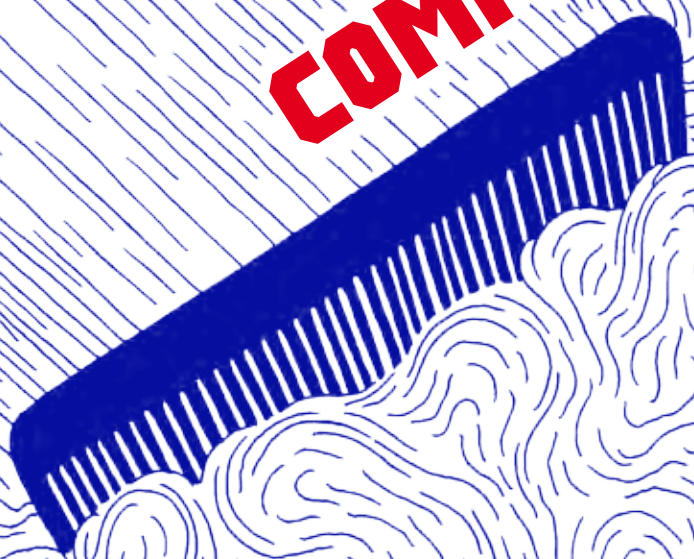
Think:Act

navigating complexity

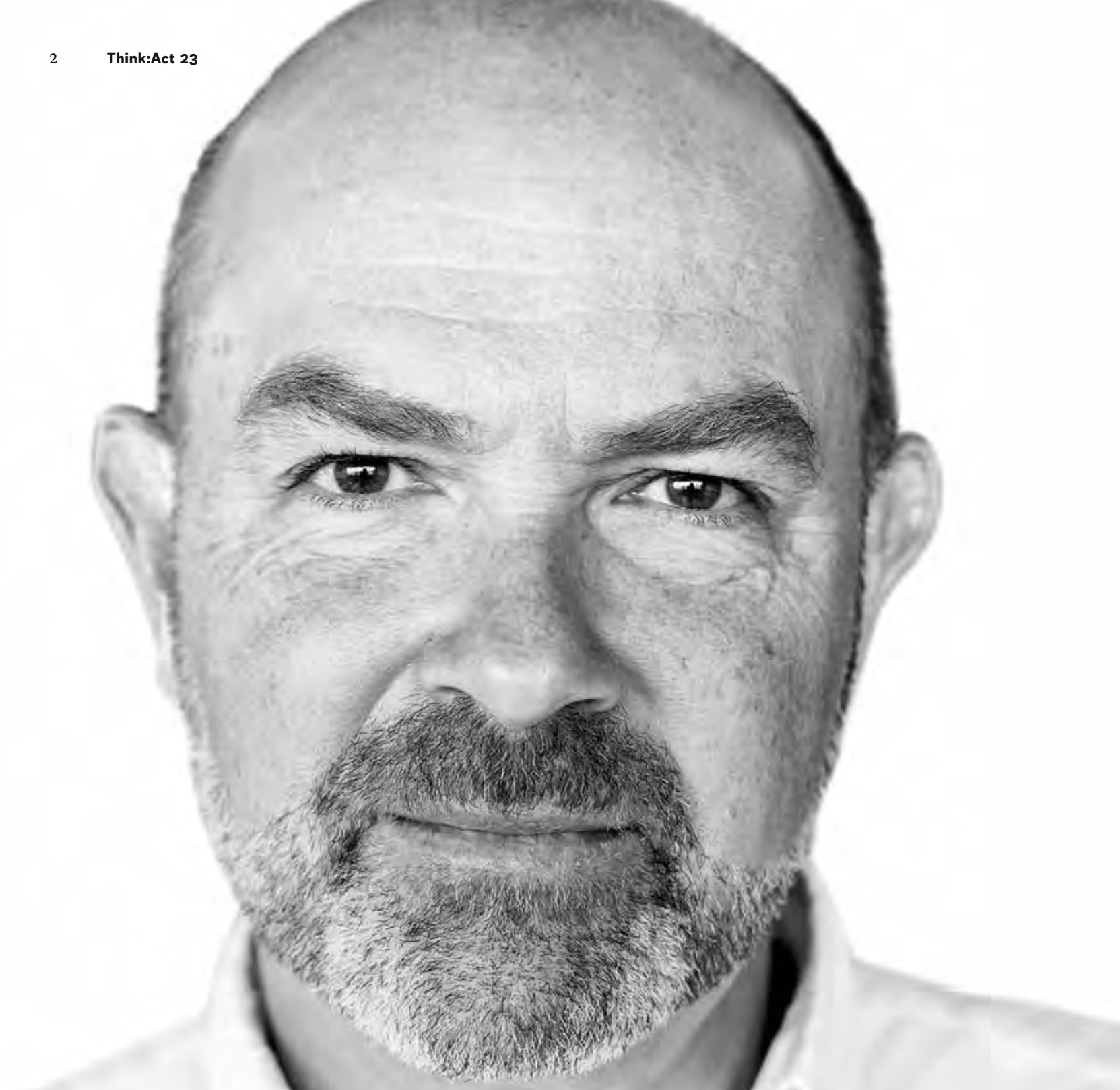
Think:Act #23 10|2017 COMPLEXITY

WE NEED TO TALK ABOUT COMPLEXITY



Roland Berger

50 navigating complexity



"The internet exposed the latent demand for choice. We didn't have the mechanical ability to expose people to choice until the internet opened that up."

CHRIS ANDERSON
Tech visionary, former editor-in-chief of *Wired* magazine and author of *The Long Tail*

READ MORE ON PAGE 58

PHOTO: CHRISTOPHER MICHEL

"I encourage researchers to go beyond using the human mind as their only, or even primary, template."

ERIK BRYNJOLFSSON
Artificial intelligence expert and co-author of *The Second Machine Age*

READ MORE ON PAGE 26

PHOTO: GETTY IMAGES

"Innovation is hard work. You can't force somebody to innovate; they have to volunteer, which is why you have to work to create a context that makes them willing."

LINDA HILL
Leadership guru and co-author of *Collective Genius*

READ MORE ON PAGE 70

PHOTO: ALASTAIR FYFE

"We know that because customers are busy, they are surprisingly likely to take whatever option is made the default."

RICHARD THALER
Behavioral economist and co-author of *Nudge*

READ MORE ON PAGE 45

PHOTO: MATT FURMAN / REDUX / LAIF

"To survive in our increasingly complex world, we can seek inspiration from nature which doesn't try to manage complexity; rather it focuses on evolution by adapting its mechanisms to the changing environment."

CHARLES-EDOUARD BOUÉE
CEO of Roland Berger

PHOTO: JAN VOTH

Think:Act

THE COMPLEXITY ISSUE

12

YOU ARE HERE, AND IT IS COMPLEX AS HELL. HOW DO YOU FIND YOUR WAY?

The list of things that can go wrong is getting longer all the time. We take a look at how to break through the complexity and get the facts you need the most to spot key trends – and act on them.

34

King of Hearts

How do you make complex operations manageable and affordable? Surgeon Devi Shetty has some innovative solutions.

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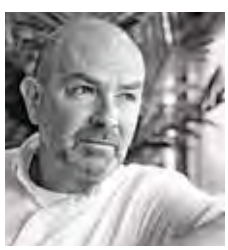
The Long Tale of a Man On Trend

Chris Anderson talks about how open-source tools are changing the idea of entrepreneurship.



COVER ILLUSTRATION: MRZYK & MORICEAU | PHOTOS: HARI ADIVAREKAR; PR 3D ROBOTICS | ILLUSTRATION: MARK VON ULRICH

Think *in* Numbers

19

THE NUMBER OF G20 country leaders who pledged their support to back the Paris Agreement at the summit in Germany in July of this year. They will continue their commitment despite US withdrawal.

100

THE NUMBER OF DAYS Tesla boss Elon Musk has promised it will take to install the world's largest lithium-ion battery in Australia. It aims to protect against energy blackouts and stabilize the energy network.

3.2

BILLION DOLLARS. The valuation of tech company Jawbone in 2014. Now in liquidation, it is the second-largest failure among venture-backed companies and an example of Silicon Valley "death by overfunding."

1

MILLION plastic bottles are bought globally every minute, causing a massive waste and pollution problem. The figure is set to jump 20% by 2021, which could lead to an environmental crisis some campaigners say is as serious as climate change.

Food for Thought

Are moral decisions as important as financial ones in doing business?

BY *David Jones*

I DON'T ACTUALLY THINK they are two different things, or disconnected. If we learned one thing from the financial collapse of 2008, it was that the pursuit of profit purely for profit's sake leads to a very bad place. That economic meltdown took business in a more socially responsible direction. Smart CEOs now understand that morally good decisions are invariably financially good ones too.

This is being driven in large part by Millennials – we see these young leaders coming through **One Young World** and they are much better informed than any preceding generation, much more socially reponsible and they will use social media to punish companies that don't live up to their expectations. Equally, the most socially responsible companies benefit from social media as they gather positive advocates who spread the word about their brand or business. The best business leaders, such as Unilever's CEO Paul Polman, who has put social responsibility at the core of their business strategy, know the importance of socially responsible business – Unilever's Sustainable Living brands grew over 50% faster than the rest of the business and delivered more than 60% of Unilever's growth in 2016.

Financial success walks hand in hand with social responsibility. They are not mutually exclusive options. Doing good is good for business. Social media has taken corporate social responsibility out of the silo and put it in the profit and loss account.

DAVID JONES is former CEO of Havas, founder of the world's first brandtech group You & Mr Jones and co-founder of ***One Young World.*** He is the author of the best-selling book ***Who Cares Wins: Why Good Business is Better Business.***

PHOTOS: GETTY IMAGES; PR ONEYOUNGWORLD. SOURCES: BBC; REUTERS; EUROMONITOR INTERNATIONAL

Thin

AT A GLANCE

Thoughts to *Live By*

"We always *overestimate* the change that will occur in the next two years and *underestimate* the change that will occur in the next 10. Don't let yourself be lulled into inaction."

— Bill Gates
Microsoft co-founder, investor and philanthropist

Re-Thinking Buzzwords

Get to grips with new industry lingo in a flash with our stripped-down explanations of the latest jargon.

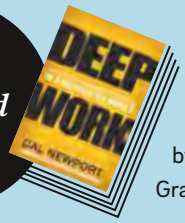
"Catalytic questioning"

Hal Gregersen's great alternative to brainstorming is a five-step procedure to help you ask the right questions to get to the heart of a matter. The process helps a group center on a problem and winnow the irrelevancies and flex its "questioning muscles."

So what are those five stages?
1: Get around a whiteboard,
2: Choose the right problem,
3: Engage in question talk,
4: Identify "catalytic questions"
and 5: Find a solution. That all
sounds suspiciously like, er, just
asking questions. But maybe
there's more to it. Gregersen calls
it an "essential skill to unlock
solutions."

Think:Act

The Redacted Read



Deep Work: Rules for Focused Success in a Distracted World
by Cal Newport. 304 pages.
Grand Central Publishing. **$28.**

Work, work, work

Too busy to read the strategy books? We have it covered for you. Here's Cal Newport's new offer cut down to its essentials, in the style of the original.

WHY CAN'T YOU GET MORE DONE AT WORK? Maybe it's because you don't do enough deep work – professional activities performed in a state of distraction-free concentration that push your cognitive capabilities to the limit. More deep work will help you wring every last drop of value out of your current intellectual capacity, improve your mental abilities, learn hard things and perform at a high level.

Busyness is often treated as a proxy for productivity, which is why deep work is relatively rare in the workplace. This scarcity means that if you develop your personal ability to go deep when you work, then you can reap great rewards. To succeed in this, you'll need to follow these four rules:

1. WORK DEEPLY.
To work deeply, you must focus on the tasks that matter most to meeting your most important goal.

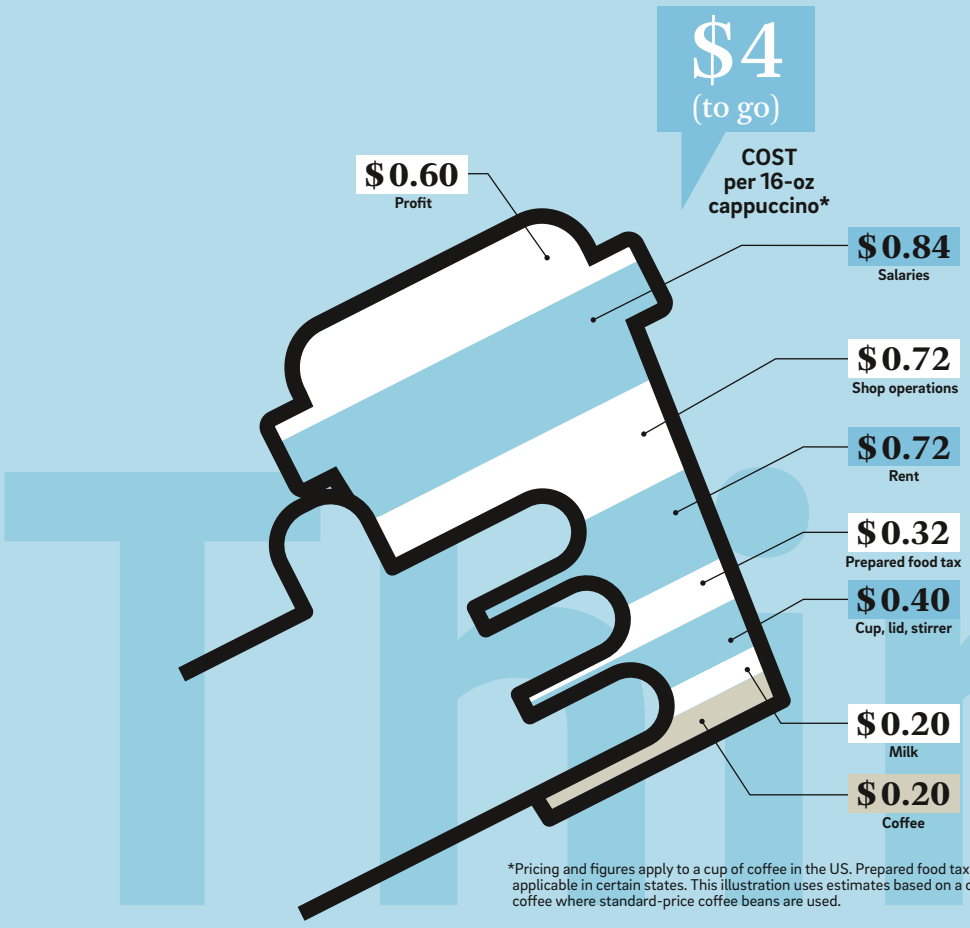
2. EMBRACE BOREDOM.
The internet makes it easy to lose your focus. Try to ration your internet use, at home as well as at work.

3. QUIT SOCIAL MEDIA.
Social media is a distraction that reduces your capacity to focus. Stay off social media except when you can see a tangible benefit to your career.

4. DRAIN THE SHALLOWS.
Stop working late. Committing to an early quitting time reduces your opportunity to waste time doing shallow work during the day. In the end, if you replace the shallows with more deep work, you may actually be more successful.

Actual Cost

YOU BUY A CUP OF COFFEE. While licking the first bit of warm, frothy milk from your upper lip, did you ever pause to consider that coffee is one of the smallest cost components in producing your morning cappuccino/skinny latte/flat white/ latest coffee takeaway fad? Although that can change if the bean is small batch and single source, the biggest factor remains the smiling barista. Think about that before you tip (or sip).



*Pricing and figures apply to a cup of coffee in the US. Prepared food tax is applicable in certain states. This illustration uses estimates based on a cup of coffee where standard-price coffee beans are used.

ICON: OKSANA LATYSHEVA / THE NOUN PROJECT. SOURCES: COFFEE MAKERS USA; COFFEED.COM; THE TAX FOUNDATION / US; ROADSIDE RETAIL; INTELLIGENT BUSINESS SYSTEMS

Best Practice

For goodness' sake, who pours the sake in Japan?

SO YOU ARE AT THAT BUSINESS DINNER IN TOKYO. The sake bottle comes out and before you know it, one of the women at the table is pouring it into one of those tiny cups in front of you. You might try to take the bottle and pour your own, but what will follow will be akin to a prolonged wrestling match: Your Japanese hosts will exchange embarrassed glances and eventually one of them might explain to you, the *gaijin* (foreigner), that pouring sake in Japan is a woman's business. Not always, perhaps, but it's the norm. Some might feel uneasy about a woman serving a man like this. But many Japanese don't see it that way. Spend enough time in Japan and you will find that sometimes the strongest, most empowered and successful women will happily pour a man a cup of sake. Occasionally, if they are the only woman at the table, they will even keep pouring for all the men all evening long. *Kanpai* (that's cheers to you and me)!

Economic Impact

Putting Pittsburgh over Paris

DO TRUMP'S NUMBERS ADD UP?: Donald Trump galvanized voters in states like Pennsylvania by promising to turn his back on the Paris Agreement and send America's coal miners back to work. On June 12, 2017, he tweeted to announce the opening of the Acosta mine. Located 60 miles south of Pittsburgh, it was the first new coal mine to open in the US since his inauguration – the plans, however, had been in place since before the election and statisticians say the positive growth numbers being reported by his administration are preliminary at best, misleading at worst.

Think:Act

AT A GLANCE

PHOTOS: PR, GETTY IMAGES (2)


COMPLEXITY

YOU ARE HERE

AND IT IS COMPLEX AS HELL. HOW DO YOU FIND YOUR WAY? →

Fake news, ransomware, disruptive competition: The list of things that can go wrong for a company seems to get longer all the time. But in a global economy, fortunately so does the number of things that can go right. Can you spot the key trends in time to act on them? In this highly unpredictable era, how do you make sure you are getting the information you need to identify the facts that matter the most?

BY ***Bennett Voyles***

ILLUSTRATIONS BY ***Mark Von Ulrich***

COMPLEXITY

EVEN SUPERHEROES NEED HELP

TODAY, MARVEL ENTERTAINMENT, a subsidiary of The Walt Disney Company, is indeed a marvel of consumer entertainment and the home of some of the world's most valuable entertainment franchises, including Spider-Man and X-Men. But when Peter Cuneo arrived as CEO in 1999, it was a floundering comic book company just coming out of bankruptcy. If Cuneo had been Wonder Woman, he might have used his magic lasso to make his team tell the truth. If he were the Hulk, he could have cracked the conference table in two and gotten some cooperation right away. Lacking any such special powers, the executive realized he did have one superheroic advantage up his sleeve: He knew how to ask for help.

"When you as a leader are in unfamiliar territory – by that I mean, you're in an industry you don't know, or there's new technology that you're not an expert in... don't hesitate to find people who know what they're talking about," advises Cuneo. "I've been privileged to be associated with many great mentors in my career, in the military and in

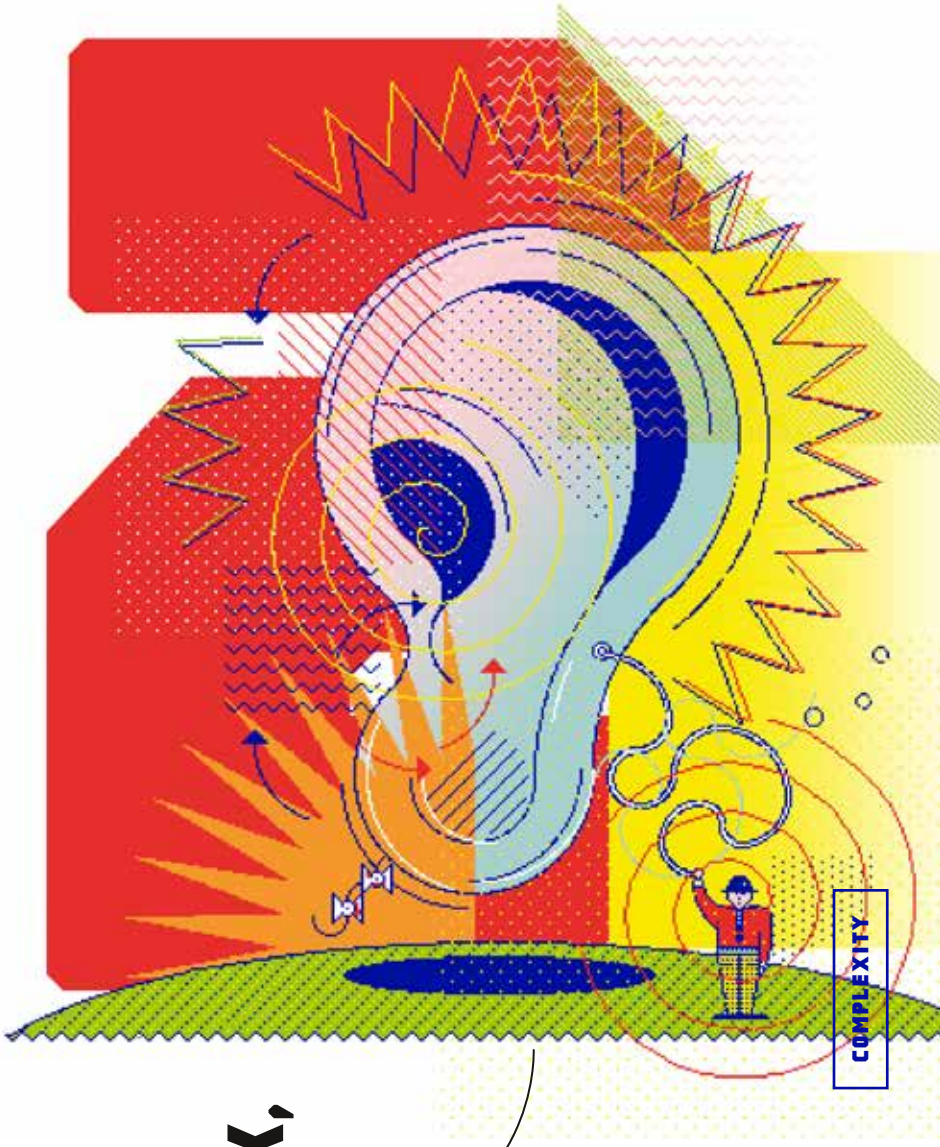
business, and all of them were completely devoted to finding world-class help when they needed it," says Cuneo, whose leadership career began on a US missile ship during the Vietnam War and included the successful turnaround of seven businesses, including such household names as Remington as well as divisions of Clairol and Black+Decker. And, of course, Marvel Entertainment.

Admitting the gaps in your knowledge might seem like common sense, but Cuneo says it's not universal. "Sometimes we see leaders who are insecure and are resistant to demonstrating the fact that they don't have the in-depth knowledge that they need for a particular challenge," says Cuneo, who is now the chairman of Cuneo & Co LLC, a firm that invests in venture capital opportunities in consumer, media and entertainment businesses. Ignorance – intelligently deployed – can even be an advantage. "When I came to Marvel, I had no background in motion pictures," recalls Cuneo. "I loved movies, but knew nothing about the practicalities of making films and knew nothing about publishing comic books. I think that was actually a benefit.... Marvel required a group of people who took a very fresh look at how business was conducted and asked the question, 'Why do we do that? Why do we do this?'"

"When you as a leader are in unfamiliar territory... find people who know what they're talking about."

Peter Cuneo,
Former CEO of Marvel Entertainment

PHOTO: THE NEW YORK TIMES / REDUX / LAIF



STRAIGHT TALK, NO GOSSIP

WHENEVER POSSIBLE, Cuneo says, look for straight-talkers. "Try to attract people who you think will be very straightforward and direct," he says. "One of the conditions that adds complexity for a CEO occurs when you have key people who are afraid to talk candidly to you about how they feel." To encourage people who aren't naturally open to engage in honest conversation, he tries to set an example by being very candid with everyone himself. "Try to be very direct – let people know what you think the challenges and issues are, make sure everybody understands that there are no subtleties. You have to communicate regularly and consistently, or the organization is going to get confused." he says. He also makes a habit of →

not shooting the messenger. "I tell people, I'm not worried about problems.... What I worry about are the situations that I don't know about," Cuneo says. "Always encourage people to expose their problems and make asking for help part of the culture of your business."

