we stressed the importance of following existing processes that managers had already defined. For the other half, the information was presented as the "go back method." We encouraged those employees to see the elements as fluid and to "go back" and rethink them. A week later we found that the workers who'd read about the "go back method" showed more creativity in tasks than the workers in the "grow method" group. They were more open to others' ideas and worked more effectively with one another.

To encourage curiosity, leaders should also teach employees how to ask good questions. Bob Langer has said he wants to "help people make the transition from giving good answers to asking good questions" (see "The Edison of Medicine," HBR, March–April 2017). He also tells his students that they could change the world, thus boosting the curiosity they need to tackle challenging problems.

Organizing "Why?" days, when employees are encouraged to ask that question if facing a challenge, can go a long way toward fostering curiosity. Intellectual Ventures, a company that generates inventions and buys and licenses patents, organizes "invention sessions" in which people from different disciplines, backgrounds, and levels of expertise come together to discuss potential solutions to tough problems, which helps them consider issues from various angles (see "Funding Eureka!" HBR, March 2010). Similarly, under Toyota's 5 Whys approach, employees are asked to investigate problems by asking Why? After coming up with an answer, they are to ask why *that's* the case, and so on until they have asked the question five times. This mindset can help employees innovate by challenging existing perspectives.

IN MOST ORGANIZATIONS, leaders and employees alike receive the implicit message that asking questions is an unwanted challenge to authority. They are trained to focus on their work without looking closely at the process or their overall goals. But maintaining a sense of wonder is crucial to creativity and innovation. The most effective leaders look for ways to nurture their employees' curiosity to fuel learning and discovery.

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The Five Dimensions of Curiosity

by Todd B. Kashdan, David J. Disabato, Fallon R. Goodman, and Carl Naughton

PSYCHOLOGISTS HAVE COMPILED a large body of research on the many benefits of curiosity. It enhances intelligence: In one study, highly curious children aged three to 11 improved their intelligence test scores by 12 points more than their least-curious counterparts did. It increases perseverance, or grit: Merely describing a day when you felt curious has been shown to boost mental and physical energy by 20% more than recounting a time of profound happiness. And curiosity propels us toward deeper engagement, superior performance, and more-meaningful goals: Psychology students who felt more curious than others during their first class enjoyed lectures more, got higher final grades, and subsequently enrolled in more courses in the discipline.

But another stream of research on curiosity is equally important, in our view. Since the 1950s psychologists have offered competing theories about what makes one person more curious than another. Rather than regard curiosity as a single trait, we can now break it down into five distinct dimensions. Instead of asking, "How curious are you?" we can ask, "How are you curious?"

A Brief History

In the 1950s Daniel Berlyne was one of the first psychologists to offer a comprehensive model of curiosity. He argued that we all seek the sweet spot between two deeply uncomfortable states: understimulation (coping with tasks, people, or situations that lack sufficient novelty, complexity, uncertainty, or conflict) and overstimulation. To that end we use either what Berlyne called "diver-

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sive curiosity" (as when a bored person searches for something—*anything*—to boost arousal) or what he called "specific curiosity" (as when a hyperstimulated person tries to understand what's happening in order to reduce arousal to a more manageable level).

Building on Berlyne's insights, in 1994 George Loewenstein, of Carnegie Mellon University, proposed the "information gap" theory. He posited that people become curious upon realizing that they lack desired knowledge; this creates an aversive feeling of uncertainty, which compels them to uncover the missing information.

But these theories, focused on our inherent desire to reduce tension, don't explain other expressions of curiosity: tourists strolling through a museum, entrepreneurs poring over feedback from beta testing, people engrossed in a book. The University of Rochester's Edward Deci addressed those in the 1970s, arguing that curiosity also reflects our intrinsic motivation "to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn." We use it not just to avoid discomfort but to generate positive experiences.

In another body of work, the University of Delaware psychologist Marvin Zuckerman spent five decades (from the 1960s to the 2000s) studying sensation seeking, or the willingness to take risks to acquire varied, novel, and intense experiences. And in 2006 the psychologist Britta Renner, of the University of Konstanz, initiated the study of social curiosity, or people's interest in how other individuals think, feel, and behave.

The Five-Dimensional Model

Synthesizing this and other important research, and in conjunction with our George Mason colleague Patrick McKnight, we created a five-dimensional model of curiosity. The first dimension, derived from Berlyne and Loewenstein's work, is *deprivation sensitivity*—recognizing a gap in knowledge the filling of which offers relief. This type of curiosity doesn't necessarily feel good, but people who experience it work relentlessly to solve problems.

The second dimension, influenced by Deci's research, is *joyous exploration*—being consumed with wonder about the fascinating features of the world. This is a pleasurable state; people in it seem to possess a joie de vivre.

