FORTUNE

NOVEMBER 1, 2017
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ASIA PACIFIC EDITION
NUMBER 14

THE FUTURE 50

WHY THESE INNOVATIVE COMPANIES ARE PRIMED FOR EXPLOSIVE GROWTH

How CEO Marc Benioff drives relentless forward thinking at Salesforce

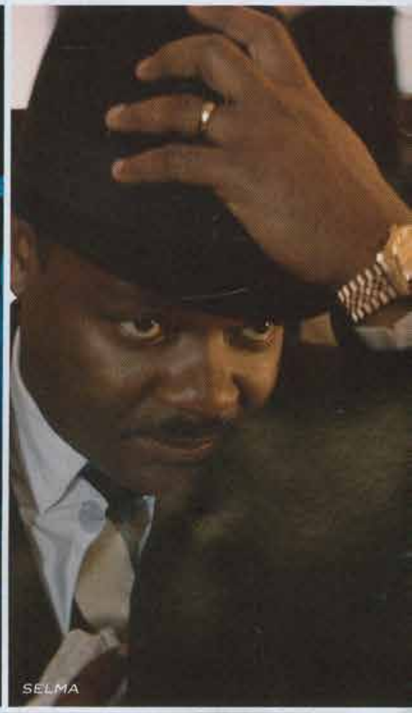
SALESFORCE
WORKDAY
ZILLOW
NETFLIX
TESLA
INTUIT
VISA
& MORE

+

EXCLUSIVE
INSIDE SAUDI ARAMCO:
The Secretive Kingdom of Oil


THE USUAL SUSPECTS


TITANIC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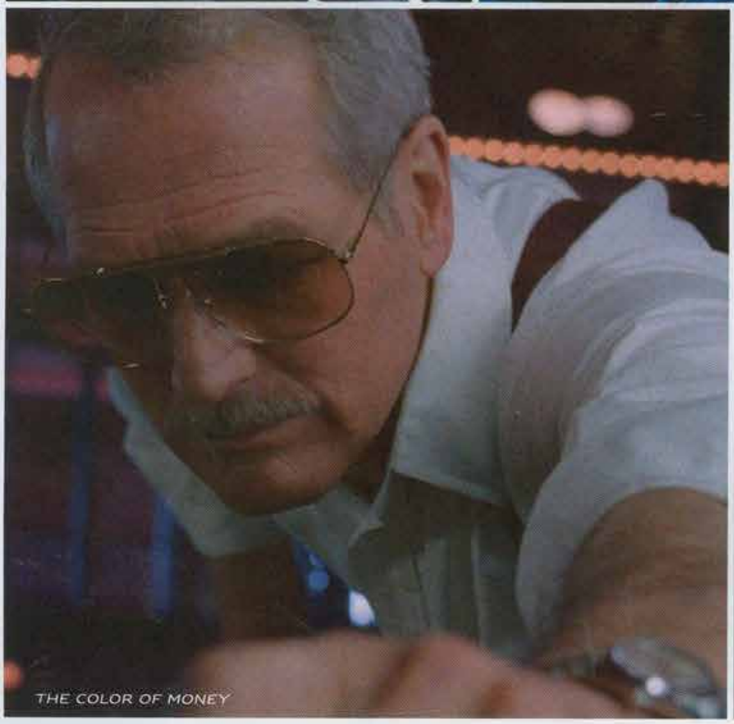
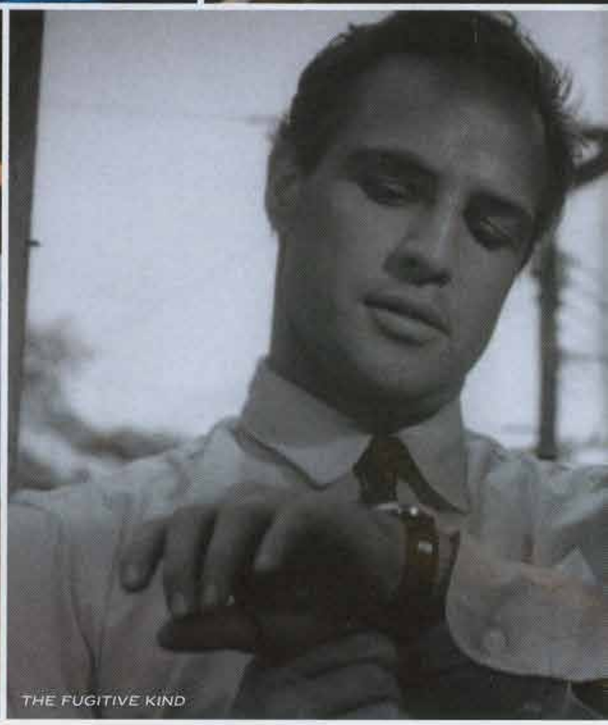

THE COLOR OF MONEY


THE FUGITIVE KIND

EXCLUSIVE WATCH OF THE
ACADEMY OF MOTION PICTURE
ARTS AND SCIENCES

A SHOT IN THE DARK

SPEED

THE DEEP

CELEBRATING CINEMA.

In the art of film-making, it's the smallest details that bring a world to life. Only when every detail is just right can the audience be truly immersed. Rolex is proud to recognise the art and craft of film-making, and to have been a part of some of cinema's most iconic moments. It doesn't just tell time. It tells history.

OYSTER PERPETUAL DATEJUST 41

ROLEX

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Text by ROBERT HACKETT; graphics by NICOLAS RAPP

CORRECTION
A caption in "Ford Finds a New Leader, By Design" (Sept. 15) misidentified the pickup trucks being assembled at a Ford plant in Louisville, Ky. That factory makes F-250s, F-350s, and F-450s, not F-150s.

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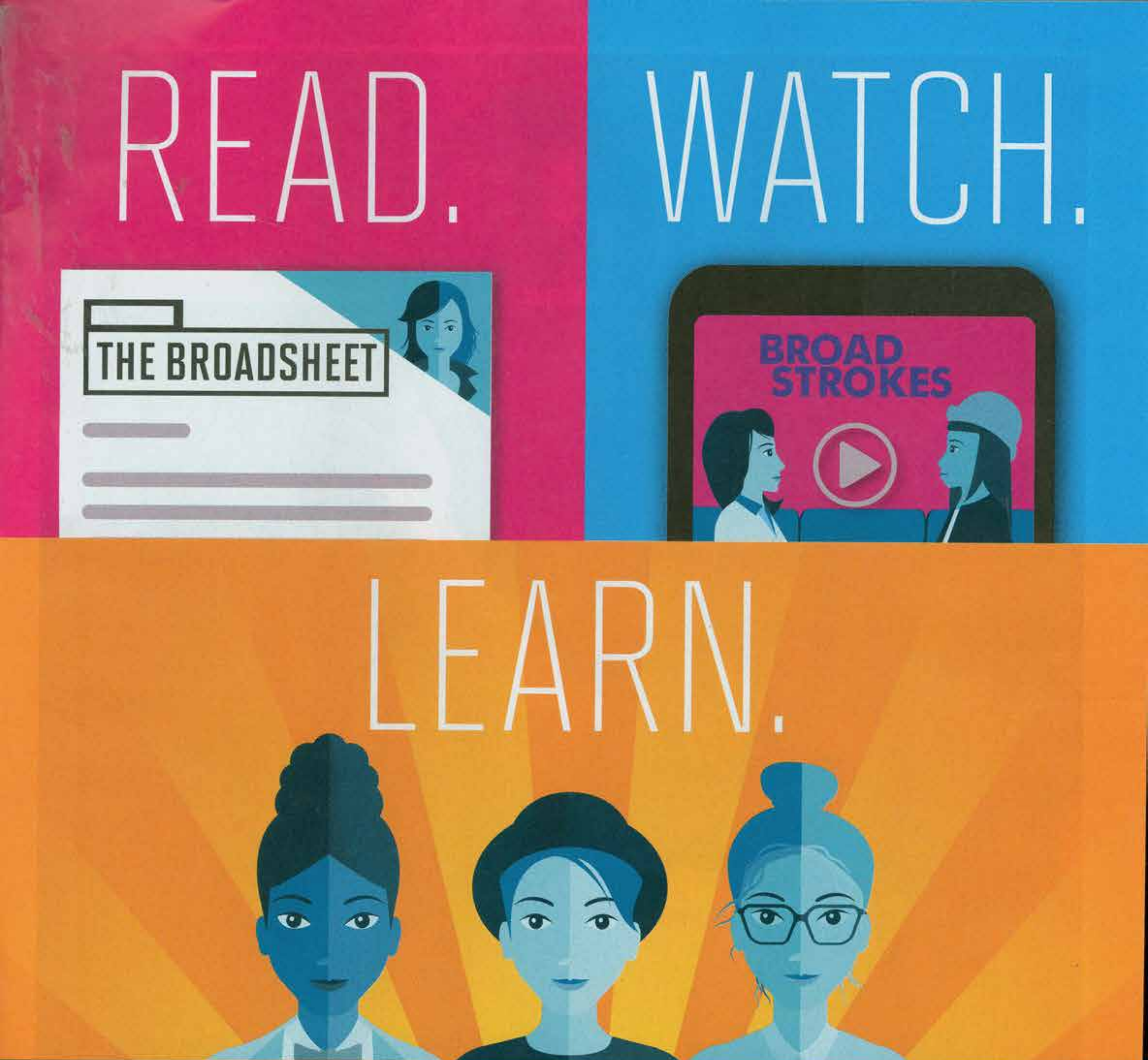
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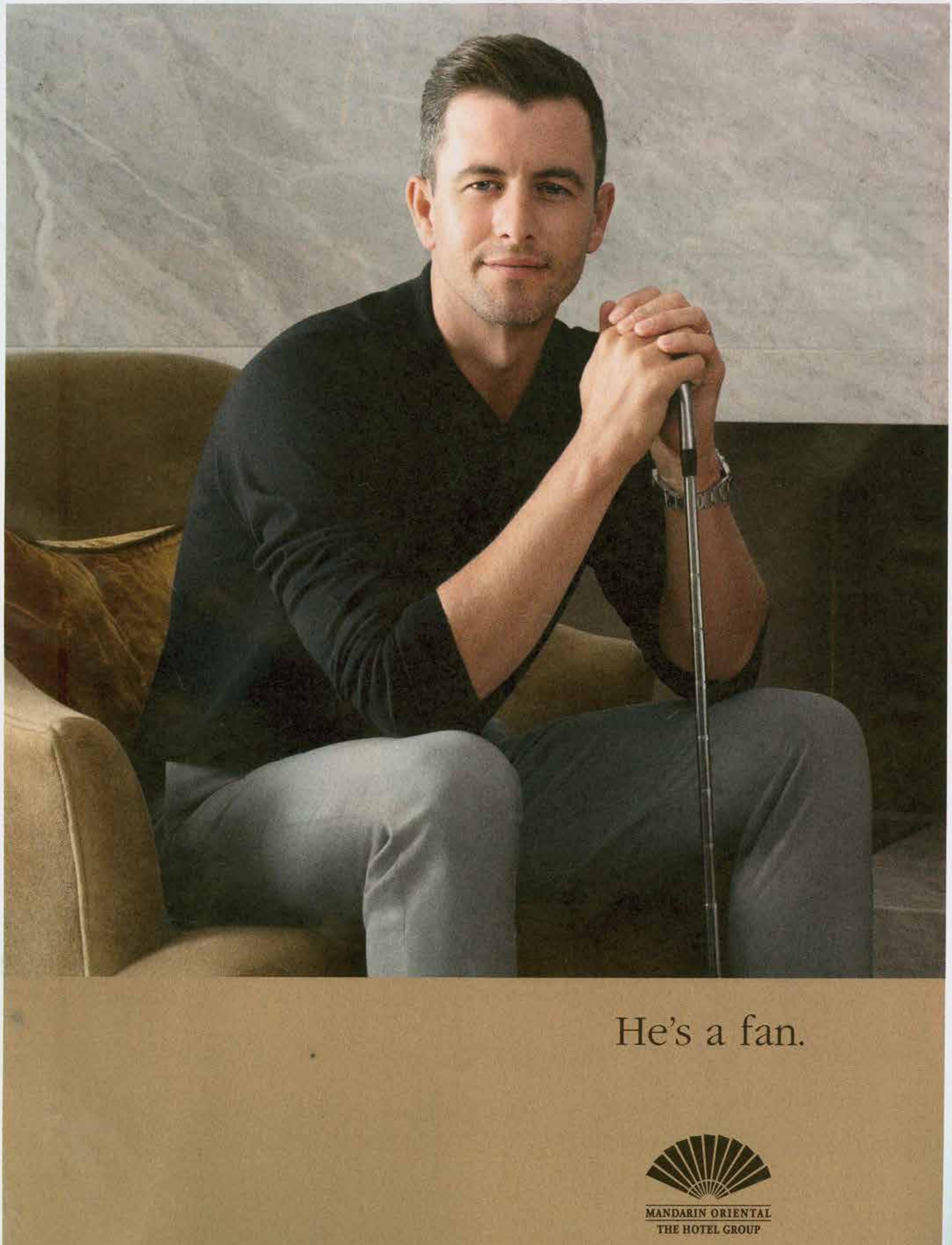
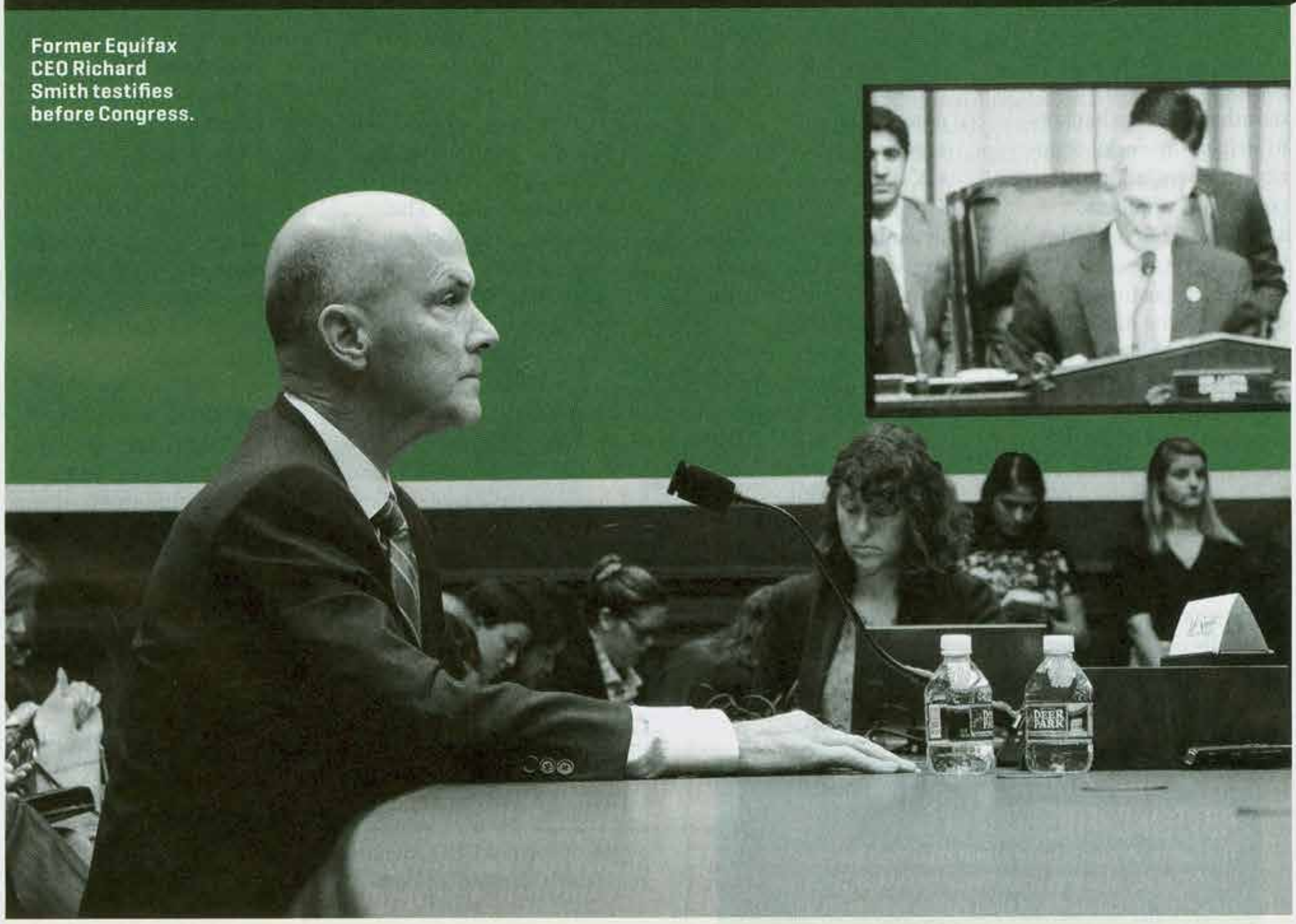
LEARN.


He's a fan.
MANDARIN ORIENTAL
THE HOTEL GROUP

THE WORLD IN 9 PAGES

BRIEFING



Former Equifax CEO Richard Smith testifies before Congress.

The People vs. the Credit Oligarchs

Credit-reporting bureaus have few incentives to be good corporate citizens. Fallout from the Equifax hack may change that. By Jen Wieczner and Jeff John Roberts

REFORM

EVEN IN AN ERA when cyberattacks are commonplace, it's hard to think of one that made bigger fools of consumers and lawmakers alike than the Equifax breach. The credit-reporting agency, which keeps dossiers full of background check–worthy personal information on nearly all American adults, exposed the data of more than 145 million people. That's nearly half the U.S. population—at least one person in every family, it's estimated—who are now at greater risk of ▷▷

▷▷ having their identities stolen, their financial accounts broken into, their credit ruined.

What's even more infuriating is that Equifax could have averted the disaster just by patching a known vulnerability in its software. Instead, the company dithered for months, allowing hackers to strip-mine Social Security numbers, addresses, credit card numbers, and more from mid-May through July, it said. When Equifax finally discovered the disaster, its first response was not to warn consumers. After waiting nearly six weeks before disclosing the breach in September, it hatched a strategy to turn its victims into paying customers—by signing them up for credit monitoring services, which originally contained fine print depriving them of the right to sue.

What is the penalty for such rank corporate incompetence? The answer, under current rules, is nothing much. Unlike with food, medicine, toys, and other consumer goods, there are few criminal or civil laws on the books that punish companies when they're careless with consumers' data. Congressman Greg Walden (R-Ore.) articulated the prevailing sense of impotence during a House hearing about the breach: "I don't think we can pass a law that fixes stupid."

It's of course easy to rail against Equifax and its executives (some of whom sold millions of dollars' worth of stock before the breach was disclosed, avoiding an initial 35% drop). But the problem goes deeper. Equifax and the two other major credit-reporting agencies—Experian and TransUnion—enjoy nearly monopolistic control over a critical industry. "The culture of the big three is to underinvest in policies to protect consumers," says Chi Chi Wu, a National Consumer Law Center attorney.

And why should they? They have little incentive to protect consumers' information: The companies' real customers are banks, mortgage providers, and marketers to whom they sell that data—business that accounted for nearly two-thirds of Equifax's $3.1 billion in revenue last year. Indeed, Equifax may actually profit off its own fiasco: If just one out of 10 victims were to buy its credit monitoring services, which it is offering for free for only a year, it would double its annual revenue. And boycotts are hardly an option: To opt out of a credit score is to opt out of modern financial life itself. As Equifax's now former CEO Richard Smith testified in October, if consumers were allowed to abandon the credit system, it would be "devastating to the economy."

The better answer is systemic reform to the credit oligopoly. One proposal, cosponsored by Sen. Elizabeth Warren (D-Mass.), is to force the credit bureaus to provide consumers with a free and easy way to freeze their credit. Other proposed reforms could compel credit bureaus to take cybersecurity more seriously, such as by mandating adherence to national technology standards and software updates. Megan Stifel, an attorney and cyberexpert with digital rights group Public Knowledge, is in favor of requiring companies that host sensitive data to insure themselves against a breach, and others suggest it may be time for criminal laws to apply to executives who are grossly negligent with private information.

While politicians of both parties are now proposing consumer protections, they are likely to face heavy resistance from the industry—TransUnion, for one, has been hiring lobbyists in the wake of the Equifax scandal. Still, as breaches become increasingly common—and galling—there will be growing pressure to make sure that the custodians of that data face real penalties when they let down their guard. ■

BY THE NUMBERS

ROTTEN CREDIT

The lucrative business of credit reporting appears to be chugging along despite the astonishing scale and potential implications of the Equifax data breach.

145.5 MILLION PEOPLE
Number of U.S. consumers who had their personal data stolen by hackers in the Equifax breach—nearly half the country's population.

$9.4 BILLION
Combined annual revenue of the three big credit bureaus—Equifax, Experian, and TransUnion—who together control consumer credit scores.

$16 BILLION
Money stolen as a result of identity theft last year in the U.S., according to Javelin Strategy & Research. That's up 5% from 2015 and poised to rise further.