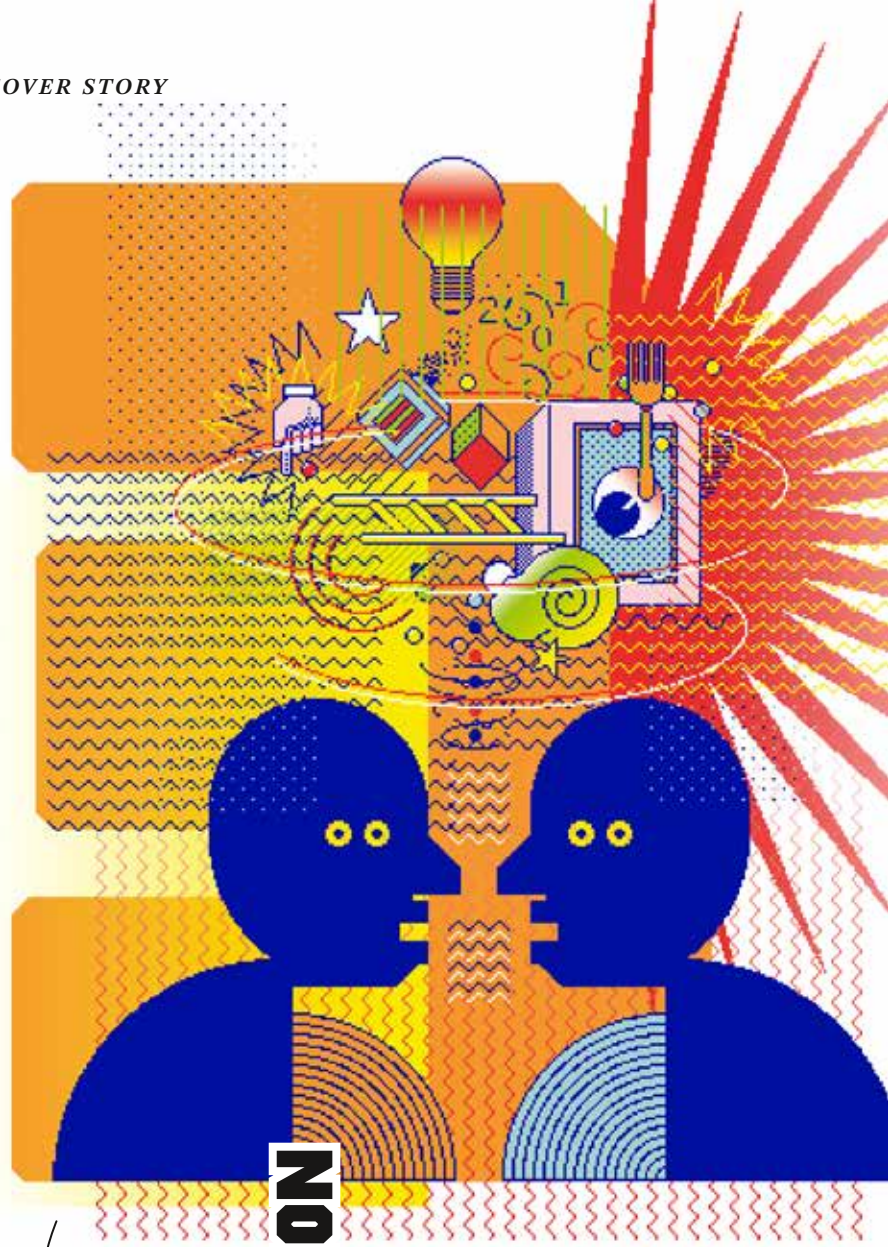
Paul J. Siegenthaler, a London-based executive who specializes in assisting corporate transitions, also starts every engagement by talking to people. "It's all about listening skills, asking open questions and capturing not only what the individuals answer, but also thinking beyond the words to capture what they are saying," he says. "Then dig through the layers of the organization, downwards, to detect any disconnect between the thinking of the senior management and what people perceive below them."

But don't stop at middle management: "The CEO of Coca-Cola, the CEO of PepsiCo, all these people, always, in a regular disciplined way, interact with the customers and with the frontline employees. So they get a very good feel for what is happening in addition to the information that comes from the information systems," says Ram Charan, a celebrated executive coach, advisor to many Fortune 500 companies and CEOs and author of 25 books on business. At the same time, executive coach Carol Kivler advises that you shouldn't listen to every rumor you hear. "If somebody starts to give information on somebody else, shut that down... third-party information – you can get into a lot of trouble with that."

COMPLEXITY

"Transference of real thought is not the same in every culture."

Ram Charan, *Executive coach*



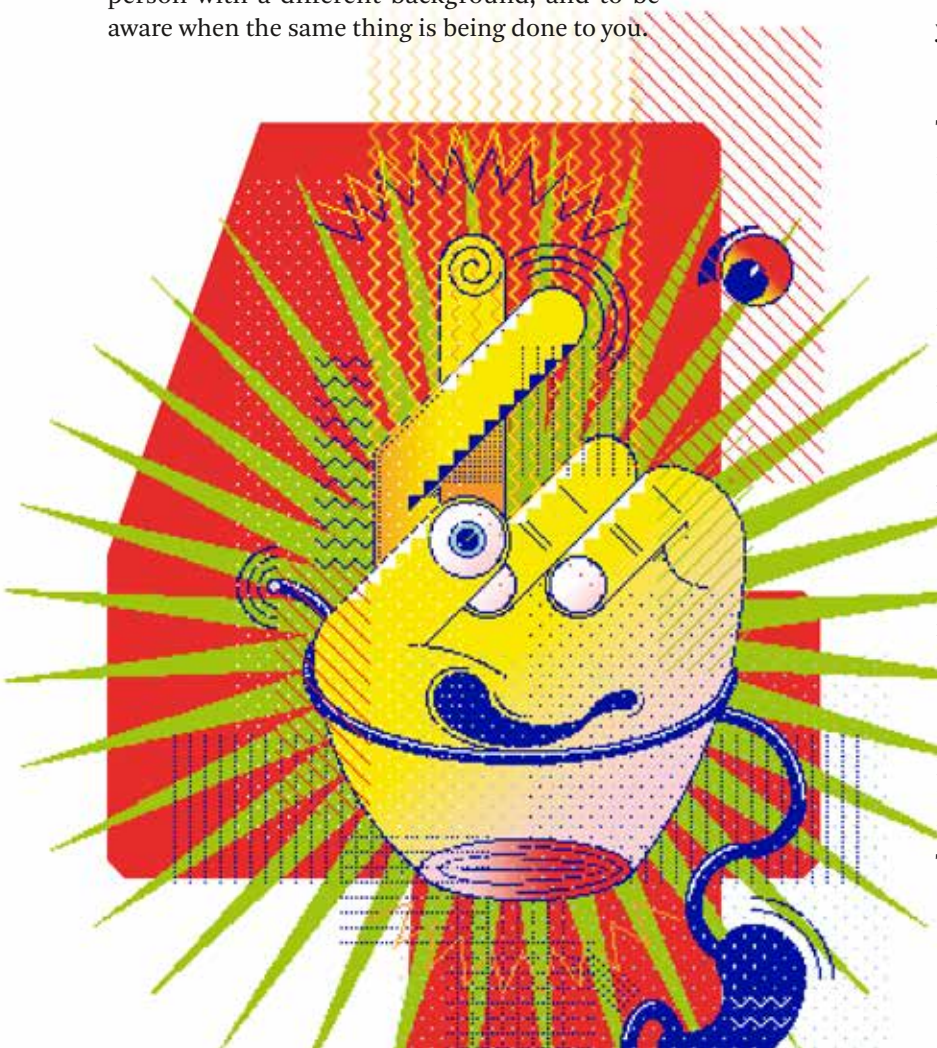
LOST IN TRANSLATION

THE SECOND CHALLENGE is making sure you understand what you've heard, which is not always easy, even if people share a common language. "One assumes there is a clear and transparent understanding when in fact, depending on one's cultural background, the same words can mean something quite different," says Siegenthaler. "The Americans have many famous jokes regarding what the British say and what they actually mean." He suggests getting around this problem by probing more deeply. "My way of finding out what is hidden behind the spoken words is to ask the respondents to illustrate their statements with a few examples that give more tangible meaning to statements – a short story or scenario gives a clearer illustration or definition of the issue the responder is trying to discuss," he says.

PHOTO: GETTY IMAGES

"Transference of real thought is not the same in every culture," agrees Charan. "You've got to build trust, you've got to listen more intently and when you get the idea from the other person, you've got to verify it. Go slow – don't go fast – and connect." Charan recommends a technique he calls "crystallizing" – concisely summarizing what the other person has just said. "It's a 100% learned skill," he says. "If you are working in a company and you have a boss or colleagues who do that, you will learn very quickly how to do that... you can pick it up in four or five weeks."

Of course, it's important to keep in mind that the difficulty in making the connection may not lie with the other person: Of the 11 million pieces of information our brain receives every second, we are only conscious of approximately 40 items. "All of us have preconceptions about people based on their social and ethnic background, and those impressions influence how we respond. We can't help it," says Sara Taylor, author of *Filter Shift: How Effective People See the World*. We aren't doomed to misunderstand, however. Taylor says it takes eight or nine hours to learn how to "filter shift" – that is, to compensate for the unconscious filters that may be preventing you from fully understanding a person with a different background, and to be aware when the same thing is being done to you.



TRUSTING YOUR INTUITION

IN OTHER SITUATIONS, however, the subconscious can be a powerful tool for better decision-making. A Dutch-American research team conducted experiments in 2008 in which they found that people tended to make better decisions about complex problems when they didn't have very much time for reflecting on the particulars. Loran Nordgren, part of that team and an associate professor of management and organizations at the Kellogg School of Business at Northwestern University, likens conscious thought to a spotlight that is narrowly focused on one aspect of a problem. Unconscious thought, on the other hand, "is more like a child's night light, casting a dim light on the entire decision space without focusing on any one particular thing."

Gerd Gigerenzer, director at the Max Planck Institute for Human Development, director of the Harding Center for Risk Literacy in Berlin and author of *Risk Savvy: How to Make Good Decisions*, also advises trusting your gut instinct, if the decision is in a field that you know well. Not acting on your intuition can be expensive: Gigerenzer has surveyed managers who said that as many as two out of three decisions they made were defensive. That is, they chose the path that carried the least personal risk, not the one they believed to be best for the company. This kind of behavior tends to be particularly prevalent in organizations with a negative error culture, according to Gigerenzer. A positive error culture openly acknowledges mistakes and adjusts the system to ensure that they don't happen again. In a negative error culture, however, mistakes should never be made. As a result, when mistakes are made, they stay hidden, and the problems remain uncorrected. How do you know whether you're working for a positive or negative error culture? If you speak on the subject and the audience greets you with a deafening silence, Gigerenzer says, you are probably working in the negative kind.

Sometimes, complexity is used as a kind of camouflage to avoid coping with reality. "In many companies that are lost and troubled, you'll find positions whose responsibilities turn out to be nothing more than taking data in one form, transforming it into another form, and distributing it. This does nothing in terms of enhancing →

decision-making in the company," Cuneo says. "Very often the reporting of complex and useless data will bog down the company as opposed to helping. In one of the turnarounds I was involved in, there was a large report generated by the IT department every week. It went to about 50 people in the company, and I was very skeptical that this report was just taking time and a lot of people's attention, but was not actionable. So I asked the IT department one week: 'Don't put the report out, and let's see how many people ask for it, because they're the people that actually need it.' Believe it or not, out of about 50 people, only three requested it. So you have to use some common sense."

Of course, even common sense should be questioned once in a while. George Soros, the financier, has claimed that he owes his life and fortune to a family talent for seeing a gap between what people generally believed and the actual truth, whether that was as a Jewish teenager in Budapest during the Second World War whose father understood early on just how murderous the Nazis were likely to be, or later on in life when his talent for arbitrage reportedly made him a billion dollars shorting an overvalued British pound in 1992. Soros codified his ideas at the London School of Economics in the 1950s, where he studied with Karl Popper, a Viennese-born philosopher who argued that because empirical truth cannot be known with absolute certainty, ideologies that claim to possess ultimate truth must always resort to force to enforce their claim. Soros found this idea very attractive – and saw the potential for a profitable corollary in modern economic theory.

11

million pieces of information are processed by the human brain every second, but we are only conscious of around 40 of them.

This led Soros to reflexivity, a philosophy that has guided his entire career and which can be boiled down to two propositions: First, that the participants' view of the world is always partial and distorted, and second, that those distorted views can influence the situation to which they relate because false views lead to inappropriate responses. Marx and Freud both tried and failed to show a fixed relationship between participants' thinking and the actual state of affairs, says Soros. Similarly, economics "started out by assuming perfect knowledge and, when that assumption turned out to be untenable, it went through ever increasing contortions to maintain the fiction of rational behavior," he says. "Economic theory should not be expected to produce universally valid laws that can be used reversibly to explain and predict historic events," Soros continues.

COMPLEXITY

Rutledge's rules of order

If there's a single lesson that investors should have learned over the last 30 years, it's that numbers can be used to mislead almost as easily as words. To stay skeptical, Ann Rutledge, a New York-based credit analyst, has developed a number of rules for sizing up quantitative data:

A Don't be impressed by the complexity of the logic. "Some good models are very simple. Be impressed by the reasonability of the results given the approach."

B Raw data inputs may not be the right proxy for current performance. "In the run-up to the crisis, 99+% of the loan data used to predict defaults came from the 1980s and 1990s, when not only was volatility lower, but most of the loans were prime. This was not true of the loans in the run-up to subprime. So it's important to ask a lot of questions about the data. Is it clean? Is it representative? Ask these two questions different ways, and see if the answers come out the same way."

C Watch for faulty logic. "This is harder to detect, and it's a great way to cheat," she writes. "Information systems are not hula hoops. If someone talks about a 'brand new' way of doing something that pulls out so much more information, like credit scores based on big data... they may just be blowing smoke."

D Beware ordinal outputs. "An ordinal output is often a number, but it doesn't mean that number. Rank the customer service at the end of this call on a scale from 1 to 5. If you say 5 and I say 3, the average isn't necessarily 4, because each of us has our own scale in our heads – the intervals are not likely to be the same.

"Knowing a little bit about how information science works is important – in a way that isn't true for physical sciences. You don't have to know how a cell phone works to know whose voice it is at the other end, or know how a clock works to tell time. You can rely on waves to act like waves and gears to move like gears. But in the world where people's behavior is the determining factor, every result is contextual. The more context you have around the result, the easier it is to judge whether the result is relevant and useful to your decision process."

E Don't check your brain at the door. "The best model in the world is the experienced, open mind."

Steven Bosworth, an economist at the Kiel Institute for the World Economy, explains it this way: "I think the core idea is that all economic decisions have a social component, i.e., in standard economic theory the individual decisions are aggregated to derive the social outcomes but reflexivity recognizes that the individual's decisions are themselves a product of the aggregate outcome. The application to financial markets is clear: People will buy what they expect others to buy and sell what they expect others to sell, and this generates feedback loops, which drive booms and busts." In retrospect, this seems sensible enough, but from the crash of 1987 to the financial crisis of 2007, investors lost trillions of dollars in meltdown after meltdown precisely because they saw physics where Soros saw frenzy. Fortunately, as credit analyst Ann Rutledge notes (see box p.18), it's possible to look at numbers critically, even without a Ph.D.

RADICAL SIMPLICITY

OTHER RISK EXPERTS ARGUE that, in a world of deep uncertainty, the best defense is radical simplicity. Richard Bookstaber, risk manager of the University of California's $100 billion investment portfolio and whose background includes stints in the Treasury Department during the Obama Administration and senior positions at several major hedge funds, argues that it pays not to define potential problems too narrowly. The question that executives should be asking themselves is "if they are being too fine-tuned to the current environment, optimizing in a very fine way, relying too much on the data of the current world," Bookstaber suggests. "If they are, they might find themselves doing very well now, but out to sea if the world changes in an unexpected way. And while mechanical systems – robots producing goods, self-driving cars – can use big data, a long-term model of human interactions and experience cannot. Long-term survival requires being somewhat of a generalist."

"Act like a cockroach!" Bookstaber concludes, quoting his book *The End of Theory: Financial Crises, the Failure of Economics, and the Sweep of Human Interaction*. For 300 million years, he notes, the humble roach has survived transitions from jungle to desert, flatlands to cities and seen many predators come and go, all thanks "to a singularly basic and seemingly suboptimal mechanism: The cockroach simply scurries away when little hairs on its legs vibrate from puffs of air, puffs that might signal an approaching predator...." Remarkably, those little hairs have always done the job: The cockroach doesn't hear, it doesn't see, it doesn't smell. It seems to ignore a wide set of information about the environment that you would think an optimal system would take into account. The cockroach would never win the "Best Designed Bug Award" in any one environment, but it does "good enough" and makes it to the finish line in all of them. ■


COMPLEXITY
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TAKE A LESSON FROM YOUR BRAIN*

*AND BECOME A CEREBRAL EXECUTIVE OFFICER

The brain is the best mechanism we have for managing complexity. Yet, we are just beginning to understand how complex its own processes really are. Can we take lessons from how the brain manages the body to find new ways to manage business better? And what, exactly, would such a "neuroscientific management system" look like?

BY ***Detlef Gürtler***

ILLUSTRATIONS BY ***Martin Nicolausson***

COMPLEXITY

YOU HAVE THIS MAGAZINE in your hands. You are reading these words right now and making sense of them. But before you settled on this story, you probably flipped through the pages, your eyes darting across the printed words and quickly scanning the headlines and images. When an article caught your attention – like this one did – you stopped. You decided to take a deeper look. You let the text and images register a little more deeply. You engaged. Now, take a step back. How exactly did you go through this whole process? Did you consciously instruct your fingers to flip the pages? Did you tell each hand and each finger individually what to do? Did you register each and every word, every picture and illustration?

When you break down what seems like a simple routine task – like reading a magazine – you quickly realize that it is an extremely complex undertaking. Your brain is constantly both receiving and sending signals: It is doing a *lot* of work without you even knowing it. If you were consciously aware of every signal, or had to absorb and process every single movement or detail that your brain picked up – every word, image, color or page texture – you might not get anything done at all. →

"The brain uses top-down guesses that are based on rudimentary input information."

Moshe Bar,
Director of the Cognitive Neuroscience Lab at the Brain Research Center at Bar-Ilan University

PHOTO: ALON KORNGREEN

The good news is that you and your brain don't have to work that hard – but you and your brain do have to work together. And it is worth considering how the harmony of complex cognitive processes and decisions work together and then, perhaps, applying them to how you run your business.

NO COMPANY HAS EVER BEEN MANAGED in the same way our brains manage us. For a moment, let us consider the extraordinary talent our brains have for reducing complexity. Here's an example: About 11 million bits of information reach the brain every second. But only 40-50 of these 11 million merit conscious processing. So what we call "thinking" is an activity that takes place only after we have reduced the data volume by a factor of somewhere around 1:250,000.

Some of the remaining bits per second are processed unconsciously; thank your instincts for that. It's a simple process: *if* (stimulus), *then* (response). But let's think about this for a second – and yes, alongside all of the other data that is still flooding in. A huge proportion of all the incoming data doesn't even reach a level requiring analysis. The brain knows what it does and what it doesn't have to worry about. In short, it uses a technique akin to predicting the future. It works on the basis of expectation and acts accordingly, only making an intervention if something is not right.

Lars Muckli, a neuropsychologist at the University of Glasgow, has put his finger on exactly that point. He has even gone so far as to call the brain a "prediction machine." The brain, he explains, does not only receive data from the sensors and organs, it also delivers continuous forecasts to them: What should your sense organ – eye, ear, or fingertip – be feeling the next moment? What performance task should you deliver right now? If the forecast and the result match, everything is fine and there's no need to think about it. "Processing continues only for the unpredicted things, the surprises," says Muckli.

THERE ARE THREE DIFFERENT WAYS that the brain then continues with its processing functions, depending, of course, on the size of the "surprise."

- → Small deviations are solved by small, mostly unconscious adjustments.
- → Larger deviations or unsuccessful adjustments activate the memory to ask the question: Is there any pattern or reaction or procedure already known that might be a better fit for these results? If this is the case, this known pattern will be used for the next predictions. If not, the process we know as "thinking" starts. The brain produces a new pattern that fits best to the new reality and lets the body act accordingly.

To think or not to think: the brain's data flow

The process we all know as "thinking" begins only after the brain has recognized a deviation from normal stimuli and does not have a known pattern with which it can predict coming events and react accordingly. Once the brain "thinks up" a new pattern, it will be used as a base on which future predictions can be made, potentially bypassing the thinking process altogether.

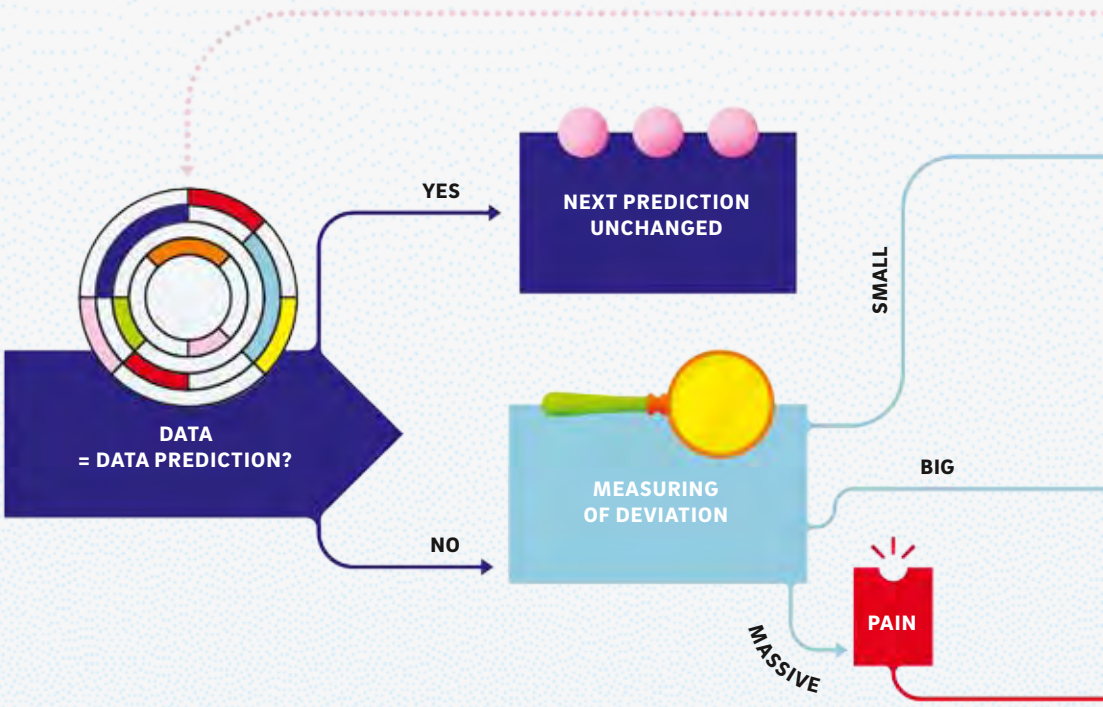


PHOTO: UNIVERSITY OF GLASGOW

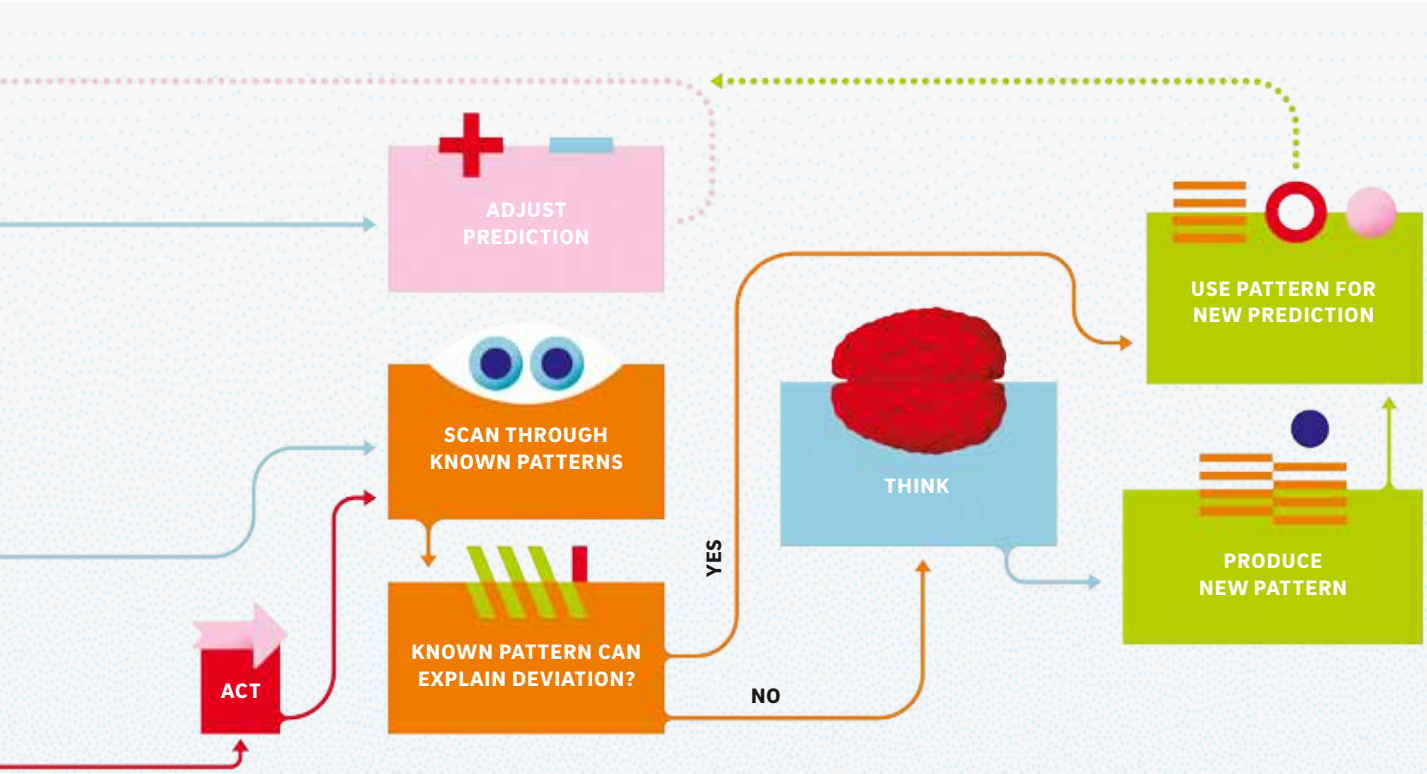
"The brain does not only receive data from the sensors and organs, it also delivers continuous forecasts to them."