The third dimension, stemming from Renner's research, is *social curiosity*—talking, listening, and

HOW ARE YOU **CURIOUS?**

Use this scale to indicate the degree to which the following statements describe you:
1: Does not describe me at all. 2: Barely describes me. 3: Somewhat describes me.
4: Neutral. 5: Generally describes me. 6: Mostly describes me. 7: Completely describes me.

DEPRIVATION SENSITIVITY

Thinking about solutions to difficult conceptual problems can keep me awake at night.	
I can spend hours on a single problem because I just can't rest without knowing the answer.	
I feel frustrated if I can't figure out the solution to a problem, so I work even harder to solve it.	
I work relentlessly at problems that I feel must be solved.	
It frustrates me to not have all the information I need.	
TOTAL	

JOYOUS EXPLORATION

I view challenging situations as an opportunity to grow and learn.	
I am always looking for experiences that challenge how I think about myself and the world.	
I seek out situations where it is likely that I will have to think in depth about something.	
I enjoy learning about subjects that are unfamiliar to me.	
I find it fascinating to learn new information.	
TOTAL	

SOCIAL CURIOSITY

I like to learn about the habits of others.	
I like finding out why people behave the way they do.	
When other people are having a conversation, I like to find out what it's about.	
When around other people, I like listening to their conversations.	
When people quarrel, I like to know what's going on.	
TOTAL	

STRESS TOLERANCE

The smallest doubt can stop me from seeking out new experiences.	
I cannot handle the stress that comes from entering uncertain situations.	
I find it hard to explore new places when I lack confidence in my abilities.	
I cannot function well if I am unsure whether a new experience is safe.	
It is difficult to concentrate when there is a possibility that I will be taken by surprise.	
TOTAL	

THRILL SEEKING

The anxiety of doing something new makes me feel excited and alive.	
Risk taking is exciting to me.	
When I have free time, I want to do things that are a little scary.	
Creating an adventure as I go is much more appealing than a planned adventure.	
I prefer friends who are excitingly unpredictable.	
TOTAL	

Scoring instructions: Compute the average score for each dimension (reverse score the items under stress tolerance). By comparing your results with those of a nationally representative sample of people in the United States, you can determine whether you are low, medium, or high on each dimension. See the next page to interpret your scores.

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observing others to learn what they are thinking and doing. Human beings are inherently social animals, and the most effective and efficient way to determine whether someone is friend or foe is to gain information. Some may even snoop, eavesdrop, or gossip to do so.

The fourth dimension, which builds on recent work by Paul Silvia, a psychologist at the University of North Carolina at Greensboro, is *stress tolerance*—a willingness to accept and even harness the anxiety associated with novelty. People lacking this ability see information gaps, experience wonder, and are interested in others but are unlikely to step forward and explore.

The fifth dimension, inspired by Zuckerman, is *thrill seeking*—being willing to take physical, social, and financial risks to acquire varied, complex, and intense experiences. For people with this capacity, the anxiety of confronting novelty is something to be amplified, not reduced.

We have been testing this model in several ways. With Time Inc. we conducted surveys across the United States to discover which of the dimensions lead to the best outcomes and generate particular benefits. For instance, joyous exploration has the strongest link with the experience of intense positive emotions. Stress tolerance has the strongest link with satisfying the need to feel competent, autonomous, and that one belongs. Social curiosity has the strongest link with being a kind, generous, modest person.

With Merck KGaA we have explored attitudes toward and expressions of work-related curiosity. In a survey of 3,000 workers in China, Germany, and the United States, we found that 84% believe that curiosity catalyzes new ideas, 74% think it inspires unique, valuable talents, and 63% think it helps one get promoted. In other studies across diverse units and geographies, we have found evidence that four of the dimensions—joyous exploration, deprivation sensitivity, stress tolerance, and social curiosity—improve work outcomes. The latter two seem to be particularly important: Without the ability to tolerate stress, employees are less likely to seek challenges and resources and to voice dissent and are more likely to feel enervated and to disengage. And socially curious employees are better than others at resolving conflicts with colleagues, more likely to receive social support, and more effective at building connections, trust, and commitment on their teams. People or groups high in both dimensions are more innovative and creative.

A monolithic view of curiosity is insufficient to understand how that quality drives success and fulfillment in work and life. To discover and leverage talent and to form groups that are greater than the sum of their parts, a more nuanced approach is needed.

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Todd B. Kashdan is a professor of psychology and a senior scientist at the Center for the Advancement of Well-Being at George Mason University. **David J. Disabato** and **Fallon R. Goodman** are doctoral students in clinical psychology at George Mason University. **Carl Naughton** is a linguist and an educational scientist. The first three authors consult with Time Inc., and all four consult with Merck KGaA.