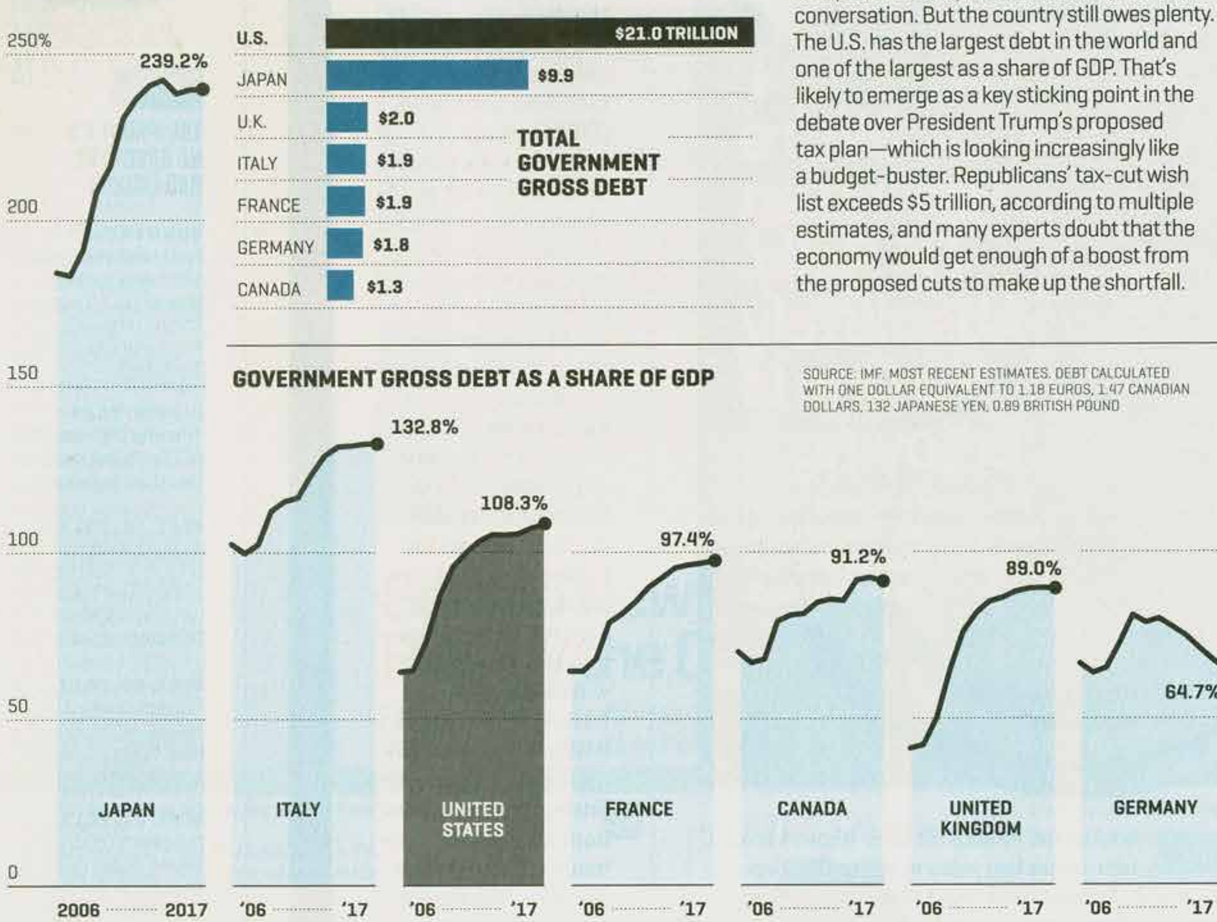
24%
Amount Equifax's shares have fallen since the hack. That relatively modest loss suggests investors don't expect the stock price to go to zero.

ANALYTICS Seeing Trends in the Data

■ TAX REFORM

REMEMBER THE DEFICIT?

The federal debt, for years a bogeyman for business leaders and politicians alike, has lately felt curiously absent from the national conversation. But the country still owes plenty. The U.S. has the largest debt in the world and one of the largest as a share of GDP. That's likely to emerge as a key sticking point in the debate over President Trump's proposed tax plan—which is looking increasingly like a budget-buster. Republicans' tax-cut wish list exceeds $5 trillion, according to multiple estimates, and many experts doubt that the economy would get enough of a boost from the proposed cuts to make up the shortfall.



SOURCE: IMF. MOST RECENT ESTIMATES. DEBT CALCULATED WITH ONE DOLLAR EQUIVALENT TO 1.18 EUROS, 1.47 CANADIAN DOLLARS, 132 JAPANESE YEN, 0.89 BRITISH POUND

■ 401(K)

THE IMPRESSIVE RISE OF THE TARGET-DATE FUND

The set-it-and-forget-it approach to investing, once mostly the purview of the lazy, has become the favored strategy of a new generation of workers hesitant to play the market. The funds (which automatically rebalance portfolios to minimize risk in sync with an investor's age) are now offered in 92% of retirement plans, up from 28% in 2005.

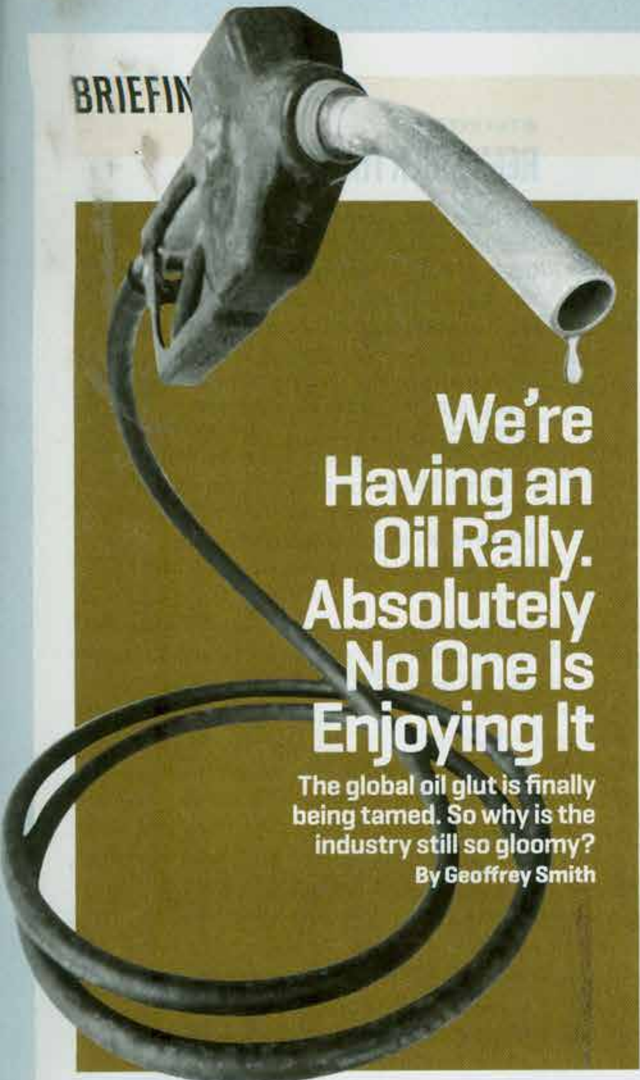
SOURCE: CENTER FOR RETIREMENT RESEARCH, BOSTON COLLEGE

■ MACRO

COMPANIES FEEL STORMS' HEADWINDS

This fall's brutal hurricane season was bad for business too. Analyzing earnings calls through mid-October, FactSet found that half of S&P 500 companies told investors the storms had had a negative impact on business. (Rising payroll costs didn't help either.)

SOURCE: FACTSET



We're Having an Oil Rally. Absolutely No One Is Enjoying It

The global oil glut is finally being tamed. So why is the industry still so gloomy?
By Geoffrey Smith

ENERGY

WORLD OIL PRICES hit their highest level in more than two years at the end of September. The international Brent blend even briefly surpassed $59 a barrel—more than double its price in the dark days of 2016. The cause: The global glut is finally being absorbed as the world economy enjoys the most broad-based period of growth in a decade. OPEC's agreement on output restraint has already been extended through March 2018. And after ballooning in 2016, the developed world's crude stocks are now—almost—back in their historical range (OPEC's goal).

Yet the rally remains unloved, and for good reason. Recent highs were driven partly by speculative buying. Hurricane Harvey, which took one-third of U.S. refining capacity off-line, was only a temporary hiccup. And above all, major improvements in efficiency now enable the U.S. shale sector to turn a profit at anything above $50 a barrel. That means that U.S. production will ramp up even further at current price levels, dampening any upside. Indeed, market jitters restarted almost immediately after September: Prices fell on the news that the U.S. drilling rig count grew and the EIA reported larger U.S. stockpiles. A balanced market can tip both ways.

PAGE 4

APPLE

THE IPHONE X'S NO GOOD VERY BAD LAUNCH

SUMMER 2017
Apple reportedly has problems getting enough OLED screens for the iPhone X from manufacturer Samsung.

SEPT. 8, 2017
The title ["X" not "Pro" or "Ten"] leaks a few days before launch.

SEPT. 12, 2017
Apple unveils the iPhone X, but pre-orders won't start until late October. The stock falls.

SEPT. 20, 2017
Further production delays, which could lead to shortages for early orders.

SEPT. 27, 2017
Suppliers reportedly have trouble making enough of two key modules for facial recognition.

NOV. 3, 2017
First deliveries expected. Likely outcome? Apple still makes a bunch of money.
—**AARON PRESSMAN**

BOOK VALUE

A TECH INDUSTRY TIME WARP

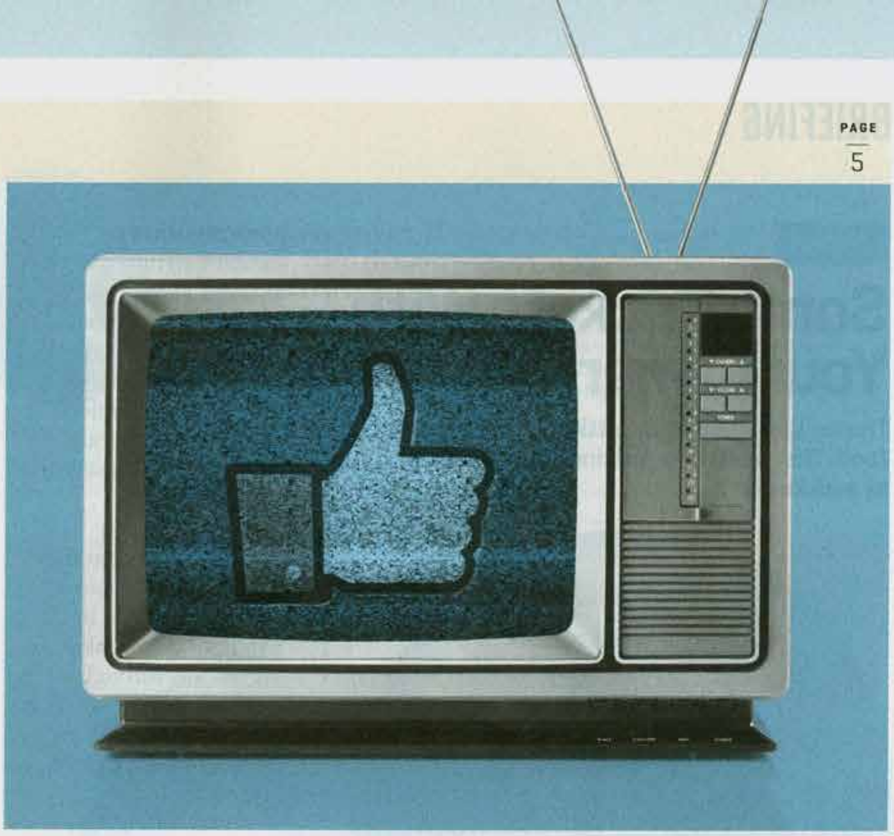
APPLE'S LATE cofounder Steve Jobs liked to hang out with an older generation of Silicon Valley entrepreneurs because, he claimed, "you can't really understand what is going on now unless you understand what came before." For the rest of us, Leslie Berlin's new history of tech in the '70s and '80s is the next best thing. As the Valley is roiled by sexism scandals, hacking, and Russian social media snafus, *Troublemakers* is an essential reminder of what the great minds in tech accomplished, how they did it, and the diverse teams that made it possible. —JEFF JOHN ROBERTS

GAS PUMP: RODERICK CHEN—GETTY IMAGES; IPHONE: COURTESY OF APPLE

FORBIDDEN LOVE

WHEN YOUR CORPORATE MASCOT IS TOO ATTRACTIVE

PITY THE SOUL who runs the Twitter account for Kellogg's Frosted Flakes. Tweets from @RealTonyTiger—mostly friendly messages about how breakfast is "gr-r-eat"—are met with hundreds of replies involving obscene fantasies (nearly all of them unprintable). Twitter may have recently fanned the flames by suspending some accounts, which gave rise to headlines like "This Guy Was Suspended From Twitter After he Sexually Harassed Tony the Tiger." Kellogg's has responded that it respects individuals' "creative expression," but reserves the right to block them. —J.J.R.



Should New Media Play by the Old Rules?

Facebook has a greater reach than TV ever did. Some say they should be held to the same standards. **By Jeff John Roberts**

BIG IDEA **LAST YEAR,** as Donald Trump was gaining traction as a presidential candidate, Russian accounts paid to promote thousands of Facebook ads in a bid to spread false information and poison the U.S. electoral system, according to new revelations from the 2-billion-user social media giant. Perhaps it's no surprise, then, that Congress is now calling for more regulation for online sites' content.

One idea in particular that's gaining momentum: "Stand by Your Ad" rules, which require political ads to identify who is behind them and which have applied to television and radio for years.

Until recently, the idea of subjecting Internet companies to the same rules as broadcasters was a nonstarter. It's a lot easier to police 30-second ad blocks than to monitor trillions of pieces of user-submitted content. Attempts to regulate Facebook and other online platforms might misfire or overreach, and critics argue that they would stifle the dynamism that has made the U.S. tech sector the envy of the world.

But mounting problems on social networks—from the spread of fake news, to the live-streaming of suicides, to the censoring of pictures of alleged ethnic cleansing—have made the existing "light touch regulation" seem inadequate.

The good news? There's a precedent for regulation of online behavior that actually works. In 1998, Congress drafted two landmark laws to address copyright and free speech concerns for Internet companies, while helping to ensure they didn't get smothered with lawsuits about user behavior. The laws are widely regarded as a success and could be a model for future rules. Facebook is already the most powerful media platform the world has ever known. It's arguably in the national interest for it to start acting accordingly.

TV: GETTY IMAGES; STATIC: JEFFREY COOLIDGE—GETTY IMAGES; THUMB: ROBYN BECK—AFP/GETTY IMAGES; TONY THE TIGER: KRIS CONNOR—GETTY IMAGES

PROTEIN

Some Crickets With Your Caviar?

The ex-CEO of Cisco is betting big on insects as food. The result is surprisingly appetizing.

By Beth Kowitt

JOHN CHAMBERS, former longtime CEO of Cisco, likes to call himself a growth and disruption guy. "I get market inflections," he says. The latest inflection the tech veteran has his eye on? Insects.

Chambers explained his bet on bugs over dinner at the Michelin-three-star restaurant Saison in San Francisco, making his way through private batch caviar with broth made from cricket sauce; live spot prawns grilled with sweet cricketff glaze; and sea urchin in a sauce of grilled bread and, yes, crickets. The insects are sourced from Aspire, an Austin-based startup that Chambers invests in and advises. It launched three years ago intending to automate the farming of crickets—one of the most efficient and sustainable sources of protein—and nudge them into the mainstream of U.S. diets.

Aspire started as an ingredient play, milling the bugs into powder. But it soon noticed customers buying them whole off its site and decided to run with it. "[We thought] the average American consumer was not ready to come face-to-face with crickets," Aspire CEO Mohammed Ashour says. "We had it wrong."

Now, even Saison is serving Aspire's crickets (it insists that they arrive live for freshness). Says chef Joshua Skenes: "They're just delicious."

CLEAN STREETS

THE RACE TO ZERO EMISSIONS

WITHIN A FEW short years, China has gone from zero to hero on the global climate change stage. As its air pollution reaches crisis levels, the planet's largest carbon emitter has stepped up its world-leading solar capacity, and it announced tough new targets for automakers last month. European leaders are also setting big goals for zero-emission cars. The U.S., on the other hand, is easing off the gas on the national level, though some states (like California) are plowing ahead with policies of their own. —**ERIKA FRY**

	U.S.	EUROPE	CHINA
STANCE ON PARIS CLIMATE AGREEMENT?	Backing out	Oui, oui!	All in
PERCENTAGE OF GLOBAL EMISSIONS	14.90%	9.70%	28.60%
CARBON EMISSIONS PER CAPITA (2015)	16.8 metric tons	6.9 metric tons	7.5 metric tons
SHARE OF POWER GENERATED BY COAL	30%	25.30%	62%
AIR POLLUTION DEATHS (2016)	86,400	257,000	1.1 million
RENEWABLE ENERGY INVESTMENT (2016)	$58.6 billion	$70.9 billion	$87.8 billion
CLEAN CARS?	Ten states aim to get zero-emission vehicle sales up to 4.5% by 2018.	France and the U.K. plan to outright ban gas and diesel cars by 2040.	China will require green vehicles to make up 10% of automaker sales by 2019.

SOURCES: GLOBAL CARBON ATLAS, NATIONAL BUREAU OF STATISTICS OF CHINA, U.S. ENERGY INFORMATION ADMINISTRATION, EUROSTAT, STATE OF GLOBAL AIR REPORT, BLOOMBERG NEW ENERGY FINANCE

© CRICKETS: JOE WEAVER—COURTESY OF ASPIRE FOOD GROUP; TESLA MODEL S: COURTESY OF TESLA; RENAULT ZOE: COURTESY OF RENAULT; BAIC EX200: QILAI SHEN—BLOOMBERG VIA GETTY IMAGES

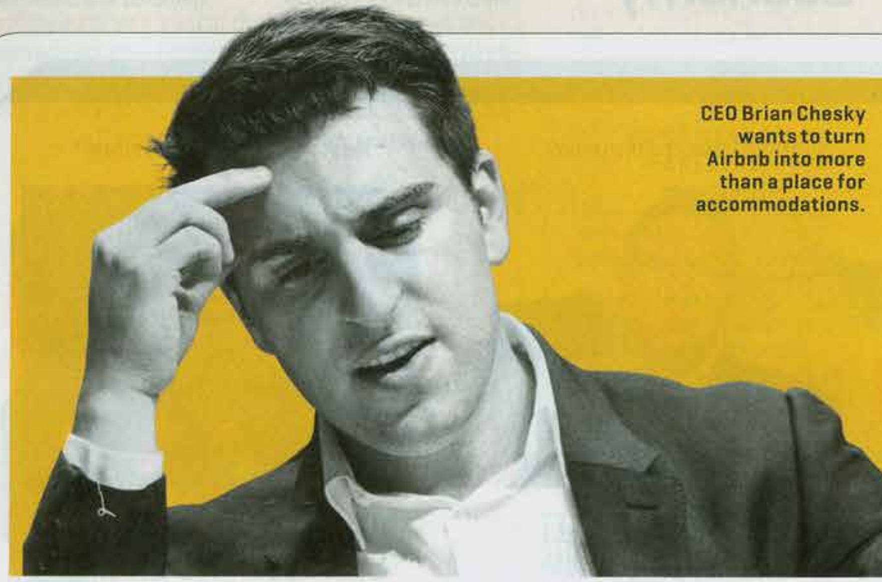
INDEPENDENCE

THE EUROPEAN UNION IS (STILL) STRUGGLING TO KEEP IT TOGETHER

CATALONIA has blinked first in its game of independence chicken with Spain. In October, after its messy vote to secede, it "suspended" the efforts. Part of the reason: no support from EU leaders, who know that backing one group of renegade separatists would egg on every regional movement that feels shortchanged. (Belgium's Flemish and Italy's Lega Nord are the most obvious examples.) Beyond that, Catalonian secession would open an economic can of worms, destroying the fiscal balance in Spain, while leaving the region subject to border controls and no longer eligible for EU funds. Small wonder then that EU honcho Jean-Claude Juncker has said it won't intervene, for fear of creating "a lot more chaos."
—GEOFFREY SMITH

"If they were smart, they would be magnanimous now and say, even though we won, we're putting Nelson Peltz on the board because the vote was so close."

—Activist investor Nelson Peltz, after losing his bid to join the board of Procter & Gamble in a narrow vote (which has yet to be certified). P&G's stock had risen more than 8% in two months, partly in anticipation that he would win. For more on Peltz's continuing fight, go to Fortune.com.



CEO Brian Chesky wants to turn Airbnb into more than a place for accommodations.

Airbnb's Conquest Is Just Getting Started

How the sharing economy pioneer plans to shake up the (rest of the) travel industry—and more.

TECH **AIRBNB ISN'T STOPPING** at disrupting hotels. The tech titan last year expanded into "experiences"—where hosts provide unique excursions—and recently teamed up with restaurant app Resy. CEO Brian Chesky sat down with *Fortune's* **Leigh Gallagher** to outline the company's next steps.

***Fortune*: How is the Experiences business going so far?**
Chesky: It's grown 12x from January, and we've earned about a half a million dollars. We've purposefully kept it small—a lesson I learned from the core business.

You once mentioned Airbnb wants a piece of the travel "daily spend." Is that the strategy here?
This is part of our strategy to do for travel what Amazon did for retail—which is to be the one-stop shop.

What's your take on tech's recent sexual harassment crises?
I think people expect more of Silicon Valley. For an industry that is so progressive in other ways to not honor that from a workplace and gender inclusion perspective is extremely disappointing.

What's the latest on your plans for an IPO?
We're slightly more than halfway through a two-year project. But to make it very clear, because some people will read that as, 'We're going public next year,' it just means we'll be ready.

PELTZ: DAVID A. GROGAN—CNBC/NBCU PHOTO BANK VIA GETTY IMAGES; CHESKY: RICHARD BORD—GETTY IMAGES; CATALONIA: PACO FREIRE—SOPA IMAGES/LIGHTROCKET VIA GETTY IMAGES

FORTUNE FACE TIME

Building a Workforce for Every Economy

THE PACE OF CHANGE in business is feverish. The question of how to attract, retain, and retrain a workforce that can sustain that pace was a unifying theme at two major gatherings of CEOs hosted by *Fortune* this fall. The conferences—one our newest, one our oldest—brought together leaders from business, medicine, politics, and the arts to share ideas.