Lars Muckli,
Neuropsychologist at the University of Glasgow

→ Huge deviations, or big surprises, often mean danger. Evolution has linked them with a strong signal: pain. And also with a special response: stress. Both will short-circuit the brain's pattern prediction process and lead to immediate action – running, fighting, hiding or whatever seems to be the most appropriate response.

RENOWNED NEUROSCIENTIST MOSHE BAR, director of the Cognitive Neuroscience Lab at the Brain Research Center at Bar-Ilan University in Ramat Gan, Israel and an associate professor of psychiatry at Harvard Medical School, calls it a "feed-forward method for top-down predictions." His explanation highlights the difference between this method and the one usually attributed to the brain: a more computer-like way of decision-making. Instead of "interpreting our world merely by analyzing incoming information," he says the brain is using "top-down guesses that are based on rudimentary input information." This is part of a never-ending story that leads from analogies to associations to predictions to new analogies and so on.

The brain, it seems, is extremely successful with this "feed-forward" process. So it is perhaps interesting to observe that nothing else seems to have made use of its model – that is to say, no one has really tried to replicate its success. None of the objects, →



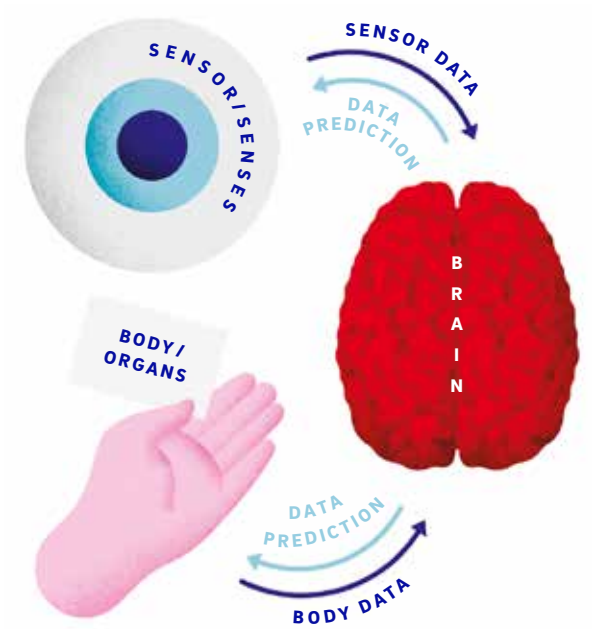
institutions or systems built by men mirror the way the brain works in this idiosyncratic way. The top-down channels in companies are not used to predict the outcome of departments, teams or individuals over the following seconds or minutes. Instead, they are accustomed to giving orders and/or setting targets with much longer timescales, such as for the next quarter or fiscal year. The military and bureaucratic roots of management are still abundantly clear in both theory and practice, but they are not very neuroscientific management methods. It could be said they are not using an intelligent model.

SO HERE'S A LITTLE THOUGHT EXPERIMENT. How would a brain go about managing a company if it were to use the same techniques and processes on that company that it uses to manage a body? Maybe it would be something like this:

- The main brain management tool is the micro-forecast: Based on what we know now, what will happen next? And "next" does not mean next month, next quarter or even next year. It means next as in what will happen in the next day, next hour or next minute.
- These forecasts would be compared in real time with all the data flowing in from the branches and divisions (analogous to the organs) to the center (analogous to the brain). The new data would then be added to the center's knowledge and used to create the next micro-forecast.
- Every deviation from these forecasts raises attention at the center and starts an adjustment routine with several levels of escalation. The lower levels would be solved by slightly altering the prediction or the outcome. On the higher levels, the pattern used for prediction would be replaced by another pattern already known. Only the highest of these levels will qualify for the problem being tackled on the C-level – that is to say, conscious processing.
- Though the C-level still exists, most of today's layers of middle management are no longer necessary: There's no need for motivating the workforce, no chains of command translating the messages from the center into orders for every desk in every corner of the company. Instead, rapid reaction staff are needed to handle the major deviations from the predicted status and sudden threats – just like the leucocytes or the stress hormones that are activated by the brain.

THIS NEUROSCIENTIFIC MANAGEMENT scenario may sound like dictatorship at first with an all-knowing, almighty CEO setting the pace minute by minute and reaching out to employees immediately if things don't go as planned. But this is not an intelligent way of thinking about it. Our brains aren't body dictators. In fact, they are quite the opposite. The heart, the eyes, the hands and so on – or, the parts of the company – just do their jobs without ever being disturbed by the brain. It is only in situations that go beyond the problem-solving capacities of the parts that the center has to step in and get involved in the process. The relationship between consciously processed information and incoming data (remember that ratio of 1:250,000) shows the high level of autonomy that could exist in a neuroscientifically managed company.

What kind of company would this suit best? The tiny time span of micro-forecasting would surely fit complex and data-rich industries: Logistics could be an example. It could also be well worth considering how a company could replicate the brain's prediction abilities, looking at what data is required and how to assess it. While it could take a lot of brainpower to make a company work as efficiently as the brain, it could redefine the role of the CEO, turning it from one of chief into one of "cerebral executive officer" instead. Think about it. ■



Getting things done: It takes brainpower

Even picking up a magazine and deciding what article to read involves a complex series of signals. Luckily for you, your brain leaves you out of most of the process.

Racing the brain to faster decisions

Information overload is a huge burden for business executives. Nicolas Bissantz, Germany's big data pioneer and the CEO of Bissantz & Company, has gone some distance in solving the problem with a little help from a neuroscientist... and a celebrated racing driver.

KEEP YOUR THINKING ON TRACK
Big data pioneer and CEO Nicolas Bissantz rounded up a famous racing driver and a top neuroscientist to prove that we can work with our brains to fight through distraction and reach decisions at faster speeds.

Nicolas Bissantz has his eye on data. Noticing that business reports are often so heavy on information that the really important facts get lost in tables and charts, he asked himself a question: How can you spot the information you need to know at a glance? How do you filter the signal from the noise? Bissantz's approach is to change the way data looks – and also how we look at data. Alongside a team of 130 experts, he set out to develop software that visualizes big data and helps managers make quick decisions.

His research on perception led him to Gerhard Roth, one of Germany's leading neuroscientists from the University of Bremen. With Roth on board, Bissantz then called on the skills of motor-racing legend Hans-Joachim "Strietzel" Stuck. They equipped Stuck with some high-tech glasses designed for neuroscientific eye tracking for a race on the famous Nürburgring. After analyzing some 20,000 film frames, the team discovered that a racing driver, despite distracting visual impressions, can make his eyes stick to his ideal track. "Distraction is 'expensive' for the brain," says Roth. Or as Stuck puts it: "On a racing track you learn how to blind out the things that could slow you down."

So what can that teach a CEO? Instead of a racetrack, a CEO has business reports with lots of figures to absorb. Can you change your perception to improve your decisions? Bissantz and Roth say it just takes two colors: blue for "it's fine" and red for "take action." Their research found that a maximum of two colors used to color-code the numbers and indicators can rapidly speed up decision-making. And the level of meaning comes from the shade – the darker the red or the blue, the more important the information. For example, a deep blue cash position signifies relaxation, whereas sales in medium red shows a potential problem that requires attention.

"First things first," as Bissantz says. "Behind the steering wheel or in front of a management dashboard, what really counts is: Don't get distracted. Stay focused and dismiss all the unnecessary information. The right software does this for an executive."

Alexander Ross

COMPLEXITY

PHOTOS: BISSANTZ & COMPANY (FRANK KRETSCHMANN)

TAKING THE A

Has anything in your neuroscientific research and understanding led you to think that a human mind could be replicated as AI?

The more I learn about how bewilderingly complicated the brain of a rat is, the more I think we will never be able to physically re-create a piece of hardware as such. That said, the computations performed by various brain networks are by no means sacred, and most certainly will be matched or exceeded by AI. The key here is generality – artificial general intelligence – which is still just an idea on the horizon. If it were possible to make an artificial neural network (ANN) capable of acquiring and learning to solve problems on its own, that would be a historical landmark, and a major step toward a human-like mind. But in my lifetime, I'd be happy to see an AI mouse.

Are emotions an important or vital component in how the mind works?

Regardless of whether one thinks of emotions as important to how the mind works, the fact is that the mind and emotions co-evolved over countless eons together. There are certainly various neural computations which are invariant to emotional status (e.g., performing algebra), but on the whole the mind works day-to-day with some kind of registered emotional status and our mood can indeed have a huge effect on the way we think on a given day. Emotions may well have evolved as internal extensions of motivational states (fear, pleasure, etc.), which are the primary forces which drive behavior in all living animals.

What AI developments have made you think differently about the brain and its workings?

I really liked the work of Olshausen and Field in 1996 – they showed the receptive field properties seen in the primary visual cortex could be recapitulated by unsupervised learning algorithms using maximally sparse coding strategies. It made me think of convergent evolution – it was an instance where the visual system and a computer algorithm converged on the same (or very similar) coding principles to encode natural scenes. It makes one realize that it is possible to recapitulate biological coding principles using unsupervised approaches, and it could probably work for other modalities and for higher-dimensional representations as well. The only limit is the programmers and the limits of the computers we can use. My own research in behavioral planning and action perception has yet to be impacted, but it would be a great day indeed if AI got to the point where it paralleled these functions of the brain.

Jonathan Whitlock

Head of the Whitlock research group at Kavli Institute for Systems Neuroscience, Jonathan Whitlock's work is focused on unraveling the neural circuits behind how we plan our own actions and understand the actions of others.

OUT OF AI

Neuroscience vs. artificial intelligence engineering: We asked a leading exponent in each field to weigh in on where the two meet.

COMPLEXITY

What neuroscientific research or insights have made you think differently about the brain and its workings and how might they be applied to AI development?

Different parts of the brain are used when addressing ethical questions, like the famous "trolley problem."* Specifically, duty-based moral decisions tend to trigger automatic emotional responses, while more utilitarian judgements are more likely to require conscious reasoning. If we want robots to make decisions that have an ethical component, then we may need to think hard about how these different systems might apply in artificial intelligence.

What developments in AI give you reason to think that AI can and will (or won't) be able to mimic the fundamental features of the human mind?

Much of AI research implicitly or explicitly seeks to mimic the human mind – after all, that provides "existence proof" that a particular problem or task is at least possible. I think this is laudable and have little doubt that it can ultimately be achieved, if only because the human mind is itself a physical system, made of atoms, and subject to the same laws of physics as any material object. I encourage researchers to go beyond using the human mind as their only, or even primary, template. Computers have so many different strengths and weaknesses that we can create superhuman intelligence on some dimensions, even as we fall short on others. Ultimately, having distinct strengths and weaknesses compared with humans makes it more likely that humans and machines can complement each other in a way that creates shared prosperity.

Are emotions an important component in AI research?

It depends on what you mean by emotions. Reinforcement learning depends very much on AI systems seeking to increase rewards and avoid punishments. Perhaps that can be thought of as a primitive kind of emotion. Another area that is increasingly important is sentiment analysis in natural language processing and detecting emotions in facial expressions. In many applications, like call centers, text analysis, voice recognition or medical diagnoses, machines can do a better job if they understand the emotions of humans.

Erik Brynjolfsson

Director of the MIT Initiative on the Digital Economy, professor at MIT Sloan School and co-author with Andrew McAfee of The Second Machine Age, *Erik Brynjolfsson specializes in the effects of information technologies on business strategy, digital commerce and intangible assets.*

PHOTOS: PRIVATE; PR

*A moral dilemma about the choice to divert an imagined runaway railway trolley where both outcomes will end in differing casualties.

EASILY SOLVED!

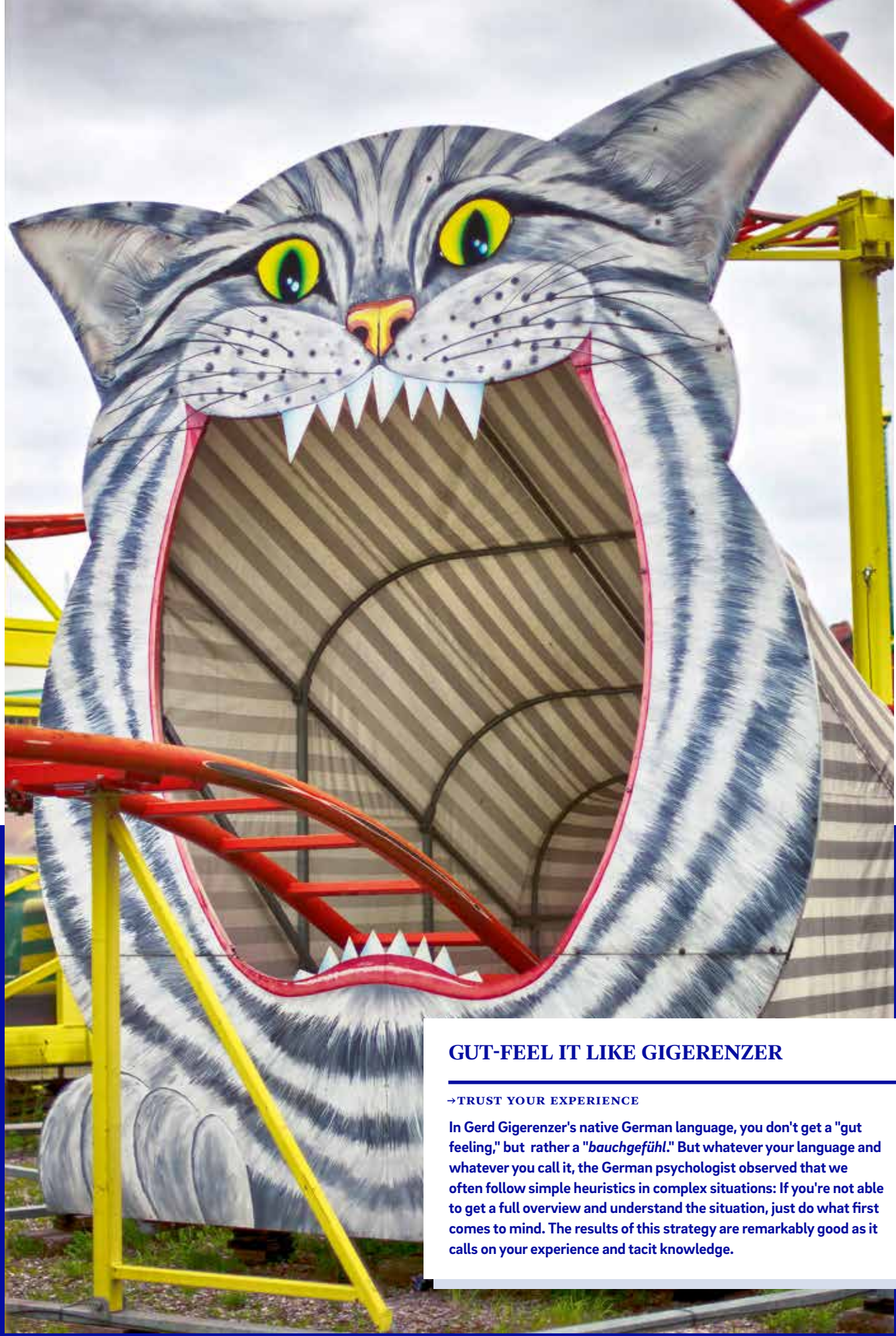
BY *Detlef Gürtler*

Has complexity got you paralyzed and deadlocked? Don't panic! We've put together some simple strategies, inspired by history, heroes and contemporary figures, that will help you cut through even the most complicated conundrums...

STIR IT LIKE SCHUBERT

→USE YOUR ADVANTAGE

If you're having a hard time dealing with complexity, it could be that others are finding the situation even trickier than you are. So if it happens that you're better dealing with it than your competitors, use your advantage. Take a page from the fisherman's strategy in Franz Schubert's song *The Trout* and add even more complexity to the mix: "So long as the water stays clear, he won't catch the trout with his fishing rod." He stirs the water, reduces the visibility, makes the situation more "complex" for the trout – and catches it. It might not be fair, but it is highly efficient.



GUT-FEEL IT LIKE GIGERENZER

→TRUST YOUR EXPERIENCE

In Gerd Gigerenzer's native German language, you don't get a "gut feeling," but rather a "*bauchgefühl*." But whatever your language and whatever you call it, the German psychologist observed that we often follow simple heuristics in complex situations: If you're not able to get a full overview and understand the situation, just do what first comes to mind. The results of this strategy are remarkably good as it calls on your experience and tacit knowledge.

PHOTOS: JULIE CHERKI; PLAINPICTURE

RISE ABOVE IT LIKE APOLLO

→FIND A NEW PERSPECTIVE

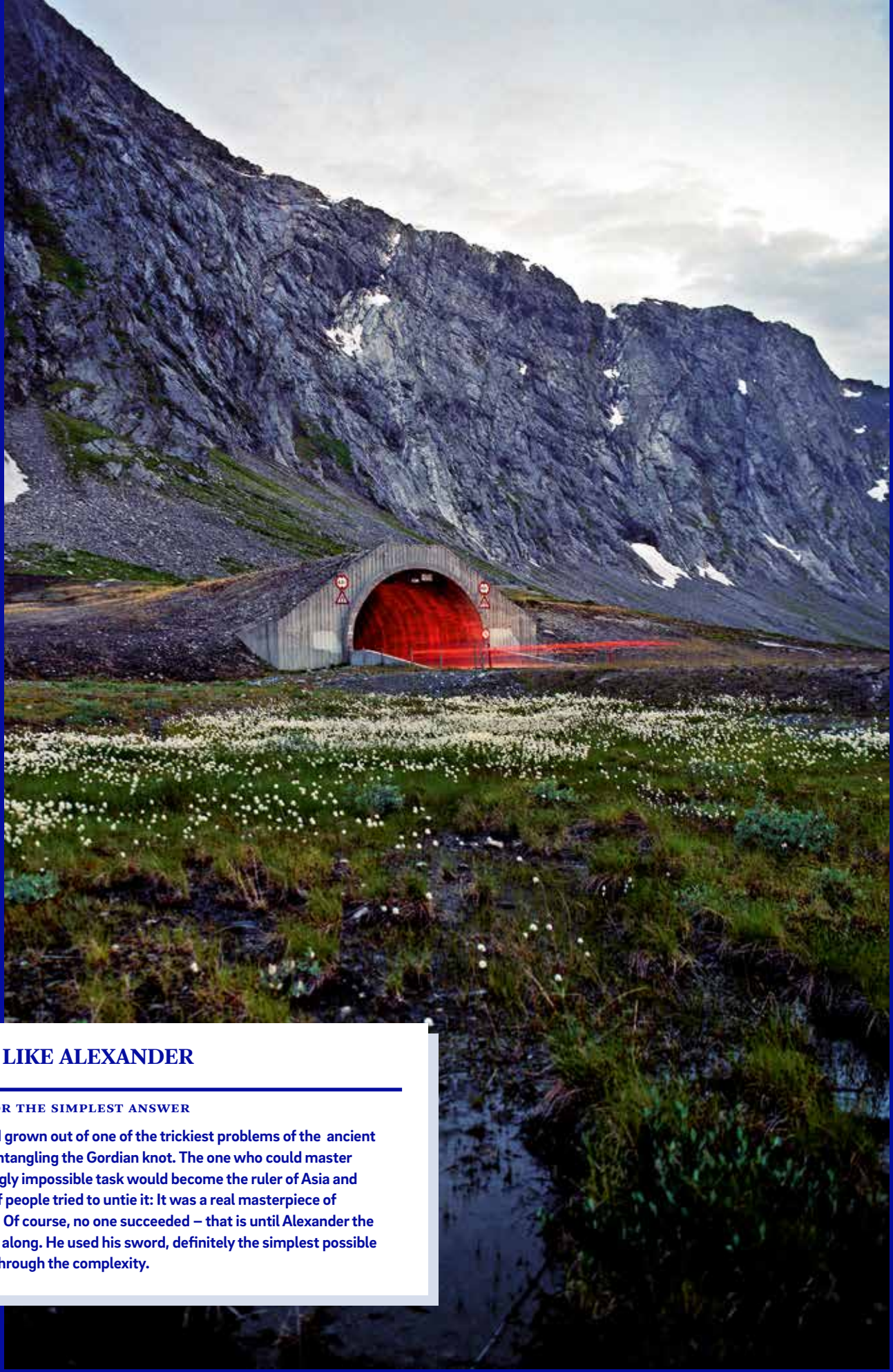
Astronauts may be some of the toughest guys on earth, but all on board Apollo were moved – even overwhelmed – when they left Earth behind and saw the blue planet from above: just one of a billion planets out there, small and vulnerable, and still the only one we have. But even if you don't plan to leave our orbit anytime soon, it's worth remembering that switching to a bird's (or satellite's) point of view will definitely change the way you see the problems ahead of you.

PHOTOS: PRASHIL PAREKH; BLOOMBERG / GETTY IMAGES

BANANA-IZE IT LIKE GOOGLE

→TAKE A LONG VIEW

It may sound a bit pejorative when software developers call their products "bananaware" – that is, software that ripens on the journey from producer to consumer, just like bananas on their way from plantation to supermarket. But in today's world, that's a feature and not a bug: A "perpetual beta" mode treats users as co-developers, adding and removing functionalities on the fly. One of the biggest "banana" success stories is Gmail: When Google's mail service finally exited beta status in July 2009, five years after it was launched, it already had more than 30 million users.



CUT IT LIKE ALEXANDER

→ LOOK FOR THE SIMPLEST ANSWER

It's a legend grown out of one of the trickiest problems of the ancient world: disentangling the Gordian knot. The one who could master this seemingly impossible task would become the ruler of Asia and hundreds of people tried to untie it: It was a real masterpiece of complexity. Of course, no one succeeded – that is until Alexander the Great came along. He used his sword, definitely the simplest possible "short cut" through the complexity.

PHOTOS: PLAINPICTURE / FOLIO IMAGES / IVAN BRODY; ALVARO SANCHEZ-MONTANES

JUMP OVER IT LIKE SILICON VALLEY

→EMBRACE IMPERFECTION

If you want to solve problems the way Silicon Valley does, there's one thing to remember: Nobody's perfect, and even trying to be is the wrong way to get around complexity. The Internet Engineering Task Force (IETF) sums up the strategy as "rough consensus and running code." The truth is that things never turn out like you intended, and planning too exactly in complex contexts may just kill your project. Markets, technologies and consumer needs may simply outgrow what once looked like a roadblock. A bit of operative fuzziness will help you to get along.

COMPLEXITY

KING OF HEARTS

Devi Shetty's radical approach to handling heart operations is revolutionizing health care in India by scaling up resources and bringing down costs dramatically. His ideas are at the cutting edge of surgery and show how complex and expensive procedures can be reduced to manageable and affordable tasks.

BY ***Rohini Mohan***
PHOTOS BY ***Hari Adivarekar***

COMPLEXITY

INSPIRING SIMPLICITY
A former patient, Mother Teresa continues to inspire Shetty to take a simple approach to complex problems.

"What's the use of brilliant surgeries when more than half of our patients can't afford it?"

Devi Shetty

COMPLEXITY

OPERATING THEATER ONE in Narayana Health (NH), Bengaluru, India, is an oasis of calm. Madonna's song *Don't Tell Me* is playing through the speakers. The anesthetist softly hums along as she stands at the head of the patient – Debashish Saha (not his real name), male, 50 years old – watching his vitals. A couple of junior doctors stand over him and two nurses wordlessly hand them scalpels and sutures. A perfusionist and her assistant sit by the heart-lung machine, keeping an eye on blood circulation. Two technicians record medical and clinical stocks being used. Over a couple of hours, with easy, experienced precision, the team opens Saha's skin and sternum, exposing his pink, beating heart underneath.

It is time for the crucial part of this four-hour surgery, the "unroofing" of an anomalous right coronary artery – which means attaching the errant artery from the left to the right collection of veins. This will be done by the cardio specialist.

IN WALKS DEVI SHETTY, cardiac surgeon, global pioneer in low-cost health care and a veritable messiah to many. As Shetty, the founder of NH, enters the theater, the anesthetist quickly changes the music from 90s pop to Bollywood ballads, as is his preference. In his mid-sixties, the doctor is in blue scrubs and a blue surgical cap, both of which he's rarely seen out of, even in the hundreds of media portraits he's done since he established NH in 2001. His face is tranquil, his hand steady: The perfect stillness that he exhibits in the operating theater is the result of 30 years of practice. The junior doctor opposite him – on this day, his youngest son, Varun Shetty – briefs him quickly, the anesthetist reads out the vitals and the operating theater nurse hands him a scalpel. They work in silence, with Shetty occasionally cracking a joke, or asking a stern question. After an hour, his job successfully done, he steps back. The junior doctors close up Saha's chest. Now that his congenital disorder is fixed, he will no longer have to live with the fear of sudden cardiac arrest.