WHAT YOUR SCORE MEANS

Deprivation Sensitivity	Joyous Exploration	Social Curiosity	Stress Tolerance	Thrill Seeking
LOW <3.7	LOW <4.1	LOW <3.0	LOW <3.1	LOW <2.6
MEDIUM +/–4.9	MEDIUM +/–5.2	MEDIUM +/–4.4	MEDIUM +/–4.4	MEDIUM +/–3.9
HIGH >6.0	HIGH >6.3	HIGH >5.8	HIGH >5.8	HIGH >5.2

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From Curious to Competent

by Claudio Fernández-Aráoz, Andrew Roscoe, and Kentaro Aramaki

FOR 30 YEARS our executive search firm has been in the business of assessing leaders along two broad dimensions: potential and competence. One key conclusion? You can't have either without curiosity.

Although we have found that high potentials also need insight, engagement, and determination, curiosity—defined as a penchant for seeking new experiences, knowledge, and feedback and an openness to change—is perhaps most important. In fact, in analyzing exactly how leaders develop, we've found that curiosity—which we assess on a four-point scale, from emerging to extraordinary, using interviews and reference checks—is the best predictor of strength in *all seven* of the leadership competencies we measure (results orientation, strategic orientation, collaboration and influence, team leadership, developing organizational capabilities, change leadership, and market understanding).

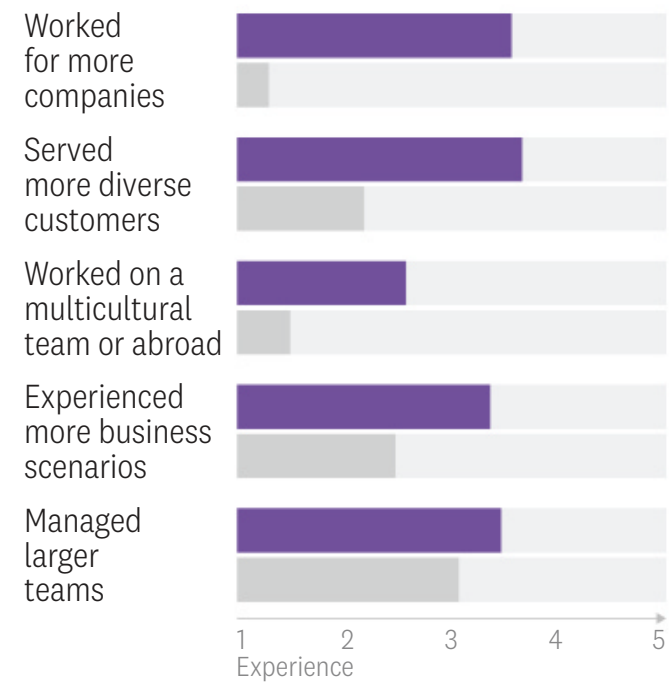
We've also found that executives with extraordinary curiosity are usually able, with the right development, to advance to C-level roles. However, that development is critical. Although a strong positive correlation exists between curiosity and competence, there is a significant spread—and a highly curious executive may score much lower on competence than less curious counterparts.

How can organizations help people make the leap from curious to competent? Studying our

Experiences That Transform Curiosity into Competence

Consider 20 leaders, all rated as extraordinarily curious. Ten leveraged that into high competence scores (represented by purple bars); 10 did not (gray bars). What made the difference? The extent to which they were given the opportunities below.

The top 10 had:



From: "From Curious to Competent," by Claudio Fernández-Aráoz, Andrew Roscoe, and Kentaro Aramaki, September–October 2018

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global database of information on executives' backgrounds, experiences, potential, and competence, we came up with an answer: by providing the right types of stretch assignments and job rotations.

Consider the cases of 20 actual general managers. All were rated as extraordinarily curious, yet only half reached the top level of competence; the other half were at the bottom. What separated the two groups was the complexity and breadth of the opportunities they'd been given, as shown in the graph on the preceding page. The top 10 executives had worked for more companies, been exposed to more diverse customers, worked abroad or with colleagues from other cultures, dealt with more business scenarios (start-ups, rapid growth, M&A, integration, downsizing, turnarounds), and managed more people. When curious people are given these experiences, they shine. When they aren't, they either stagnate or jump ship. While most of the low-competence managers had worked for just one company, the outstanding ones had worked for more than three.

Note, too, that although our potential and competence models hold true around the world, not all cultures achieve the same competence return on curiosity, as depicted in the graph at left. For example, although the Japanese have lots of curiosity, their competence scores are barely average. The British, by contrast, are less curious but more competent. Why these differences? We believe that Japan's cultural norms limit people's development by rewarding tenure above all and by discouraging big job moves. Meanwhile, British firms embrace company and role changes along with coaching. This is yet more evidence that although curiosity is a necessary ingredient for executive success, in itself it's not enough.