At the inaugural ***Fortune* + *Time* CEO Initiative** (New York City, Sept. 25), a remarkable 99 CEOs gathered to discuss how their core corporate missions could lead to a positive social impact. Most agreed that companies must play a bigger role in closing America's wealth gap. One solution: continuously "reskilling" rank-and-file workers so they can keep up with, and profit from, technological change. A panel of executives proposed significant but pragmatic innovations, including the expansion of internships and apprenticeships, better cooperation with community colleges, and a credentialing process to help workers advance based on what it called "competency, not pedigree."

Attracting top young talent is just as vital to a vibrant workforce. At the 19th **Most Powerful Women Summit** (Washington, D.C., Oct. 9–11), leaders from companies as dissimilar as Amazon and candymaker Mars stressed the importance of emphasizing values and purpose in recruiting new workers. Just as important is hiring for resilience—reaching out, for example, to military veterans, who are comfortable performing amid extreme uncertainty. And panelists stressed the urgency of cultivating strong women and minority executives, a task made more daunting by their underrepresentation in business's upper ranks. Read more about the leaders' ideas at Fortune.com.

—MATT HEIMER

FORTUNE + *TIME* CEO INITIATIVE

"TRAIN THESE PEOPLE. LET NOTHING GET IN YOUR WAY. PLEASE DO THIS."

—**JOHN KASICH (R),** GOVERNOR, OHIO
Kasich described a plea he made to Ohio community colleges to expand their cloud-computing programs.

"WE HAD TO WEAVE PURPOSE INTO THE CORE BUSINESS MODEL OF THE COMPANY."

—**INDRA NOOYI,** CEO, PEPSICO
Nooyi said social purpose was crucial in hiring millennials who no longer see work as "just a paycheck."

MOST POWERFUL WOMEN SUMMIT

"YOU DO NOT 'WORK ON' BETTER EARNINGS . . . YOU EITHER DO OR YOU DO NOT."

—**MELLODY HOBSON,** PRESIDENT, ARIEL INVESTMENTS
Hobson questioned the commitment of companies that said they were "working on" increasing diversity in their leadership ranks.

"IT HAS LED TO A BETTER LEVEL OF DECISION-MAKING THAN WE COULD EVER HAVE IMAGINED."

—**JUSTIN TRUDEAU,** PRIME MINISTER, CANADA
Trudeau described the impact of having appointed Canada's first-ever cabinet with full gender parity.

© KASICH AND NOOYI: REBECCA GREENFIELD—CEO INITIATIVE; HOBSON AND TRUDEAU: STUART ISETT—MOST POWERFUL WOMEN SUMMIT

The Best Small and Medium Companies to Work For

To compile this year's list of the country's top small and medium workplaces, *Fortune* partner Great Place to Work received input from over 74,000 employees at businesses across the U.S. For the full list of 150 standout companies, go to Fortune.com. **BY CHRISTINA AUSTIN**

TOP FIVE SMALL COMPANIES

01
RELTIO

HQ..Redwood Shores, Calif.
EMPLOYEES.....................325
REVENUE...........$25 million

Workers love that this data management company is "extremely collaborative," makes new employees feel "very comfortable," and has an egalitarian bent. Says one staffer: "No idea is not considered."

02
PROPELLER

HQ.................Portland, Ore.
EMPLOYEES........................78
REVENUE...........$11 million

"Management's actions match their words," says one employee at this West Coast consulting firm, where senior leaders are "exceptional listeners."

03
STREAMSETS

HQ................San Francisco
EMPLOYEES.......................60
REVENUE..........Confidential

Flexible working arrangements and "true teamwork" get high marks at the San Francisco data tech company. "There is no micromanagement here," says one staffer.

04
RELIANCE PARTNERS

HQ..................Chattanooga
EMPLOYEES.......................61
REVENUE..........$5.6 million

Employees rave about the level playing field at this insurance firm. "It feels like I'm showing up at my own business every single day," says one.

05
TAPESTRY TECHNOLOGIES

HQ........Chambersburg, Pa.
EMPLOYEES.......................95
REVENUE........$20.1 million

Investment in innovation and training at this security and IT firm fosters a "unity" that "generates a sense of pride in each employee."

TOP FIVE MEDIUM COMPANIES

01
POINT B

HQ...........................Seattle
EMPLOYEES......................640
REVENUE..........$160 million

There's an "ownership mentality" at the professional services firm, where "driven" employees are encouraged to find "a balance between life and work."

02
ASANA

HQ................San Francisco
EMPLOYEES.....................297
REVENUE..........Confidential

This software firm boasts an "open and supportive workplace" that specializes in "empowering" workers to "do the job well," employees say.

03
WEST MONROE PARTNERS

HQ..........................Chicago
EMPLOYEES......................925
REVENUE.......$160.7 million

"Everyone does work that they are proud of" at this tech consulting firm, which employees say takes time to ensure they are "progressing through their careers."

04
INTUITIVE RESEARCH AND TECHNOLOGY

HQ................Huntsville, Ala.
EMPLOYEES......................339
REVENUE......$271.3 million

The aerospace engineering and analysis company "emphasizes community" and makes staffers "feel like part of a team or family, not just an employee punching a clock."

05
EVERGREEN HOME LOANS

HQ.............Bellevue, Wash.
EMPLOYEES......................808
REVENUE..........Confidential

"Our CEO knows each and every one of us by name," says one employee at the lender, where staff feel like "family." Adds another: "This is my favorite job ever."

*EMPLOYEE COUNTS ARE GLOBAL TOTALS.

ILLUSTRATIONS BY JONATHAN CALUGI

TIME®






FIRST

HEAR THE STORIES OF GROUNDBREAKING








TO CATCH A CRYPTOTHIEF

The next big cybercrime threat? Cryptojacking.

By Robert Hackett

TECH

MEET THE INTERNET'S latest menace. Hackers and penny-pinching website hosts are hijacking people's computers to "mine" cryptocurrency. And we're not talking about coal and canaries.

Cryptocurrency is mined, or produced, by solving complex mathematical puzzles. It's like a lottery: The more computing power you throw at the problems, the likelier you are to win a reward. Every so often, a computer finds a solution and strikes (digital) gold.

The moneymaking phenomenon, once the exclusive domain of Bitcoin enthusiasts, is more common than you might think. CBS's Showtime reportedly ran cryptominer tech on viewers' PCs this year, removing it after security researchers called it out in September. (A Showtime spokesperson declined to comment to *Fortune*.) The mining code later appeared temporarily on the official website of soccer star Cristiano Ronaldo. (A spokesperson could not be reached.) The Pirate Bay website, host of many links to copyright-infringing files, also tested a cryptominer without telling its audience. After an outcry, the site's operators said in a public note that they were experimenting with alternatives to ads as a source of revenue. That rationale may explain why the phenomenon has been linked to so many media-oriented sites.

Cryptomining has seen a resurgence since the cryptocurrency Monero arrived on the scene in 2014. Designed to be mined on PCs, the privacy-minded e-coin sparked the development of a handful of off-the-shelf Monero mining tools, such as Coinhive, JSEcoin, and Crypto-Loot. When added to a website, these tools transform typically unsuspecting visitors' computers into cryptographic quarries—and new revenue streams. "Ads don't work that well anymore—plus they are annoying," says a spokesperson for Coinhive. The project debuted in September, and Coinhive says it has generated a total of 3,200 Monero tokens—worth approximately $288,000—to date. The project takes a 30% cut of the loot, leaving the rest to the tool's installer.

Bitcoin mining requires customized chips, bespoke hardware, and large, centralized server farms—far beyond what a gaggle of PCs can offer. As newer, gaming-resistant cryptocurrencies have sprouted, however, the trend has started to make a comeback.

Maya Horowitz, a threat intelligence manager at Check Point, an Israeli cybersecurity giant, tells *Fortune* that her team has discovered thousands of examples of video-streaming and file-sharing websites hosting cryptomining software like Coinhive. Almost all fail to disclose the tools' use, she says. "I don't think any one of these is very safe or good for users," Horowitz warns, noting that the code can make computers crash and can provide an avenue for hackers to insert their own malicious code.

Coinhive says its top priority is to add an opt-in button so people can grant the miner their consent. Even with their permission, it's hard to imagine the scraggly crew ever toppling the digital ads market, an $83 billion industry in the U.S. alone. In the meantime, if you're worried about miners manipulating your computer to mint Monero, consider downloading a "blocker" browser extension, like minerBlock or No Coin. ■

THE LEDGER

The intersection of tech and finance: blockchains, digital money, and more.

▲ ILLUSTRATION BY **NICHOLAS LITTLE**

Risk Control and the Real Economy are Driving Change

China Construction Bank's Mid-Year Results are Evidence of the Benefits of the Bank's Transformation

A great scientist one said: "It is not the strongest, nor the most intelligent that survives. It is the one that is the most adaptable to change." China Construction Bank Corporation (CCB), the second-largest bank in the world, has been actively adapting to change, accelerating its transformation and development, while continuing to serve the real economy, maintain compliance, and conduct overall risk prevention and control. By embracing change CCB is not just surviving, it is thriving.

That fact is evident in operating results from the first half of 2017* that showed strong performance in all core indicators and measurable improvements in terms of scale, effectiveness and quality. The Bank reported total assets of RMB21.69 trillion, an increase of 3.47% since the end of 2016, which delivered a net profit of RMB139 billion, up by 3.81% year-on-year. Annualized return on average assets and annualized return on average equity were 1.30% and 17.09%, respectively. The Bank's total capital ratio and common equity tier-1 ratio were 14.50% and 12.68%, respectively.

STRONG CORE INDICATORS AND GROWING PROFITABILITY In an economic and financial environment that presented both challenges and opportunities, CCB has continued to evolve and deliver steady growth. Its core financial indicators were in line with expectations, while the Bank delivered outstanding results in some areas.

Gross loans and advances to customers increased by 6.38% to more than RMB12.5 trillion since the end of 2016. Deposits from customers amounted to over RMB16.2 trillion, representing an increase of 5.66% since the end of 2016. Meanwhile, the Bank proactively responded to challenges brought by the liberalization of interest rates, actively expanded its customer base, and strengthened product innovation, growing its net fee and commission income by nearly RMB900 million year-on-year, or 1.32%. The Bank continued to improve its cost management and optimized its expense structure, achieving a cost-to-income ratio of 22.31% and maintaining overall stability year-on-year.

THE REAL ECONOMY AND IMPROVING SERVICE CCB is resolutely committed to serving the real economy through its business operations. It has given its full support to national strategies such as the "Belt and Road Initiative", as well as the coordinated development of the Beijing-Tianjin-Hebei region, the Yangtze River Economic Belt and the construction of the Xiong'an New Area.

The Bank furthered its contribution to the real economy by leveraging its strengths in infrastructure construction, its engineering cost advisory service and its comprehensive licenses. As a state-owned financial institution, CCB also played a pivotal role in national economic development by providing superior, efficient and comprehensive financial services to major projects and key clients. The Bank has increasingly improved its integrated services by upholding the customer-centric philosophy.

As of the end of June, CCB recorded more than RMB3.2 trillion in loans to the infrastructure sector, accounting for nearly 50.8% of corporate loans and advances. Agriculture-related loans amounted to over RMB1.7 trillion, of which loans to new countryside construction accounted for over RMB42.1 billion. Meanwhile, the Bank continued to optimize its credit structure by strictly implementing "name list management" to control loans across five industries with severe overcapacity: iron and steel, cement, electrolytic aluminium, plate glass and shipbuilding.

In embracing change, the Bank continued adopting advanced technology. During the first half of 2017, CCB established its Inclusive Finance Division to enhance the application of big data and internet technologies in targeted customer service and precise risk control.

Small and medium-sized enterprises also received better service. The Bank created the "Small and Micro Fast Loan", "Yunongtong" and other key products specifically for them. At the end of June, loans to small and micro enterprises exceeded RMB1.49 trillion, representing an increase of nearly RMB48.2 billion since the end of 2016. The number of small and micro enterprise borrowers reached 397,400, an increase of 88,500. The availability rate of loan applications for small and micro enterprises was over 92.8%, up by 1.95 percentage points, fulfilling the regulatory requirements of "Three No Less Than."

In housing finance, CCB continued to maintain its core competitiveness in housing finance. Residential mortgage loans had increased by 9.5% since the end of 2016 to more than RMB3.9 trillion. In support of government policy on low-income housing, the Bank continued to meet the housing needs of low and middle-income residents by granting personal indemnificatory housing loans of RMB5.21 billion in the first half of 2017.

In addition, consumer finance grew rapidly and at the end of June, the number of credit cards issued totalled 102 million, with the spending amount reaching RMB1.24 trillion.

FINANCIAL RISKS AND MANAGEMENT CCB continued to enhance its risk management system in 2017. Through its business operations, the Bank has conscientiously helped to maintain financial security and create stability in the market through its role as a state-owned financial institution. It has been studying in-depth the evolution pattern of the occurrence, transference and transmission of risks in order to identify and control risks more accurately. CCB has introduced a number of measures to identify, assess and mitigate risks more scientifically, detect risks upfront, improve the cooperative risk-prevention and -management system, and coordinate the liquidity management of the Bank more scientifically.

The Bank focused on embedding comprehensive risk management in all segments of the Bank, covering all types of risks. It strengthened issues monitoring and alerts, the assessment and diagnosis of risks, and enhanced the whole-process risk management system. In addition, the Bank enhanced its issues monitoring across its subsidiaries to assess their business risks in a more systemic manner.

In the first half of 2017, the CCB reported positive trends across all regulatory indicators, and the risks faced by the Bank remained stable and within control. At the end of June, the non-performing loan ratio stood at 1.51%, a decrease of 0.01 percentage points from 2016. The provision coverage ratio was 160.15%.

CREATING COMPETITIVE ADVANTAGES AND INNOVATION In the first six months of 2017, the Bank's total assets across all integrated operation subsidiaries had grown by 10.41% to over RMB409.5 billion, and net profit grew nearly 20.90% year-on-year to RMB3.36 billion. The net profit of CCB's overseas commercial banks grew 86.70% year-on-year to RMB5.43 billion. The volume of international settlements amounted to nearly USD578.9 billion, generating income from international settlements of more than RMB2.7 billion, while the total volume of cross-border RMB-denominated settlement was more than RMB428.9 billion.

The Bank forged ahead with its overseas expansion: CCB Indonesia was inaugurated in February 2017, followed by the opening of branches in the Polish capital of Warsaw, CCB Malaysia, and Perth in Australia. At the end of June, CCB had a total of 251 overseas branches in 29 countries and regions.

In the meantime, the Bank's new services experienced rapid growth: the balance of wealth management products was RMB2 trillion, the underwriting amount of debt financing instruments and the number of deals for non-financial enterprises outstripped competitors, and assets under custody totalled RMB10 trillion.

CCB continued to turn information technology and product innovation into drivers of development. The Bank successfully introduced its new generation core banking system, promoted the "Long Card" payment system, and improved its mobile finance products. It enacted the national policy requirements for targeted financial poverty alleviation through issuing poverty alleviation bonds and launching innovative projects such as Shan Rong Village-Town Connection, targeting poverty alleviation platforms. In the first six months of this year, the Bank completed 152 product innovation projects and 280 product transplantation projects.

CCB continued to accelerate its channel transformation. The number of integrated outlets accounted for 99% of all outlets. The number of personal online banking users, mobile banking users and WeChat banking users topped 250 million, 240 million and 62 million, respectively. With cutting-edge financial technology products, the Bank achieved whole-process control of customer inquiries by developing a 24/7 comprehensive, multi-function, smart cloud customer service system, which is available via telephone banking as well as on mobile and online channels.

Going forward, in the second half of the year, CCB will sustain its efforts in all the aforementioned areas, building on lessons learned, knowledge gained, and fostering innovation to maintain our leadership position as an institution that supports the real economy and strives to achieve the goals of our corporation and our nation.

**Data herein was prepared according to the International Financial Reporting Standards on a consolidated basis and expressed in RMB unless otherwise stated.*

中国建设银行
China Construction Bank

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A worker constructs an elevator shaft with the use of cross-laminated timber, which reduces construction time, costs, and labor compared with typical masonry installation.

BUILDING UP FROM THE ASHES

Many entrepreneurs face challenges when starting their companies, but few encounter obstacles quite as big as Casey Malmquist has.

By Jennifer Alsever

VENTURE

THE BLUE BALL OF FIRE rising in slow motion from Casey Malmquist's hand was the first sign that something was wrong. Then, nanoseconds later, before he could make sense of the situation, a deep *whoosh* struck his rib cage, and the gas explosion hit. The blast threw Malmquist, then 56, 50 feet away from the deck where he had gone to pour a glass of wine, smoke a cigar, and watch a storm on the horizon. He hadn't known there was a gas line leak in the newly constructed house when he flicked on the lighter.

The Montana entrepreneur roused, climbed to his feet, and watched as his athletic T-shirt glowed bright white and then vaporized, and his skin began to fall off his hands and arms.

It's hard enough to survive as a startup, let alone while its founder is recovering from a serious accident that left severe burns across 75% of his body. But Casey Malmquist did survive—and so did his nascent business, which is based in Whitefish, Mont.

In March 2013, four months before the explosion, Malmquist started SmartLam: the first American producer of a wood building

© PHOTOGRAPHS BY HEIDI LONG

Casey Malmquist inside the SmartLam production facility in Columbia Falls, Mont.

material called cross-laminated timber that can be used in lieu of concrete for solid walls, floors, and roofs.

The blast that nearly killed him made him even more determined to keep his company alive. Not only did he have 30 employees counting on SmartLam, Malmquist was passionate about the product, which was already popular in Europe, where it originated. An avid environmentalist, he felt the material, if widely adopted, could massively reduce greenhouse gas emissions since wood produces far less carbon than concrete products, and is a better natural insulator. "I was passionate—I ate, breathed, and slept the business and wanted to see it survive."

Doctors put Malmquist into a drug-induced coma for 10 days, and because of the third-degree burns on his chest, back, and arms, he went through nine major skin-graft surgeries. He also discovered he had broken both his thumbs and his left arm, cracked vertebrae, and blown out his knee.

Meanwhile investors, who put $6 million behind SmartLam, managed to keep things afloat at the nascent company. But Malmquist says much of his vision and plans for the company were in his head, not written down. That left his wife, Natalie, to interpret what he might want. She closed her own horse boarding business and often consulted with investors and employees on SmartLam business, helping to answer email and handle sales deals and paperwork from Malmquist's hospital room. His secretary ran most of the day-to-day operations. "We were all holding our breath to see what would happen to Casey," says Natalie. "It was teamwork that saw us through."

"I WAS PASSIONATE—I ATE, BREATHED, AND SLEPT THE BUSINESS AND WANTED TO SEE IT SURVIVE."

Doctors expected Malmquist would stay in the ICU for six to nine months; he was home in four and soon after that was back on business calls. Doctors also warned that the vast majority of married couples who go into the burn unit end up separating. The Malmquists stayed married. While in the ICU, Natalie gave him a Superman robe. "The guy eats Kryptonite," she says. "He'd be in excruciating pain and just still get up and walk if they said to walk."

Still, the next year and a half wasn't easy. In addition to frequent bandage changes, it took an hour and a half for Malmquist to get dressed, wearing compression clothes to go anywhere. A single physical therapy appointment could take up his energy for the day. Typing and using the computer was painful and exhausting, and because he no longer has sweat glands, he could easily become overheated. Work was, simply put, hard work.

Malmquist says he came out of the tragedy more determined to make his startup successful, recalling a dream in a drug-induced coma in which he had to choose one of two tunnels. The first tunnel was white, peaceful, and easy, and the other was difficult and painful. He believes they were choices—death or life. He chose life, knowing it would be hard and that he needed to do something important with his second chance. He says he wants to build something to change the world and impact climate change.

SmartLam isn't changing the world yet, but Malmquist says every product that replaces concrete or steel has a positive impact on the earth. And builders are buying into the vision too. The company has $18 million in annual revenue and a long pipeline of U.S. projects including industrial buildings, government buildings, and schools that want to use the prefab sheets for walls, floors, and roofs. It recently installed a roof system for an Amtrak facility in Tacoma.

"Hopefully this experience has made me a better person," he says. "You don't always control what happens to you, but you can control how you respond to it. It gives you a renewed sense of purpose." ■

THE FUTURE OF COFFEE

Using the blockchain to track java, from bean to barista. By Robert Hackett

COFFEE, A BELOVED BEVERAGE tracing its origin back hundreds of years, is being reimagined for the 21st century. San Francisco–based Cafe X built a latte-serving robot barista. Startup Bulletproof Coffee is pitching a healthier kind of brew—just add butter. (Don't ask.) Mercedes-Benz is even testing out coffee delivery via drone in Zurich.

It's all a little frustrating for Bitcoin fans, who have long dreamed of the day when they can pay for a cup of coffee with their crypto-currency of choice. For now, alas, the Bitcoin network—a swarm of volunteer machines maintaining a secure digital accounting ledger—doesn't have the capacity to handle so many small transactions within an industry worth $48 billion in the U.S. alone. The wait times for payment confirmations are too long. The transaction fees required to get an order through are too high. By the time a receipt gets generated, your joe has cooled.

But the crypto-coffee era may not be far away. Bext360, a one-year-old startup based in Denver, is taking an entirely different approach to getting your coffee, using a blend of mobile apps, robots, and blockchains—the shared ledgers upon which cryptocurrencies are based—to overhaul the tracking process from crop to cup.

The current processing system, says Bext360 CEO Daniel Jones, is antiquated. Growers, many of whom depend on family labor and unreliable income, are judged more on quantity than quality. By closing the feedback loop and rewarding farmers for superior harvests, Jones hopes to incentivize better farming practices.