Shetty washes up and goes to an office bathed with natural light. There is not a moment to pause. He has to meet a stream of visitors who come pouring in all day. They are government representatives, medical partners from Japan, Africa, Dubai and

A HANDS-ON APPROACH
Shetty interacts with patients and performs at least one surgery every day.

MENDING HEARTS
Narayana Health's pediatric cardiac ward is one of the world's busiest.

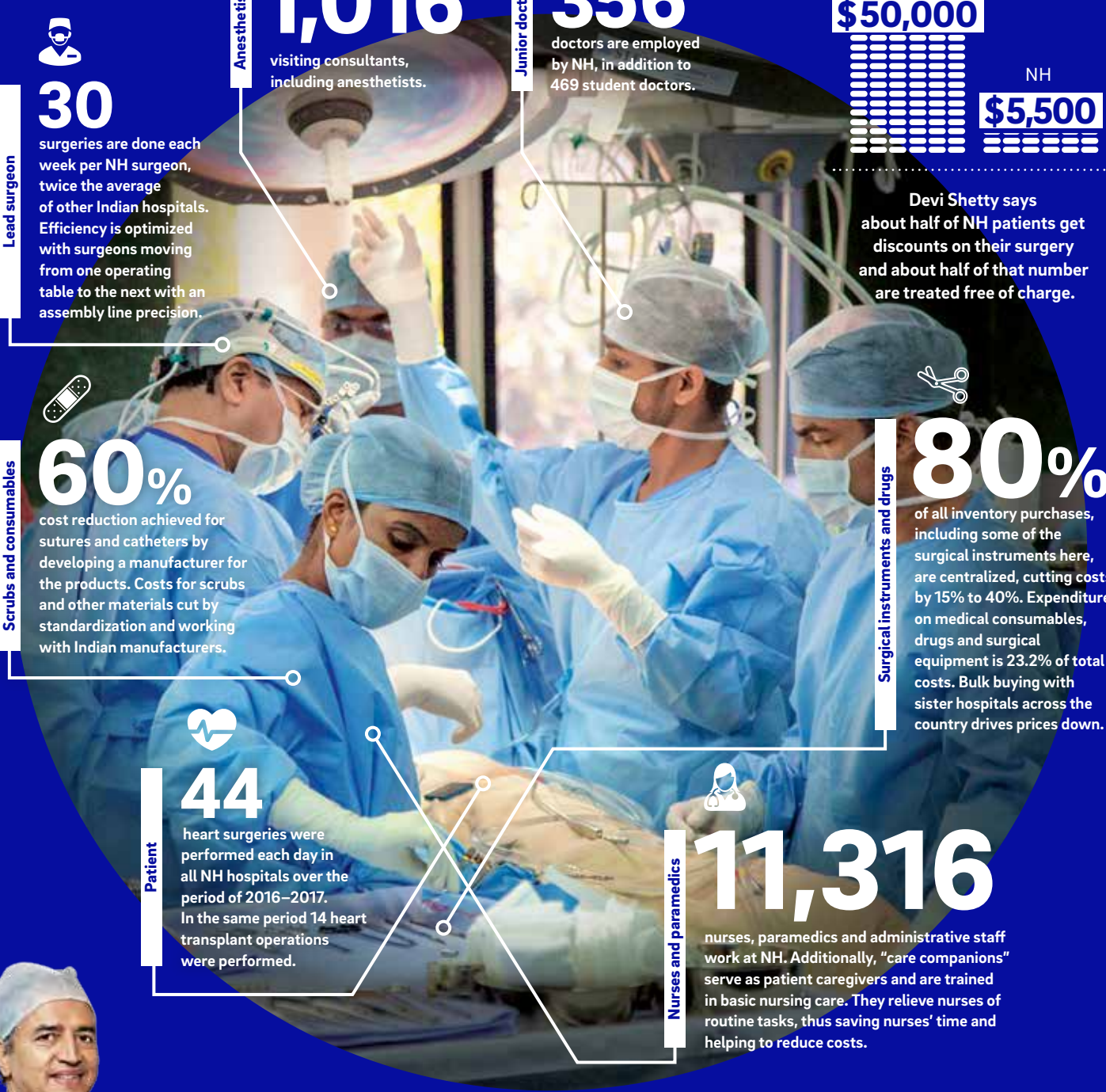
Bangladesh, techies from the US, researchers and local suppliers. But the most important visitors are poor patients, some worried, some with questions, some simply grateful.

"I am happiest in the operating theater, just being a cardiac surgeon," Shetty says. Despite his hands-on style managing 24 hospitals, he makes sure he does at least one surgery a day when at the NH campus (the parent hospital). "But that's not enough. What's the use of brilliant surgeries when more than half of our patients can't afford it? In most countries, doctors just do what's best for the patient, but in India, we have to have a keen sense of how a treatment plan or surgery will impoverish the patient's family." Despite robust economic growth over the past two decades, the per capita income in India is only $1,500 a year and patients typically have to pay 60% of health care expenses out of their own pockets. Indians are genetically three times more vulnerable to heart attacks compared to Caucasians. Yet, of the two million Indians in need of heart surgery, fewer than 5% get it due to lack of access and prohibitive medical costs. India's infant mortality rate is three times higher than China's and seven times greater than that of the US. →

60%

of all health care expenses are paid by Indians out of their own pockets, despite an average per capita income of $1,500.

HIGH VOLUMES AND SMART SURGERY MEANS QUALITY LOW-COST HEALTH CARE



Lead surgeon

30
surgeries are done each week per NH surgeon, twice the average of other Indian hospitals. Efficiency is optimized with surgeons moving from one operating table to the next with an assembly line precision.

Anesthetist

1,016
visiting consultants, including anesthetists.

Junior doctor

356
doctors are employed by NH, in addition to 469 student doctors.

The cost of cardiac surgery:

USA **$50,000**

NH **$5,500**

Devi Shetty says about half of NH patients get discounts on their surgery and about half of that number are treated free of charge.

Scrubs and consumables

60%
cost reduction achieved for sutures and catheters by developing a manufacturer for the products. Costs for scrubs and other materials cut by standardization and working with Indian manufacturers.

Surgical instruments and drugs

80%
of all inventory purchases, including some of the surgical instruments here, are centralized, cutting costs by 15% to 40%. Expenditure on medical consumables, drugs and surgical equipment is 23.2% of total costs. Bulk buying with sister hospitals across the country drives prices down.

Patient

44
heart surgeries were performed each day in all NH hospitals over the period of 2016–2017. In the same period 14 heart transplant operations were performed.

Nurses and paramedics

11,316
nurses, paramedics and administrative staff work at NH. Additionally, "care companions" serve as patient caregivers and are trained in basic nursing care. They relieve nurses of routine tasks, thus saving nurses' time and helping to reduce costs.

"Medical innovations don't have to be on equipment, but on processes."
Devi Shetty

Measures of quality:

Mortality rate 30 days after surgery

1.3% NH

NH cites its success rate as being mostly lower or at least comparable with hospitals in the US.

SOURCES: NH ANNUAL REPORT 2016–17; DEVI SHETTY; HBR PAPER (GOVINDARAJAN); KNOWLEDGE@WHARTON

THE MAGNITUDE OF THE PROBLEM became clear to Shetty when he worked in Kolkata upon his return from studying in England in 1989. Although he saw over 100 patients every day, few turned up for surgeries. A bypass surgery would cost about 150,000 Indian rupees, or around $7,500 at the time. He realized that the cost of care had to decrease for patients to be able to access it. At the same time, he also witnessed Mother Teresa's Missionaries of Charity helping the poor and sick with next to no funds. He had operated on her after she had a heart attack, and subsequently served as her personal physician in the last five years of her life. He has often talked about how her simple approach to complex problems inspired him. "Real health care is not about heart surgeries, it is about heart: Never having to send a terminally ill child home because his mother can't afford [a surgery]," says Shetty. "But having a heart doesn't mean charity, which is not scalable. It means frugality, data management and procedural innovation."

In 2001, he established NH, then called Narayana Hrudayalaya, in Bengaluru. It provided excellent treatment within a low-cost setup. Today, coronary bypass surgery costs $106,385 in the US, while at NH it costs about $5,500. NH has since expanded across the country with clear processes in place to achieve its primary goal of providing affordable health care to all. Its model has impressed many. Management guru C.K. Prahalad singled out NH as a case study for his book *The Fortune at the Bottom of the Pyramid* and the model is also used as a case study at Harvard Business School. After 15 years in business, in December 2015, NH went public and raised $952 million.

Vijay Govindarajan, a renowned management thinker, professor at Tuck School of Business and the man behind the "reverse innovation" concept, has studied NH's innovations closely. He says that the hospital has taken radical steps in implementing many well-defined industrial concepts in health care, such as standardization, specialization of labor, economies of scale and assembly line production. "But since it deals with human life, quality is equally important, and NH has shown itself to be on par with the world's most reputed hospitals," says Govindarajan. One measure of quality is the mortality rate 30 days after surgery. At NH, even despite India's tropical air, pollution and hygiene conditions, it is 1.3% – below the average rate from a 143 sample of Texas hospitals.

NH relentlessly strives to lower the cost of treatment so that it never has to turn away a patient in need – over half of NH's patients come from economically weaker backgrounds. But its reputation for high quality also attracts affluent patients. It has the capacity to perform about 60 surgeries a day (it did 34 a day this financial year) and adopts a hybrid pricing model. In other words, it uses the surplus from these paying patients to subsidize surgeries for those who cannot afford the full cost. The dual pressure of meeting global quality standards for every patient and lowering costs drastically for the poor has led, remarkably, to an overall drop in spending. Such a business model can scale, explains Govindarajan, because it allows the overall enterprise to be profitable.

Bulk purchases of locally produced products, like this antiseptic alcohol hand rub, enable NH to reduce its daily expenses.

22%

of NH's revenue is spent on salaries, nearly one-third of the average spent by Western hospitals.

BUT HOW EXACTLY DOES NH CUT SPENDING and keep quality levels high? Three drivers sustain this hybrid model. The first is the very thing that frustrates health care providers about India: high volumes. In just 16 years, NH has grown rapidly from one hospital with 280 beds to running 24 hospitals and seven heart centers across 31 cities and towns in India – a total of 5,600 operational beds. Today there are around 180 doctors across more than 40 specialties, 238 student doctors and 12 visiting consultants in the Bengaluru facility NH Health City alone. NH uses economies of scale to dramatically reduce costs, and therefore the patients' bills. It sends clinics on wheels to rural areas, screening people for ailments and bringing them to the hospital for surgery. It has set up cardiac care units in small towns with basic facilities like diagnostic centers and EKG machines and it provides sparse primary health care in government hospitals. It has also entered into agreements with three state governments to treat impoverished patients who hold state insurance: The state reimburses a large part of NH's costs.

Only people who need surgeries are referred to the Bengaluru hospital. "We rationalize fixed costs like salaries, equipment and building or rent by incurring them only in places they will be most efficient," says NH Senior Vice President of Strategy and Planning Viren Shetty. "We don't believe in making costly, large, multispecialty hospitals in every place." Govindarajan calls this the "hub and spoke model" – hundreds of thousands of spokes treat patients close to home, while NH invests on high-tech equipment and experienced specialists – both expensive – only in a handful of hubs. A dominant player in cardiovascular services, it performed 14,700 surgeries and 54,000 cardiology procedures over the 2016 financial year. →

Doctors perform approximately 30 surgeries a week, double the average doctors in other major Indian hospitals do.

HUBS AND SPOKES (TOP)
Patients are diagnosed and treated at local "spokes" where possible, traveling to "hub" facilities only when necessary.

DELIVERING THE BASICS (RIGHT)
Clean, "no-frills" waiting rooms demonstrate NH's frugal approach.

COMPLEXITY

THE SUCCESS OF THE MODEL CAN BE SEEN at the Bengaluru hospital. In its pediatric cardiac ward – one of the busiest in the world with 4,500 surgeries last year – six-year-old Chandru plays near his bed. A tribal child from a village in Raichur, Karnataka, Chandru had an ASD closure (mending a hole in the heart) a month ago, and has returned to have his sternal wire removed. The procedures would have cost $3,500, but his grandmother paid nothing but the bus fare to the hospital. The Karnataka government's medical insurance – which Shetty helped develop in 2002 – paid for the surgery and NH waived the wire removal. Further down on the same floor, Farooq Mustafa, an investment banker from Dubai, is signing discharge papers for his five-year-old daughter Noor. She had the same ASD procedure and now sits in her plush deluxe room with her mother, cheerfully drawing a picture for a thrilled nurse. According to the tiered pricing, Mustafa is paying full price. "At least five friends recommended NH to me," he says. "Every day I was here, I saw how many people these doctors treated, how experienced and driven they were."

The second cost driver has been task shifting. Harvard Business School Professor Tarun Khanna, co-author of *Winning in Emerging Markets*, explains that NH takes "a production line approach" to health care. "By streamlining the systems and processes of the hospital and clearly defining protocols, they lower both costs and errors," he says. Open-heart surgery involves six steps – prepare the patient, open the chest, harvest a vein from the leg or arm to the heart, divert blood to the graft, close the chest and move the patient from the OT to the Intensive Care Unit. "In the US and Europe, the cardiac surgeon does all the steps," explains Govindarajan. "At NH, the senior surgeon comes only in the fourth step, leaving him free to do more surgeries per day."

Protocols are not clinical alone, but also about how a patient is received, transferred and billed, and how medicines, surgical tools and equipment are bought, used and disposed of. When these systems are followed, patients go home faster and comparatively less material is required. The hospital has also been investing in technological innovations in collaboration with American universities and software developers. "Medical innovations don't have to be on equipment, but on processes," says Shetty, opening a trial app NH is creating called HealthFile, which has scans of his patients' EKGs, X-rays and other records. "Why should a patient come all the way here to do tests when he can do it in a lab in the village and send me a scan? The fewer unnecessary footfalls I have, the more I save, for me and the patient." Only the payment gateway – a system for the patient to pay the doctor he consulted online – has yet to be implemented.

THE THIRD DRIVER FOR COST-CUTTING in NH is good old frugality and financial discipline. The foyer at the NH in Bengaluru is minimalist, the wards and waiting rooms are clean and without embellishment and, except where medical equipment is used, natural ventilation replaces air-conditioning. NH monitors and measures cost regularly. Its ERP is implemented on cloud, providing real-time information and accessible remotely even at its small town clinics. Senior consultants and doctors get an email and text by noon every day with the previous day's revenue, expenses and estimated EBITDA margins. This not only tunes all employees into NH's goal of frugality, but also helps doctors consider the cost component when they schedule their surgeries. Shalini Rajesh, a diabetologist who has worked at NH since its inception, says: "All of us must be on the same page, work in the same direction.... As doctors, our decisions are based on medical parameters, but the financial SMS habituates us to balance free and paid surgeries, or just be conscious of the size of our responsibility. It reminds us that everyone can contribute."

Proving innovation also lies in the process, NH is developing an app called HealthFile to keep patient records in one place, send scans from village labs and lower operational costs even further.

Frugality is common in Indian hospitals, says Tarun Khanna, "but NH has more practice doing it, simplifying complex things by trying fresh iterations." For instance, it utilizes personnel and medical equipment far more efficiently than most. While hospitals in the West spend about 60% of their revenues on salaries, Shetty says NH spends only 22%. "This doesn't mean our doctors and staff are poorly paid, but that they work 12–16 hours, longer than most, performing more procedures," says Shetty. NH doctors perform approximately 30 surgeries a week, double the average doctors in other major Indian hospitals do. Instead of being paid per surgery, they are paid a fixed salary to maximize productivity.

Khanna writes in the Harvard Business School case study on NH that very early on, instead of doing chest X-rays with film that required processing, the hospital cut the recurrent cost through digital X-rays. "Hospitals in America, Singapore, Malaysia and Thailand have ICUs for individual patients, each served by one or even three senior nurses," says Viren Shetty. "In NH, most ICUs hold more patients, and we distribute the same experienced nurses across many, using supervision, protocol and inspection to control errors." NH does not buy all its equipment, and rather leases some on a pay-per-use basis to keep capital costs low. They are maintained well to extend their life. Ultrasound machines, for instance, cost between $20,000 and $75,000. NH scans 200 times more than an average American hospital, and 100 times more than Indian ones, reducing the unit cost of each scan.

Some frugal ideas, of course, don't work out. For example, it tried to have zero inventory: Instead of storing consumables, it got suppliers to deliver them just in time. Quality suffered. So instead, NH set up an in-house central buying unit and standardized purchases. "Being innovative means to accept failures and take corrective measures," says Viren Shetty. The central unit makes 80% of all purchases, cutting inventory costs by 15% to 40%.

Back in his office, Devi Shetty points behind him to refer to his neighbor, Electronic City, the hub of India's IT revolution. "We think India's potential is there," he says. "But it is here. It is in health care. The world's best health care innovations will be from India, not the US or Europe. What I have done is just a beginning." ■

COMPLEXITY

BUYING INTO SIMPLICITY

Too much consumer choice is confusing and can even cause anxiety. Many shoppers now crave simpler solutions and are even looking to brands to help make the decisions for them. Here's how some retailers have found that simplicity doesn't just sell – it's becoming increasingly attractive in an ever more complex world.

BY ***Anja Dilk*** ILLUSTRATIONS BY ***Vanessa Kinoshita***

MIAMI AIRPORT. A man, briefcase under his arm, leaps down the escalator, past the lines of rental cars outside and whips out his smartphone. He's received an alert: "Fred, your car is waiting for you just to the right and next to the exit." A silver Audi A4 shimmers in the morning light. The gas tank is full. The navigation system is fired up and the Wi-Fi and satellite radio are ready to go. With a click of his smartphone, Fred unlocks the car, jumps in and drives off.

It sounds simple – and it is. This is how Silvercar does car rental, stripped right back to the basics and delivered in a smart, high-tech fashion. The car is always the same: a silver Audi A4. The process has been streamlined so there's no standing in line, no paperwork, no confusion about add-ons. For Silvercar CEO Luke Schneider, simplicity is at the heart of the brand and is the key to its success. "For our customers, simplicity is the new luxury," he says in a stylish, yet simple, promotional video for his brand. "They want it plain and easy.... We have aimed [our offer] at people who want three things: Buy only what you want, pay only for what you use and use your mobile device to do it." Since the company was founded in 2012, it has expanded to 15 US cities. It's not just customers who seem to like it: Automaker Audi announced it was taking over Silvercar in April this year.

In a world that is becoming ever more complex, simplicity is attractive again. Modern shopping choices can be overwhelming, from being confronted by 170 kinds of jam on the supermarket shelves to having to decide on a pair of jeans. Being a consumer in 2017 can quickly turn into a full-time job that needs a day to finish. Overwhelmed by choice, many consumers crave simple solutions, or as behavioral economist Richard Thaler puts it, a good default option to defer to (see box p.45).

American psychologist Barry Schwartz has managed to summarize today's consumer dilemma with a catchy slogan: He has dubbed it the "paradox of choice." The more choices one is given, the greater the pressure is to make the perfect decision. The result is overload, paralysis and growing frustration. Choice feeds doubt: Perhaps I could have made a better decision?

COMPANY

Silvercar

INDUSTRY Car rental	**FOUNDED** 2012	**BUSINESS MODEL** Provide app-based car rentals with no paperwork, no lines and include quality features.
HEADQUARTERS Austin, USA		
EQUITY FUNDING $59.53 million	**CITIES SERVED** 15	

"For our customers, simplicity is the new luxury."
LUKE SCHNEIDER, CEO

TRANSPARENCY, PLAIN AND EASY
Silvercar offers only one model of car, a silver Audi A4 with a navigation system, Wi-Fi and satellite radio.

ALL THAT HAS CONSEQUENCES for consumer behavior. In a field study, business psychologists Sheena Iyengar and Mark Lepper, from Columbia Business School in New York and Stanford University in California respectively, proved that customers prefer to be given a smaller selection to choose from rather than be flooded with options. Give them six types of jam to choose from and 12% will buy, but give them 24 different kinds of fruit spreads and only 2% will make a purchase. But it isn't just the vast array of products that people are finding a burden in the day-to-day life of the global economy. Complexity is growing in other ways too. Take what should be a simple time-saving device such as the TV remote. Coupled with the on-screen guide, you almost need a PhD to know how to use it properly, and it all increases stress levels.

The antidote is to prescribe more simplicity to cure the ills of complexity. A study conducted by the Gottlieb Duttweiler Institute (GDI) in Zürich found a growing need for simplicity. "In the 'Age of Less,' consumers are looking for simple products – simple in their operation, clear in their use and design," says GDI CEO David Bosshart. "They want clear offers that provide orientation." Some even want fewer possessions, preferring to share things with others. Perhaps the days – and burdens – of ownership are numbered.

"We already know from brain research that people have a fundamental need for a simple solution," says Ulf-Brün Drechsel, BrandMerchand managing director and formerly of New York-based Siegel+Gale. In 2017, Siegel+Gale's team of branding experts conducted their ⟶

seventh survey of 14,000 consumers in nine countries on the topic of simplicity. The result? Customers prefer companies that they perceive to be simple and whose offers and uses they understand easily. Some 61% would prefer to recommend simple products and 64% are even prepared to pay more for them. Siegel+Gale's bottom line: "Simplicity pays off."

BUT HOW CAN SIMPLICITY be put into practice in a complex economic world? Just ask Dieter Brandes. As a top member of supermarket giant Aldi's management board in the 1970s and 1980s, Brandes helped shape the direction of the chain. "If you want to do things simply, first of all you have to understand complexity," says Brandes. For a food retailer, that primarily means getting to grips with the complex processes that lie behind every single item and element of organization: logistics, sales, suppliers. "Every item is linked many times to all the others. The more items, the more closely they interlink and the more complex the process.... The solution is simple: fewer items, simpler organization."

Brandes calls this approach the "Aldi Principle," which he summarizes in his book of the same name. It's based on rigorous limitation. Whereas most supermarkets stock 40,000 to 90,000 items, when Brandes was working there Aldi kept only 600 on its shelves. This brings with it a number of distinct advantages. Firstly, it drives down prices in purchasing. Secondly, it forces exact and precise checks and balances. For every item that the Aldi management wants to add to the selection, another needs to be taken out. Each and every new product is tested for three months in three stores and then the decision is put into effect. The principle is trial and error. Market research is irrelevant. A decentralized organization team is in place so such decisions can be discussed in close contact with the individual branches. This means that there are no superfluous or expensive management positions standing in the way. As Brandes describes it, "as long as the core principle of the business model can be relayed like it is in cell division, then that will even work in a global corporation."

COMPANY

Teekampagne

INDUSTRY Tea imports	**FOUNDED** 1985	**BUSINESS MODEL** Larger packages, no middlemen and focusing on one type of tea all translate to lower prices.
HEADQUARTERS Potsdam, Germany		
IMPORT VOLUME 420 tons	**ACTIVE CLIENTS** 200,000	

"Customers want top quality at a fair price."
GÜNTER FALTIN, FOUNDER

NOTHING MORE, NOTHING LESS
Teekampagne offers its customers top quality Darjeeling tea for a third less than its competitors.

The basic framework of the Aldi Principle is still in place. The key element, according to Brandes, is that "the customer is also extremely satisfied with the smaller selection.... If there's an excellent quality toilet paper on offer for a low price, then they often don't need two to choose from." But he is the first to admit that such a strategy requires courage, and that there is a risk that a company can lose customers this way too. "But fear is the biggest driver of complexity," he says before adding: "Ask yourself what the customer wants, not what more can you offer!"

Günter Faltin agrees. His customers only have to handle one single item: pure Darjeeling tea. That's it. Nothing more. Nevertheless, the Teekampagne tea company's founder has seen his profits rise for 30 years. "In the end, [customers] want top quality at a fair price and they want it as easily as possible," says Faltin. Yet while customers do expect to be treated well, they don't want companies to put them first all of the time. Or, as Faltin puts it: "They see companies more like experts who advise them and who select the basics out of the complexity."

BACK IN 1985, Faltin was at the Free University of Berlin as a professor of entrepreneurship and wanted to set up a company. How could he teach his students when he had no experience himself? One thing he was sure of was that the product had to be something that he could defend alongside his academic position. Something simple, something manageable – something like tea. He visited plantations and auctions, assessed distributors, importers and exporters and spoke with logistics companies.

He soon realized that a lot of middlemen and small packaging is what makes tea so expensive. So he made the packages larger and got rid of the go-betweens. "I save so much money that way that I can sell the best tea in the world for a third less than anyone else." Today the company is the largest Darjeeling tea dealer in the world with annual sales totaling $11.5 million.

Simplicity experts Chris Brügger and Michael Hartschen see time and time again how hard it is for businesses. "The old dictum 'more is better' continues to have an effect," says Brügger, who wrote a book with Hartschen and colleague Jiri Scherer on simplicity as a business strategy called, very simply, *Simplicity*. "To say goodbye or to reduce what's been established, and to do so while others are diversifying, naturally also holds a risk." Especially as companies with a wide product range are very often also rather successful. "But simplicity is an important strategic attitude for finding out, step by step, what fits your company, where your own strengths and the needs of your customers lie," says Brügger.