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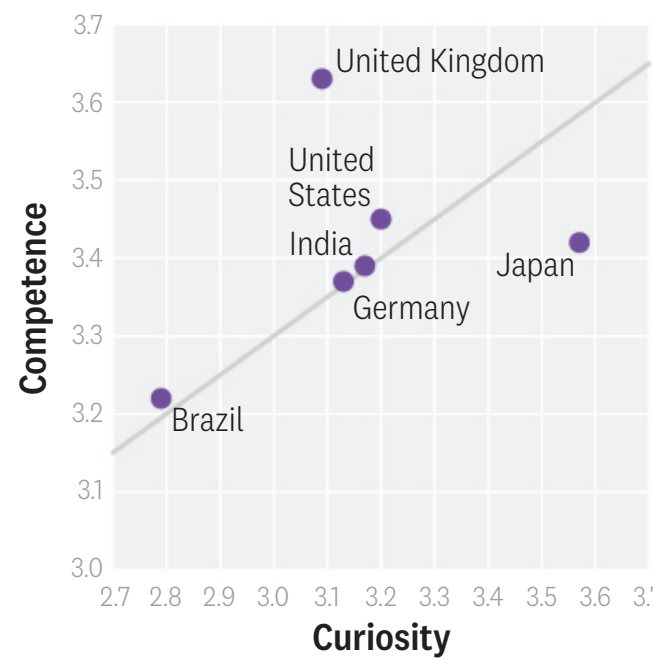
The Curiosity-Competence Link Across Six National Cultures

In many countries, executives' average scores on curiosity (measured on a scale of one to four) and competence (one to seven) come in at similar levels. But Japan and the UK are outliers. In the former, high curiosity does not yield high competence. In the latter, low curiosity does not stop leaders from being highly competent. Cultural norms that prevent (Japan) or encourage (the UK) big job moves may be one reason.



Note: Egon Zehnder selected these countries because they were the only ones in its database with a statistically significant sample set. From: "From Curious to Competent," by Claudio Fernández-Aráoz, Andrew Roscoe, and Kentaro Aramaki, September–October 2018

Claudio Fernández-Aráoz is a senior adviser at Egon Zehnder and the author of *It's Not the How or the What but the Who* (Harvard Business Review Press, 2014). **Andrew Roscoe** is the former leader of Egon Zehnder's Executive Assessment and Development Practice, and **Kentaro Aramaki** is the leader of that practice in Japan.

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Quick Takes

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How to Give and Receive Feedback About Creative Work

by Spencer Harrison

FEEDBACK IS crucial for learning and improving, but being on the receiving end of it when it's critical is rarely fun. Many people have a negative reaction to feedback, especially feedback on their creative work. In a study of seven companies and 11,471 days of creative work, researchers found two striking patterns: First, getting feedback was incredibly rare, indicating that people seemed to avoid it; and second, when people did receive feedback, it generally left a negative emotional residue.

So what might good feedback for creative work look like? By "good feedback," I mean feedback that creative workers actually want and that leads to changes that improve their creative output.

Identifying this requires understanding how creativity works. Creativity is the generation of an idea that is both useful and novel. Combining the two requires some care because novelty, by definition, is something unfamiliar to both the creator and anyone seeing the idea for the first time. As a result, early creative ideas can be fragile and dismissed as too new, weird, or unnecessary. New ideas need direction that can build them up, rather than critiques that may tear them down.

At the same time, creativity does require feedback. As much as we have mythologized creativity as the domain of an individual genius working alone, almost all creative processes used in organizations—design thinking, lean-startup methodologies, agile development, and more—require getting feedback on early creative work. As a result, organizations need to provide effective feedback to cultivate creative ideas; it's one of the ways for them to adapt to industry changes and competitive pressures. In other words, there's a real need to understand how to give and receive feedback effectively in creative work.

When providing feedback to creative workers, signal that your opinion is exactly that: an opinion.

Suffolk University's Karyn Dossinger and I recently published research that addresses this topic, focusing on a successful online company that crowdsources T-shirt designs from a large community of freelance designers. Their website hosts a forum where designers can ask for feedback on early design prototypes from their peers and then post updated designs based on the feedback they received. Looking over almost 2,000 feedback statements, we learned that two dynamics seem crucial: First, designers who were motivated to seek feedback out of curiosity, rather than simply to improve their design, attracted more and higher-quality feedback. Second, the peers providing critiques who recognized that feedback is a subjective opinion rather than an objective statement were more effective in enhancing the creativity of the final design. I'll explain each below.

Asking for feedback out of curiosity. How we ask for feedback influences the scope and type of feedback we receive. Sometimes requests for feedback are overly narrow. For example, we found that some T-shirt designers asked for feedback about the color of a dinosaur they illustrated,

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their font choice, or the placement of a monkey working on a typewriter. There are often underlying reasons for asking a specific question like this, including limiting a coworker from attacking your work or showcasing something you're proud of (in which case you really don't want feedback—you want admiration).