Here's how it works. Coffee cultivators load their daily haul—usually about 30 kilograms—into a machine equipped with sensors and optical recognition tech that sifts and sorts coffee cherries. This automated appraiser assigns each a grade based on quality (bigger and riper is generally better). The machine then links this output to special crypto tokens tracking the produce across its life span.

Bext360 is using a blockchain built by Stellar, a financial tech startup founded by Jed McCaleb, an entrepreneur whose previous projects included the Mt. Gox Bitcoin exchange (he sold it years before its demise in a widely publicized hacking) and the interbank cryptocurrency network Ripple. Unlike the hiccuping Bitcoin network, Stellar was built to handle a high volume of cross-border micropayments. "It's a way to compensate farmers more fairly for what they actually produced," McCaleb says.

Bext360 successfully tested its machinery in California over the summer. It plans to run more trials in Uganda and Ethiopia in coming weeks. If all goes as planned, it could reshape a multibillion-dollar industry. And perhaps we'll know one day from where, and for how much, that drone-delivered coffee arrived. ■

▲ PHOTOGRAPH BY SHAYLA HUNTER

PASSIONS

AUDIO

Phantom of the Opéra: Devialet's cobranded speaker features gold leaf from the Palais Garnier.

THE NEW SUB CULTURE

Its fans include rap superstars, venture capitalists, and even Presidents. Now French audio startup Devialet is taking its high-tech speakers to the heart of one of Paris's most prestigious cultural institutions. By Lindsey Tramuta

© COURTESY OF DEVIALET

SPEAKERS FOR DESIGN AND MUSIC LOVERS

1. SONOS ONE $199

Can't fight the competition? Align with them. More than a leader in home audio, Sonos sees itself as a platform in the making with the launch of One, a new smart speaker with Amazon Alexa voice control built into the hardware to switch on music, podcasts, or news from 49 different services.

2. BANG & OLUFSEN BEOPLAY A9 $2,699

The distinctive satellite-shaped A9 speaker, designed in collaboration with textile manufacturer Kvadrat, is as much a modular decorative piece for the home as it is a source of premium sound. It delivers high performance, wireless audio streaming and supports Apple AirPlay.

3. BOWERS & WILKINS ZEPPELIN $699

In a much anticipated update to its handsomely shaped Zeppelin speaker, British audio brand Bowers & Wilkins has rolled out a wireless edition, free from the cumbersome dock of previous models. Buyers can stream their tunes via Bluetooth, AirPlay, and Spotify Connect.

"HEAR THE UNHEARD" seemed a lofty promise to the twentysomething audiophile who strolled into the Paris flagship of the French audio brand Devialet. He slipped off his Beats headphones and approached the sales consultant with a line of "prove it" questions. Could the company's ambitious claims of having revolutionized an industry that hasn't seen a significant innovation in the past 40 years be upheld in practice?

The brand's marquee product, the Gold Phantom, is a $2,990 wireless speaker that claims digitally powered, analog-grade sound. A frequency response of 14Hz to 27kHz (far outside the range of the human ear), 4,500W of power, and a maximum volume level of 108dB (read: extremely loud) combine to capture details that are indiscernible on lower-end speakers, from a musician's breath between notes to a subtle drumbeat in the background.

"It's like being front row at a festival," beamed the young music lover after listening to a live version of "Hotel California" on two Phantoms paired in stereo. Slack-jawed, he wanted to hear more.

That visceral reaction to powerful and precise sound—and the full-bodied, emotional experience that often goes with it—has earned the brand a coterie of loyal acolytes including musician will.i.am, French President Emmanuel Macron, and investors like Android founder Andy Rubin and rapper Jay-Z, who were among the supporters that pumped $106 million into the company's 2016 Series C round.

Devialet's most ambitious project yet rolls out at the end of the month—a 10-year partnership with the Opéra National de Paris, with which it will inaugurate a sound discovery room in the Opéra's Palais Garnier. Visitors will be able to listen to performances recorded inside the Chagall-bedecked auditorium; purchase a cobranded Phantom speaker decorated with gold leaf from the building itself; and experience the full breadth of Phantom's power by listening to other musical styles played simultaneously on all 18 devices, mimicking an orchestra. Existing Phantom owners will also be able to stream any performance at the Palais Garnier or Opéra Bastille, in real time, from wherever they are in the world.

"The idea of setting up shop in the Opéra, a very traditional, nearly 350-year-old institution, wasn't even conceivable. But we're driven by the impossible, so we pitched them the idea," explains Devialet CEO Quentin Sannié. "Charles Garnier was a maverick, a relatively unknown architect who created the most extravagant and innovative monuments of the 19th century—we could relate to his ambition."

Timing was certainly on Devialet's side. For the Opéra National de Paris's adjunct director Jean-Philippe Thiellay, the concept presented a clear opportunity: "It's the best way we can enrich the experience for operagoers and attract a new generation of guests. [Devialet] brings the modernity we need, and we provide the visibility and cultural cachet."

Whether it's within the Opéra or directly inside Devialet's storefronts around the world, Sannié insists everything the company does is motivated by an experiential ambition: "It's not about us, we're merely a vehicle. We want people to feel the magic of sound, and there's still more to be done." F

SONOS ONE: COURTESY OF SONOS; BEOPLAY A9: COURTESY OF BANG & OLUFSEN; ZEPPELIN: COURTESY OF BOWERS & WILKINS

THE FUTURE 50

FORTUNE

FEW THINGS ARE MORE FOOLISH THAN TRYING TO PREDICT THE FUTURE. The fracking boom and the social media explosion are but two recent examples of economy-shifting revolutions that largely took the world by surprise. The fate of individual companies is unknowable too. When Steve Jobs returned as CEO of Apple in 1997, no seer prophesied that two decades later Apple would be the world's most valuable company. Most of the time, the best we can do is plot trajectories, extrapolating from what we already know to peek past the horizon. But *Fortune* has partnered with the Boston Consulting Group (BCG) to create a tool for seeing what's ahead—the Future 50, our new list of companies best-positioned for growth. Read on for a glimpse of what's to come. The first surprise? Apple isn't on the list. —BRIAN O'KEEFE

BY JONATHAN CHEW, GEOFF COLVIN, ERIKA FRY, ROBERT HACKETT, ADAM LASHINSKY, SY MUKHERJEE, ANDREW NUSCA, AND ANNE VANDERMEY

IN SEARCH OF 'VITAL' COMPANIES

TODAY'S FAST-CHANGING BUSINESS ENVIRONMENT DEMANDS A NEW APPROACH FOR IDENTIFYING TOMORROW'S WINNERS. MEET THE FUTURE 50. BY MARTIN REEVES

"How do you keep the vitality of Day One, even inside a large organization?"

Amazon.com's Jeff Bezos, in a 2016 CEO letter to shareholders

IF YOU'RE LOOKING FOR a model of a big company that retains the dynamism of a startup, Amazon.com is a good place to start. Why? In part because, as the quote above suggests, founder and CEO Jeff Bezos knows that successful companies must nourish and retain one characteristic above all: vitality. At BCG, we define vitality as the capacity of a company to explore new options, renew its strategy, and grow sustainably. Preserving past advantages and position is not sufficient to thrive in today's complex and dynamic business environment. In a fast-changing world, only the vital will survive.

Declining vitality is making large companies increasingly vulnerable to change, according to our research. A 2015 BCG study, for example, found that just 7% of companies that are market share leaders in their industries are also profit leaders. Many are merely hanging on. Loss of vitality stems in part from the natural life cycle of companies: The high growth rates typical of younger companies are hard to sustain. But in the long run, the majority of returns for shareholders are driven by revenue growth. For companies to prosper and deliver for investors well past the startup stage, they must learn the secrets of staying vital.

A FORWARD-LOOKING MEASURE

Today, most business decisions are still informed using backward-looking financial metrics, with the implicit assumption that past success is predictive of future success. But the high rate of change and uncertainty driven by technology, business model innovation, and other factors make this assumption increasingly untenable and demand new metrics and approaches. We believe the *Fortune* Future index, based on the idea of vitality, can help fill this gap.

The result of a two-year research effort, the Future 50 ranks U.S.-listed companies with the best prospects for growth. The index has two pillars: 1) a market view of growth potential and 2) an assessment of the firm's actual capacity to deliver that growth, based on four dimensions: strategy, technology and investments, people, and structure (see the box on the facing page for more on methodology). The result is a composite score that represents both a new metric and new perspective for business analysis.

Our scoring system extensively leverages nonfinancial data to achieve this forward-looking view, giving insights on predictive factors which are not visible from financial data alone. For instance, one measure for technological advantage is calculated by analyzing the startup investments of companies and comparing them with the activities of the best-performing VC funds.

We use machine learning to leverage unstructured data and tease out predictive patterns. Natural language processing (NLP) algorithms enable us, for instance, to assess whether the strategy expressed in a company's annual report reflects a vital approach: one with clarity, long-term orientation, and a new innovative dimension that we call "biological thinking." The latter represents management's ability to embrace and leverage the uncertainty and complexity of business environments and address them with flexibility, adaptation, and mutualism.

The variables we assessed were drawn from different branches of management theory and structured in a modular manner, permitting interpretability and avoiding the lack of transparency often associated with A.I.-based methodologies. And the choice of variables and their weighting is based on statistical testing of historical data, *ensuring that every factor has a* proven effect on long-term revenue growth.

INTERPRETING THE RESULTS

The Future 50 is actually two lists of 25 companies—those with market value above $20 billion at the time of our screen (whom we call the "Leaders"), and those with market value below $20 billion (the "Challengers"). We separated them into different pools to adjust for an inherent bias: Any analysis focused on growth naturally favors smaller companies. But we wanted to make sure we identified big companies with the high potential to continue thriving, not just rising stars. No surprise: Bezos's Amazon made the Future 50. On the other hand, Apple, though it remains a high performer for an incumbent tech company, fell short—in part owing to its recent increased emphasis on paying dividends over reinvestment.

The Future 50 is not, of course, a crystal ball. Effective strategy does not always follow precedents or aggregate patterns, circumstances change, and good strategies can be undermined by better ones or by poor decisions. But we hope and believe that the ranking provides a useful, forward-looking view of business today.

Martin Reeves is a senior partner at BCG and the director of the BCG Henderson Institute.

50

THE FUTURE 50

Present
Change

Short Term
Invest

Current
Vision

It turns out that you can learn a lot about a company from what it says about itself. BCG used its natural language processing to analyze 200,000 earnings calls and 70,000 10-Ks—specifically Item 7 in the annual reports, where the company's management lays out its strategy. BCG's algorithm then scored each company on different factors, including long-term orientation. The algorithm rewarded companies for using words like "invest" and "vision," as opposed to phrases such as "current" or "short term." —BRIAN O'KEEFE

THE FUTURE 50 METHODOLOGY

To identify the Future 50, BCG examined 2,300 publicly traded U.S. companies and reviewed 15 years of financial results through year-end 2016. We divided the companies into two different groups—those above $20 billion in market value at the time of the screening and those below.

Our methodology has two pillars: **Market potential** and **company capacity**.

Market potential is measured as a company's expected future growth as determined by the financial markets. This is determined by calculating the present value of its growth opportunities, which represents the proportion of market value that is not attributable to the earnings power of the existing assets and business model. That accounts for 50% of the overall score.

The other 50% of each company's score is the measure of its capacity to deliver on that potential. This is assessed by a score comprising 14 factors, which were drawn from a larger group of variables which were tested and calibrated against historical data for their ability to predict long-term growth. These were grouped in four clusters:

- **Strategy:** Trained on 70,000 10-K reports, our A.I. algorithm uses natural language processing to detect semantic fields around initial keywords. It assesses companies' long-term orientation and also detects "biological thinking," characterized by an emphasis on adaptation, mutualism, and sustainability, which are essential to thrive in dynamic and complex business environments. Finally, clarity of expression in a company's strategy and vision is measured using the Flesch-Kincaid score.
- **Technology and Investment:** The capital-expenditure-to-sales ratio measures a company's investment in the future. Technology advantage is measured through a company's patents portfolio, weighted for quality (citations), digital emphasis (share in computing and electronic communication), and sustainability (proportion expiring beyond five years). To account for external innovation, too, a company's portfolio of startup acquisitions is assessed for similarity with best-performing venture capital funds and share of tech areas with the strongest investment growth.
- **People:** Board size and average age of executives reflects the empirically observed advantage of tight, youthful senior teams, while stability (the inverse of turnover) reflects the observed advantage of consistency.
- **Structure:** The size (revenue-based) and age of the company are strongly correlated to vitality loss, which may however be compensated by revitalization, as measured by sales growth in the past five years. F

LEADERS

CORPORATIONS WITH MASSIVE MARKET VALUES THAT HAVE THE POTENTIAL AND CAPACITY TO KEEP GROWING AT A RAPID PACE DESPITE THEIR SCALE.

Market values as of Oct. 9, 2017; source: S&P Global

01 SALESFORCE

1.2 3.7 4.9

MARKET POTENTIAL SCORE / COMPANY CAPACITY SCORE / OVERALL SCORE

Salesforce cofounder and CEO Marc Benioff draws inspiration for his company's constant innovation from everywhere, even the residual energy from the dormant volcano underneath his vacation home on the Big Island of Hawaii. Indeed, innovation permeates the everyday routine at Salesforce. (For more on the company's culture of innovation, see "Benioff in Bloom" in this issue.) The tone is set by Benioff himself, who at Salesforce has pioneered a new business model (subscription software), a new technology model (storing a customer's applications online), and a new philanthropic model (which dictates giving away product, equity, and the time of its employees).

Recent market value: **$69.2 billion**

02 TESLA

1.3 3.1 4.4

Elon Musk's electric-car maker has outmaneuvered the competition at every turn, revving up a massive market capitalization (nearly $60 billion) despite having built relatively few cars and annual sales that are a fraction of the revenues of old-line automakers GM and Ford. Tesla's innovations to date have included new ways of selling (no dealerships), groundbreaking technology (autopilot self-driving capabilities), and even financing (persuading customers to make deposits far in advance of delivery). Auto giants from Detroit and beyond are beefing up their electric and autonomous muscles—a clear sign that they are trying to play catch-up to Tesla's outsize innovation.

Recent market value: **$57.2 billion**

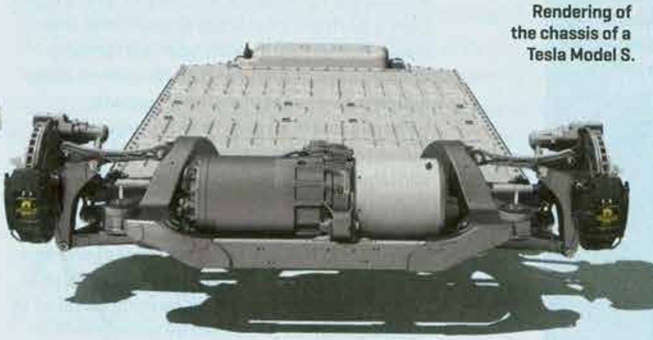
03 FACEBOOK

0.9 3.1 4.0

All hail the company that took a paperbound campus staple (the student "face book") and turned it into a colossus of the social networking, oversharing, fact-challenged media and advertising landscape of today. Founder Mark Zuckerberg's company has innovated repeatedly by enabling new ways to share first news about oneself, then photos and video, then content of common interest. It successfully transitioned from desktop to mobile and snatched up fast-growing Instagram at a bargain price. Now Facebook, with Oculus Rift (below), is focused on virtual reality—game-changing innovation in the making.

Recent market value: **$501.0 billion**

Rendering of the chassis of a Tesla Model S.



MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE

X.X X.X X.X — OVERALL SCORE

FACEBOOK: DAVID PAUL MORRIS—BLOOMBERG/GETTY IMAGES; TESLA: COURTESY OF TESLA

04

NETFLIX

3.4
1.2 2.2

The former movies-by-mail company, now a streaming-media mammoth, is rapidly shifting focus away from subscriber growth [at about 51 million paying customers, the U.S. market is nearly maxed out for Netflix] and toward revenue and margin expansion on top of its global footprint. At the same time, Netflix, based in Los Gatos, Calif., is spending large sums on developing original content—$7 billion is earmarked for 2018—to mitigate a decline in licensed media. So far, so good: In its third quarter, Netflix grew sales by 30% over 2016.

Recent market value: $85.0 billion

50

THE FUTURE 50

$129

BILLION

Average market capitalization of the 25 companies on the LEADERS list as of Oct. 9, 2017.

05

INTUITIVE SURGICAL

3.2
0.9 2.3

You can thank Intuitive Surgical for robot surgeons. The Sunnyvale, Calif., company has been pioneering the field for two decades. [See our longer story in this issue.] Intuitive's da Vinci robotic surgery machines give human surgeons control over four surgical arms—and human surgeons like using them. Intuitive's stock and revenue have soared over the past two years owing to strong global demand for the systems. The company's market value has shot up more than 70% so far in 2017.

Recent market value: $39.7 billion

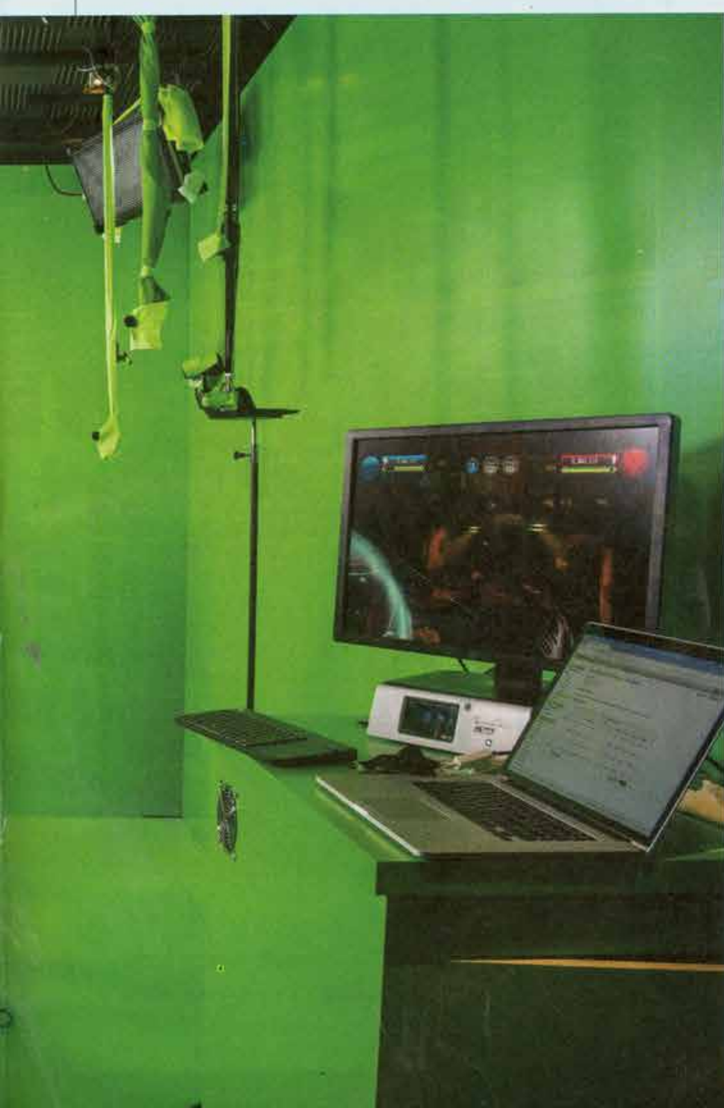
06

VMWARE

3.0
0.9 2.1

The Palo Alto, Calif., virtualization software pioneer is charging into its cloud-computing future thanks to addition by subtraction. Facing impossibly steep competition from Amazon's AWS and Microsoft's Azure, VMware unloaded its infrastructure-as-a-service business and plowed the savings into other areas with more potential. The result? A portfolio that better caters to cloud-curious corporations, whatever the approach: public, private, or hybrid. The strategic shift has been popular with investors: Its stock is up more than 40% year to date.

Recent market value: $45.7 billion



07

EDWARDS LIFESCIENCES

2.7
0.7 2.0

Edwards Lifesciences' Sapien 3 artificial heart valve, implanted through a catheter, is an alternative for heart disease patients whose conditions are bad enough to make surgery too risky. Over the past two years it's been FDA approved for an increasing number of procedure types, including for repairing existing artificial valves that are breaking down. The company's growing footprint globally has driven strong sales abroad, where these kinds of minimally invasive heart procedures are becoming more popular. Edwards has been able to maintain at least a 24% net profit margin through the first half of 2017.

Recent market value: $23.3 billion

08

INTUIT

2.6
0.7 1.9

The maker of TurboTax and QuickBooks software is a master of self-disruption: a skill every business increasingly needs and most don't have. The company's method, which isn't simple, works because it's hard-wired into the culture. And is it ever effective: After 34 years and several tech revolutions, Intuit has defeated all challengers and is delivering knockout results: Its sales have risen 36% since 2012 to $5.2 billion, profits are at an all-time high, and its return on capital is a towering 60%. At 19.3%, Intuit's research & development spending as a percentage of sales is higher than Alphabet's or Amazon's.

Recent market value: $36.7 billion

09

ACTIVISION BLIZZARD

2.6
0.9 1.7

The Santa Monica gaming giant has ridden its industry's growth to new highs over the past four years. It appears the sector may now be slowing. But Activision is looking past games: Its ambition is to become the 21st-century Walt Disney Co. Look no further than Activision's heavy investments in e-sports (the curious spectacle of watching professional gamers compete with one another in an arena) and in film and television studios to better capitalize on its popular game franchises.