For Keisuke Okushita it's an obvious choice. "The philosophy of simplicity and transparency is rooted in the Japanese culture," says Okushita, who is managing director for Japanese lifestyle chain Muji in Germany. "We consider it a clever, contemporary concept that helps to avoid waste, reduces costs and aids us in being able to offer a reasonable price." Muji consistently forgoes the bells and whistles. Everything Muji sells rests on its own purpose and style without the addition of a label, whether it's a cosmetic box, a shirt or a pencil sharpener.

Is every product as simple as possible and still functional? Okushita calls this the "hidden intelligence of simplicity." The primacy of simplicity, as the philosophy goes, is that having it in focus helps sharpen your view of how something can be even simpler, even clearer and even better. "Simplicity is one of the most important concepts by which we clearly differentiate ourselves from our competitors," says Okushita. For its customers, Muji has become an attitude to life and way to express a need for clarity in a complex world. What could be simpler than that? ■

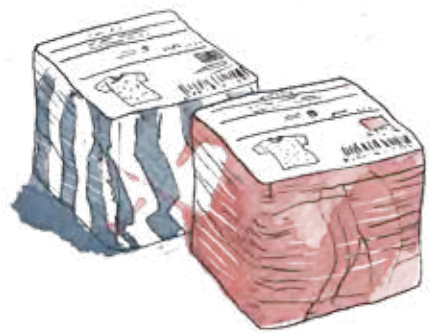
COMPANY

Muji

INDUSTRY Retail goods	**FOUNDED** 1980	**BUSINESS MODEL** Offer simple consumer goods with minimal branding and less waste at a reasonable price.
HEADQUARTERS Tokyo, Japan		
REVENUE $2.77 billion	**PROFIT** $310 million	

"The philosophy of simplicity is rooted in the Japanese culture."

KEISUKE OKUSHITA, MANAGER



SIMPLER, CLEARER, BETTER
Muji's shelf presentation clearly communicates the company philosophy to its customers.

Richard Thaler

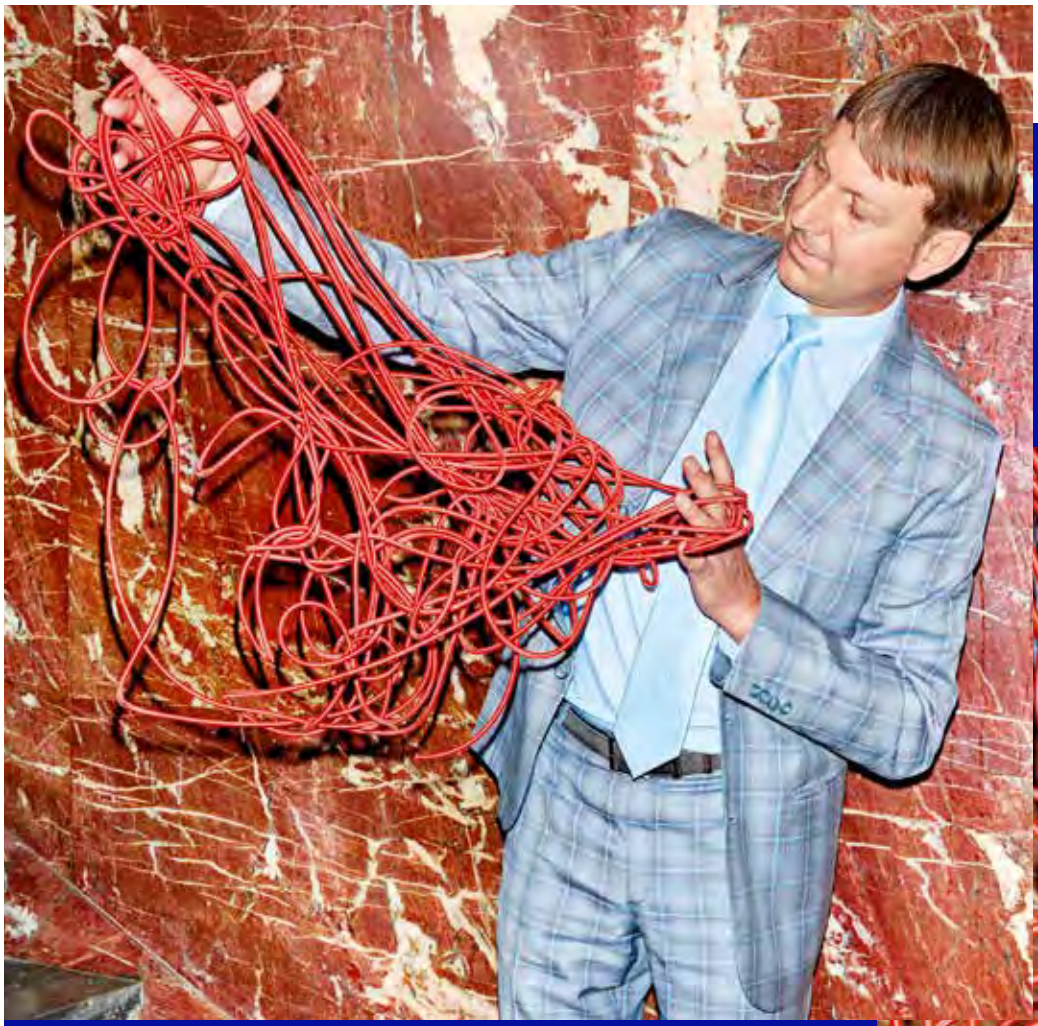
The behavioral finance guru shares his thoughts on the power of choice and how to use it...

One of your key theories refers to what you call "choice architecture." Can you explain what that is? What does "responsible leadership with choice architecture" mean for managers?

In our book *Nudge*, Cass Sunstein and I define choice architecture as the environment in which people make decisions. It includes all the aspects of that environment that can influence the choice someone makes, whether or not those influences would affect someone who was making what economists would consider to be a "rational" choice. A classic example is the setting of default options. We know that because customers are busy, lazy and often confused, they are surprisingly likely to take whatever option is made the default. "Responsible leadership" refers to the way choice architects utilize their ability to influence decisions. Do they "nudge for good," as we urge, helping people achieve their own objectives, or do they steer people to choices that help the choice architect?

Richard Thaler is the co-author of *Nudge: Improving Decisions About Health, Wealth and Happiness*, and *Misbehaving: The Making of Behavioral Economics*.

COMPLEXITY



DECOMPLEXING THE SYSTEM

Computer scientist Dirk Helbing seems to have all the answers. His wide-ranging, free-thinking ideas focus on how to cope with those complexities of the modern world that could threaten our way of life. His solutions are bold: Get rid of as many links as possible and give everybody their own private investment funds.

INTERVIEW CONDUCTED BY ***Detlef Gürtler***
PHOTOS BY ***Norman Konrad***

We have the best technology and access to more and more data every day, but even so it seems that we are increasingly losing control over our world. Is that in spite of technological progress? Or because of it?

The problem is not technology – it's how we use it. While processing power is increasing exponentially, the data volume is growing even faster and the complexity of the world's systems is beyond reach. As we globalize the planet, we are increasingly connecting everything with everything else within one system. This creates a combinatorially exploding number of possibilities – and, in turn, a dramatic growth in complexity.

We have seen a lot of situations over the course of world history in which complexity increased, even exponentially, and most of the time the solution to cope with this growth in complexity was found in technology. The invention of the computer was a solution to the complexity problems of its time.

So what is the complexity problem of our time? We'll only find the right solution if we identify the problem. The problem we face today is over-connectedness: There are too many links. Technology can certainly be part of the solution, though we'll have to use it in a different way.

So, it's the internet's fault?

No, it's globalization's fault. Today's globalization paradigm has led us pretty much to over-connected systems. We experienced this a decade ago when the global financial system collapsed: Having too many links in a system can create systemic risks. Highly connected systems can be convenient and profitable most of the time, but this does not imply sustainability. If you don't have a sustainable system, people will die sooner or later.

A law limiting links might be rather difficult to implement....

A link tax might be better. Adding links to already overconnected systems raises risks. If links were taxed, particularly long-term ones, people would think before they link: "What links are really important?"

Or they would relocate their server with links to a tax haven somewhere in the Caribbean?

That sounds a bit like a funny science fiction story. The elite is afraid of losing control, so they have an interest in fixing overcomplexity. Overall, I believe we need a new control paradigm.

A giant global control dashboard installed and operated by a German professor?

No way, just the opposite! The new control paradigm should leave degrees of freedom for local cultures, local innovation and local interaction. Not a one-size-fits-all solution, as the current globalization paradigm suggests. Rather, we need the paradigm of glocalization: Think globally, but act locally.

So giving up control is the new control paradigm?

To some extent. We need a distributed control approach. Let me explain it with a seemingly simple example: traffic lights, a system used worldwide to control traffic flows. Each city has a lot of them, and to find the optimal control solution, a lot of parameter combinations must be checked out. There are so many →

Dirk Helbing

Dirk Helbing is professor of computational social science at ETH Zurich. He was one of the founders of the FuturICT Knowledge Accelerator project, an information and communication system to accelerate innovations and counter global threats.

GETTING FROM A TO B ***If traffic lights and ants can adapt to respond more flexibly to real needs, so can we.***

possibilities that the optimization problem cannot be solved in real time, even with supercomputers. Therefore, authorities (traffic control centers) simplify the problem, for example by switching traffic lights in a periodic way based on typical traffic data and on a synchronization of the cycles. However, it turns out that as you do that, the best solutions – the non-periodic ones – are thrown away. Note that the variability of traffic flow is huge: The number of people arriving at a red light or turning right at a given intersection varies dramatically. So there is no "typical" traffic – a seemingly optimal control scheme is therefore created for a situation that never occurs.

Still, it's better than having no control.

But that's not the only alternative. We have found means of traffic light control that respond flexibly to actual traffic flow. So traffic flow controls the traffic lights rather than the other way round. That creates a flexible response to actual needs. And we have added a second mechanism to coordinate with neighboring intersections. If neighboring traffic lights are coordinated, this coordination can spread via self-organization throughout the entire city. This way you can combine higher flexibility with better performance. Amazing, isn't it?

In theory, or in reality?

The latter. The decentralized control approach outperforms classical top-down state-of-the-art control using a traffic control center. Additionally, control centers are vulnerable to electricity blackouts or communication downtime. Operation schemes based on self-organization would be adaptable, meaning resilient to perturbations and not dependent on any single node.

This sounds a bit like the "small is beautiful" idea. We don't need the big systems. We can solve the complexity problem on a small scale, one traffic light at a time.

It's not really a matter of size – many of these principles are scalable. And that makes them suitable for really big and global systems. Take an anthill for example. It can include hundreds of thousand of ants – so it's not a small system. Ants are a species as successful as humans (measured in terms of biomass). Interestingly, both species – humans and ants – are social. But ants obviously don't have much intelligence. They operate on the basis of simple and decentralized principles.

But ants have queens, like bees.

But these queens don't command the workers. They lay eggs. The work process is based on simple interaction mechanisms that have been optimized by evolution over millions of years. In principle, you can run such evolutionary processes in a supercomputer to speed them up – that is actually what we are doing.

***Think:Act* readers don't command ant hills. They manage large, highly complex systems with global reach. Are they in danger of losing control?**

They are facing an even bigger danger: that these control systems will become obsolete. Once you have built a global supply chain, you want to use it for 30 years or so. But information technology changes on a much faster time scale – and environmental and demographic conditions change as well. Suddenly you can produce stuff locally with 3D printers that can even print pharmaceutical pills or entire houses – at a much cheaper price. Suddenly there's a new production technology that doesn't require a huge global supply chain. I am sorry to say this, but many of those big global systems will be fundamentally...

"You have to be courageous to experiment with new solutions, even if your cash cows are being challenged."

...destroyed?

Let's rather say, "reinvented." Just look at the energy industry. There is a dramatic change from some big central power stations to a dense network of independent tiny energy producers. Some years ago, the energy business was boring – because you could not do anything wrong. Energy production was a reliable cash cow, almost like printing money. How dramatically that has changed! It's really important that we become much more adaptable, flexible and resilient. That needs different kinds of systems. You have to be courageous to experiment with new solutions, even if your cash cows are being challenged. If you don't dare to do it yourself, someone else will certainly do it.

That's something that requires heroism. Being courageous, destroying your business model before someone else does it....

At least you should be prepared for this situation. Look at Kodak, for example. Kodak had worked extensively on digital cameras. They had a lot of patents in that field, but they were not able to transform themselves quickly enough, anxious about destroying their old business model – so someone else did it. A similar thing may now happen in the transportation sector. Outsiders and newcomers like Google, Tesla and Uber are revolutionizing this business completely. All legacy companies threatened by drastic change should do the following: Take 5-10% of the R&D budget and put these funds together with those of other companies to pay for something like a "European Media Lab" – a European network of digital labs run by a group of visionary thinkers who dare to challenge established ways of thinking and institutions, who dare to think 10, 20, 30 years ahead – as far as they can – without taboos. Let them do these things. Give them the freedom. Let them have fun. Don't try to influence them. And then watch the wonderful things that happen. Learn from them. Be the first to turn results that fit your company into new products, services and business models.

But wouldn't this lab be another big, central institution with global reach – like the ones you want us to get rid of?

Yes and no. No, because it would be like the queen ant. It doesn't command; it lays eggs. Yes, because it would still be far away from an ideal system, where money flows to the places where the best ideas are. At the moment, we have a system where some people have money and some people have ideas. In the end, there are only a few ideas that get funded, while all the others are buried and will never get anywhere.

So, you want all of us to have the chance to "lay eggs"?

Exactly. Now, here's the solution. I call it "investment premium." Technically, it would be like a conditional basic income that everyone gets. However, it would be money that you couldn't spend on yourself – you would have to give it to someone else, someone with great ideas or someone who engages with society. So, it would be like a kind of crowdfunding for everyone, or "democratic (venture) capitalism." Everyone would try to attract investment premiums by convincing people of their engagement and ideas. Some people might invest their premium in new technologies, others into neighborhood projects – planting trees, repairing streets, building kindergartens or makerspaces. People would have more opportunities to decide about the things that concern their own lives. There could also be a City Olympics to find the best solutions to energy, environmental, sustainability and climate problems and how they can be implemented. These measures would create a lot of innovation and could fundamentally transform our economy. We could all benefit from each others' ideas, all learn from each other – creating a paradise on Earth together, as much as that is possible. ■

5–10%

of current R&D budgets could be pooled together to create a "European Media Lab" and challenge established ways of thinking.

KEEP IT SIMPLE, SMARTY-PANTS

Resist that temptation to take shortcuts. Simple solutions require application and always keeping the big picture in focus.

BY ***Gunter Dueck***

ILLUSTRATIONS BY ***Mark Von Ulrich***

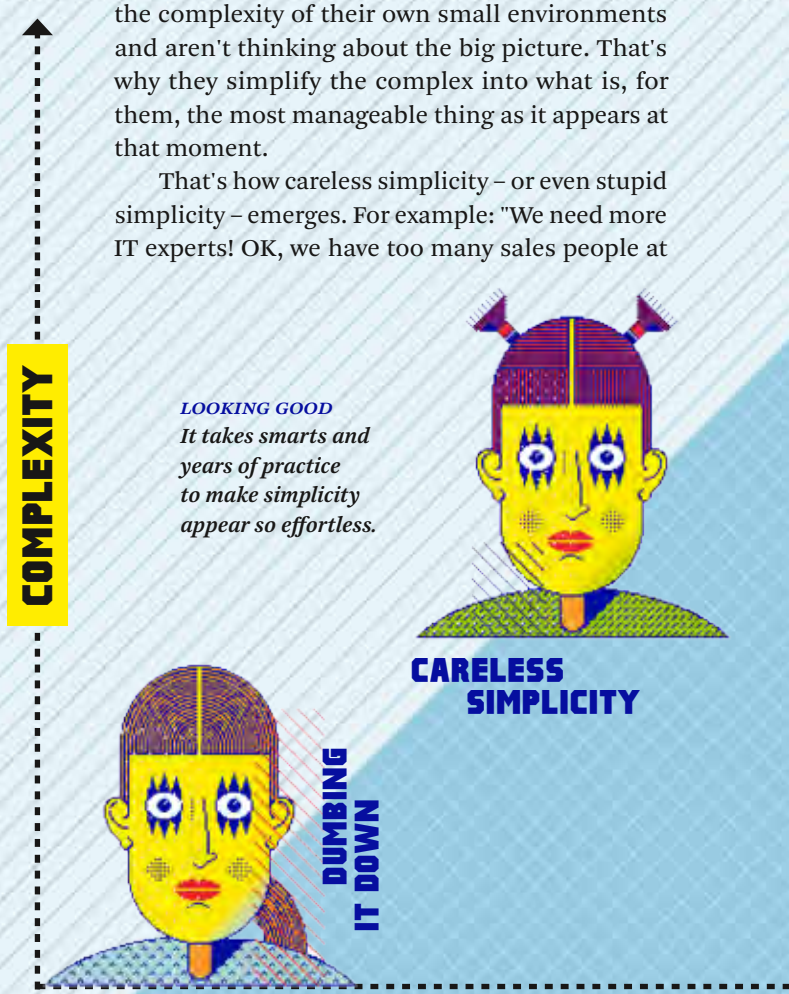
COMPLEXITY

COMPLEXITY SEEMS TO HAVE TAKEN HOLD OF THE WORLD. It's all digitization's fault, it seems, which has heralded in "control freakery" and engendered management obsession. But stand back for a moment and take a step out of your personal bubble. Complexity can be interpreted as the lack of system overview. No one can get close to the actual problem or cause, which means no solution is found. Instead, simplicity is sought to relieve the symptoms of complexity and the mantra is: Don't think about it too much – simplify the issue, and simplify it fast. But often we're not very clever in how we try to be simple. We don't strive for simplicity itself, but instead turn to experts, mathematical models, big data that we barely understand, AI, psychology and, yes, we even look to evolution and nature for examples. But we don't ruminate on the issue ourselves, which means that we get taken in by those who dazzle us with "concrete and simple solutions," often presented in hour-long presentations.

What's the magic formula? People look around to see where simple solutions have led to super success. To be sure, history does have a few examples and some simple things have sporadically succeeded in all the decades of nonsense. Companies like Aldi (logistics), Apple (aesthetics) or Google (customer value) are all, in their own ways, models of simplicity. I would like to illustrate the drama of the naïve hope for simplicity and the gullibility for pointless concepts, the underlying idea for which I found in the online article *How To Simplify Your Presentation Without Dumbing It Down* by Olivia Mitchell.

You can arrive at two types of simplicity: Either you can reduce the complex to a level of stupidity, or you can shape complexity into clear genius. Stupid simplification is more seductive than shaping simplicity into genius. It is stimulated by things like: "Let's do it fast, the boss insists." In contrast, genius simplicity can only come from hard work by those who are thinking and behaving holistically. There aren't that many people in the world who can do it. As I mentioned earlier, Aldi managed it. Steve Jobs and the founders of Google did, too. But their kind of genius can't be replicated quickly or cheaply. Even if a company did have a genius in its ranks, that person would probably end up sitting in meetings where everyone is searching feverishly for simple ways out. The people in the meeting aren't fools, but they do want to simplify the complexity of their own small environments and aren't thinking about the big picture. That's why they simplify the complex into what is, for them, the most manageable thing as it appears at that moment.

That's how careless simplicity – or even stupid simplicity – emerges. For example: "We need more IT experts! OK, we have too many sales people at



LOOKING GOOD
It takes smarts and years of practice to make simplicity appear so effortless.

the moment, so let's retrain them quickly." The "better to do something than nothing" philosophy mixed with time pressure turns people into fools. Almost every manager surely knows the KISS principle: "Keep it simple, stupid." But surely the last "S" should stand for something else, like this: "Keep it simple, smarty-pants."

We are often awestruck by nature's wonderful solutions, by how the brain works, the harmonious interaction of orchestral musicians, Olympic champions and the shining heroes of human history. The result appears to be either smart or genius – but never something that was created. Behind that seemingly effortless "genius," that "good design," lie years of practice and learning. Yet we don't work towards genius simplicity in the workplace, and rather fight amongst ourselves in meetings where simplicity could be developed.

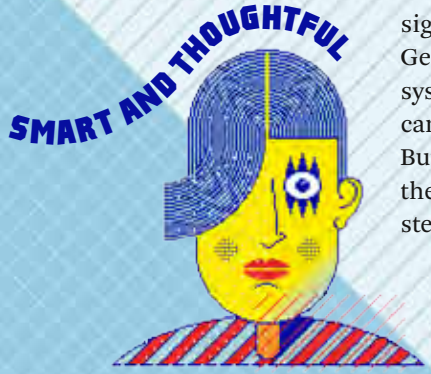
What is the result? A dreadful mix of variously simple ideas that get labeled as compromises and packaged as "having the best of both worlds." I call this "swarm stupidity." Contentious meetings turn into a fight for territory about political competence and power games, personal interests and mutual resentments, and they bring with them a long and painful struggle for solutions. In the end, you work to the edge of physical collapse and, with three-day stubble on your face, announce a heroically painful compromise that everyone now has to live with. Everything that was ever said, listened to and understood about the beauty of nature, community interaction and so on has fallen victim to this swarm stupidity. It isn't possible to unite different views into genius simplicity. "Think and act" is a good plan for an individual, but "think together and act together" leads to a drama that ends in tragedy. Here's a humorous example to illustrate my point. One of my favorite cartoons shows older men in suits sitting at a conference table and the caption reads: "With mild bemusement and resignation, they implement things they know will fail."

How could it be done otherwise? Know how to simplify without dumbing it down. Insist on simplifying towards smartness. But how do you do that? You don't just have to develop genius simplicity, you also have to counteract the ill effects of swarm stupidity. That can prove nearly impossible in large, stable organizations where the management is allergic to ideas, innovation or customer complaints. And then there are people with competing views clawing at the table who each have the sacred processes of their various departments and their vested interests to protect. Gathering experience and fruitful discussion are scarcely allowed – no, it is results that rule. Which makes me often sigh: "The process is the death of innovation." Genius simplicity will most likely perish in large systems. A single person or a startup sometimes can implement it and see it through to a final goal. But for large organizations, it's different – perhaps the only solution lies in a genius new boss who can step in from time to time to save things. ■

Gunter Dueck

A mathematician and the former chief technology officer at IBM Germany, Gunter Dueck is also an author and speaker known for his unconventional management philosophy. His best-known works include the trilogy *Omnisophie*, *Supramanie* and *Topothesie*.

COMPLEXITY



Genius simplicity can only come from hard work by those who are thinking and behaving holistically.

ELEGANCE OF THE SOLUTION

PHOTO: PICTURE ALLIANCE / DPA

1 FROM TIDAL FLAT TO HIGH-TECH HOMES

→ SONGDO, SOUTH KOREA

Built on reclaimed land close to South Korea's Incheon International Airport, Songdo International Business District has been designed to showcase the latest in sustainable design and urban technology. Many buildings are LEED-certified (Leadership in Energy and Environmental Design), 40% of the city is green space and a network of pipes takes household waste from homes to a processing center for recycling. Throughout the city, sensors monitor traffic, altering signals to prevent congestion and helping to control the public transport systems.

2 SMART HOUSING

3 CONNECTED LIVING

ICON: CHAMELEON DESIGN / THE NOUN PROJECT

How Smart Can a City Get?

High-tech metropolises are being built from the ground up. But what's it like to live in one? Take a glimpse into Chantal's life in South Korea's Songdo IBD – then jump halfway across the world to see how an older city like Vienna is smartening up.

BY ***Janet Anderson***

PHOTOS BY ***Jun Michael Park***

THE SCREEN IN HER APARTMENT tells Chantal F. that today will be cloudy, traffic in the city is running well, pollution is low, the elevator is working and the family's energy consumption is on track. If she needs it, the screen connects her directly to the building caretaker, the local medical services or the council. She can look up recipes or join an exercise class from her own living room.

Chantal lives with her family in Songdo International Business District (IBD) in South Korea, a city that has grown from nothing in a few short years and is now described as one of the world's smartest cities. Every home in Songdo is fitted with a similar screen. Called a telepresence unit, the idea is to provide a new way to deliver education, health care and government services directly into people's homes.

In Songdo, nearly every aspect of life is digitally networked (see box p.52). Currently home to around 36,000 residents, its developers, Gale International, consider it "the model ⟶

2 REDUCING THE COST OF LIVING

→ SMART HOUSING

The Homenet automation system enables residents in all of Songdo's apartments to control lighting, air-conditioning and ventilation from a digital control panel, monitors use and compares it with others on the grid. Tracking actual consumption helps raise awareness, change behaviors, reduce energy consumption and lower the cost of living.

for next-generation cities." Chantal and her family moved here from Germany, two years ago, to an apartment in a 47-story, glass-clad building. On one side, they look out over the brand new city and its green spaces; on the other, over empty land where building work is just beginning. "Songdo is changing rapidly, even in the short time we have been here," she says. "Coming from old Europe, I had to adjust to living in a place that is so new. In less than 11 years a whole functioning city has arisen."