This approach, however, limits the potential of creative work, because it doesn't allow for the possibility of novelty. Changing one color, for example, may not push the boundaries to create something that peers and potential customers haven't seen before.

Our research showed that highly curious individuals asked extremely open questions like "What do you think?" or "Where could I go next with this?" These designers received significantly more feedback than those asking narrow questions, and their final designs received higher scores. We believe this is because, by leading with curiosity, the feedback seeker is signaling he or she is open to ideas beyond his or her own. In contrast, narrow questions signal that the feedback seeker already has a set of ideas and wants validation that those ideas are correct. In this way, creative work is like dancing: Questions born out of curiosity signal that the creative worker is looking for a dance partner.

Providing feedback based on subjectivity. If asking questions is like asking for a dance partner, then providing feedback is being the type of dance partner someone would actually want to dance with. A huge part of creativity is this ability to get your audience to agree that what you're doing feels new and surprising to them. And just as asking open questions honors the fact that creativity requires novelty, providing feedback needs to honor that same assumption. It needs to provide space for something new, something that might not be anticipated by either party, to emerge.

When providing feedback to creative workers, signal that your opinion is exactly that: an opinion. This seems deceptively easy. Doing it requires providing feedback that includes first-person pronouns: I, me, and my. "I see..." or "What strikes me is that..." or "My opinion is..." Many managers find this difficult, because they have been trained to solve concrete problems, not to consider what something really means. Providing feedback on creative work means setting aside the managerial impulse to plan and retain control. This allows managers to understand that their opinions provide potential trajectories a creative worker might try—not the "right" road to take.

Feedback is tricky, and it's even trickier for creative work. But asking for feedback out of curiosity and providing feedback on the basis of subjectivity can improve both the process and the outcomes.

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RADEK MICA/GETTY IMAGES

Maybe Your Team Doesn't Need to Be Creative

by Tomas Chamorro-Premuzic

WHEN IT comes to creativity, organizations are a lot like people. They have no problem generating ideas, including potentially useful and novel ones. Furthermore, they are also generally able to access creative ideas generated by others. Where they fail, however, is at turning those ideas into actual innovations. Indeed, few creative ideas ever become innovative products or services.

Yet too many managers see a lack of innovation in their companies and lament their teams' "lack of creativity." In fact, a lack of creativity is not the problem; a lack of execution is. Before you diagnose your problem as a dearth of new ideas, first see if you need to fix any of the following more common challenges:

Fear of change. Few things are more harmful to creativity than fear of change, not least because of its ubiquity in the realm of human emotions. Although we glamorize innovation, the truth is that we are prewired to make our environments as stable and familiar as possible. To adapt is to make the world more predictable. Uncertainty is traumatic, and our quest for meaning leads to the creation of tautological and closed systems that we then fight to preserve. Religion, philosophy, and science—as well as cults and political movements—exist to reduce ambiguity and construct an illusion of truth

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that provides a sense of predictability and mental stability in our lives. These deep-seated beliefs about the world are designed to be unquestionable, and they are hard to unlearn.

Because innovation always involves a degree of creative destruction, it threatens the status quo and demands adaptation to the unknown. As Peter Drucker noted, "If you want something new, you have to stop doing something old." This happens at not just the individual level but the team and organizational levels, too. Thus, even when some individuals are courageous or crazy enough to push for change, they will be resisted by the majority. If they are not, they were not really pushing for change.

Client-centric approach. In any industry, customers tend to resist innovation. Henry Ford famously noted that if he had asked his customers what they wanted, they would have said "faster horses." The point of course is that clients don't always know what they want, but it's your task to figure out what they need—or, even better, to create that need. As Marshall McLuhan said, "Invention is the mother of necessity." Thus a customer-centric approach to innovation may lead to progressive and incremental improvements to your products and services—the sort of Kaizen-style innovation pioneered by Toyota and perfected by Amazon—but if you want groundbreaking inventions or radical innovation, you are better off ignoring your customers.

Failure to build teams. It is often said that there are no statues of committees. Yet the romantic Western view that innovation emerges from the heroic individual efforts of creative superstars—the lone rangers of disruption—is both naive and counterproductive. All innovation happens as the result of coordinated team effort, and the most innovative teams are not full of creatives. Instead, they complement one or two creative minds with diligent executors, savvy networkers, organized project managers, and, above all, hardworking implementers. Even conformist individuals can enhance the innovation output of teams, presumably by making innovation more palatable to the masses.

The most innovative teams are not full of creatives.

As much as we like to put a face to innovation, it would be fairer to acknowledge the contributions of those who work silently in the background to make innovation happen.