Recent market value: **$46.2 billion**

10

REGENERON PHARMACEUTICALS

2.5
1.0 1.5

Investors are betting big on Regeneron: Its market value has jumped by more than a fifth in 2017. Why? Sales of eye-disease treatment Eylea are strong. The company's expansive pipeline could continue to fuel steady growth. Regeneron has 11 experimental treatments in Phase II or Phase III clinical trials. One that could prove critical is REGN2810, a type of next-generation medicine currently in late-stage studies that harnesses the body's immune system to fight cancer.

Recent market value: **$50.1 billion**

50

THE FUTURE 50

Google's new Home Mini smart device.

11

PRICELINE GROUP

2.5
1.1 1.4

The Norwalk, Conn., online booking giant has one of the best-performing stocks over the past decade. The core of its growth strategy is the international travel market, not its more contested U.S. counterpart, and savvy execution on acquisitions—among them Kayak, Momondo, Booking.com, and OpenTable—has helped it fend off competitors. (Its biggest rival: Expedia.) Priceline is fighting new threat Airbnb by expanding its home-rental listings at twice the rate of its hotel listings.

Recent market value: **$94.5 billion**

12

ALPHABET

2.4
1.0 1.4

Google's parent company went through a reckoning last year at the hands of CFO Ruth Porat, who brought transparency and rigor to the search giant's signature sprawl. Though much was made of the fate of the company's so-called moonshots, the moves revealed the surprising strength of Alphabet's ad-based businesses (including YouTube) and hinted at future major moneymakers, among them the cloud-computing division, an effort led by VMware cofounder Diane Greene and fueled by hundreds of new hires. Meanwhile the tech titan is investing aggressively in artificial intelligence. Alphabet's market value of nearly $700 billion is second only to Apple's.

Recent market value: **$682.2 billion**

13 ▸

AMAZON.COM

2.4
1.2 1.2

What can't Amazon disrupt? Jeff Bezos's company long ago went beyond books to upend just about every inch of brick-and-mortar retail. Today it offers Amazon-produced entertainment and Amazon-engineered products, like its A.I.-powered assistant Alexa. And Amazon Web Services, the company's cloud-computing platform, is wildly successful. Having recently acquired Whole Foods, Amazon's incursion into the grocery market is imminent; some analysts suggest that prescription drugs or online payments may be on tap too. Meanwhile Amazon continues to experiment with drone deliveries and cashier-less "Go" convenience stores.

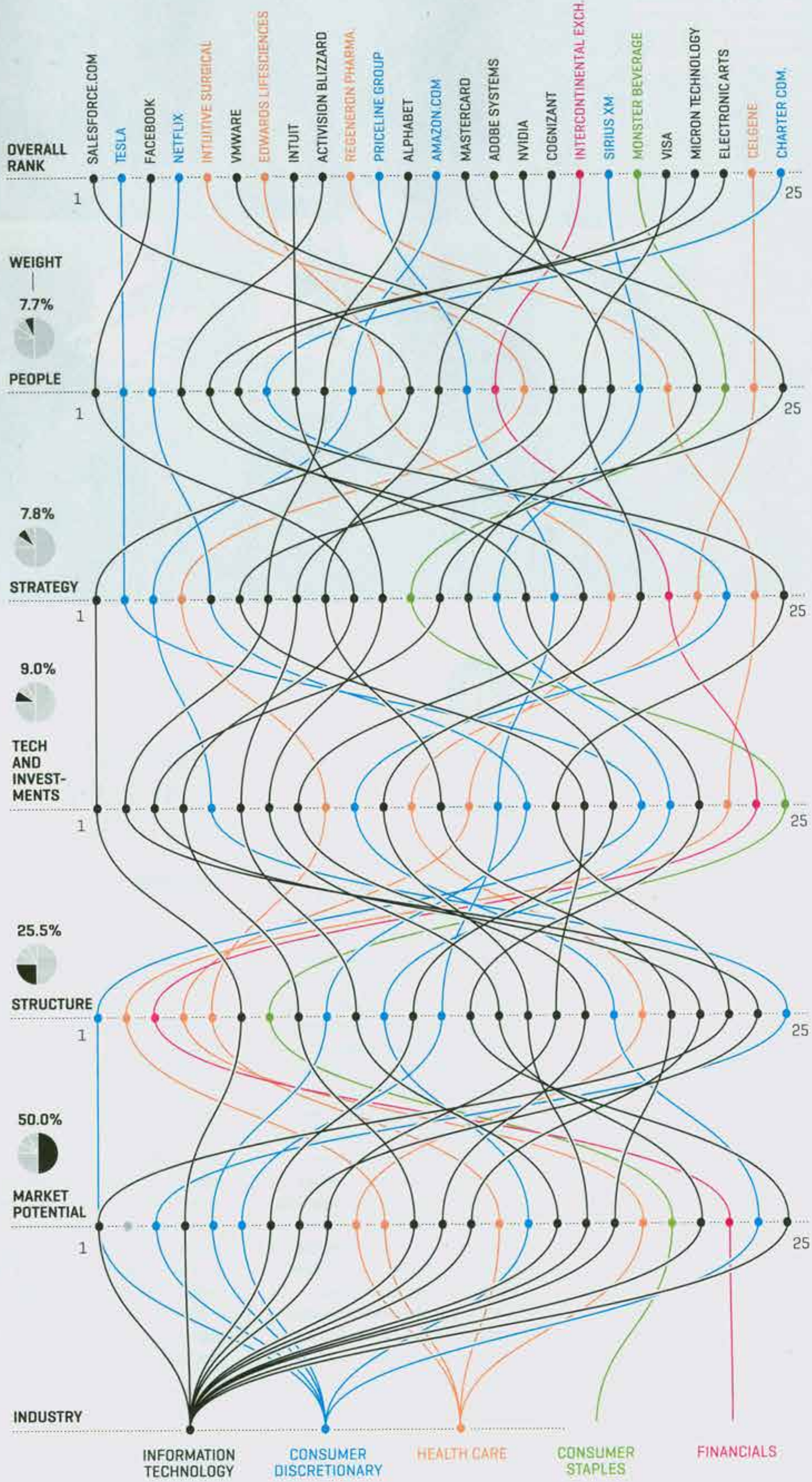
Recent market value: **$476.1 billion**

A six-ton robotic arm at work in an Amazon fulfillment center.

MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE
X.X — OVERALL SCORE
X.X X.X

GETTING BIGGER WITHOUT LOSING A STEP

LIKE A FOOTBALL player who spends the summer working out to add muscle, companies often find it hard to stay nimble as they bulk up. Not those on our "Leaders" list. The chart at right shows how they stack up. No. 1 Salesforce.com, for instance, got top scores for "Strategy" and "Market Potential" in our analysis.



14

MASTERCARD

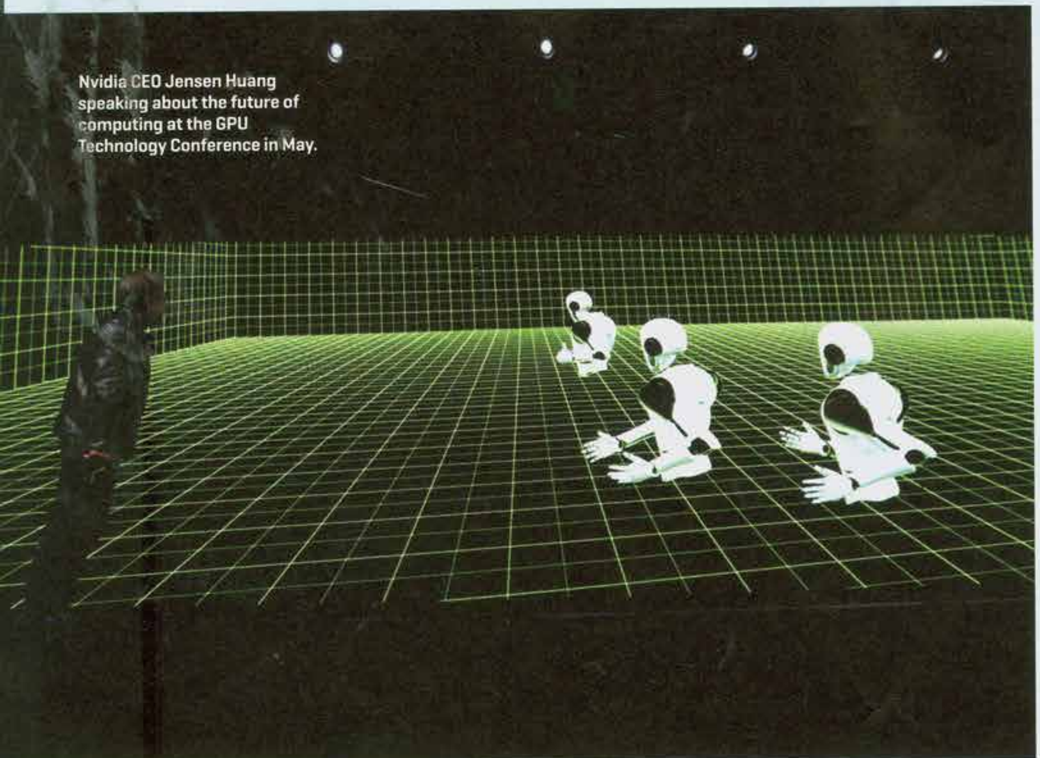
2.3

0.9 1.4

Mastercard wins in a cashless world. And the credit card giant has been aggressive in ensuring that, even in an era of digital payments and cryptocurrencies, it stays that way. Mastercard bills itself as a global payments and technology company (it launched facial recognition-enabled "Selfie pay" in 2015), and it sees enormous opportunity in our increasingly connected world. The company's tech is embedded in cars, gas pumps, vending machines, SoftBank robots, and just about every conceivable online device. As for the billions of people around the world who still deal exclusively in cash, the company views them as potential future Mastercard customers.

Recent market value: **$153.9 billion**

GOOGLE: COURTESY OF GOOGLE; AMAZON: MICHAEL CLINARD



Nvidia CEO Jensen Huang speaking about the future of computing at the GPU Technology Conference in May.

50

THE FUTURE 50

64%

Portion of the companies in the Future 50 that are software or online service providers—56% of LEADERS and 72% of CHALLENGERS.

15

ADOBE SYSTEMS

2.3
1.0 1.3

Rare is the 35-year-old tech company that can go head-to-head with the startups. But software purveyor Adobe Systems has seen its stock more than quadruple in the past five years alone. That's thanks in part to its prescient 2012 transition to cloud-based delivery, which meant selling software via online subscription [rather than a box with a CD in it]. That wasn't the company's first self-disruption—it invented the PDF in 1993 after it had already sold several successful design programs—and it may not be its last. Adobe is now channeling its immense scale and data troves into artificial intelligence applications. Soon you'll be Photoshopping vacation photos via voice command.

Recent market value: **$74.7 billion**

▲

16

NVIDIA

2.2
1.0 1.2

A 1990s graphics-chip maker worth more than $100 billion? It shouldn't make sense. But the company, based in Santa Clara, Calif., has defied the Darwinian odds in the Valley by applying its specialty in making high-capacity semiconductors, which it once produced solely to enable the whims of computer gaming geeks, to fast-growing applications such as artificial intelligence programs and cloud computing. With fast-growing *Fortune* 500 clients—including Amazon, Microsoft, and Tesla—on the books for still-nascent areas like autonomous vehicles, Nvidia is positioned for continued strength well into the A.I. revolution to come.

Recent market value: **$111.2 billion**

17

COGNIZANT TECHNOLOGY SOLUTIONS

2.1
0.8 1.3

Infotech company Cognizant Technology Solutions is a growth machine. The provider of consulting, technology, and outsourcing services has increased its sales an average of 17% over the past five years. But the New Jersey company has faced challenges too. Cognizant president Gordon Coburn recently resigned, and the company incurred $27 million in costs after a corruption probe concerning payments in India. Cognizant is carefully monitoring the political debate about the quota-based H-1B visa, as it's one of the biggest hirers of foreign workers in that visa category.

Recent market value: **$43.5 billion**

18

INTERCONTINENTAL EXCHANGE

2.1
0.7 1.4

As the operator of 12 global securities exchanges—including the New York Stock Exchange and futures exchanges in Europe and Canada—Intercontinental Exchange wants to be the platform of choice for commodities and financial markets. ICE got a boost last year when buzzy companies Line and Snap chose the NYSE for their IPOs. Add in an ecosystem of clearinghouses and data services, and ICE saw a 27% boost in its revenues to $6 billion in 2016. The company's purchase of financial market data company Interactive Data in 2015 was another win: Data services made up 33% of ICE's sales last year.

Recent market value: **$40.9 billion**

MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE
X.X — OVERALL SCORE
X.X X.X

Monster likes to spend its marketing dollars on sponsorships, as with this race car in Australia.

19

SIRIUS XM HOLDINGS

2.1
0.9 1.2

SiriusXM grew out of an innovative idea that took years to make a reality: radio broadcast nationwide by satellite rather than the old terrestrial system. Formed by the 2008 merger of rivals Sirius and XM, the company today has 32 million subscribers, many of whom it acquires through sales of Sirius-enabled cars. Liberty Media has held a controlling stake in Sirius since 2009. This year the company's stock is up nearly 30% and recently traded at an 11-year high after Sirius posted strong second-quarter results. In September, Sirius completed a $480 million investment in struggling digital-radio company Pandora.

Recent market value: **$26.4 billion**

▲

20

MONSTER BEVERAGE

2.0
0.7 1.3

The maker of Monster Energy drinks is high on a sugar rush. The Corona, Calif., company's stock price has risen 25% to $55 since the beginning of the year. Monster's introduction of new brews and entrance into overseas markets has kept consumers guzzling, even as health consciousness hurts growth in the U.S. A landmark 2015 deal with Coca-Cola—in which Monster traded its sodas, teas, and juices, along with a 17% stake for $2 billion plus a bevy of energy beverages, for access to the pop giant's global distribution network—set Monster up for international success.

Recent market value: **$31.5 billion**

21

VISA

2.0
0.8 1.2

Paper or plastic? Visa, the world's largest payments processor, favors the latter. As consumers have ditched cash for credit cards, the Foster City, Calif., company's market cap has swelled to just under $250 billion from around $95 billion in five years. Visa has remained nimble over that span, striking partnerships with tech giants like Apple, Google, and Intel on payment apps and hardware. Last June the company extended its global reach by plunking down $23 billion for Visa Europe, a separate business it operates now as a subsidiary. Eyeing the future, the company has placed a bet on Chain, a blockchain startup that's looking to overhaul financial record keeping.

Recent market value: **$244.7 billion**

22

MICRON TECHNOLOGY

1.9
1.3 0.6

If the semiconductor industry swings in feast-or-famine cycles, then Micron Technology is in the midst of a clambake. This four-decades-old Boise chipmaker's stock price has more than doubled to $40 from $18 in two years. Even the company's recent decision to sell $1 billion in shares to pay down a heap of high-interest debt barely dented investor enthusiasm. Micron has benefited hugely from demand for its memory chip products, integral to cloud hardware, computers, and smartphones. Less happy: tech giants like HP and Lenovo, whose margins have been hurt by the expense of Micron components.

Recent market value: **$45.5 billion**

NVIDIA: COURTESY OF NVIDIA; MONSTER: DANIEL KALISZ—GETTY IMAGES

50

THE FUTURE 50

23

ELECTRONIC ARTS

1.9

0.6 1.3

EA, as the Redwood City, Calif., video game maker is known, built itself on hit series like *The Sims, Madden NFL, Star Wars Battlefront*, and *FIFA*. The company ignominiously topped the Consumerist's "Worst Company in America" list two years in a row in 2012 and 2013, as gamers agitated by the ending to its sci-fi shooter *Mass Effect 3* swarmed the polls. Since then EA's stock price has surged more than 700% to $116 per share. Andrew Wilson, named CEO around the start of this dizzying ascent, has kept the company focused on the future, investing in new franchises, organizing e-sports events, and opening a virtual reality lab.

Recent market value: **$36.6 billion**

Gamers testing out EA products at a trade fair in Cologne, Germany.

24

CELGENE

1.7

1.0 0.7

Late in 2005 the Food and Drug Administration approved Celgene's Revlimid. The drug brought in $321 million in sales its first full year on the market. A decade later it collected a cool $6.97 billion (more than 60% of the biotech's 2016 revenues), and sales are expected to cross the $8 billion mark this year. Celgene has ridden Revlimid's success and approvals for various diseases to a 270% gain in market value in 10 years. Now analysts are bullish on the company's experimental treatments for multiple sclerosis, ulcerative colitis, and Crohn's disease.

Recent market value: **$109.0 billion**

25

CHARTER COMMUNICATIONS

1.7

0.6 1.1

Charter Communications became the second-biggest cable company in the U.S. after consummating its years-long flirtation with Time Warner Cable in a merger last year. Stock price for the combined company, which this year rebranded its services under the Spectrum banner, has risen nearly 30% since January. In the midst of telecom consolidation, Charter has been the consistent subject of acquisition rumors—reportedly catching the eye of Verizon, Sprint, and France's Altice. It's likely the company will wait to see how its own mobile offering, slated to debut next year, fares before listening to offers from carriers.

Recent market value: **$103.3 billion**

MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE

X.X — OVERALL SCORE

X.X X.X

CHALLENGERS

COMPANIES THAT HAVEN'T YET REACHED THE TOP TIER OF MARKET VALUE, BUT ARE ON THE GROWTH FAST TRACK.

Market values as of Oct. 9, 2017; source: S&P Global

01 VEEVA SYSTEMS

Market potential score	Company capacity score	Overall score
0.7	3.8	4.5

Enterprise software company Veeva has become an indispensable nucleus for the life sciences industry, helping Big Pharma manage customer databases, track drug developments, and organize clinical trials. Revenues rose by 33% last year to $544 million, as the likes of Abbott, Merck, and Pfizer employed a suite of its cloud-based offerings. Vault, its new content management system, is already being used by 35 of the top 50 pharma companies. The platform could help Veeva take a bigger chunk of the global life sciences applications market, forecast to reach $6.8 billion in sales by 2020.

Recent market value: **$8.2 billion**

02 WORKDAY

0.8 3.5 4.3

Hostile takeovers can lead to new beginnings—just ask Dave Duffield, whose software company PeopleSoft was acquired by Oracle in 2004. Duffield and cofounder Aneel Bhusri pivoted and launched Workday, providing cloud-based, easy-to-use software for HR and finance departments. In just 12 years, companies from Amazon to Walmart have bought into Workday's array of applications, resulting in a record $1.57 billion in revenue last year and a soaring market value. Workday is now using machine learning to analyze a mountain of data on workers. Its recently released Insight Applications, for example, can predict employee attrition and identify travel expense abuse.

Recent market value: **$22.6 billion***

03 GRUBHUB

0.8 3.1 3.9

What started as a simple way to order food from Chicago restaurants has grown into an online food-delivery empire worth over $4 billion. Since its merger with Seamless in 2013, Grubhub—which also owns brands like AllMenus and MenuPages—has enjoyed 53% year-over-year growth in revenue and made takeout as simple as a tap on an app. With 55,000 restaurants in over 1,200 U.S. cities and London, the next challenge is to hold off megacompetitors like Amazon and Uber in the food-delivery turf wars. To do so, Grubhub is betting on innovations like GrubCentral, its next-gen, in-restaurant platform to help eateries update menus in real time and track driver locations.

Recent market value: **$4.4 billion**

04 FIREEYE

0.7 3.2 3.9

When credit-reporting company Equifax disclosed a massive security breach affecting 145.5 million customers in September, it was cybersecurity firm FireEye that the beleaguered company turned to for a thorough investigation. It joined the unfortunate ranks of corporations such as Sony and Home Depot that have employed the California-based company to repair and bolster their cyberdefenses. FireEye has clearly benefited from an age of headline-making hacks, with a compounded yearly sales growth rate of 98% over the past six years. The company is now focused on becoming the prevention rather than just the cure: Recent acquisition iSight is a cyberintelligence firm that specializes in helping clients anticipate threats.