Screens play a big role in the lives of Songdo's residents – in people's homes, outside on the streets and buildings and, of course, on smartphones. "You can get help anywhere," says Chantal. "You never feel alone. At the press of a button there is always someone to talk to." Meanwhile at the U-Life Center – the city's nerve center – a wall of screens streams real-time footage from CCTV cameras located throughout Songdo, monitoring everything from traffic to crime. "If a child got lost here, they would be spotted quickly," says Chantal.

Smart initiatives like these have been on the rise in cities around the world. "We have been talking about smart cities for some time. Now we are seeing them being implemented. Cities are starting to take the first steps to actually realize something," says Thilo Zelt, partner at Roland Berger and author of *Smart City, Smart Strategy*, a survey of smart cities around the world that ranked Vienna at the top.

"Data means that we know more about our environment and about the consequences of what we do."

Carlo Ratti, *Director of MIT Senseable City Lab*

MANY OF THE SMART INITIATIVES BEING TESTED are aimed at solving the usual problems of daily urban life – traffic congestion, pollution, crime, the high cost of living – but today, cities face new challenges as well. Over half of the world's population already lives in urban areas, with that figure predicted to rise to 70% by 2050. The strain on infrastructure and the environment cannot be ignored.

"To meet today's challenges, cities have to be more efficient with resources, more adaptable and more resilient. Smart solutions can help squeeze more efficiency out of the system," says Léan Doody, who is the smart cities lead at professional services group Arup. Globalization brings yet another pressure – it means cities increasingly compete with each other to attract talent and investment. "Technology can play a role here too, in economic and social development and helping cities to differentiate themselves," she says.

Take Barcelona – the city has decided to turn itself into a platform for businesses to experiment in urban technology. It is home, for example, to Worldsensing, a tech company that has pioneered the use of the internet of things to design parking management and traffic monitoring solutions. In Rio de Janeiro, one part of the city's smart strategy is a community warning system. The new Rio Operations Center monitors conditions across the city in real time, enabling the authorities to respond more effectively to natural disasters like flooding while also bringing down crime rates – all of which makes the city more attractive to tourists and investors.

"**THE APPROACHES VARY GREATLY** and the interpretation of the concept itself differs from city to city," says Zelt. "Some see it as sustainable urban development, some see it more narrowly as smart solutions for energy and mobility. I believe the key is that smart city strategies should be comprehensive – not just isolated digital solutions."

Carlo Ratti, director of MIT Senseable City Lab in Boston, USA, and founder of design and innovation office Carlo Ratti Associati in Turin, Italy, believes a lot can be gained by using the real-time data generated by cities. "Data means that we know more about our environment and about the consequences of what we do," he says. Trash Track, a project his team ran in Seattle, tagged individual items of domestic refuse and followed them as they moved through the sanitation system. "We learned that the simple sharing of information through visualizations can promote behavioral change," says Ratti. "People involved in the project were able to follow their trash and this led some of them to embrace more sustainable consumption choices."

Not every city has the benefit of starting from scratch. It is more usual to have to find ways to introduce new technology into existing infrastructure. This requires good leadership at the political and civil service level, according to Doody. "It's not well understood yet how to do this. Unlike land use planning, which we've been doing for over 100 years, we haven't established processes yet – we're still in pioneering days." Yet one thing is clear – it requires participation from all the stakeholders to devise and implement a successful smart strategy. "Citizen involvement, stakeholder dialogue, and public-private partnerships are important," says Zelt. "The biggest error for cities is to try to do this on their own. They should especially engage with local industry, bring them to the table from the start." An equally important factor for success is consulting and engaging with citizens – like Vienna, for example, which has involved its residents from the beginning, making it more likely that they get political support to push through disruptive changes. [See interview on p. 56]

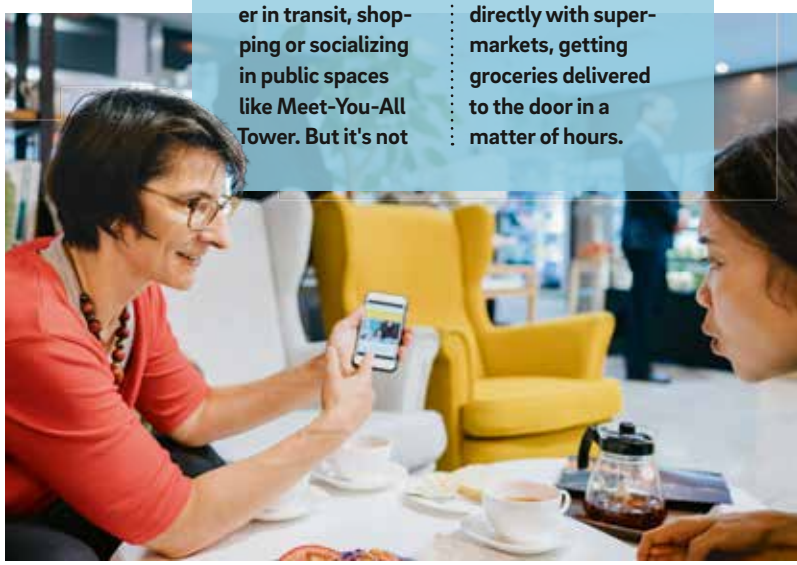
The pitfalls of avoiding this advice become clear as you listen to Chantal. "At first we found the screen entertaining. But it is all in Korean and we often don't know what we are doing. We had ceiling lights going on at 4am." The family has slowly cut out the technology they feel they don't need. "Some of it is practical, but we don't like to feel too dependent on it," she says. For example, she has dispensed with the smart refrigerator, preferring to do the shopping herself.

A more fundamental issue for Chantal is the presence of so many screens. "It's annoying that you can't switch off the screen in the apartment and the presence of so many cameras makes you feel you are always being watched," she says. On the other hand, she sees the positive side too: "You can leave your bag on a bench, go for a coffee, and it will still be there when you get back. I think as long as technology is used to manage the city better, it's a plus." ■

3 CITY LIFE, MINUS STRESS

→ CONNECTED LIVING

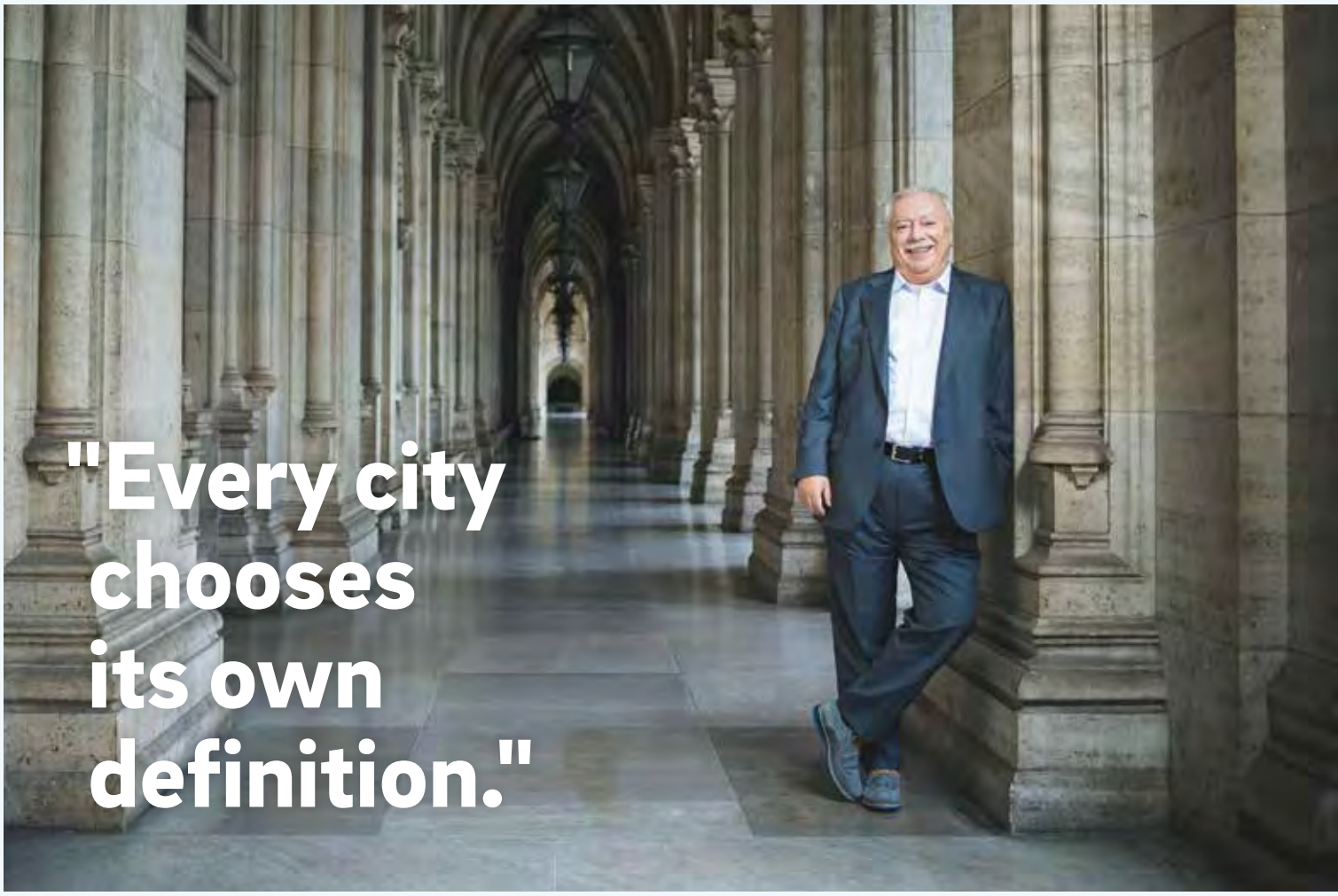
Citywide free Wi-Fi means Songdo's residents are always connected – whether in transit, shopping or socializing in public spaces like Meet-You-All Tower. But it's not just people that are connected. Refrigerators communicate directly with supermarkets, getting groceries delivered to the door in a matter of hours.



4 MORE INNOVATIVE, MORE ATTRACTIVE

→ DIGITAL INNOVATION

Cisco's Global Center of Excellence in Songdo drives digital innovation by bringing partners, customers, government and startups together to co-create solutions across every aspect of city life.



"Every city chooses its own definition."

"Smartening up" an established urban area poses more than a few problems, but Vienna is up for the challenge. Mayor Michael Häupl explains how the Austrian capital is uniting players from across municipal areas with a holistic approach called Smart City Wien. The goal? To raise the quality of life for Vienna's citizens through sustainable, innovative action.

INTERVIEW CONDUCTED BY ***Janet Anderson***

Michael Häupl

Michael Häupl has been Mayor of Vienna since 1994 and involved in city politics since the 1980s. After studying biology and zoology at the University of Vienna, he worked as a research scholar at Vienna Natural History Museum.

When you set out on the Smart City Wien strategy in 2011, what was your vision?

Even before the term "smart city" came up we had already accomplished a lot in urban development, housing construction, transport, environmental protection, supply, disposal and much more. That was our starting point. But first of all, we had to be better and more ambitious in many areas.

Secondly, we had to be flexible, yet still know where we wanted to go. The Smart City Wien framework is a long-term umbrella strategy for 2050. The vision is that Vienna will significantly reduce the amount of resources the city consumes while maintaining social cohesion and continuing to offer a very high quality of life to all its inhabitants.

How has becoming a smart city changed the lives of Vienna's citizens?

The Viennese can rely on the fact that the city administration is focusing on social aspects and also on involving the population. We work together with all stakeholders to ensure that

the excellent quality of life in our city is maintained at the highest level for everyone – no one should be left behind. We must try to promote a gentle yet effective transition to renewable energies, advance public transport and maintain sufficient green spaces in the city so that everyone who lives here can continue to feel comfortable in our city.

What have been the biggest challenges in the introduction of smart solutions to an existing infrastructure, and how have you overcome them?

We live in the age of the Fourth Industrial Revolution. New innovations are launched nearly every day to simplify urban life. In Vienna, we have a highly reliable infrastructure. But we also want to improve it and ensure that we maintain its existing quality while keeping up with the times and allowing for the best quality of life in the future as well. This, of course, takes a lot of effort.

How important is cooperating with private-sector partners in providing smart services? What is the best way to manage these relationships?

Strong cooperation determines the success of the Smart City Wien initiative. It makes planning even more ambitious and inspiring. The framework strategy runs up until the year 2050 because the changes in the energy, mobility and building sectors cannot be achieved overnight. We're paying particular attention to working with companies and enterprises from Vienna as well as business partners, research institutions, science and other fields. This is an overall strategy operating under the theme: "Find clever solutions to complicated problems."

How have you involved Viennese citizens in the process of choosing and developing these smart projects?

A smart city gives its citizens the opportunity to participate in planning processes and improvements. This cannnot, of course, be the case for all projects, which is why we want to consider all interests in the planning processes. However, our main concern is that no one should be left behind. There is a risk of keeping disadvantaged groups out of these processes. To avoid this, we offer both online and offline participation. For example, citizens can now send complaints or requests to the city administration quickly, intuitively and without mandatory registration using a new app called "Sag's Wien." It was developed through an open, online and offline process with the population.

Cities produce immense amounts of data and many smart solutions are built on capturing and using that data. How do you deal with concerns about privacy?

This is a very important issue in all our projects. Data protection and data security have become increasingly important in our information society, in particular for the administration and public trust in our services. Every person has the right to keep their personal data secret. Also, personal data may not be collected or passed on without a sufficient statutory basis. We take this topic very seriously in the development of all our services and projects where we apply new possibilities and technologies.

What advice would you give to a similar city starting out on this journey?

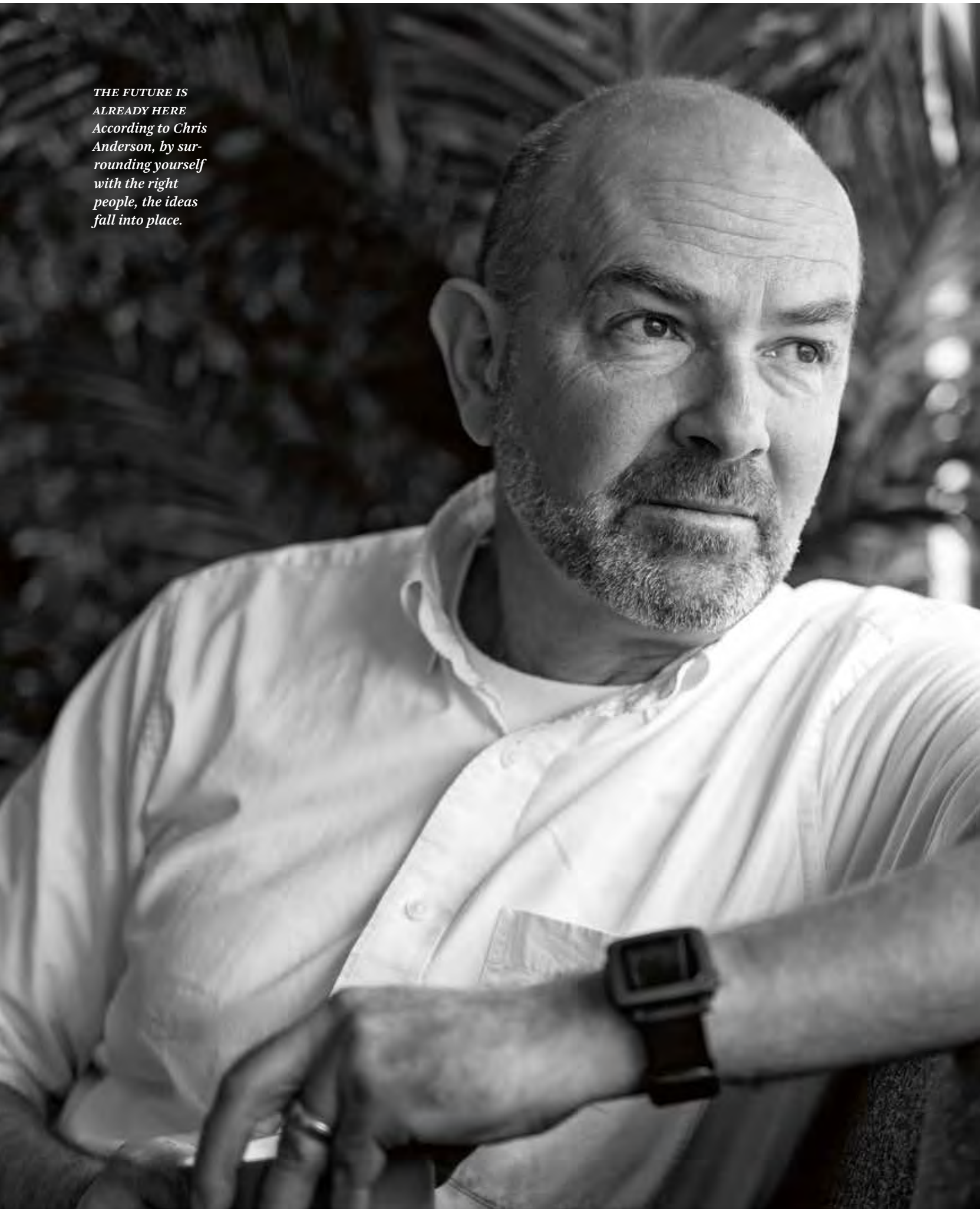
Every city chooses its own definition of a smart city and defines its own priorities in solving the problems. The diversity and uniqueness of every city is a great asset and may lead to very different approaches to the subject of the "smart city." From my point of view, the strong cooperation and involvement of all stakeholders is crucial for implementing such a strategy. This requires more effort and time in the beginning, but is worth it many times over during the process of implementation. ■

SMART VIENNA

→A QUICK LOOK

The Smart City Wien strategy includes initiatives in many sizes and shapes. Citizens' solar power plants, run by the city-owned energy provider Wien Energie, give locals the chance to invest in community-funded green energy. Aspern Seestadt is a mixed-use development taking shape on the edge of the city. It combines intelligent design with sustainability and challenges developers, architects and engineers to come up with new ways of doing things.

PHOTOS: STADT WIEN / PID / IAN EHM; PICTURE ALLIANCE / HANS RINGHOFER; ICON: CHAMELEON DESIGN / THE NOUN PROJECT



THE FUTURE IS ALREADY HERE
According to Chris Anderson, by surrounding yourself with the right people, the ideas fall into place.

PHOTO: PR 3D ROBOTICS

The Long Tale of a Man On Trend

Chris Anderson has a knack for spotting trends and acting on them. After all, he spent nearly 12 years familiarizing readers with the inner workings of technology as editor of Wired. *In this interview, we follow the author of* The Long Tail *down the stream of thought that led to his latest venture: making drones ubiquitous.*

INTERVIEW: ***Ben Knight***

→

Journalist, entrepreneur, visionary: After a stint at *The Economist* and going on to serve as editor-in-chief of groundbreaking and agenda-setting magazine *Wired* and writing three influential books – including *The Long Tail: Why the Future of Business Is Selling Less of More,* which offered readers fresh insight into how business can be done on the internet – Chris Anderson is now helping shape the future by tackling technology hands-on as the CEO of 3DR, a company putting drones front and center for commercial exploitation. Here he talks about how low barriers and open-source tools are vital to getting your ideas out there.

You are often described as a visionary or a utopian – or even a guru. What do you make of that?

Those are all terrible terms. I never use any of those. That's not what I intend to do. It's really simple: I just happen to be lucky to live in an interesting place in an interesting time, surrounded by interesting people. And I tend to do rather than just watch – and when you do things with interesting people, trends become obvious. There's no intention to trend-spot, they just kind of jump up in front of you, and you can't ignore them.

In reviews of your books there's often an undertone among critics that you're over-optimistic about the future.

That's just the standard line about Silicon Valley. Everything I've written has been completely obvious to people around me, and considered either wrong or outrageous or optimistic by those who don't live in the technology industry. The notion that something is over-optimistic is basically the slander applied to computing for about 50 years – it's just normal. I think it was William Gibson who said, "The future is already here, it's just not very evenly distributed."

$500

The amount on the check Chris Anderson wrote 3DR co-founder Jordi Muñoz, then a recent Mexican immigrant, to begin their collaboration in 2007.

$53 million

The amount raised by the company as part of its Series D funding round in early 2017.

"When you do things with interesting people, trends become obvious. They kind of jump up in front of you."

It's been over 10 years since you published *The Long Tail*, a powerful idea at the time that explained how internet retailers were beginning to concentrate on the "tail" of niches as a new market, rather than trying to find hits. How do you think the notion has played out?

It's played out exactly as expected. I didn't invent the concept, it was already playing out, and it'd been playing out for years. I just put a name on it. It's like asking: "How's gravity working out?" You know, it worked! *The Long Tail* is basically a statistical observation about humanity. It's an old phenomenon that's just been amplified by the internet and the ability to extend it to more domains and more markets so we can measure it better. But it's deeply wired in our biology and

GOING SOLO
Anderson with 3DR's Solo, the world's first smart drone.

MAKERS UNITE
The Maker Faire calls itself the "Greatest Show (& Tell) on Earth." It holds fairs around the world, including this one in New York in 2013.

CASE IN POINT
Amazon has made a long tail business strategy the focus of its success.

PHOTOS: CHRISTOPHER MICHEL; RANDY DUCHAINE / ALAMY; GETTY IMAGES

it's probably been true for about a million years. The internet exposed the latent demand for choice. We didn't have the mechanical ability to expose people to choice until the internet opened that up.

Warren Buffett recently predicted that AI would be "enormously disruptive" for the economy because of the loss of jobs it would entail. Do you ever feel like new technologies sometimes present dangers?

Well, the way you stated the sentence is all in absolutes, and of course the one absolute is that there are no absolutes. Will new technologies destroy jobs? Of course. Will new technologies create jobs? Absolutely. Is the latter greater than the former? You know, over time it tends to be. I don't see any reason why it wouldn't be this time. We've got about 300 years of experience, going back to the plough, and so far so good.

But is the pace of upheaval accelerating, so we're constantly having to adapt quicker than we used to, as a species?

Yes, we are. Are you suggesting we've reached some sort of metabolic limit to our ability to adapt? Maybe. I haven't seen it.

In 2012, you described a very optimistic vision of what it meant to be an entrepreneur, where much of the infrastructure, such as distribution and fundraising, can now be done online. Do you still feel that way in 2017? Or has something changed?

Well, let's be precise: Are the barriers to entry for entrepreneurship lowering? Yes. Are they continuing to lower? Yes. Those barriers include regulatory, technical, team building, fundraising. All those things are continuing to lower thanks to open-source software, or global markets, or crowdfunding and so on – so all that's continued. Then when we look at the incentives to entrepreneurship, the question is: How do they compare to a safe job at a good company in good economic times? So we can believe that the barriers continue to fall, but the incentives vary, based on the alternatives. I'm sure there are cycles, but right now all the metrics suggest there have never been more startups created, never been more startups funded. Venture investments are close to an all-time high.

Isn't there a danger that digital entrepreneurs of the type you describe in the book *Makers: The New Industrial Revolution* will only end up making luxuries rather than necessities? That necessities will still be made in China, while American tinkerers make luxury items for niche markets?

There's certainly something to that, but I don't think that's an economic trend. Makers are always continuing from amateurs to professionals, or from dabblers to obsessives. We have the Maker Faire here in the Bay Area. Around 120,000 people attending are all going to be doing their own thing. All that stuff will fall into three categories. Number one: It's things that they all did themselves. Number two: It's something that probably did not exist before. And number three: It's probably of such narrow interest that the only explanation for why it exists is "because I can." ⟶

FROM EDITOR TO ENTREPRENEUR *Chris Anderson got the idea that turned into 3DR at his dining room table while still working as editor-in-chief at* Wired *magazine.*

But it doesn't necessarily pass any economic test. Why would anyone else want it? Where are you going to sell it? How do you compete with China? A fraction of those makers might have aspirations to entrepreneurship, and they're going to have to ask those tough questions about market size, distribution and building materials, etc. But that's the minority.

The great liberating thing about the maker movement is that you don't really need a good reason to do anything. When the cost of creation is so low, you don't have to overthink stuff. You can just do it and see what happens, and let the marketplace pull you into entrepreneurship, rather than falling in love with a dream, pursuing it obsessively on your own for years, releasing it into the world to a giant shrug and then having your spirit crushed.

Chris Anderson

Chris Anderson built two successful careers in the space of a decade. The former editor of ***Wired*** magazine set out his stall in 2006 with the book ***The Long Tail: Why the Future of Business Is Selling Less of More***. This much-discussed bestseller showed how the new distribution models of the digital age had enhanced an old retail truth – that selling a few of a large number of items can sometimes beat the blockbusters. Two more books followed, the last of which, ***Makers: The New Industrial Revolution***, served as the theoretical backdrop for his second career as an entrepreneur in the burgeoning consumer drone market. From being a "maker," Anderson went on to become co-founder and CEO of 3DR, a leading developer of drone software.

PHOTO: PETER DASILVA

"The great liberating thing about the maker movement is that you don't really need a good reason to do anything."