Complacency. All organizations are victims of their own success, because success is the chief enemy of innovation. Indeed, a fundamental law underlying the life cycle of any successful venture is that innovation leads to growth, but growth inhibits innovation. In other words, when you are young and small, you are hungry and aggressive, which leads to success. However, success contains the seeds of self-destruction because when you grow rich, you become fat, lazy, and too interested in preserving and maintaining what you achieved to focus on accomplishing more.

The problem is that complacency nurtures entropy—a gradual deterioration and degeneration into chaos and extinction. From Kodak to Nokia, from Blockbuster to Borders, the cemetery of defunct companies and products is the result of complacency trumping drive and ambition. The ability to remain dissatisfied with one's achievements is what helps both individuals and companies grow.

Ineffective leadership. Innovation is ultimately about leadership. It takes leadership to see or create the future before others do. It takes leadership to foster entrepreneurship, the process by which creativity becomes innovation. And it takes leadership to provide a compelling vision to others—that is, a meaningful mission that provides a sense of purpose and direction for the business and aligns its members in the pursuit of a common task.

Leaders are also responsible for creating the culture that rewards and sanctions the relevant behaviors that make innovation happen. A comprehensive meta-analysis of the organizational drivers of innovation reported that support for innovation, vision, and external communication were the strongest predictors of creativity and innovation. Thus, without a good strategy or the ability to turn that strategy into action, innovations will be futile. Most leaders say they value, and even prioritize, innovation, yet how many put their money where their mouth is or have the capacity to unleash an organization's creative potential?

In short, it may be wise to spend less time coming up with new ideas and more time setting up the conditions that enable a few ideas to become innovative products, services, and businesses.

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Executive Summaries

"Most people are in fact quite capable of novel thinking and problem solving, if only their organizations would stop pounding them into conformity."

HOW TO BUILD A CULTURE OF ORIGINALITY
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10 | Reclaim Your Creative Confidence

Tom Kelley and David Kelley

Most people are born creative. But over time, a lot of us learn to stifle those impulses. We become warier of judgment, more cautious, more analytical. The world seems to divide into "creatives" and "noncreatives," and too many people resign themselves to the latter category. And yet we know that creativity is essential to success in any discipline or industry.

The good news, according to authors Tom Kelley and David Kelley of IDEO, is that we all can rediscover our creative confidence. The trick is to overcome the four big fears that hold most of us back: fear of the messy unknown, fear of judgment, fear of the first step, and fear of losing control.

The authors use an approach based on the work of psychologist Albert Bandura in helping patients get over their snake phobias: You break challenges down into small steps and then build confidence by succeeding on one after another. Creativity is something you practice, say the authors, not just a talent you are born with.

HBR Reprint R1212K

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ARRANGE A TIME AND PLACE

16 | Find Innovation Where You Least Expect It

Tony McCaffrey and Jim Pearson

When the *Titanic* collided with an iceberg and sank, only 705 of its 2,200 passengers and crew, floating in 16 lifeboats, were saved. Imagine how many more might have lived if crew members had thought of the iceberg as not just the cause of the disaster but a lifesaving solution.

The iceberg rose high above the water and stretched nearly 400 feet in length. The lifeboats, or the *Titanic* itself, might have been able to pull close enough to the iceberg for people to scramble on.

Regardless of whether this could actually have worked, it's an intriguing idea—yet surprisingly difficult to envision. That's because a cognitive bias called "functional fixedness" limits people to seeing objects only in the way in which they're traditionally used. In a nautical context, an iceberg is a hazard to be avoided; it's very hard to see it any other way.

When it comes to innovation, businesses are constantly hampered by functional fixedness and other cognitive biases that cause people to overlook elegant solutions hidden in plain sight.

We can overcome this bias—and similar biases about an object's design and purpose—by changing how we describe the object and how we think about its component parts.

This article also presents techniques and tools to help managers think in innovative ways—a process the authors call "brainswarming"—about common business problems, whether it be conceiving new products, finding novel applications for existing products, or anticipating competitive threats.

HBR Reprint R1512F

24 | Drunk People Are Better at Creative Problem Solving

Andrew Jarosz

Can a certain amount of alcohol boost creative problem solving? A study performed by professor Andrew Jarosz of Mississippi State University and some of his colleagues suggests that it does, in fact, do just that. As part of the study, Jarosz and his colleagues gave 20 male subjects ages 21 to 30 enough vodka-cranberry cocktails to push them near the legal limit of drunkenness. The researchers then gave the men a series of word association problems to solve. The result? Those who drank the cocktails outperformed those who were in a sober control group—they delivered answers more quickly and correctly.

The study helps back up the oft-repeated claim by writers, artists, and composers who say that drinking helps lubricate their creativity. But while research shows that out-of-the-box thinking may benefit from a few drinks in the bar, imbibing too much—beyond the .08 limit—likely will inhibit productive thinking. In fact, drinking too much will make it difficult to filter out bad ideas. Future research might include studying the effects of alcohol on the creative problem-solving abilities of two additional groups—young women and older people.