Recent market value: **$3.3 billion**

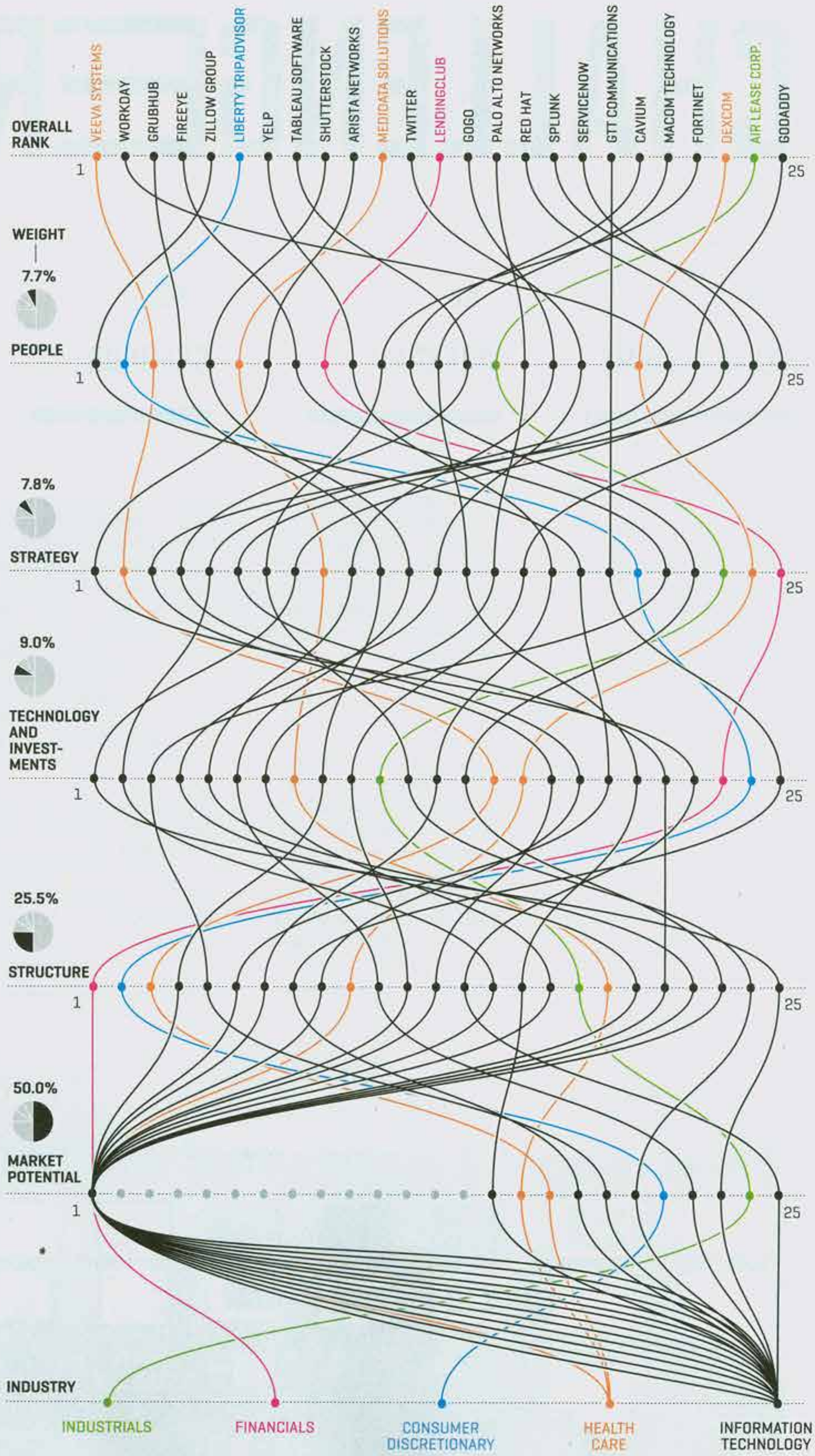
*Market value has risen above $20 billion since screening was completed.

Computer screens in FireEye's control room.

© COURTESY OF FIREEYE

SOFTWARE IS STILL EATING THE WORLD

MORE THAN two-thirds of the "Challengers" come from the infotech sector, including software innovators such as Workday, which is revolutionizing HR and other business functions. No. 1 Veeva Systems, a software provider to life sciences companies, scored especially high in BCG's analysis of its "People" and "Strategy."



05

ZILLOW GROUP

3.6

0.8 2.8

If you're looking for a new home in the U.S., chances are you're using Zillow. The online real estate group—which includes brands like HotPads and StreetEasy—accounts for nearly two-thirds of the total online real estate category, and the term "Zillow" is now searched more frequently than "real estate" in the U.S. The Seattle company has been on a buying spree of its own, with the $3.5 billion purchase of rival Trulia in 2014, the headliner among 13 acquisitions in six years. To keep its edge, Zillow wants to sharpen its marquee Zestimate algorithm, which tracks home values. The company recently offered a $1 million Zillow Prize to data scientists for the best tweak.

Recent market value: **$7.7 billion**

07

YELP

3.5
0.8 2.7

Credit the flu for the start of Yelp—when cofounder Jeremy Stoppelman (above) couldn't find good suggestions for local doctors online to cure his illness, he got to work on a site that would review and rate nearby businesses. What started as a simple email of referrals has become a go-to service for finding and giving feedback on local businesses in 219 cities spread across 32 countries. The San Francisco–based company has translated the 135 million reviews on its site and mobile app into dollars. Its net revenues jumped 30% last year to $713.1 million. What's key now is to expand Yelp into new tech like wearables and to monetize its data through programs like Yelp Knowledge, which uses analytics to give brands sophisticated feedback.

Recent market value: **$3.7 billion**

06

LIBERTY TRIPADVISOR HOLDINGS

3.6
0.7 2.9

In the competitive world of online travel, Liberty TripAdvisor Holdings—owner of the hugely popular review site TripAdvisor—has been pulling out all the stops to stay top-of-mind among click-happy travelers. With its 500 million reviews, TripAdvisor sways more than 40% of global online hotel reservations, according to ComScore studies. But the company will need to nurture recent acquisitions like social mapping platform Citymaps and HouseTrip to fend off challengers.

Recent market value: **$975 million**

08

TABLEAU SOFTWARE

3.4
0.8 2.6

Baseball and data are a hand-in-glove fit, as the Texas Rangers realized, even outside the diamond. The MLB team has worked with data visualization firm Tableau to track real-time food and beverage sales and to measure the boost in ticket sales from bobblehead giveaways. Big companies like Deloitte and Honeywell use Tableau to analyze data too. With more than 60,000 customer accounts and growing, Tableau's revenues rose by 27% last year. The company's transition to a subscription-based revenue model will be closely monitored, as well as its expansion in international markets, which currently account for almost 30% of sales.

Recent market value: **$6.1 billion**

09

SHUTTERSTOCK

3.4
0.6 2.8

Since its launch in 2003 as an online repository of stock photos, Shutterstock has evolved into a digital library of around 150 million images and 8 million videos. But the bigger picture for the New York City company is how to excel in a marketplace that's becoming increasingly crowded with low-cost options. Last year, Shutterstock entered into an exclusive distribution agreement with the Associated Press and acquired 700,000 images from the Art Archive and Kobal Collection, bolstering the quality of its images. The company also rolled out reverse image-search capabilities, where users can upload photos and find ones similar in look or feel.

Recent market value: **$1.2 billion**

10

ARISTA NETWORKS

3.3
0.5 2.8

Arista, a cloud-networking company in Santa Clara, Calif., might be seen as the quintessential David taking on a Goliath of the industry, Cisco. Led by CEO Jayshree Ullal, a onetime protégé of former Cisco CEO John Chambers, Arista's networking products have won huge clients, such as Microsoft, Netflix, and Facebook, and revenues in 2016 grew to $1.1 billion, a 35% jump over the prior year. Morgan Stanley predicts that Arista will double its market share by 2020. With that success, however, comes a challenge—Cisco and Arista are embroiled in a fierce legal battle, with Arista's products facing an import ban over claims that Arista copied Cisco patents.

Recent market value: **$14.0 billion**

YELP: JOE PUGLIESE

MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE
X.X — OVERALL SCORE
X.X X.X

11

MEDIDATA SOLUTIONS

3.2
0.7 2.5

Multinational drug developers like GlaxoSmithKline and Bristol-Myers Squibb have taken their clinical research and trials to the cloud, thanks to Medidata's software. Already, the company's clinical cloud platform is being used by 17 of the top 25 global pharmaceutical companies, and nine of the 10 bestselling drugs in the world were developed on the platform. That success helped push revenues last year to $463 million, up 18% from the previous year. To keep more established competitors like Oracle at bay, Medidata will need to continue diversifying its customer base—the company's top five customers accounted for approximately a quarter of sales last year.

Recent market value: **$4.7 billion**

12

TWITTER

3.2
0.8 2.4

Much has been made of the stagnant growth of Twitter's user base, and rightly so: The number of monthly active users worldwide on the social media platform grew by just 5% last year to 319 million, a worrying number when compared with the growth of Facebook. And President Trump's frequent use of the platform hasn't done anything to boost sales, which slipped 5% year over year in the second quarter. But the company has been innovating its way toward possible solutions. Twitter Lite was launched in April to target emerging markets with patchy connectivity. Twitter is also moving to longer-form content. It announced 16 streaming-video partnerships in May, with companies like Buzzfeed and Viacom, and has been testing tweets with double the original 140 characters.

Recent market value: **$13.0 billion**

13

LENDINGCLUB

3.2
0.8 2.4

Since its launch in 2007, LendingClub has become the epitome of everything that's right, and wrong, about the burgeoning fintech sector. Operating the world's largest online marketplace for borrowers, the company has facilitated $24.6 billion in loans, persuading both individual and institutional investors like banks and hedge funds to provide loans to needy customers. But recent events have brought the company under scrutiny. Last year, LendingClub founder and CEO Renaud Laplanche and several other execs resigned after the company acknowledged some loan malpractices. LendingClub will need to show it can thrive if called-for regulations for the online lending industry are implemented.

Recent market value: **$2.6 billion**

One of President Trump's most famous tweets, as presented by *The Daily Show*.

50

THE FUTURE 50

35

Number of top 50 pharma companies that use Vault, Veeva Systems' content management system.

55 THOUSAND

Restaurants that delivery service Grubhub works with in over 1,200 U.S. cities and London.

9 OUT OF 10

Number of the world's bestselling drugs that were developed using Medidata's cloud platform.

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MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE
X.X — OVERALL SCORE
X.X X.X

14

GOGO

3.1

0.8 2.3

Gogo began, like so many great ideas, on the back of a napkin: Founder Jimmy Ray sketched his plan for an affordable telephone system in private airplanes at a Texas restaurant. Twenty-six years later, Gogo provides in-flight connectivity to much of the global aviation industry, including Air France, Delta Air Lines, and British Airways, with sales growing 30% annually over the past six years. To stay on top, Gogo is rolling out its next-gen 2Ku system to give travelers faster, more reliable Wi-Fi.

Recent market value: **$1.0 billion**

Workers installing Gogo's new 2Ku connectivity system on a commercial airplane.

15

PALO ALTO NETWORKS

3.1

0.8 2.3

Accenture, Microsoft, and Amazon have all tapped this provider of network firewalls to safeguard their data and prevent them from being the latest victim of a cyberattack. The company's stock got hammered early in 2017, falling 25% in a week, after it missed sales estimates for its fiscal second quarter. But strong results since indicate that its financial performance is back on track. To step up the pace of innovation, the company recently launched a $20 million security venture fund with a goal of driving development of new security applications on its own proprietary platforms.

Recent market value: **$13.4 billion**

16

RED HAT

3.0

0.6 2.4

The kernel of open-source operating systems may lie inside the ubiquitous Linux platform, but Red Hat is the farmer that distributes the seed to the masses. Founded in 1993, Red Hat has worked with companies from Barclays to Sprint, who utilize its software. Revenues last year exceeded $2 billion, making Red Hat the world's first open-source company to hit that milestone. With around 70% of its sales subscription-based, it's focused on working with third-party cloud service providers to run its software. One of the 150 providers that do is Microsoft Azure—a once-unthinkable alliance for Red Hat, given that Microsoft is the creator of competing Windows OS.

Recent market value: **$20.7 billion***

17

SPLUNK

2.9

0.8 2.1

"Machine data" is the digital information created by devices from smartphones to cars, and Splunk is perhaps its foremost translator. Since 2013, the big-data analysis firm has been providing software and services to organizations to help them interpret and present real-time operational intelligence. Splunk's list of more than 13,000 customers now includes at least 85 of the *Fortune* 100 companies. Revenues leaped 42% to $950 million last year, an explosive jump for Splunk. Part of the company's strategy includes the nurturing of Splunkbase, a germinating community where users and partners have so far shared over 1,300 custom apps that run on Splunk's software.

Recent market value: **$9.2 billion**

18

SERVICENOW

2.9

0.8 2.1

ServiceNow, one of the fastest-growing enterprise software firms around, has become the darling of the cloud-computing industry on the back of its eye-catching growth: Sales jumped 38% last year to $1.4 billion. Michelin and Hershey's are just a couple of the big companies using the software, which automates processes like collecting approvals for legal contracts, and the Santa Clara, Calif., company reports an annual customer renewal rate of 98%. To bolster its intelligent automation offerings, earlier this year ServiceNow acquired a pair of startups: Qlue, which has a "virtual agent" system, and BuildOnMe, an early stage company creating A.I. applications.

Recent market value: **$20.7 billion***

*Market value has risen above $20 billion since screening was completed.

GOGO: COURTESY OF GOGO

19

GTT COMMUNICATIONS

2.7
0.7 2.0

Software and services that run in the cloud have become all the rage, but GTT Communications has taken a niche part of that universe and turned it into a thriving business. GTT acts as a dedicated connector to the cloud for companies, providing networking services to around 5,000 customers in over 100 countries. With the cloud-computing industry expected to grow from $67 billion to $162 billion in 2020, according to research firm Gartner, GTT is well positioned to keep growing.

Recent market value: **$1.4 billion**

20

CAVIUM

2.7
0.8 1.9

Cavium is a low-profile star in the tech world. Look under the hood of hardware products from the likes of Cisco, Netgear, and IBM, and chances are you'll find a Cavium-made semiconductor processor powering them. Mainly used by manufacturers of networking equipment, the company's chips are in high demand: Net revenues grew 46% last year to $603 million. Cavium's challenge now is to keep that growth going in a semiconductor market for which experts have widely different forecasts—with many wondering whether key sectors like the PC and smartphone markets are booming or plateauing. Cavium's recent acquisition of cloud solution tech provider QLogic was made with an eye toward strengthening its position in the data center, cloud, and storage markets.

Recent market value: **$4.7 billion**

21

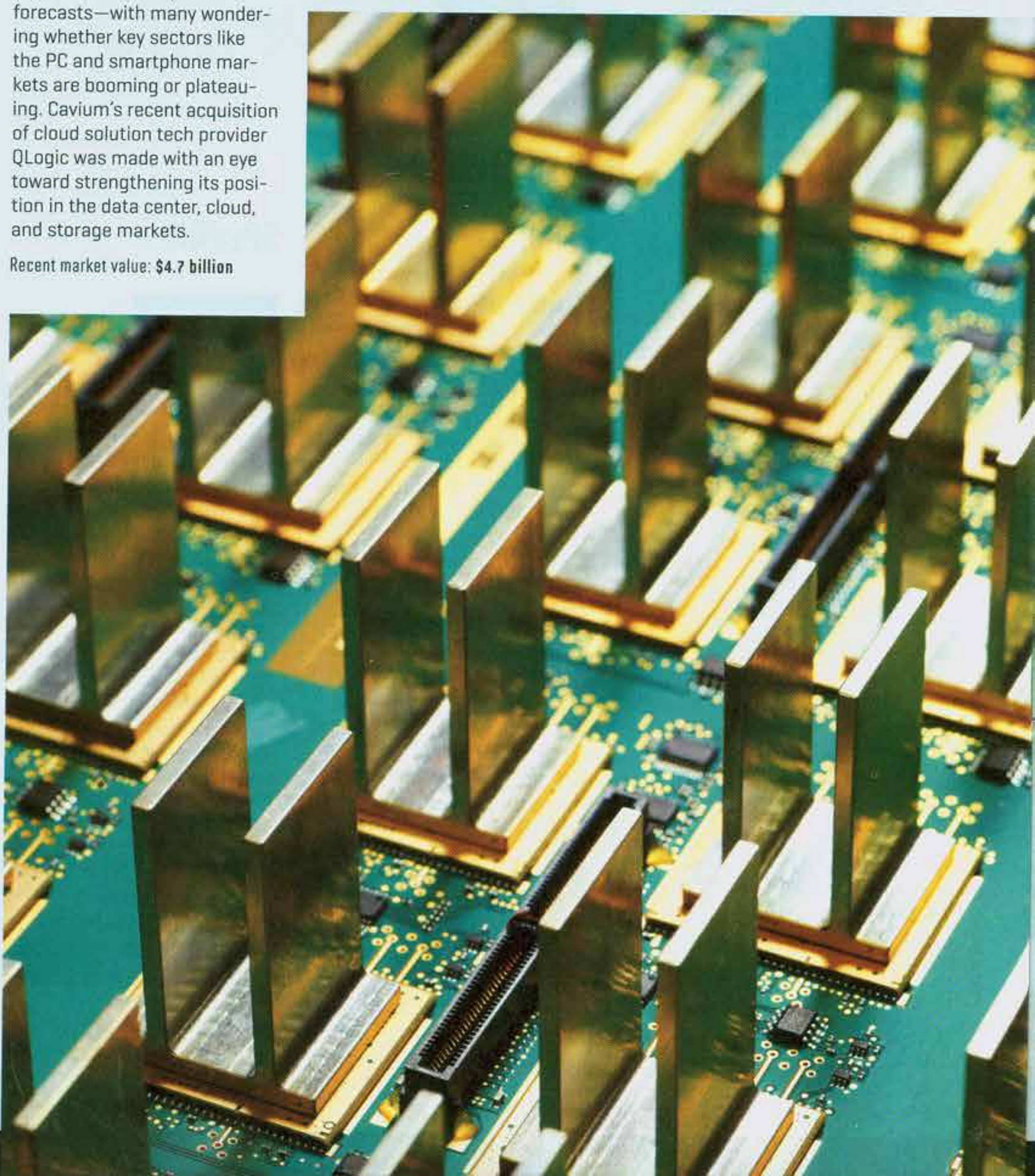
MACOM TECHNOLOGY SOLUTIONS

2.6
0.7 1.9

Markets ranging from the aerospace to medical to networking industries—including major manufacturers such as Huawei and Cisco—have made chipmaker Macom Technology Solutions the engine that drives their hardware. The Lowell, Mass., company provides chips for wireless, satellite, and fiber-optic networks. Macom also has ambitions to grow in a semiconductor market that is consolidating, with companies seeking to cut costs and diversify product lines. Last year it bought fellow chipmaker Applied Micro Circuits for about $770 million, signifying its interest in expanding into the data center connectivity business. Wall Street has high expectations: Macom's stock tumbled in early August after it announced third-quarter sales that were up 37% over the previous year but below analysts' estimates.

Recent market value: **$2.8 billion**

▼



MACOM: COURTESY OF MACOM TECHNOLOGY SOLUTIONS

22

FORTINET

2.6
0.7 1.9

When Philip Quade, a former National Security Agency cyber task force senior exec, joined cybersecurity firm Fortinet as its first chief information security officer last year, it was yet another indicator that companies are muscling up in the cyberwars. Fortinet's customers include the Nasdaq stock exchange, Panasonic, and the Boston Red Sox. Future growth may be driven by Fortigate, the company's next-generation group of physical and cloud security solutions. The new tech positions Fortinet well in the global cybersecurity market, which researcher Market and Markets says will grow from $122.5 billion in 2016 to $202.4 billion in 2021.

Recent market value: **$6.8 billion**

Dexcom's G5 Mobile CGM System.

23

DEXCOM

2.6
0.8 1.8

The number of adults living with diabetes has almost doubled globally since 1980, with the World Health Organization estimating that 422 million adults were living with the disease in 2014. To help address the crisis, in 2015, Dexcom, a medical device company specializing in the development of continuous glucose monitoring (CGM) systems for diabetics, released the G5 Mobile CGM System, the first to enable real-time tracking of glucose levels for adults and even young children. And Dexcom is partnering with Google's life sciences arm, Verily, to launch a coproduced miniature CGM system next year. Dexcom's stock price plunged in late September, however, after news that pharma giant Abbott Laboratories had received FDA approval for a rival glucose monitoring system that won't require a pinprick.

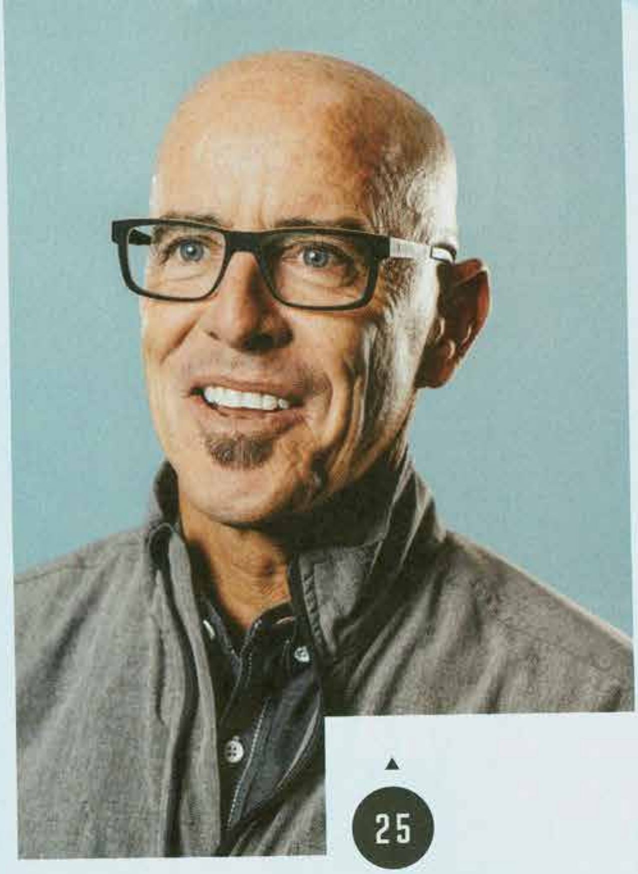
Recent market value: **$4.1 billion**

80%

Portion of the North American in-flight Wi-Fi business held by Gogo.

$162 BILLION

Size of the cloud-computing industry in 2020, estimates Gartner, up from $67 billion—good for GTT Communications, which connects companies to the cloud.



24

AIR LEASE CORPORATION

2.5
0.6 1.9

Last year, global air passenger traffic grew by 6.3%. And the International Air Transport Association (IATA) estimates that the number of annual passengers will double in the next 20 years, to 7.2 billion. That's bullish news for Air Lease, which purchases aircraft from manufacturers like Boeing and Airbus and then rents or sells them to airlines around the world. Air Lease has grown its sales by an average of 21% per year since 2012. To guard against volatility in the aviation industry, the company is diversifying its customer base, turning to regions like Asia, where the most air traffic growth is expected to take place.