Was it similar when you started your companies?

Always. I got pulled into all this. I just did stuff, and most times people ignored it. Every now and then people liked it, and when they liked it I made more of it. Every weekend I do projects – sometimes doll houses with my daughters, sometimes software, or electronics, or mechanics. Every weekend it's a struggle and I've accomplished something – or not. And I'm like: "Okay, does that feel like I want to do more of it, or not?" And sometimes I'm like: "That was hard. I don't like doing that. I'm going to stop." And sometimes I'm like: "That was actually amazingly cool. I had no idea I was going to get so far – I think next weekend I've got to do more." It's like raising kids: It's full of failures and struggle, but the occasional successes are so inspiring that they're worth everything else.

Is there anything you've learned from running 3DR that's made you question some of the things you were writing when you were a writer?

Absolutely, yes. And the book to test it against is *Makers*, which was written before I came on full-time at 3DR. When I wrote it (in 2011) I was still the editor of *Wired*. The memory of starting the company at my dining room table with my children was still pretty fresh and I still had one foot in the garage and the maker movement. You could see how we got there, but what was less clear was how to get from five to 50 to 100 employees – you know, the scaling part.

I had a thesis that you could scale the maker movement into a big traditional company. And I think that thesis turned out to be wrong. I knew that, on the manufacturing side, there was a discontinuity in terms of scale – you couldn't just scale bigger and bigger garages, if you will. But the discontinuities went beyond even that. For example, the difference between selling online and selling through traditional retail – involving distributors and price protection and marketing and inventories sitting out there in other people's warehouses. That, right there, is a completely different business model, and one that the garage doesn't train you for. The other thing we weren't trained for was this: We knew that China would be strong and the speculation was that by open-sourcing software you could leverage Chinese hardware manufacturers and create a kind of Android-like ecosystem. That thesis may still be true, but it has not been proven true yet.

What future tech trends are you seeing now?

I started the website DIY Drones 10 years ago, and that kicked all this off. The question there was that drones had been around for 50 years and sold by big aerospace companies and used in the military, so what made me think that a bunch of amateurs with a website could do anything truly innovative? And the answer was that the enabling technologies of drones – sensors and smartphone guts, GPS and cameras and so forth – were now so good and cheap that you could come at the industry from the bottom up rather than having to create a traditional aerospace company. And that worked out really well. There are already millions of drones in the air, and they're all made by companies like ours.

Now we're doing the same thing with cars 10 years later. A sister site for DIY Drones is DIY Robocars (an ideas forum for building robot cars) and the question is: What could you amateurs possibly do that the Googles and Teslas and Ubers can't do better? And the answer is: Well once again, we can come from the bottom. Cheap, open, easy, unreliable – unreliable is a good thing because it means you don't have to spend all your time obsessing over regulations and safety because the cost of failure is so low. You might look at it and think: "Those are toys." Until you look closely and realize it's the exact same software that's used on the big cars, but because it's open source, the cost of entry is so low you can do it for a couple of hundred dollars on the weekend. It's the same democratization – you can transform traditional industries by simply opening them up. ■

3DR

The company's name refers to a third axis where consumer robots hadn't yet traveled, something Chris Anderson and Jordi Muñoz vowed to change when they founded 3DR in 2009. They launched the first smart drone, Solo, in 2015. Site Scan, a complete aerial analytics package, followed in 2016.

READY FOR THE ROAD AHEAD
With record numbers of university graduates in recent years, China's next generation is creating a competitive job market – and a global mindset.

Is China Ready to Become the 新超级大国*?

Brexit and the US election have left more than a few people reeling – and just as many talking about a new world order. Could China rescue globalization?

BY ***Henrik Bork***

[*New Superpower]

PHOTO: REUTERS

IN MAY OF THIS YEAR, the city of Beijing came to a standstill. Major restrictions were imposed on traffic and factories ground to a halt. The reason? Beijing's need to ensure picture-perfect blue skies for a major international summit. The effort paid off. When nearly 30 global leaders smiled for a group photo, Beijing's usual smoggy backdrop was not in the frame.

Chinese president Xi Jinping is pulling out all the stops to woo world leaders – and cleaning up the sky is a small part of his meticulous plans. His latest charm offensive – the One Belt, One Road (OBOR) initiative, a huge, global infrastructure investment program – is gaining fans, as the turnout at the OBOR summit at Yanqi, in Beijing's outskirts, proves. If successful, OBOR, also known as the New Silk Road initiative, could dwarf the Marshall Plan and catapult China to the forefront of global affairs. So far, Xi's efforts seem to be working and world leaders appear to be letting their guard down. Take Russian president Vladmir Putin, who displayed his talent for music – playing the piano while he waited for Xi to arrive. Putin might be the one playing the music, but he is probably dancing to Xi's tune.

The geopolitical tectonic plates are shifting. The US government might threaten to build walls, cancel trade agreements and question the merits of globalization and global climate deals, but Xi is suddenly seeing himself referred to as the "new global grown-up" (as *The Economist* put it). He earned this title after another Alice-in-Wonderland moment for foreign policy analysts: In January, in the mountain resort of Davos, Xi staunchly defended globalization and free trade. Like it or not, he said, the global economy was like "a big ocean in which we all have to swim." With his resounding "no to protectionism" and reconfirmation of the Paris Agreement, he sounded like a welcome antidote to Trump's nationalistic shout-outs.

Add Brexit and the populist political movements in Europe to the mix, and it seems as if globalization is in danger of collapsing. "People are looking for signposts in a complex and uncertain world," Klaus Schwab, founder of the World Economic Forum, told *The Guardian*. And some people, he clearly hinted, think they have found those signposts in Beijing. All of a sudden it seems as if China, of all countries, has to rescue an economic order that has, for over 70 years, been led by the US and its western allies. Xi pledged $78 billion in financing to build roads, railroads, bridges, power plants and harbors in countries in Asia and Europe. He encouraged banks to contribute $44 billion in overseas capital to support what he calls the "project of the century" – a new version of the ancient Silk Road linking Europe and the Far East.

***A WEIGHTY ISSUE** Policy reforms and globalization efforts are creating a new class of Chinese consumers, but for many the tangible products of the global economy remain out of reach.*

Globalization in China

1978 In December Deng Xiaoping announces economic reforms that open up the country to foreign investment, beginning in four special economic zones.

1990 In November the Shanghai Stock Exchange is re-established and begins operations in December after a 41-year hiatus.

2001 China joins the World Trade Organization. As part of the agreement, restrictions on foreign investment are further lifted across several sectors.

1978 ● ● 1990 ● 1995 ● 2000

PHOTOS: GETTY IMAGES (4), PICTURE ALLIANCE

"We are neither financially nor psychologically prepared for such a role."

Jin Canrong, *Director of the School of International Studies, Renmin University*

WITH SUCH GLOBAL AMBITIONS, a question has resurfaced, one first discussed after the global financial crisis in 2007: Will China be able to replace the US as a global power? Ask professor Jin Canrong and he cracks up laughing. "No," says the director of the School of International Studies at the renowned Renmin University in Beijing. Jin's response carries weight: After all, he has the ear of China's communist leaders. He cites the economic size of both countries. The GDP of the US stands at $18.6 billion, China's $11.4 billion. He argues that China has yet to gather any experience in the field of global governance. "We are neither financially nor psychologically prepared for such a role." Even so, his "no" sounds rather more like a "not yet," and the Chinese seem to be aware that the US has gifted their president the perfect opportunity to raise the country's profile.

The Chinese are the first to admit that they have been among the biggest winners of globalization, alongside Germany and Japan. Ever since China's pragmatic leader Deng Xiaoping started opening up the People's Republic to the outside world in 1978, this country has rapidly become a part of the global economy. China's accession to the WTO in 2001 ⟶

2005 China becomes the world's fourth-largest economy, behind the United States, Japan and Germany. It beat the UK by an output of just $94 million.

2008 Beijing plays host to the Summer Olympic Games. The success of the event helps secure China's position on the world stage.

"The global economy is like a big ocean in which we all have to swim."

2017 Xi Jinping defends globalization in a World Economic Forum speech, underlining China's commitment to being part of the global economy.

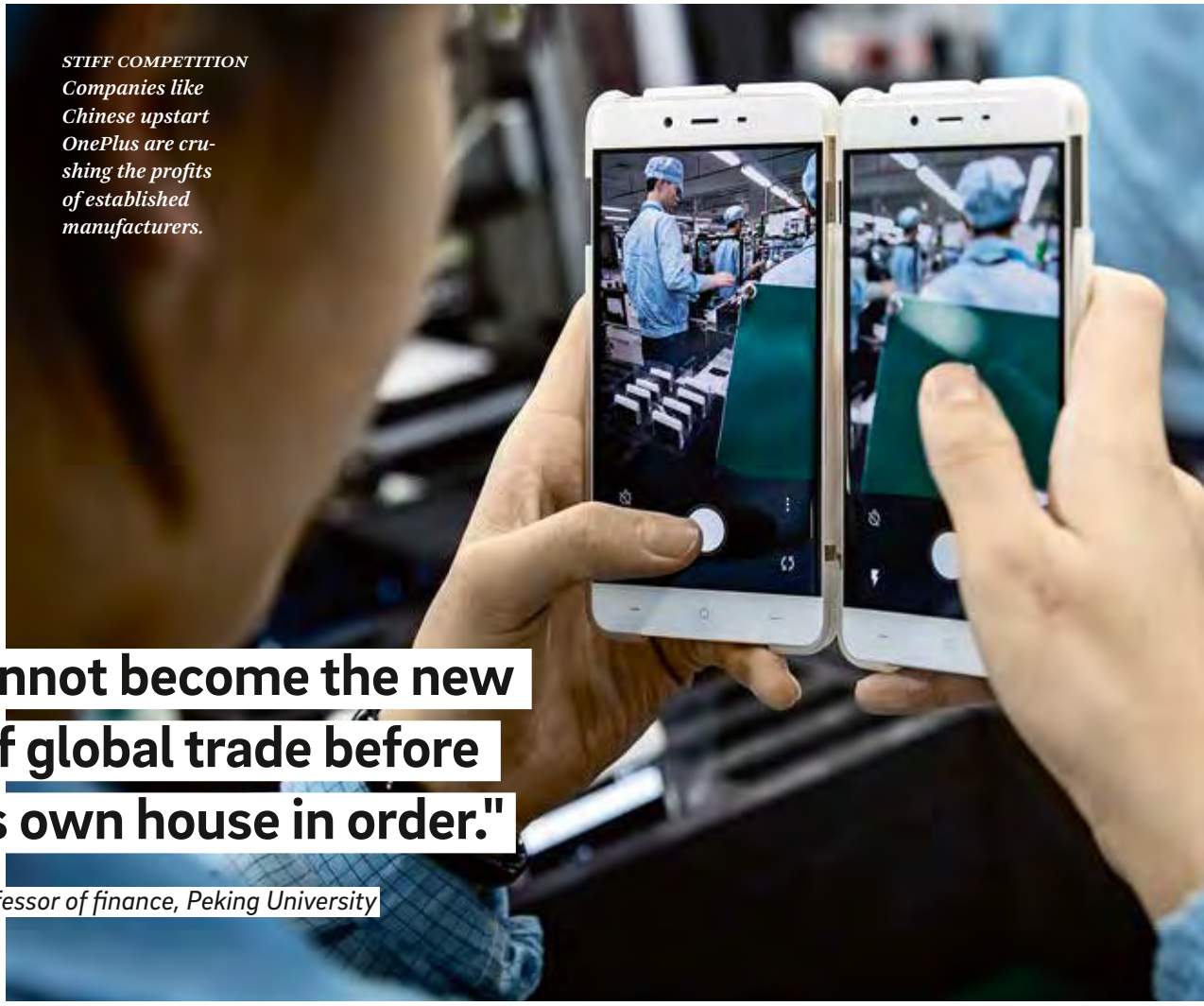
2005 2010 2015 2020

and the Olympic Games in Beijing in 2008 were significant milestones on its road to participation.

"China has become one of the fastest-growing national economies and biggest trading nations on Earth. It belongs to the most important beneficiaries of globalization," says Wang Huiyao, director of the Center for China and Globalization (CCG) in Beijing. The think tank, which counts former Chinese trade officials and diplomats among its consultants, organizes discussion forums about China's global role. "Globalization has become a leading theme in China's political discourse," says Wang. Not so long ago China's politicians would only speak about their own country on trips abroad. That's all changed. "Today our leading politicians have accepted the concept of globalization, and that is a very big change for China," says Wang. In other words: China hasn't just joined the club and profited from it, it is now ready to become one of its cheerleaders.

IT IS IRONIC, PERHAPS, that China has discovered its love of globalization when the rest of the world seems ready to abandon it. China may not be willing or ready to take on the US on political or military terms, but it does want to reshape the world order according to its own interests – and OBOR is China's way to announce a new-found self-confidence. Beijing wants to be taken seriously, and it has started to restructure the world financial order that originated in Bretton Woods after the Second World War. "Globalization 1.0, or the UN, the World Bank, the International Monetary Fund, all of that was of good service for a while," says CCG director Wang Huiyao. "But now we need new players, new input." There is little doubt who he has in mind.

The most important step in that direction so far has been the creation of the Asian Investment Infrastructure Bank (AIIB), set up in Beijing in 2016 – China's answer to the World Bank. After begging political leaders for many years to give China more



STIFF COMPETITION *Companies like Chinese upstart OnePlus are crushing the profits of established manufacturers.*

"China cannot become the new master of global trade before it puts its own house in order."

Michael Pettis, *Professor of finance, Peking University*

clout in international institutions, and being brushed off consistently, Beijing has now started to create parallel institutions – ones that critics fear it aims to dominate itself. China's president denies it, but when he uses the word globalization, he still means this new "Globalization 2.0," a new global world order shaped much more by Chinese interests. Yet, many observers warn about confusing China's ambitions with its abilities. "Giving a speech is not enough to dominate the global trade system," says Michael Pettis, professor of finance at Peking University's prestigious Guanghua School of Management and author of the book *The Great Rebalancing: Trade, Conflict, and the Perilous Road Ahead for the World Economy*. China cannot become the new master of global trade before it puts its own house in order, argues Pettis. "China would have to be in the position of showing very, very large trade deficits so that the world can run reciprocal surpluses – as the US is currently doing," says Pettis.

PHOTO: GETTY IMAGES. SOURCE: BLOOMBERG

One Belt, One Road

A plan to revive China's Silk Road glory days, OBOR is the most ambitious economic and diplomatic program in the history of the People's Republic.

65%

of the world's population will be connected by OBOR's roads and maritime routes.

ALREADY, THERE ARE WARNINGS that with multi-billion dollar investments in railroads, nuclear power plants and port projects from Sri Lanka all the way to Greece, Beijing is overstretching its reach. The double-digit growth that China enjoyed for a long time has recently slowed to 6.5%. The years of China's economic miracle are over. And even the current growth is financed to an alarming extent by credit. China now needs globalization more than globalization needs China. Its national debt has reached two and a half times the country's GDP. "Debt is increasing faster than China's ability to pays those debts back," warns Pettis. It would already take more than $2 trillion to clean up China's debt problem. In order to return to sustainable growth, China's economic planners would have to begin serious economic reforms to increase household income and stimulate domestic consumption. But those reforms are nowhere in sight. China's ambitions to lead the world are currently being foiled by... China.

The US and European business community in China has grown increasingly skeptical regarding pledges of globalization and free trade. "The mood among US businesspeople here at the moment is not very positive when it comes to China. That has really changed," says James McGregor, a former *Wall Street Journal* correspondent and author of the best-selling book *One Billion Customers: Lessons from the Front Lines of Doing Business in China*. McGregor, who now works as chairman of the public relations firm APCO in Beijing, is, like other foreign businessmen, eyeing the Made in China 2025 plan with suspicion. They fear China has started to buy high-tech companies abroad, while investments by US and European companies in China remain restricted.

THE WORD "RECIPROCITY" has found its way into official publications at the European Chamber of Commerce in Beijing. "China now invests four times as much in Europe than Europe in China," says Jörg Wuttke, who served as president of the European Union Chamber of Commerce in Beijing until May 2017. Beijing has armed its large state-run enterprises with cheap loans and instructed them to invest in Europe on a large scale in strategically important sectors like IT, including cloud computing and semiconductors, or robot technology. European companies, on the other hand, are still forbidden from investing in many sectors, with insurance and banking services the most glaring examples. China is allowed to buy harbors in Greece, airports in France and robot companies in Germany, while similar deals in the other direction are still unthinkable. In Europe, says Wuttke, people are asking: "And... where are we?" ■

Eureka? You're Wrong!

LINDA HILL *says it's time to forget about "a-ha moments." To turn an organization into a world-class innovation machine, today's leaders should focus on the genius of collective discovery.*

BY ***Bennett Voyles***

ILLUSTRATIONS BY ***Mario Wagner***

AFTER FOLLOWING OVER 30 EXECUTIVES of innovative companies for several years, Linda Hill and her team came to the conclusion that our conventional view of what it takes to lead an innovative company is wrong. Forget charisma and "eureka moments" – Hill and her co-authors argue in *Collective Genius: The Art and Practice of Leading Innovation* that the most important role played by leaders profiled in the book, executives at highly innovative organizations like Pixar Animation Studios and Google, is to create an environment where employees feel free to make suggestions.

The winner of the 2015 Thinkers50 Innovation Award and, alongside her *Collective Genius* co-authors, the 2015 Warren Bennis Prize for Excellence in Leadership as well as the 2015 Axiom Business Book Award Gold Medal for the Best Book on Leadership, Hill argues that the most innovative companies have leaders who focus on creating an innovative culture rather than pursuing a particular vision.

In a conversation between classes at Harvard Business School, the professor of organizational behavior talked with *Think:Act* about the kind of leadership that can turn a company into a world-class innovation machine.

What's special about leaders in an innovative organization?

All the people [we] studied were visionaries. They were perfectly capable of visionary leadership, and in fact one of the challenges they faced was making space for other people. But the leadership function they served was to build an environment that encourages people to innovate. Fundamentally, these leaders ⟶

"It's not enough to be what we call a 'value-creator,' you also have to be a game-changer."

understood that innovation is mostly a bottom-up activity. It's rarely the result of some individual "a-ha" moment. It really is a collaborative and discovery-driven, iterative activity. As the leader, I will create psychological safety and be supportive to encourage the sharing of ideas, but also I will be challenging so that those ideas are refined to meet our performance objectives. Yes, we have to learn and experiment, but eventually we have to produce. We might improvise, but we have some structure in the organization so we all have some clarity about our responsibilities and also guardrails or boundaries within which we must work.

How do you know if you're succeeding?

The question of metrics for innovation is one that I don't think anyone has really nailed. This is an area that boards have talked a lot about with me, but it's not clear what the metrics should be. Some use things like vitality indices – what percentage of our revenue is from new services? – but a lot of them are using process milestones or non-financial metrics (e.g., increased insight about "stickier" relationships with the customer), because they know that a lot of metrics are too short-term to be meaningful.

Everyone talks about innovation but do investors really support it?

Yes and no. When we talk to many CEOs, they say: "The board wants us to innovate, but if we miss our quarter, we're going to be in big-time trouble." The company's ownership may affect the attitude as well. One public company CEO was telling me recently that he worries about the rise of passive versus active investing and the impact it has on innovation. Passive indices, he feels, actually might be leading CEOs and boards to be even more short-term oriented and discourage investment in breakthrough innovations that may not pay off for years. If you have a Warren Buffett or a shareholder who intends to hold your stock for the long term, then you have someone you can talk to about your strategy and manage their expectations.

Does that mean it's easier for privately held businesses to innovate?

We've done a number of interviews with CEOs and directors but we're still collecting data. So far, it seems that that is the case because the private companies seem to find it easier to think more long-term. The capital is often more patient. In fact, one of the CEOs we talked to, his company went private so they could be more innovative.

Do you find that innovative companies define their missions differently?

Innovation is actually hard work. You can't force somebody to innovate; they have to volunteer, which is why you have to work to create a context that makes them willing. We found the heart of that willingness is a sense of collective purpose that animates the work and helps them in the face of missteps and even failures. The CEO we studied in the luxury brand business believes luxury impacts how people define who they are and what matters to them. She wanted to create a luxury brand that led women to feel empowered and not, as she put it, like "concubines." There was a purpose to the work that served as a compass for how they made certain business decisions, as well as helping employees find meaning in their work.

If everybody in a company is innovating, how do you maintain a focused idea of your brand?

Well, innovation was central to the brand identity in one company we studied. And if the brand is about

innovation, then everything about the brand needed to be innovative. Brands are built, as the executive put it, from the inside out. So as he told us everything had to be innovative about the brand, not just product design. Having said that, even innovative companies set up guardrails within which the organization works. You may come up with an idea and maybe it is new and exciting, but if it doesn't fit the brand proposition, then it is not implemented. An innovation is something that is both creative and useful.

Does innovation have to happen mostly under the company's umbrella?

No. Co-creation with the customer can be exceptionally fruitful for companies as it makes it more likely that it will meet the customers' needs and facilitates better execution. For instance, an insurance company we are studying has begun to include customers in their design thinking workshops to develop new online services. By doing so, they are learning a lot about what customers (Baby Boomers versus Generation X) actually value and will pay for and how to best deliver those services to different customer segments.

Can you tell us about the supplier's role in innovation?

Many companies are also partnering with suppliers for the same reason, to come up with new processes that improve their mutual operations. One executive who runs a supply chain of a major company is creating what he refers to as an "innovation ecosystem." In an effort to be more customer-centric, together they are completely reimaging the supply chain. Among other things, the new open architecture makes for more transparency for quality control and efficiency for all with its "plug and play" design. He is also working with competitors in the industry to see if they can't develop standards for more of their work, like what we saw with electricity providers decades ago, that make it easier for all to collaborate and develop better outcomes for the end customers.

Do you feel we're in a very particular time in which creativity is more important, or is this just how business is going to be?

We live in a very unforgiving global economy. It is hard to grow and thrive without innovation. For sure. Technology is driving the need to be more innovative, as are employee expectations, and I'm being invited to give lots of talks about *Collective Genius*, not only because companies want to innovate more, but also because they are eager to build corporate cultures that will help with talent management.

So managing for innovation is also good organizational management?

A lot of the speeches I'm asked to give are for people who are trying to figure out how they can retain and unleash the diverse talent they have. As one of the leaders we studied said: "People don't want to follow me to the future, they want to co-create the future with me." Although he was talking about innovation, what this leader said is something we know from other research on Millennials – they want to co-invent, not follow. We know from a growing body of research that purpose and having impact matter a great deal to them in particular, but also to top talent no matter the generation. Without diversity, you rarely get innovation. So companies are also asking us to share any insights we have about how to build more inclusive cultures in which people of diverse thought and demographics can flourish. I do think innovation matters more today – to differentiate, and to grow. It's not enough to be what we call a "value-creator," you also have to be a game-changer. If you're going to deal with the "coulds" and not just with the "shoulds," you have to be prepared to lead change and innovation. ■

How to create a context of innovation

1. **Give support:** Create an environment of psychological safety. Encourage the sharing of ideas. Provide basic structure and guardrails.
2. **Bring collective purpose:** Innovative problem solving is hard work, and you can't force it. Collective purpose creates a context for employees to volunteer and find meaning in their work.
3. **Be inclusive:** Innovation rarely happens without diversity. Build a culture where diverse thought and demographics can thrive.

The principle of the collective genius:

To be truly innovative, you have to lead for innovation. Don't create a vision and try to make innovation happen yourself. Instead, create and sustain a culture of willingness in which innovation can happen time and time again.

The Right Side of the Digital Divide

Going digital is no longer an option if you're in it for the long haul – it's a necessity. With technology widening the chasm between the digital haves and the digital have-nots, we spoke to three companies about how they got ahead of the curve and crossed over to the other side. (P.S. It was a lot of hard work.)