HBR Reprint F1803B

32 | Why You Should Rotate Office Seating Assignments

Harvard Business Review Staff

Design firms have long claimed that workspace reorganizations promote collaboration and creativity, and research studies back up those claims. But the financial return has been hard to prove—until now. Research at a South Korean e-commerce firm finds that relocating "merchandisers"—employees who source product deals—near employees they hadn't previously had much contact with boosted creativity among those with high deal-sourcing ability and significantly increased revenue per worker. Merchandizers in the area containing more teams sourced 20% more deals from new suppliers, on average, than all merchandizers had sourced before the move. The daily deal revenue of each merchandizer sitting with previously unfamiliar colleagues was, on average, 40% higher ($16,510 a day) than the merchandizers' premove average. The employees did not work directly with each other. Rather, the increased quality of work was inspired by dialogue that was overheard and informal conversations. And the benefits were realized fast—within a month.

Companies competing on knowledge sharing and innovation could find payoffs from periodic workspace reconfigurations, the researchers say. Many companies have already moved from closed-door offices and cubicles to communal workstations. Some workstations have wheels. Other firms randomly and periodically reassign desks. The idea is to encourage individual and collective performance by exposure to different worlds and ways of thinking.

HBR Reprint F1802A

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IMPROVE YOUR TEAM'S BRAINSTORMING

38 | Better Brainstorming

Hal Gregersen

Great innovators have long known that the secret to unlocking a better answer is to ask a better question. Applying that insight to brainstorming exercises can vastly improve the search for new ideas—especially when a team is feeling stuck. Brainstorming for questions, rather than answers, helps you avoid group dynamics that often stifle voices, and it lets you reframe problems in ways that spur breakthrough thinking.

After testing this approach with hundreds of organizations, MIT's Hal Gregersen has developed it into a methodology: Start by selecting a problem that matters. Invite a small group to help you consider it, and in just two minutes describe it at a high level so that you don't constrain the group's thinking. Make it clear that people can contribute only questions and that no preambles or justifications are allowed. Then, set the clock for four minutes, and generate as many questions as you can in that time, aiming to produce at least 15. Afterward, study the questions generated, looking for those that challenge your assumptions and provide new angles on your problem. If you commit to actively pursuing at least one of these, chances are you'll break open a new pathway to unexpected solutions.

HBR Reprint R1802C

BUILD BETTER PRODUCTS

50 | Design Thinking

Tim Brown

In the past, design has most often occurred fairly far downstream in the development process and has focused on making new products aesthetically attractive or enhancing brand perception through smart, evocative advertising. Today, as innovation's terrain expands to encompass human-centered processes and services as well as products, companies are asking designers to *create* ideas rather than to simply dress them up.

Brown, the CEO and president of the innovation and design firm IDEO, is a leading proponent of design thinking—a method of meeting people's needs and desires in a technologically feasible and strategically viable way. In this article he offers several intriguing examples of the discipline at work. One involves a collaboration between frontline employees from health care provider Kaiser Permanente and Brown's firm to reengineer nursing-staff shift changes at four Kaiser hospitals. Close observation of actual shift changes, combined with brainstorming and rapid prototyping, produced new procedures and software that radically streamlined information exchange between shifts. The result was more time for nursing, better-informed patient care, and a happier nursing staff.

Another involves the Japanese bicycle components manufacturer Shimano, which worked with IDEO to learn why 90% of American adults don't ride bikes. The interdisciplinary project team discovered that intimidating retail experiences, the complexity and cost of sophisticated bikes, and the danger of cycling on heavily trafficked roads had overshadowed people's happy memories of childhood biking. So the team created a brand concept—"Coasting"—to describe a whole new category of biking and developed new in-store retailing strategies, a public relations campaign to identify safe places to cycle, and a reference design to inspire designers at the companies that went on to manufacture Coasting bikes.

HBR Reprint R0806E

MAKE YOUR ORGANIZATION MORE CREATIVE

62 | Creativity and the Role of the Leader

Teresa M. Amabile and Mukti Khaire

In today's innovation-driven economy, understanding how to generate great ideas has become an urgent managerial priority. Suddenly, the spotlight has turned on the academics who've studied creativity for decades. How relevant is their research to the practical challenges leaders face?

To connect theory and practice, Harvard Business School professors Amabile and Khaire convened a two-day colloquium of leading creativity scholars and executives from companies such as Google, IDEO, Novartis, Intuit, and E Ink. In this article, the authors present highlights of the research presented and the discussion of its implications.

At the event, a new leadership agenda began to take shape, one rooted in the awareness that you can't manage creativity—you can only manage *for* creativity. A number of themes emerged: The leader's job is not to be the source of ideas but to encourage and champion ideas. Leaders must tap the imagination of employees at all ranks and ask inspiring questions. They also need to help their organizations incorporate diverse perspectives, which spur creative insights, and facilitate creative collaboration by, for instance, harnessing new technologies.