Recent market value: **$4.4 billion**

▲

25

GODADDY.COM

2.5
0.8 1.7

Once known mostly for its sexually suggestive and (in the eyes of many) sexist TV ads, web hosting company GoDaddy has, since its IPO in 2015, been earning plaudits for its financial performance. The company, which provides a marketplace to buy domain names and website-building tools for small businesses, had sales of $1.85 billion last year. Such is the company's online ubiquity that 19% of the world's registered domains are with GoDaddy. The immediate future, however, will require negotiating—CEO Blake Irving (above), who has overseen an image makeover of the company, will retire by the end of this year. The Scottsdale-based business must also continue building its defenses after cyberattacks on its domains in recent years, and broadening its customer base into Europe and Asia.

Recent market value: **$7.3 billion**

MARKET POTENTIAL SCORE — COMPANY CAPACITY SCORE
X.X — OVERALL SCORE
X.X X.X

BENIOFF IN BLOOM

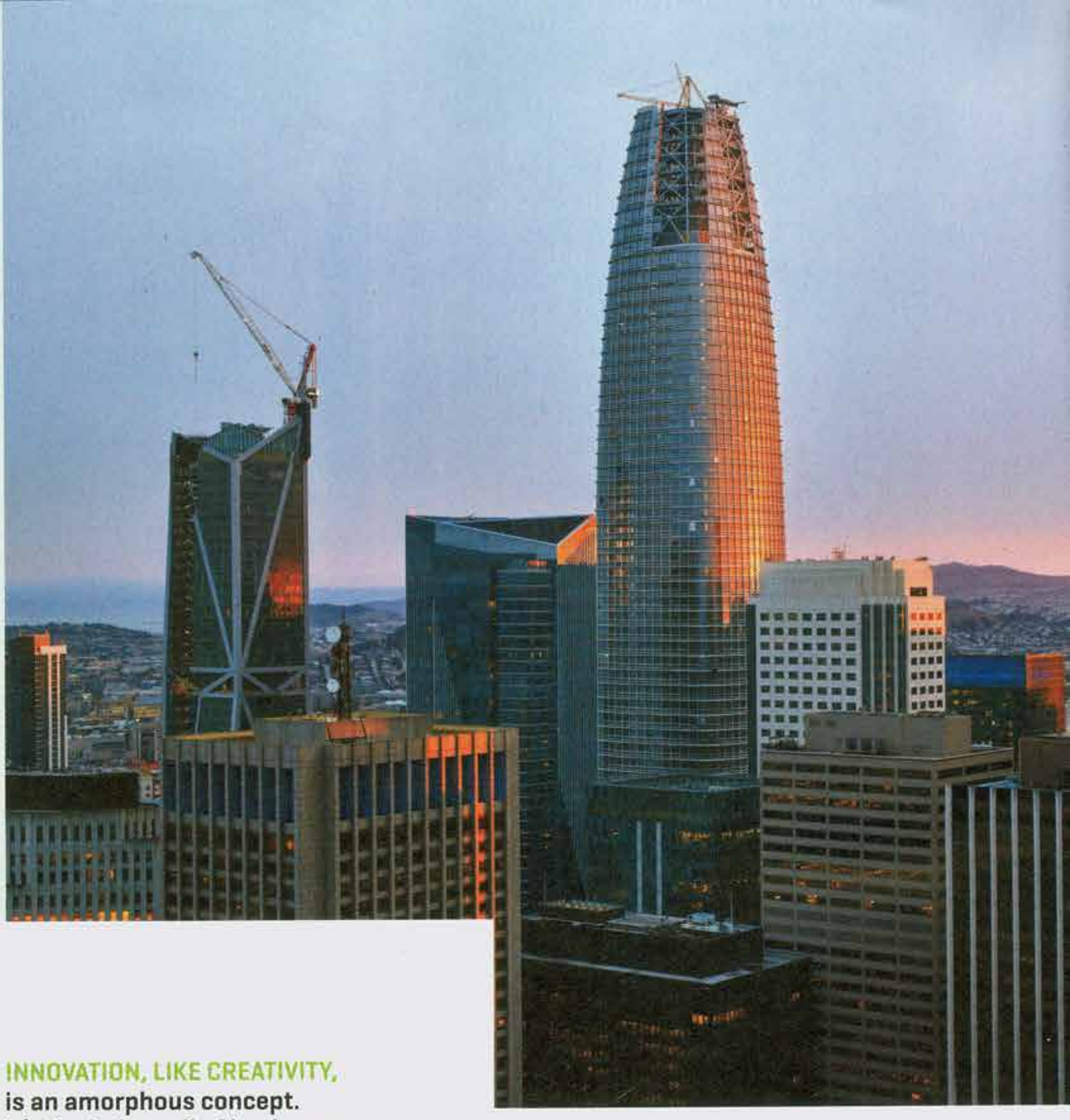
SALESFORCE COFOUNDER AND CEO MARC BENIOFF RUNS ONE OF THE WORLD'S MOST INNOVATIVE BIG COMPANIES. HIS SECRET? RELENTLESSLY FORWARD-LOOKING LEADERSHIP.

BY ADAM LASHINSKY

↗

Marc Benioff photographed on the "Ohana" floor of the Salesforce East tower in San Francisco on Oct. 11. The name comes from the Hawaiian word for family.

▲ PHOTOGRAPHS BY SPENCER LOWELL



At a height of 1,070 feet, the nearly completed Salesforce Tower will be San Francisco's tallest skyscraper and is visible for miles outside the city.

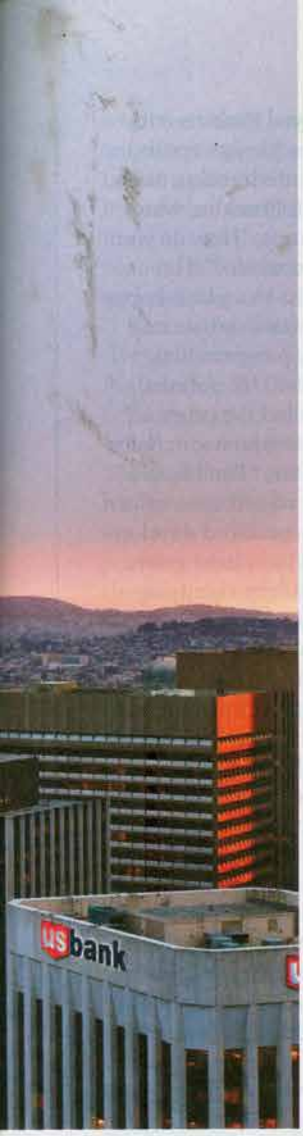
INNOVATION, LIKE CREATIVITY, is an amorphous concept. It's the holy grail of business, but achieving it—even merely explaining it—is lightning-in-a-bottle difficult.

In that way, Salesforce is a major outlier. Despite the fact that its products are mundane business productivity tools, Salesforce has nevertheless managed to bake innovation into its very corporate fiber. It's a company that was innovative in the way it started doing business, in how it sold its products, and in the articulation of its corporate mission.

Indeed, asking cofounder and CEO Marc Benioff, 53, to describe how Salesforce is innovative is a bit like asking Plácido Domingo to hum a few bars of a favorite aria. With little provocation Benioff will rattle off the three ways Salesforce has been a trailblazer since its inception nearly two decades ago. "I think our top three are a technology model which is now known as the cloud, the subscription business model, and our 1-1-1 model," he says, referring to the company's philanthropic commitment to give away 1% each of equity, products, and employee hours.

These now widely copied practices are merely the beginning. Under Benioff's quirky, obsessive, and dripping-with-chutzpah tactics, Salesforce is as original a product marketer as exists in enterprise (or nonconsumer) technology. It has proved adept at predicting and embracing technology shifts, the latest being an aggressive move into artificial intelligence. Salesforce even innovates in the realm of financial accounting, having waged a multiyear battle to persuade standards boards and regulators to adopt its methods of revenue and expense recognition.

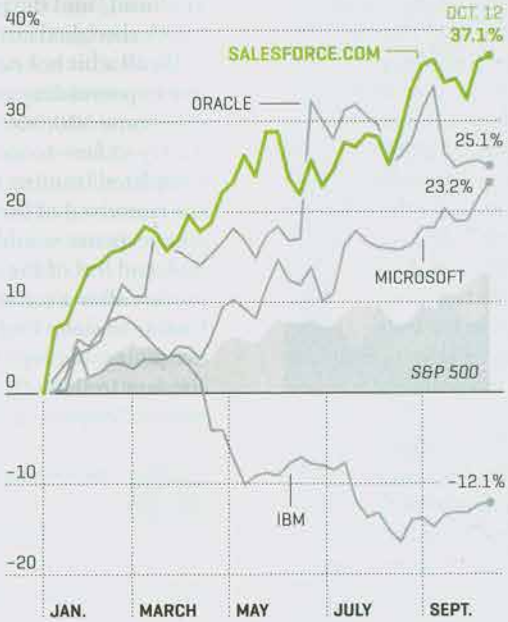
These accomplishments help explain why Salesforce has landed atop the inaugural *Fortune* Future 50 list of innovative U.S. companies (ranked No. 1 on the "Leaders" list of corporations with a market value above $20 billion). Based on analysis by



Rising Above the Rest

Salesforce's stock has outperformed rivals such as Oracle and Microsoft this year, continuing an extended run of strong returns. Over the past three years, Salesforce's market value has more than doubled, from $33 billion to around $70 billion.

YEAR-TO-DATE CHANGE IN STOCK PRICE



SOURCE: S&P GLOBAL

BCG, Salesforce earns its ranking from a variety of factors including Wall Street's expectations of future growth and public messaging that communicates a future-focused orientation.

Innovation has its limits, of course, and Salesforce has proved adept at supplementing its growth with acquisitions, a tool long available to older rivals like Oracle and SAP. Salesforce acquires companies—it has snapped up 55 since 2006—that are either more innovative or that have pioneered market segments that Salesforce hasn't yet cracked.

There are plenty of risks to the Salesforce model—with Benioff's indispensability topping the list. Though the company has a deep management bench, no one disputes the top dog's singular role. All major decisions are his, and the entire 28,000-person-plus organization caters to his sometimes capricious whims.

Benioff's outsize role would be less of an issue if he hadn't already signaled a willingness to let go, namely, his flirtation with selling the company to Microsoft two years ago. (No deal materialized.) Benioff himself doesn't discount the possibility that he'll step down as CEO one day. Asked the likelihood of his being in the top job for another 30 years, he says, in reference to the many social causes he champions: "I don't think it's very high, because I really feel the pull of the world on me. The world has more challenges than ever." Benioff says he spends 95% of his time on Salesforce, and "5% is on a lot of the issues and things that are really important to me. I think at some point that will shift a little bit more where I'll want to spend more time directly working on those causes."

But Benioff isn't quite ready to call it a day at Salesforce. There are still too many potential customers to woo.

SALESFORCE EMPLOYEES are so immersed in the fervor over their offerings and their unique workplace that they are nearly incredulous to learn that few people beyond the legions of customers using Salesforce's product have the faintest idea what the company does. San Franciscans, at least, are well aware of Benioff's personal largesse and Salesforce's corporate generosity: Together, the CEO and his company have given away hundreds of millions of dollars to fund schools, hospitals, and a myriad of causes. And they certainly know about Salesforce Tower, the soon-to-be-completed 1,070-foot skyscraper that will be San Francisco's tallest and is already visible for miles outside the city.

As for its products, Salesforce started with an application that helps salespeople track their clients and their managers measure their progress. That sort of thing had existed, but Salesforce innovated by putting its product online and letting customers pay by the month. This lowered technology costs for buyers and also diminished the risk of purchasing the wrong software. Over time the company built or acquired applications for customer-service workers, marketers, and companies who sell goods and services online. It's all the nuts-and-bolts stuff of business, but configured for the Digital Age. "They took existing markets and made them cool," says Brent Thill, a research analyst with the investment firm Jefferies who followed Salesforce for years.

As a company, Salesforce moves fast, a shift from the traditional providers of software to "enterprises," or big-business customers, whose product updates typically were measured in years. "We ship a new version every four months," says Alex Dayon, the company's chief product officer. This means every customer always is using the latest version of the software, a high bar in an industry used to a patchwork quilt of software generations and sporadic updates. "It's our secret sauce," says Dayon, a Frenchman who joined Salesforce in an acquisition nine years ago. "No one else can update hundreds of millions of users three times a year."

Another crucial part of Salesforce's formula is aggressive marketing, which it has been doing since its inception. Parker Harris, the company's chief technology officer and a cofounder, recalls the company's introductory "end of software" marketing campaign, an elaborate misdirection stunt suggesting that because Salesforce was selling software as a service rather than in a package, it wasn't selling software at all. The company hired actors to stage fake protests at conferences hosted by a competitor. Prospective customers challenged Salesforce, arguing that it, too, sold software but in a different format. "At that point we had them, because we had engaged them in the conversation," says Harris.

The lavish spending on marketing has an impact on Salesforce's bottom line. For years it rang up net losses. But the tactics also have fueled the company's growth. As an example, Benioff has been a longtime acolyte of Klaus Schwab, the German business academic who founded the World Economic Forum and helped popularize the "stakeholder" theory of business, that shareholders aren't the only constituency that matters for business success. Schwab's ideals appealed to Benioff, who proceeded to spend many millions of dollars to become a key partner of Schwab's forum. The result: Salesforce punched way above its weight in "thought leadership" in the influential global organization, a status that opened doors for sales to the kinds of companies that were otherwise reluctant to buy from an unproven upstart.

Persuading customers to use their software—as well as teaching them how—is often a challenge for nonconsumer technology companies. Salesforce takes a predictably unconventional approach. It spends extravagantly on its annual Dreamforce developers conference in San Francisco, an event that is as likely to include a performance by a magician or rock star as its many software tutorials.

Yet Salesforce has topped itself recently by designing a whole new "design vocabulary," as Benioff calls it, for educating users. The challenge, says Sarah Franklin, who heads developer relations, is, "How do you skill everyone up on what we do?" The solution, which she credits to a game-happy "evangelist" on her staff, was to create an elaborate online training program that draws inspiration from the U.S. national park system. Franklin called the program "Trailhead," and the people who use it, Salesforce's cherished customers, "Trailblazers."

It's all a bit hokey but nonetheless effective in persuading customers and developers—some 500,000 of whom have given it a try so far—to earn badges signifying completed training classes. Franklin says she conceived of the program, which at great expense would change the entire look and feel of the company's public profile, after a conversation with Benioff. Unable to sleep that night, she picked up her phone and typed a manifesto, which she sent to Benioff. In the morning he replied, "Approved. Aloha, Marc."

BENIOFF AND HIS FAMILY spend as much time as they can on the Big Island of Hawaii. Each major Salesforce building has an "Ohana" floor, a community space named for the Hawaiian

People working in the "Trailhead exploration area" of the Cafe and Techforce Bar on the 27th floor of the Salesforce East tower in San Francisco. The space features various "Trailblazers," which is also what Salesforce calls its cherished customers.

word for family, which Benioff wants every Salesforce employee, customer, and partner to feel a part of. It is fitting, then, that at least where the CEO is concerned, Salesforce operates on a corporate version of "island time." Meetings with Benioff start and end whenever he's ready.

I learn this firsthand on the day I arrive to interview him. (As a fellow San Franciscan, I've known Benioff for years.) I'd been invited to arrive 90 minutes early to tour the nearly completed Salesforce Tower with Benioff—a thrilling opportunity to view the Bay Area from the 62nd floor of a building whose windows haven't yet been installed. He didn't show up for the tour, though we did have lunch across the street at another Salesforce building afterward. When we finally sit down, it's clear the agenda is his, not mine. He takes me through the working-document version of the keynote presentation he'll give at Dreamforce in about two months. I see how Benioff hones his message, trying out lines as Leandro Perez, a product marketing executive, takes notes on Benioff's riffs. (Perez, whose official role is "corporate messaging and content," says: "We make sure our executives are spreading the message consistent with Marc's.")

Taking into account Benioff's tweaks, this is the 86th version of the presentation, on its way to about 150 in total. It hits all the company's key messages including its core values (trust, growth, innovation, and equality) and explains the three "chapters" of the company's history: the cloud (1999–2009), the customer (2009–2017), and the Age of Intelligence (2018–).

We run out of time before I get to ask a single question.

A week later Benioff FaceTimes me from Hawaii, where he's taken a long weekend, and patiently allows me to direct the flow of the conversation. He proudly reflects on Salesforce's accomplishments. He calls Joe Allanson, the company's longtime controller, "the cloud industry's unsung hero" for working with accounting standards boards to allow for the deferred recognition of sales commissions—an arcane but important maneuver that enables subscription-model software companies to more accurately reflect the reality of their finances in their accounting. Benioff notes that 3,000 companies have adopted Salesforce's 1-1-1 philanthropic model. He also pays homage to Amazon, an early inspiration for the type of consumer experience Salesforce aims to deliver. He unabashedly notes that Salesforce's earliest versions were copies of Amazon's user interface. The goal, he says, was to "build an enterprise app that looks, feels, talks, and walks like Amazon, because they are not training anybody to use their website, and we want to build software that's not going to be like the current generation of enterprise software."

Benioff is as sui generis as they come, yet he credits a diverse set of influences. From Schwab, he took the concept of "stakeholders" as opposed to only shareholders. Larry Ellison, his first boss, motivated Benioff by helping him see the value of new ideas, even if "working for Larry was at times psychological warfare." And he has learned the value of being inquisitive from a guru of self-improvement: "My friend Tony Robbins says the quality of your life is created by the quality of your questions."

More than anything, perhaps, Benioff values his own intuition. Salesforce engineers didn't understand his devotion to social media, especially when he asked them to create Chatter, an in-house messaging tool for Salesforce's applications. They complied, though, and the move gave Salesforce a consumer-oriented edge.

Similarly, Benioff explains the company's move into artificial intelligence as his realization that "a lot was happening in A.I. But I also realized it wasn't clear what Salesforce's role in A.I. was. That's when we started acquiring quite a few artificial intelligence companies, maybe a dozen." That's also when, according to Benioff, the owner of the website Einstein.com contacted him out of the blue and offered to sell it. To Benioff, it was a sign. "Right then I'll always say to myself, 'Why is somebody doing that?' And then I'll have an intuitive response: 'This could be our A.I. brand.'" Today, Einstein is the Salesforce-branded product that's integrating machine learning and other A.I.-related technologies into the rest of the company's offerings.

FOR ALL OF SALESFORCE'S uniqueness, a nagging criticism has crept up internally and externally. As the company grows, it begins to look and act ever so slightly more like the Goliath to which Salesforce has always played David:

Benioff's Influences

The Salesforce CEO is his own guru. But here, on this page and the next, are six people he admires.

TONY ROBBINS
Self-help coach

The empowerment guru, one of the many successful people Benioff surrounds himself with, inspired Benioff's goal-setting methodology for Salesforce.

NEELIE KROES
Salesforce director

The Dutch politician and former European Commission competition regulator has influenced Benioff on digital privacy issues.

STEVE JOBS
Apple cofounder

Once an Apple intern, Benioff learned the importance of attention-grabbing marketing—and the need to spend serious money on it—from the master.

© ROBBINS: NOAM GALAI—GETTY IMAGES; KROES: ETIENNE ANSOTTE—SHIMERA/EUROPEAN COMMISSION; JOBS: JASON KEMPI—FILMMAGIC/GETTY IMAGES

Larry Ellison's Oracle. Like Oracle, Salesforce has become an acquisitions machine, prompting some to suggest the company overpays to make up for its own shortcomings. "The question I hear most from investors is, 'Is this the modern-day Oracle?'" says Brent Thill, the analyst. "'Can they grow without acquisitions?'" (Investors weren't pleased last year when Benioff explored buying Twitter after bidding against Microsoft for LinkedIn. He backed off on the former and lost out on the latter.)

The seeming proof of Salesforce's incipient Oracle-ness is the presence of president, vice chairman, and chief operating officer Keith Block, a 26-year veteran Oracle sales executive before joining Salesforce four years ago. In many ways the buttoned-down yin to Benioff's Hawaiian-shirt-wearing yang, Block says Salesforce isn't like any other company he's seen, including during his days as a Booz Allen management consultant. "We're not diluted by servers and storage," he says, a knock on Oracle. "We're not diluted by games," he adds, a reference to Microsoft's Xbox franchise.

Yet almost inevitably Salesforce partners talk about the company with equal parts reverence and fear. A company doesn't get to $10 billion in revenues without stepping on a few toes. "Salesforce is like the rose-colored version of Amazon," says a venture capitalist who invests in companies that compete with Salesforce. Examples abound of Salesforce making moves that rival Amazon's legendarily cold-blooded tactics. It pushed aside onetime partner Marketo, for instance, by buying Exact Data, whose product line included Pardot, a direct competitor. Similarly, pricing software startup Apptus had been a key Salesforce partner, which didn't stop Salesforce from buying an Apptus competitor called SteelBrick—even as Salesforce's corporate venture arm invested in Apptus.

Salesforce acknowledges that its own growth is more important than its partners, which it excuses by playing the honesty card. "I have seen this movie in a prior life," says Block, alluding to his Oracle days. "We need to be transparent. We need to publish road maps of where we're going." Block is looking after another big-company aspect to Salesforce's growth, the need to add systems that can take the

50

THE FUTURE 50

SHERYL SANDBERG
COO of Facebook
Benioff says he's admired the Facebook business chief since her Google days. How she's dealt with her husband's death has made him even more of a fan.

NEIL YOUNG
Musician
Besides Young's Hall of Fame musical career, Benioff says he looks up to the rocker for his longevity as an artist, his iconoclastic approach, and his activism.

LARRY ELLISON
Chairman of Oracle
Once his boss, the Oracle cofounder left Benioff "constantly inspired by his ability to motivate me and to let me see new ideas and new ways of thinking."

company from $10 billion in revenue to $20 billion. "I think we can have our cake and eat it too," he says. "We can be a different *Fortune* 100 company. We can think differently, but with operational discipline."