BY ***Jessica Twentyman***

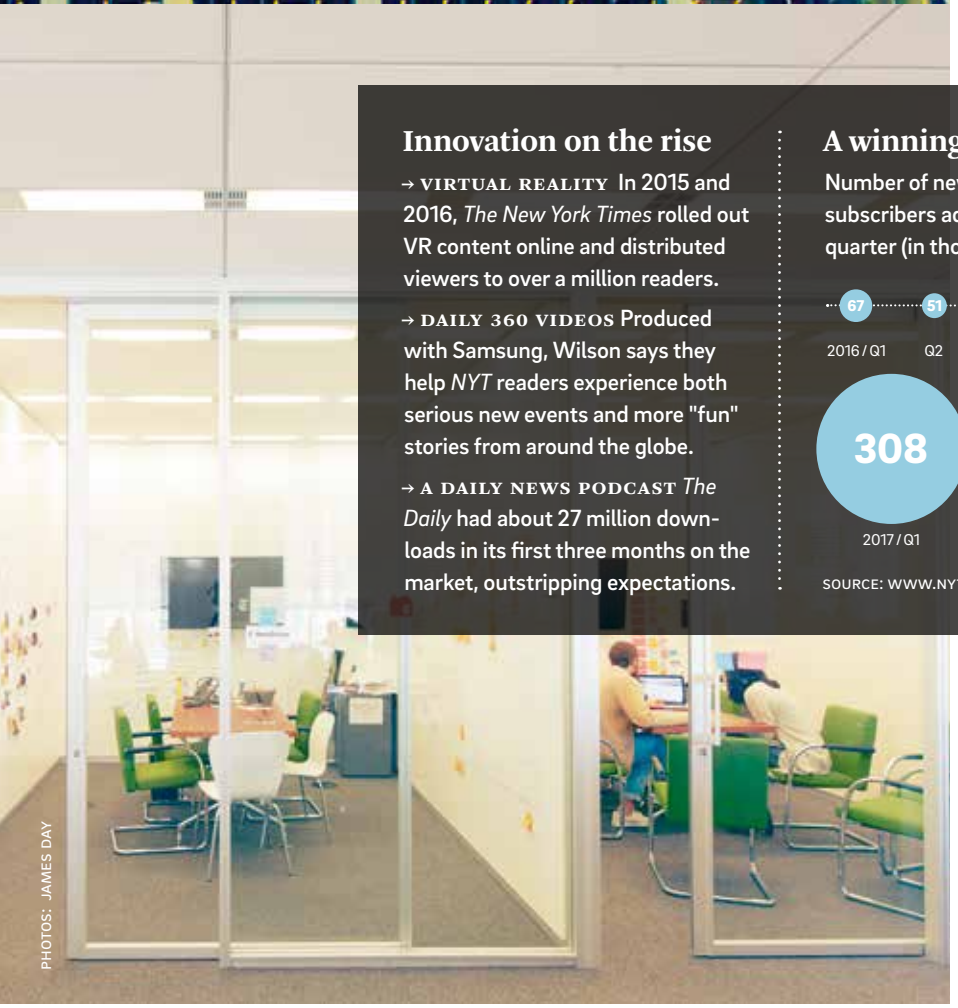
COMPLACENCY KILLS. Just ask former leaders at once-thriving video store chain Blockbuster. When Netflix launched in 1997, first as a movie-by-mail company and later as an online streaming service, Blockbuster failed to see the warning signs. It was another six years before Blockbuster launched its own movie-by-mail service, but by then, it was too late. On September 23, 2010, Blockbuster filed for Chapter 11 bankruptcy protection, $900 million in debt.

Digital transformation is not a fad or a marketing catchphrase: It's a matter of survival. That's the verdict of a recent survey of 388 CEOs and senior business leaders conducted by IT research company Gartner. Of those polled, 56% claim that digital improvements have had an impact on their profits. And if that's not enough to make bosses sit up and take notice, 47% said they are now being challenged to make further progress in digital business by their boards of directors. One in five, meanwhile, are putting "digital first" at the heart of their approach to business change.

Savvy leaders are recognizing that becoming irrelevant, as established competitors and emerging startups forge ahead in digital, constitutes a greater risk to survival than taking a punt on new digital apps and services. Here, three of them share their strategies and some of the valuable lessons they've learned along the way.

RADICAL TRANSFORMATION
The New York Times *is using digital strategies to combat the "death of print."*

A NOSE FOR THE NEW
The "beta group" at the renowned paper is pioneering new ground in coverage and applications.



PHOTOS: JAMES DAY

CASE STUDY #1

The New York Times

Name: Kinsey Wilson, executive vice president of product and technology
Company: The New York Times Company
Digital focus: 'Pockets' of innovation

THE NEW YORK TIMES, a newspaper that has been published daily in New York City since September 18, 1851, is on a radical digital transformation journey. Unlike many similar media organizations facing the rapid erosion of traditional revenue streams (mostly newsstand sales and print advertising) at the hands of digital, *The Times*' goal isn't simply to maximize revenue from online advertising, but to turn digital subscriptions, via its paywall, into its main engine of sales and growth while simultaneously introducing new online services and features that attract new subscribers and keep the existing ones coming back.

So far, that strategy seems to be paying off. During a conference call with financial analysts marking the end of its 2016 fiscal year, The New York Times Company CEO Mark Thompson announced that it added 276,000 net new digital subscriptions in the fourth quarter of the year. "For comparison, that's more net new subscribers in one quarter than we added in the whole of 2013 and 2014 combined," he said.

But continued success along these lines hinges on *The Times* continuing to bring new digital services and ⟶

Innovation on the rise

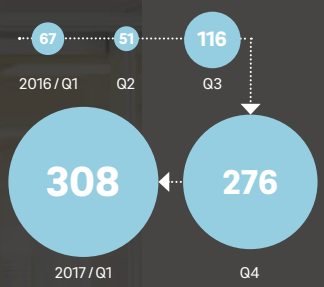
→ **VIRTUAL REALITY** In 2015 and 2016, *The New York Times* rolled out VR content online and distributed viewers to over a million readers.

→ **DAILY 360 VIDEOS** Produced with Samsung, Wilson says they help *NYT* readers experience both serious new events and more "fun" stories from around the globe.

→ **A DAILY NEWS PODCAST** *The Daily* had about 27 million downloads in its first three months on the market, outstripping expectations.

A winning strategy

Number of new digital subscribers added each quarter (in thousands):



SOURCE: WWW.NYTIMES.COM

features to market. Overseeing much of that work is Kinsey Wilson, executive vice president of product and technology at the company.

For him, the secret to success in innovation is having several "pockets" of research and development at work in the organization, each working on different objectives and different timescales. One is the Story X R&D team, which sits in the newsroom and takes a "blue-sky" approach.

"Given the speed of change, we feel it's important to have a group that's not necessarily charged with driving innovation for the next day or the next week or even six months out, but is tasked with understanding how consumer behavior is likely to change over time, and how technology might change the way we report and tell stories," he says. "So their mission is really to look out on a distant horizon, and to begin some discreet experiments, start asking questions and prototype some things that give us insight into where the market might be going."

Equally important, however, is the work contributed by three other digital groups. The first also sits in the newsroom, and includes software developers, interactive graphic artists and data journalists, but works with journalists on day-to-day storytelling.

The second and third groups sit within Wilson's product team. One is called the "beta group" and it works on pioneering new areas of coverage and new applications, such as creating a cooking site that mines around 170,000 recipes already in *The New York Times*' archives in order to offer a "recipe of the day" for time-poor New Yorkers who are nonetheless passionate about good food and seasonal ingredients. The "core group," meanwhile, takes responsibility for the building, maintaining and ongoing development of the core *New York Times* website as well as its mobile applications.

"So that's three different loci, each working to a slightly different pace and different purpose, in addition to Story X," he says. "It's what enables us to meet the different needs of readers, those that are new, those that are emerging and those that we expect to emerge over time."

This work gets a great deal of support and backing from management at *The New York Times*, he adds. "The focus of the executive team on most days is pinned on digital and I think that's created the best conditions for the rest of the organization to rally around the vision of what it takes to be a robust, vigorous and engaging news-gathering organization in the digital era." ■

CASE STUDY #2

Travelex

Name: Anthony Wagerman, CEO
Company: Travelex
Digital focus: Customer behavior

IN 1976, TRAVELEX FOUNDER Lloyd Dorfman started his bureau de change business with one small shop on London's Southampton Row. Fast-forward four decades and Travelex not only has 1,500 stores and desks worldwide, but also has a thriving digital element in its retail activities.

Many people probably still associate Travelex with those walk-up currency exchange desks. Its continued presence on major streets and in transport hubs shows it's still a "real world," "brick and mortar" business.

However, the digital transformation effort that Travelex started in earnest in 2014 is now bearing fruit: Its online retail business shows double-digit revenue growth across "pretty much" all of the markets in which the company operates. "In the UK, in our peak summer months, it's around 30% to 40% of turnover," says Chief Executive Anthony Wagerman.

Thanks to new online services, travelers now have more options when it comes to getting their hands on the foreign currency they need. They can

PICKING UP ON THE CUES
Travelex started online services and prepaid cards after observing that today's customers demand the flexibility of digital offers.

"You've absolutely got to keep pace with customer demands and customers are telling us they want digital."

Anthony Wagerman,
CEO of Travelex

With e-receipts successfully launched across the UK,

290,000

email addresses
were added to Travelex's customer database and about

60,000

customers
were added to its marketing network as of the end of 2016.

order it online and it will be delivered directly to them or, alternatively, ready and waiting for pickup at the Travelex desk or store of their choice. Alternatively, they can take the self-service option, withdrawing the money from one of Travelex's foreign currency ATMs located in around 14 countries. Or they can forget about cash altogether and carry one of the company's prepaid currency cards instead. These are all entirely new products that the company has launched in recent years. ⟶

PHOTO: SHUTTERSTOCK

According to Wagerman, his decisions in this area are based on direct observations of changing customer trends. "When it comes to digital, the first really important maxim for us is to go where our customers go, to interact with them in ways that suit them. He continues: "One of the things I often say to people in my business is to think about what you're like as a customer and what your expectations are." In order to stay competitive, he believes, Travelex needs to be offering the same kind of slick online customer experience that they might expect from Apple or Amazon.

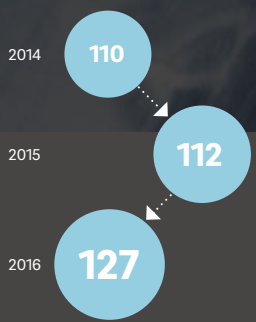
On this point of customer expectation, he adds, he's fascinated by the disconnect he witnesses in other business leaders he meets. "They'll dismiss digital transformation outright as marketing speak, but at the same time, they're fiddling with their iPhones even as they're talking, booking their train tickets and buying books online." In other words, they're not even picking up signals from their own behavior, let alone that of their customers.

A great deal of Wagerman's focus goes into fostering that customer experience mindset in his workforce, he says, particularly among the IT teams that create new digital channels for customer interactions. "Technology is hugely important – it's how we become accessible to customers, it makes a huge difference in how we serve them. But it's important not to become bogged down in the technology itself. What matters is that it helps us give customers a better experience of Travelex."

Digital transformation has taken a lot of hard work at Travelex, but it certainly seems to be paying off. "There's absolutely no point shutting your eyes and pretending the rush to digital isn't happening," says Wagerman. "You've absolutely got to keep pace with customer demands and customers are telling us they want digital." ■

Growing a culture

Employee development is at the heart of Ipsen's strategy. Annual training hours (in thousands):



SOURCE: WWW.IPSEN.COM

"I don't want to see anyone bored or frustrated. I want them to be excited about the work they do."

Malika Mir, *Chief information and digital officer at Ipsen*

PHOTO: PR IPSEN

KEEP THE IDEAS COMING
Ipsen engages new recruits with multiple projects, keeping motivation high and fostering excitement for digital innovations.

CASE STUDY #3

IPSEN

Name: Malika Mir, chief information and digital officer
Company: Ipsen
Digital focus: Smart staffing

AT TIMES LIKE THESE WHEN DIGITAL SKILLS are in short supply (and those that are available come at a premium), a smart staffing strategy is essential for any company with digital transformation ambitions, says Malika Mir, chief digital and information officer at Ipsen, a $1.67 billion global pharmaceutical company based in France. After all, when young graduates enter the job market, their hopes are often pinned on finding work with an internet giant like Google, Facebook or a fast-moving startup. That puts the onus on the more established employer to give them great projects to work on and to keep them interested, she says.

But in the pharmaceutical industry in which Ipsen operates, digital skills are not always enough. "One of our challenges is that, before we launch a new mobile app or online service, we have to satisfy a host of people in our business: legal, regulatory affairs, medical professionals, ethics and compliance specialists." That's why in addition to her team of digital "generalists," Mir set out to bring three new digital managers into Ipsen who each had at least five years' experience working in digital transformation at other pharmaceutical firms.

"Digital people with a pharma background tend to have a better idea of how people with diseases cope and what will be useful to them. They also have a much clearer idea of the processes, regulations and constraints around communicating about diseases and products. They understand the market and they understand the patient. It really makes a big difference," she says. And the recruitment of her digital managers, she believes, will enable Ipsen to accelerate its four-year digital transformation road map, which at present covers the years from 2016 to 2020. Early fruits of this strategy include the website "Living with NETs" for patients with neuroendocrine tumors (NETs). Here, Ipsen addresses an identified gap in the market: There is a dearth of information available to patients because of the rarity of these tumors, but Ipsen specializes in drugs for this market.

Another recent digital product is a mobile app launched in late 2016 that offers patients information and guidance on rehabilitation exercises that help to combat upper-limb spasticity. And, in future, it's likely that Ipsen will be branching out into smart, connected health care devices, more online services for health care providers and perhaps even the sale of data, such as that gathered through clinical trials. "This is where digital disruption will make its presence felt in our market and we need to be part of that movement. Our top management understands that if we're not part of it, someone else will do it – either an established competitor or a new health care startup."

That piles on the pressure not only to attract new recruits with digital skills, but also to keep them engaged and interested in their work with multiple projects to which they contribute. "This has a major impact on their motivation levels, I've observed. I don't want to see anyone bored or frustrated. I want them to be excited about the work they do and excited about what digital can bring to our business." ■

Food for Thought

Take a deep dive and find out more in related articles, studies and magazines.

CONSUMER GOODS

Riding the new waves in marketing

Digital disruption, hypercompetition, changing consumer needs – the list of waves crashing over consumer goods companies goes on and on. How can you surf those waves with style, or at least keep your head above water? In this study, Roland Berger dives into consumer goods disruption and leads the way out of the deep end with key tactics that show that the solution to staying afloat starts with breaking the rules and ends with wowing your customers. Read about how to overcome the "perception gaps" across crucial challenges and get pro tips to boost your performance with foolproof strategies. Surf's up!

→ BREAKING THE RULES
The time for playing in the shallows is over. Take your organization to the next level: http://rb.digital/2rh7nJK

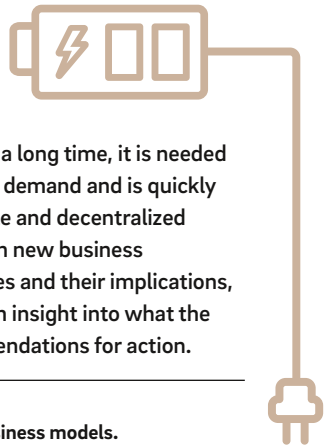
83%
of marketing decision-makers
do not believe that their strategies are good enough to beat their competitors.

54%
of consumer goods companies
think that their salesforce will fail to meet its targets this year.

5
powerful tactics
to help you close strategic gaps and take your organization to the next level.

UTILITIES

Business models in energy storage



While energy storage has been around for a long time, it is needed to maintain a balance between supply and demand and is quickly becoming mandatory in the new renewable and decentralized energy system. These changing roles mean new business opportunities. Taking a look at several cases and their implications, Roland Berger offers industry players fresh insight into what the market's future holds and shares recommendations for action.

→ SEIZING NEW OPPORTUNITIES
Energy storage has the potential to disrupt business models. Are you ready for what's next?: http://rb.digital/2swAcIt

TANGIBLE ASSETS

A view to transform asset efficiency

Asset efficiency is a key differentiating factor for companies working in asset-intensive industries, yet just one in four has successfully adapted their asset base to changes in the market. Roland Berger looks at the main German players and offers tried-and-tested solutions that are tailored to your particular industry and situation and designed to directly impact your bottom line.

→ WINNING THE GAME
Our study reveals four transformation areas where your firm can take action: http://rb.digital/2uOF5I7

Mobility
Automated Driving
Digital Experience
Electrification

#MADE

AUTOMOTIVE

Keeping an eye on the disruption radar

The automotive industry has always followed a linear path of development. That is, until now. In the last two years we have witnessed the parallel emergence of four megatrends – (M)obility, (A)utomated driving, (D)igital experience and (E)lectrification (MADE). These trends are poised to completely reshape the automotive industry over the next 10–15 years. Despite rising uncertainty, executives have to decide on long-term capital allocation. To do this, ongoing monitoring and analysis of market dynamics is required. Roland Berger's breakthrough Automotive Disruption Radar systematically tracks 25 early indicators of disruption occurring in the world's most important markets. A reliable database in volatile times, this valuable tool is neither restricted by times nor limited to national economies and provides the guidance necessary to navigate the complexity facing the automotive industry while monitoring the automotive environment and providing the expert support required to make effective decisions in the eye of the perfect storm.

→ CONQUERING THE PERFECT STORM
The automotive industry is veering off a linear path. Get the new road map: http://rb.digital/2pcDnge

MEGATRENDS

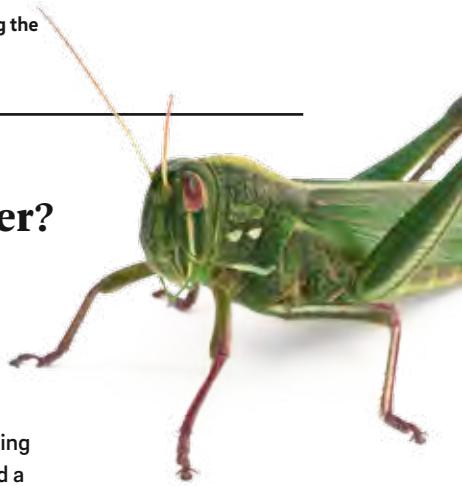
A bigger picture for a better strategy

In our volatile, uncertain, complex and ambiguous (VUCA) world, a sound grasp of the most important megatrends makes for a superior perspective that can be leveraged for corporate advantage – not least in strategic planning processes. Now in its third, re-tooled edition and with a decade of collective insight and a successful cooperation with the World Economic Forum standing behind it, Roland Berger's most popular global trend resource, the Trend Compendium 2030, offers a deep, analytic view into the seven megatrends that are changing the world, from dynamic demographics and scarcity of resources to sustainability, innovation and global responsibility. The wealth of information contained in the Trend Compendium has already aided a vast number of projects around the globe and has proved time and time again that knowledge is power.

GLOBAL MEGATRENDS

1 Dynamic demographics
2 Globalization & future markets
3 Scarcity of resources
4 Climate change & ecosystem at risk
5 Dynamic technology & innovation
6 Global knowledge society
7 Sustainability & global responsibility

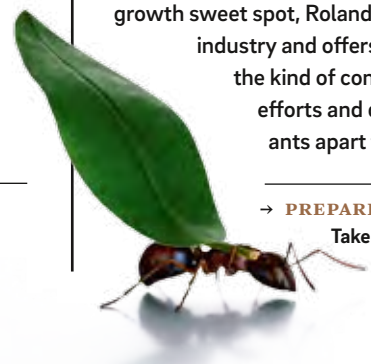
→ GRASPING THE MEGATRENDS
Get unique insight into the megatrends that are changing the way the world does business: http://rb.digital/2sWII9O



ASSET MANAGEMENT

The ant or the grasshopper?

The favorable curve of today's market may delay strategic reviews and restructuring, but the one thing that it doesn't offer asset managers is inherent protection from the challenges that still lie ahead – and those will only continue to grow in number. Offering insight into the industry's increasing cyclicality and looking at ways to counter it and find a growth sweet spot, Roland Berger examines the asset management industry and offers four key recommendations for nurturing the kind of competitive advantage, cost cycle, marketing efforts and digital approach that will set the industry's ants apart from its grasshoppers when winter comes.



→ PREPARING FOR FUTURE SUCCESS
Take advantage of today's tailwinds and survive tomorrow's downturns: http://rb.digital/2r41tdp

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THREE QUESTIONS: ITAY TALGAM

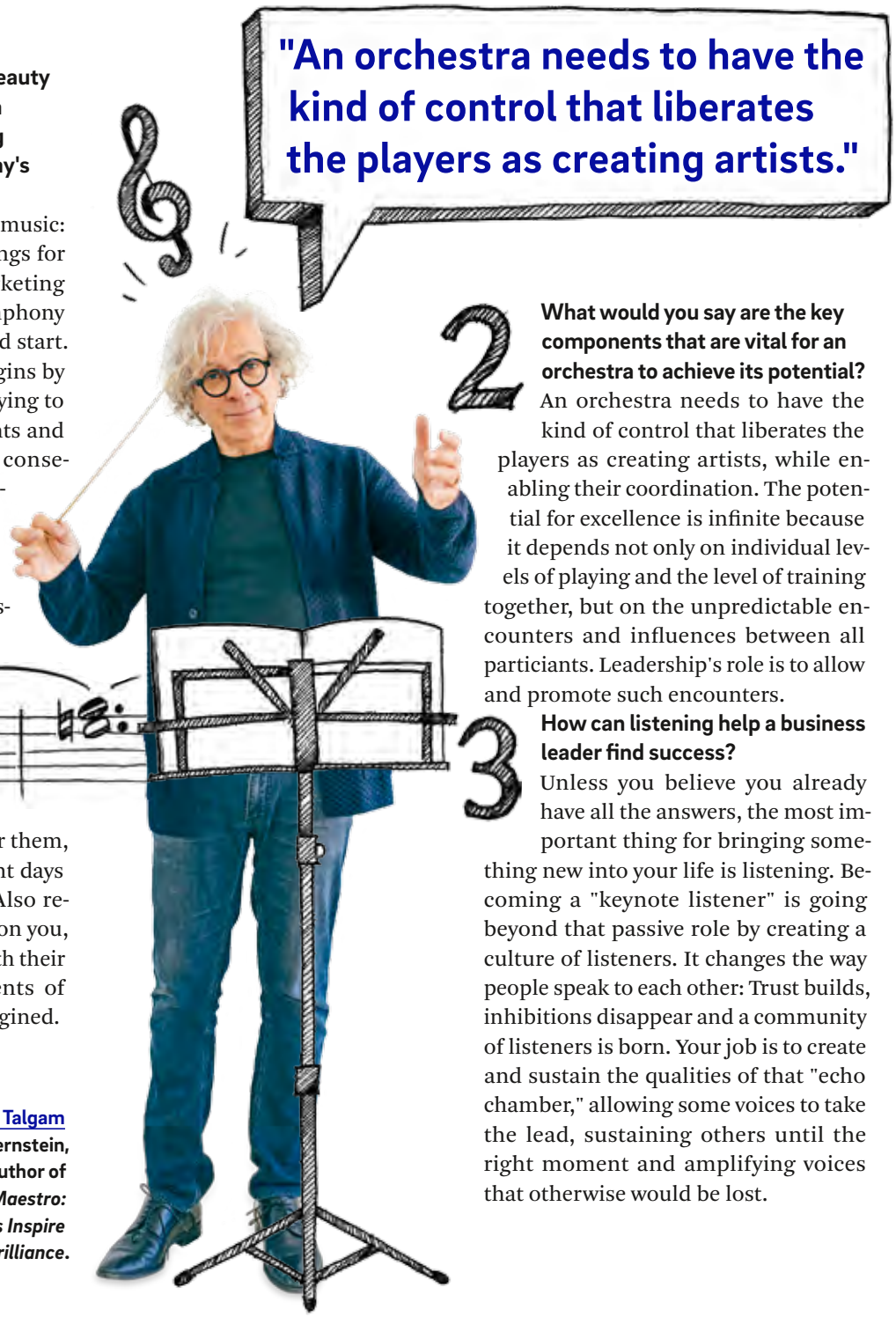
Conductor **ITAY TALGAM** *believes that you can fine-tune your business to run in harmony like an orchestra. Here he answers three questions on* **complexity.**

COMPLEXITY

1 What can the intricacy and beauty of an orchestral score teach a business leader encountering increasing complexity in today's business environment?

A music score is a great *plan* to make music: It is not music, yet. If the drawings for your new product or your marketing plan are as good as a Mozart symphony score, I guess you are of to a good start. Your job as a conductor-boss begins by diving into that obscure plan, trying to identify patterns, recurring events and connections over time. As a consequence, "your" Mozart will always be different: Your unique interpretation of the given facts of the score gives you the edge you need as an artist, or as a masterful businessperson.

And as you move to the realization of the interpreted plan with your partners – musicians, employees – remember you have an edge over them, simply because you already spent days or weeks with the task ahead. Also remember that they have an edge on you, because their fresh encounter with their roles is bound to yield moments of insight far beyond what you imagined.



2 What would you say are the key components that are vital for an orchestra to achieve its potential?

An orchestra needs to have the kind of control that liberates the players as creating artists, while enabling their coordination. The potential for excellence is infinite because it depends not only on individual levels of playing and the level of training together, but on the unpredictable encounters and influences between all particiants. Leadership's role is to allow and promote such encounters.

3 How can listening help a business leader find success?

Unless you believe you already have all the answers, the most important thing for bringing something new into your life is listening. Becoming a "keynote listener" is going beyond that passive role by creating a culture of listeners. It changes the way people speak to each other: Trust builds, inhibitions disappear and a community of listeners is born. Your job is to create and sustain the qualities of that "echo chamber," allowing some voices to take the lead, sustaining others until the right moment and amplifying voices that otherwise would be lost.

Itay Talgam
A protégé of Leonard Bernstein, Itay Talgam is the author of *The Ignorant Maestro: How Great Leaders Inspire Unpredictable Brilliance.*

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FOOLS
IGNORE COMPLEXITY.
PRAGMATISTS
SUFFER IT.
SOME
CAN AVOID IT.
GENIUSES
REMOVE IT.

Alan Perlis,
Computer scientist (1922–1990)