The participants shared tactics for enabling discoveries, as well as thoughts on how to bring process to bear on creativity without straitjacketing it. They pointed out that process management isn't appropriate in all stages of creative work; leaders should apply it thoughtfully and manage the handoff from idea generators to commercializers deftly. The discussion also examined the need to clear paths through bureaucracy, weed out weak ideas, and maximize the organization's learning from failure. Though points of view varied, the theories and frameworks explored advance the understanding of creativity in business and offer executives a playbook for increasing innovation.

HBR Reprint R0810G

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72 | How to Build a Culture of Originality

Adam Grant

Fresh, innovative thinking is essential for business growth, and most people—not just a few gifted "visionaries"—are capable of it. So says the Wharton School's Adam Grant, whose research shows that you can develop this skill in your organization by creating a culture of nonconformity.

Start by giving employees license to let their imaginations run wild: A large quantity of diverse ideas will ultimately yield the highest-quality ones. To help people dream up a multitude of new products, strategies, or solutions, encourage them to adopt the mindset of a competitor, for example, and have them generate ideas privately (group brainstorming tends to conform to the majority's taste).

Once lots of ideas are in, get feedback on which one to pursue from the right people: other innovators with a track record of spotting winners. You might even stage a contest to find the best ideas, and have peer judges and other subject-matter experts vet the submissions and suggest improvements.

Sustaining a culture of originality is as important as building it. So focus, too, on balancing cultural cohesion (which can improve decision making) with creative dissent (which prevents a strong culture from becoming a cult). Long-term, it's the combination of the two that brings great ideas to the table.

HBR Reprint R1603H

80 | How Pixar Fosters Collective Creativity

Ed Catmull

Many people believe that good ideas are rarer and more valuable than good people. Ed Catmull, former president of Pixar and Disney Animation Studios, couldn't disagree more. That notion, he says, is rooted in a misguided view of creativity that exaggerates the importance of the initial idea in developing an original product. And it reflects a profound misunderstanding of how to manage the large risks inherent in producing breakthroughs.

In filmmaking and many other kinds of complex product development, creativity involves a large number of people from different disciplines working effectively together to solve a great many inherently unforeseeable problems. The trick to fostering collective creativity, Catmull says, is threefold: Place the creative authority for product development firmly in the hands of the project leaders (as opposed to corporate executives); build a culture and processes that encourage people to share their work in progress and support one another as peers; and dismantle the natural barriers that divide disciplines.

Mindful of the rise and fall of so many tech companies, Catmull has also sought ways to continually challenge Pixar's assumptions and search for the flaws that could destroy its culture. Clear values, constant communication, routine postmortems, and the regular injection of outsiders who will challenge the status quo are necessary but not enough to stay on the rails. Strong leadership is essential to make sure people don't pay lip service to those standards. For example, Catmull comes to the orientation sessions for all new hires, where he talks about the mistakes Pixar has made so people don't assume that just because the company is successful, everything it does is right.

HBR Reprint R0809D

90 | The Business Case for Curiosity

Francesca Gino

Although leaders might *say* they value inquisitive minds, in reality most stifle curiosity, fearing it will increase risk and inefficiency. Harvard Business School's Francesca Gino elaborates on the benefits of and common barriers to curiosity in the workplace and offers five strategies for bolstering it. Leaders should hire for curiosity, model inquisitiveness, emphasize learning goals, let workers explore and broaden their interests, and have "Why?" "What if...?" and "How might we...?" days. Doing so will help their organizations adapt to uncertain market conditions and external pressures and boost the business's success.

The Five Dimensions of Curiosity

Todd B. Kashdan, David J. Disabato, Fallon R. Goodman, and Carl Naughton

Psychologists have come to realize that curiosity is not a monolithic trait. George Mason University's Todd B. Kashdan, David J. Disabato, and Fallon R. Goodman, along with linguist and educational scientist Carl Naughton, break it down into five distinct dimensions: deprivation sensitivity, joyous exploration, social curiosity, stress tolerance, and thrill seeking. They explore which dimensions lead to the best outcomes and generate particular benefits in work and life.

From Curious to Competent

Claudio Fernández-Aráoz, Andrew Roscoe, and Kentaro Aramaki

The executive search firm Egon Zehnder has found that executives with extraordinary curiosity are usually able, with the right development, to advance to C-level roles. But that development is critical: Without it, a highly curious executive may score much lower on competence than less curious counterparts. Egon Zehnder's Claudio Fernández-Aráoz, Andrew Roscoe, and Kentaro Aramaki describe the types of stretch assignments, job rotations, and other experiences needed to transform curiosity into competence.

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