Then there's the question of how long Benioff stays around. In spring 2015 reports surfaced that Microsoft offered to buy Salesforce. Benioff characterizes the ensuing talks as being merely a public company's fiduciary responsibility to listen to acquisition offers. He reportedly asked for more than Microsoft was willing to pay.

I **MEET WITH BENIOFF** one last time for this article as he answers a few questions on video and prepares to have his photograph taken for *Fortune*'s cover. Since he first ran through his Dreamforce presentation for me the previous week he's presented versions of it to customers in Atlanta and Los Angeles. Like a comedian testing an act in small clubs leading up to a large-venue gig, he plans to repeat the performance multiple times before his keynote address in San Francisco the first week of November.

We meet on the "Ohana" floor of Salesforce East, the office tower kitty-corner from the new Salesforce Tower. On what ought to be a stunningly sunny mid-fall day, San Francisco's skies are clogged with smoke from the devastating wildfires still raging in Napa and Sonoma counties north of the city. Making small talk before we start, Benioff tells me he's tired. His family has just adopted a rescue kitten, and there is much excitement—and too little sleep—in the Benioff household.

As it happens, Benioff tells me, the 7-month-old, gray-black Siamese already had a name, given by his original owners. They called the kitten "Cloud." This was before anyone could have any idea this little animal was headed for a glamorous life in the home of a billionaire who made his fortune selling software online—what became known as the cloud. The story is too good to be true, and I tell Benioff with mock derision that I don't believe him. That evening he sends me an email with the subject line "Proof." Attached is a photo of the sign that hung outside Cloud's cage at the shelter, verifying his pre-adoption name.

Some things just can't be explained. Not even by Marc Benioff. ■

WHEN GUANGZHOU MEETS FORTUNE

Guangzhou: a blessed city for entrepreneurs

Recently Guangzhou staged a promotional event of the 2017 *Fortune Global Forum* in Silicon Valley. Cai Chaolin, director of the forum's Guangzhou executive committee, disclosed that the *Forum* host city sees an average of 386 newly registered enterprises each day, of which about five are foreign-invested entities.

When media asked if more Chinese in Silicon Valley are choosing to return home and start businesses in China, Cai said that Guangzhou is the second most preferred destination in the nation for returned overseas Chinese to start their careers. Cai also cited statistics from the city's foreign experts bureau showing that through the end of July, 672,000 returned overseas students had chosen to come to Guangzhou.

Some entrepreneurs who have started and developed their businesses in Guangzhou shared their success stories, exemplifying the spirit of entrepreneurship in the city.

Xiang Xi, CEO of Guangzhou-based Time Network, revealed that he and his technical team recently created the city's first-ever virtual reality (VR) promotional video, which was released at the city's Silicon Valley roadshow. "Guangzhou enjoys No. 1 status in the country's VR sector," said Xiang. "In the future, Guangzhou will also be home to the world's first VR zoo, where you can have fun with prehistoric animals and see signature animals of any zoo in the world." The company this May also made the official VR video for Beijing's Belt and Road International Co-operation Forum.

Due to great potential and market demands, Xiang's company boasts scientists from the United States and England, as well as China's earliest augmented reality (AR) developers. "Guangzhou is reputed for its good environment and great prospects and is thus a blessed place for VR innovation and entrepreneurship," Xiang explained.

Xiang's views were also shared and echoed by Du Lan, senior vice president of iFlytek, a global leader in the sector of voice recognition. "Guangzhou offers the best policy support, the most solid industrial basis, and the most excellent government service, creating a favorable environment for AI enterprises to settle," said Du. The high tech company established its South China headquarters in Guangzhou and set up new industrial sectors such as intelligent education, smart electrical appliance and intelligent marketing, expecting its second takeoff in the city.

While the city works like a magnet for niche industries like VR and voice recognition, the centennial Guangzhou Pharmaceuticals Corporation (GPC) commemorated its leap forward as the city embarked on a strategy of developing information technology, artificial intelligence and bio-medicine (IAB) industries.

"Bio-medicine, as part of Guangzhou's IAB strategy, will usher in an era of strategic opportunities," said Li Chuyuan, chairman of the company, which aspires to become a *Fortune Global 500* member by 2020.

The company's research institute has enlisted dozens of renowned domestic academicians, experts and traditional Chinese medicine masters as well as two Nobel laureates. One is Ferid Murad, the co-winner of the 1998 Nobel Prize in Physiology or Medicine and the father of Viagra, who also served as the leader of the GPC research team. The team's latest result, an innovative biological vaccine, is described as a bombshell discovery that proves effective in both treating and preventing multiple kinds of tumors. As the first of its kind in the world, the vaccine has applied for eight patents.

World Economic Forum founder Klaus Schwab once said Guangzhou is an internationalized city with a high degree of market economy, as well as a community known for its easy life and favorable investment environment.

Harley Seyedin, president of the American Chamber of Commerce in South China, further elaborated that "Guangzhou's openness and inclusiveness, as well as its favorable business environment, coincide with entrepreneurs' innovative and entrepreneurial spirit, making Guangzhou the best choice for investment." The Chamber's 2017 Special Report on the State of Business in South China revealed that Guangzhou has become an increasingly preferred destination for investment thanks to the local government's high efficiency, openness and transparency, as well as the city's enormous advantages in infrastructure and human resources.

Guangzhou enjoys No.1 status in the country's VR sector.
——Xiang Xi (middle), CEO of Time Network

Guangzhou offers the best policy support, the most solid industrial basis, and the most excellent government service.
——Du Lan (2nd Left), SVP of IFLYTEK

Bio-medicine, as part of Guangzhou's IAB strategy, will usher in an era of strategic opportunities.
——Li Chunyuan (right), Chairman of GPC

COMING TO AN

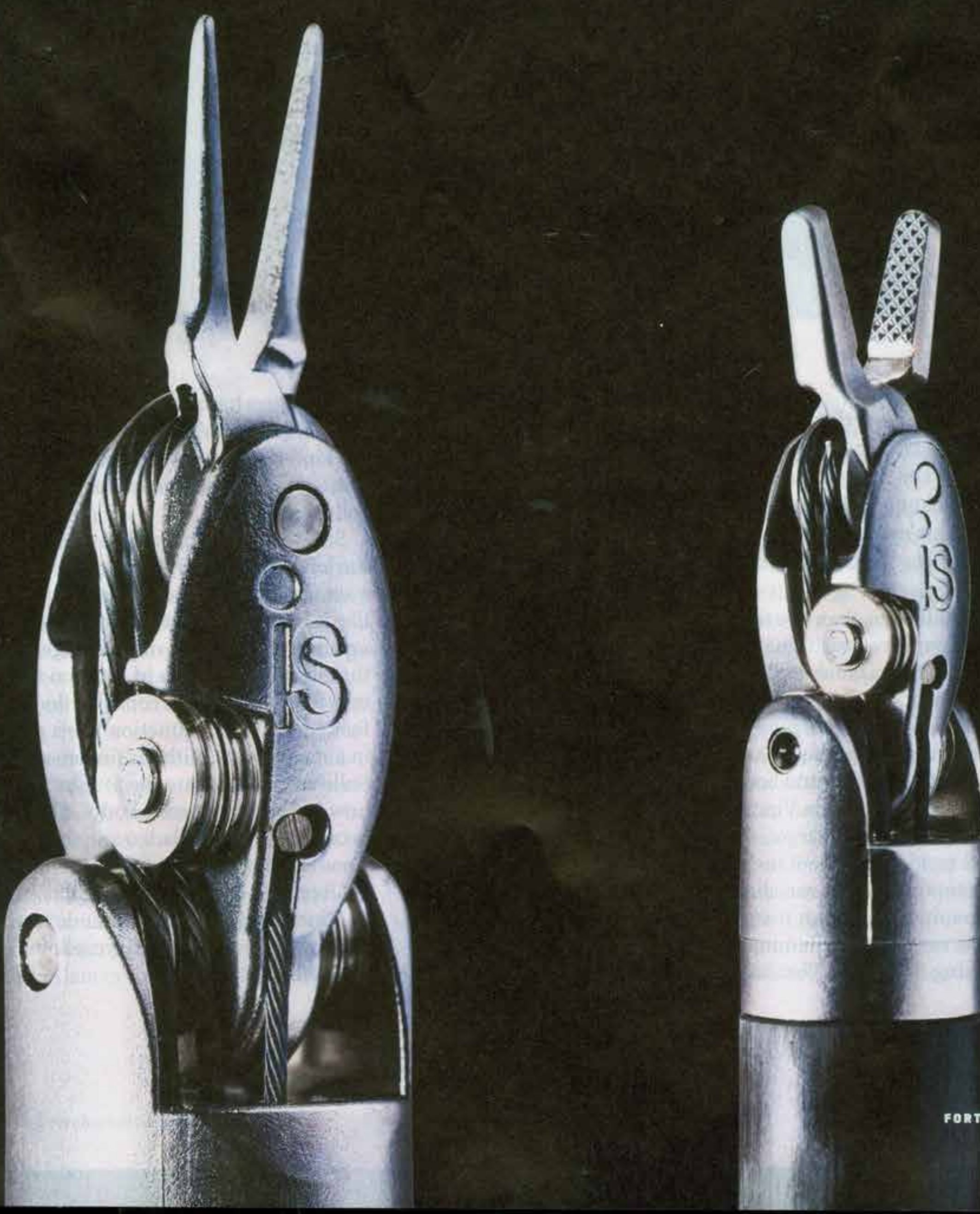
↗

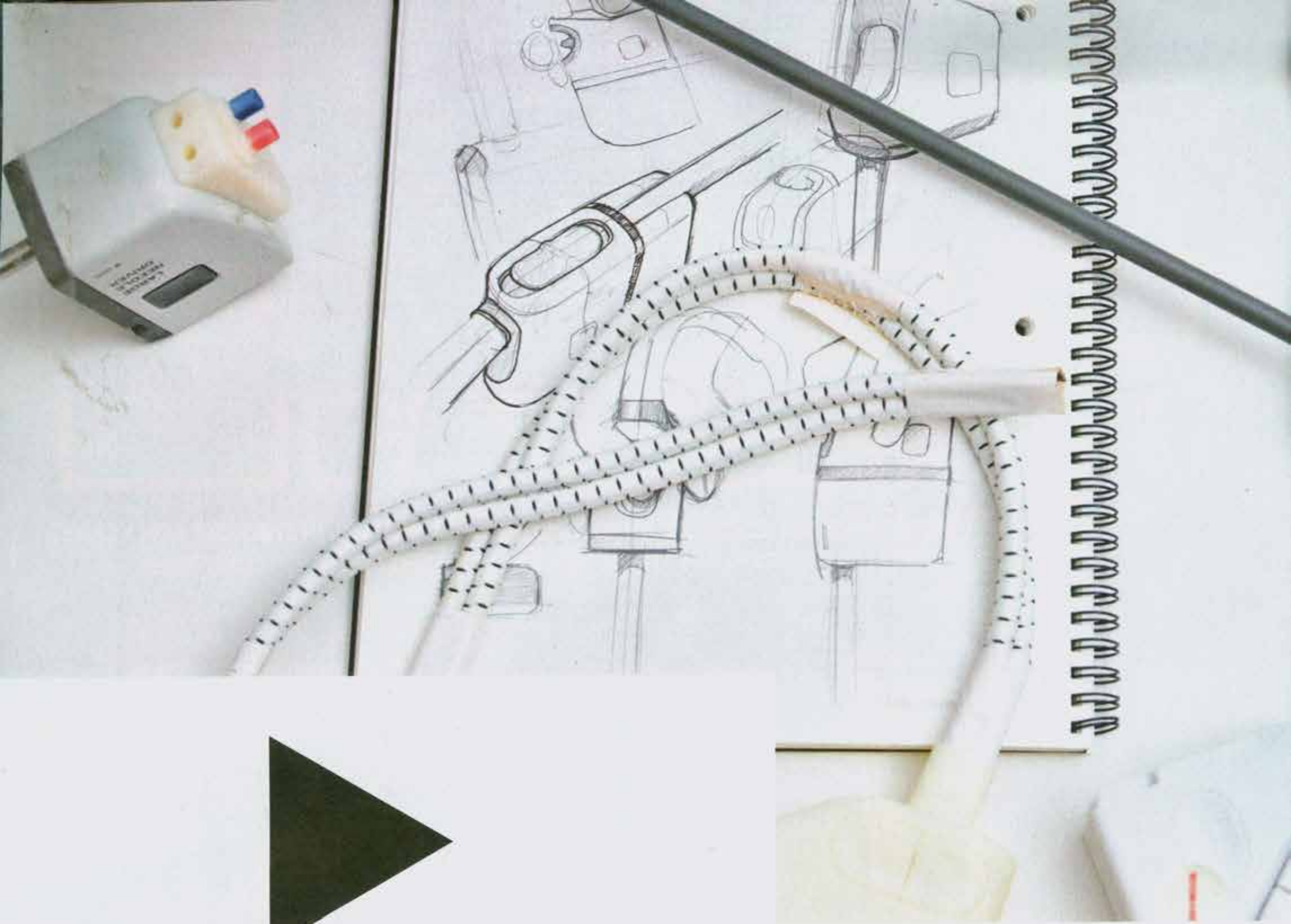
ROBOTIC REGIMENT: An array of instrument attachments for the da Vinci surgical system.

▲ PHOTOGRAPHS BY **SPENCER LOWELL**

O.R. NEAR YOU

INTUITIVE SURGICAL MADE ROBOTIC SURGERY A REALITY. IN THE NEXT FEW YEARS, IT MAY HELP US EXPLORE THE BODY AS NEVER BEFORE. BY SY MUKHERJEE





"OH, GOD, PLEASE DON'T LET ME TRIP OVER ANYTHING." That's my first thought as I tiptoe around the electrical cords snaked across the operating room floor. It's an early October morning at the Long Island Jewish Medical Center in New York. I'm decked out in a onesie-style baby blue protective suit, a hair mat, a bonnet to cover my beard, an additional mask for my mouth, and booties over my shoes.

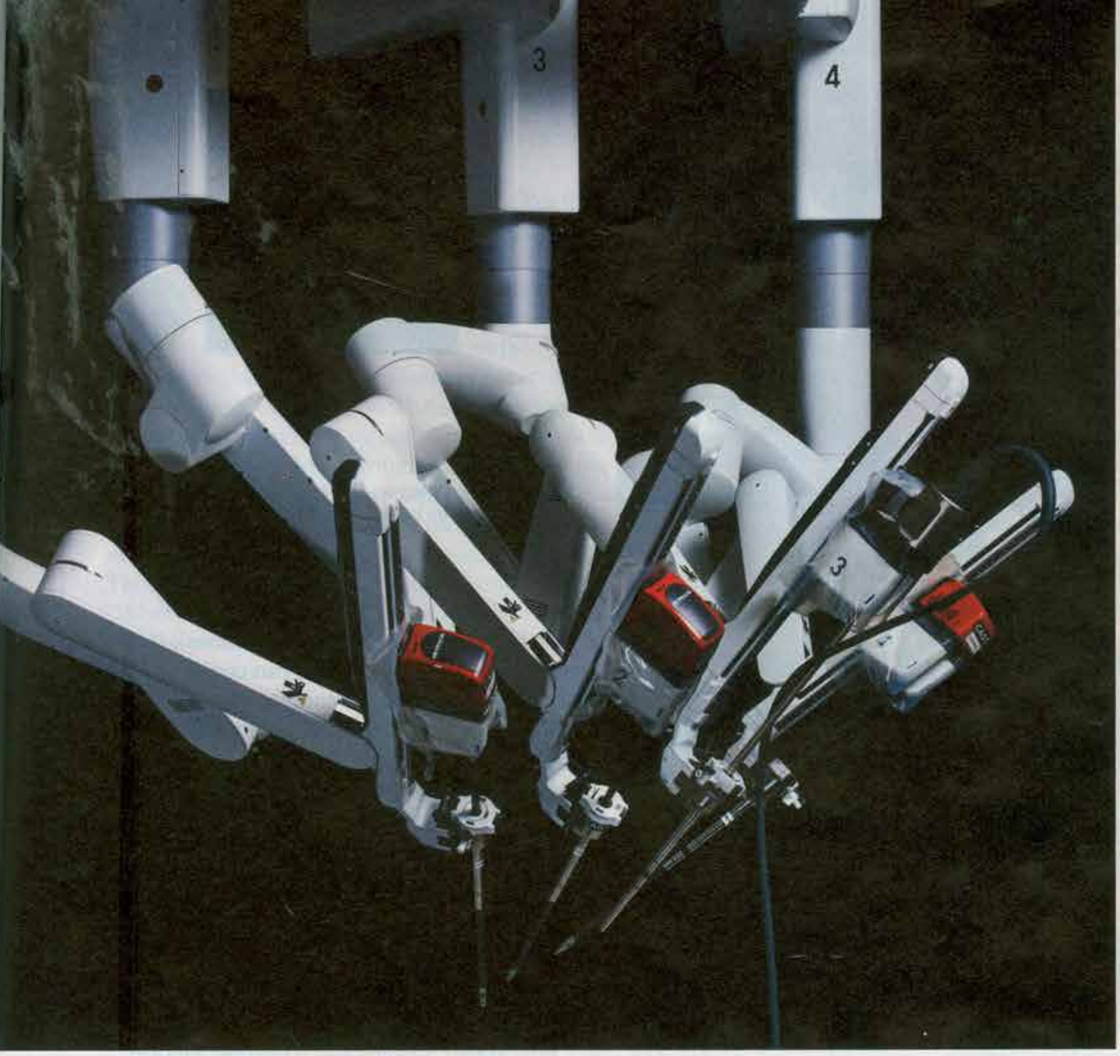
None of this is designed for agility. It's meant to protect the patient lying on the table less than five feet away from me. His exposed torso is peppered with small holes through which cancer surgery specialist Dr. James Sullivan and his team insert their medical instruments.

As it happens, there's another surgeon in the room besides Sullivan—one more modestly garbed than either of us. Wrapped in plastic sleeves that cover its central boom and sprawling white arms is Intuitive Surgical's da Vinci Xi robotic surgery system. It's hard to tell who's in charge.

The instruments inside the patient include three separate, interchangeable components that can slice, shift, grasp, cauterize, or otherwise manipulate human tissue, as well as a movable high-definition camera that illuminates the body's internal landscape in stunning 3D clarity. That's a visual advantage that Sullivan says has revolutionized how doctors perform minimally invasive surgery—the kind that doesn't require chopping someone open to remove a body part or collect samples.

Sullivan makes his way to a console on the left side of the OR, where he takes a seat in front of a viewfinder that looks like it belongs in a futuristic video game arcade. He places his middle fingers and thumbs into two pairs of rings on two movable arms. At the console's floor are foot pedals, which function like a clutch in a manual car. With his fingers and feet, Sullivan will navigate the four instruments now inside the patient's body—alternating between the pincer-laden surgical extensions and a 3D endoscopic camera.

Over the next few hours, he'll use the da Vinci to cut out a lymph node from the patient (who suffers from lymphoma) for lab testing.



FROM MIND TO MACHINE: At left, R&D drawings and plans done at Intuitive Surgical headquarters in Sunnyvale, Calif.; right, the da Vinci Xi machine.

Two hours later, I ask Sullivan how long it will be before the patient is discharged from the hospital.

"Where do you live?" he asks.

"Bushwick, in Brooklyn," I reply.

Sullivan chuckles. "He'll be home before you."

FUTURIST CULTURE HAS NO SHORTAGE OF FEVER DREAMS starring robot doctors. This story isn't about that. While we're still a ways from the day when androids become our go-to physicians, robotic surgery is already commonplace—and probably surprisingly so, if you don't happen to be a surgeon. Intuitive Surgical, headquartered in Sunnyvale, Calif., got the first-of-its-kind clearance for its robotic surgical system from the Food and Drug Administration back in 2000. But it has been largely in the past few years that its machines have exploded in popularity. Surgeons who tout the tech say it's given them a far clearer view of what's happening inside the body and greater control over their instruments.

Intuitive's devices are now used at all of the top-ranked U.S. hospitals for cancer, urology, gynecology, or gastroenterology—including venerable institutions like New York's Memorial Sloan Kettering Cancer Center, the Mayo Clinic, Johns Hopkins, and the Cleveland Clinic. More than 4,100 da Vinci base units have been installed worldwide as of June 30, including 2,703 in the U.S., 698 in Europe, 538 in Asia, and 210 in the rest of the world.

The systems aren't cheap: The list price for the fourth-generation da Vinci Xi is $1.9 million, and that doesn't include the cost of various surgical appendages, which can add tens of thousands of dollars more to the price tag. Still, the robots keep selling—and surgeons are increasingly adopting them in their practices.

The company says that more than 4 million minimally invasive surgeries have been performed with da Vinci systems since 2000—a new one begins every 42 seconds somewhere around the globe, Intuitive CEO Gary Guthart tells *Fortune*. The number of those procedures done worldwide spiked 15% in 2016 compared with the previous year, and Intuitive pro-

BUILDING A DA VINCI: A worker assembles a robotic system at Intuitive's Sunnyvale, Calif., manufacturing facility.

jects an additional 14% to 15% rise in the number by the end of 2017. Indeed, for certain more complicated procedures, such as radical prostate removal, robotic-assisted surgeries now account for nearly 90% of operations.

The boom has driven Intuitive to $2.7 billion in 2016 global revenue, with more than 70% of sales being recurring in nature—a fact that underscores the advantage that comes from being the first major player in a rapidly growing market.

That's been a draw for investors too; in 2017 alone, Intuitive's valuation has soared more than 70%, pushing its market capitalization near the $40 billion mark.

The growth has been so breakneck that it's natural to wonder if it can continue. But those who follow the company closely say they believe it can—that there is something truly intuitive about Intuitive's grasp of the future of surgery. The company, meanwhile, is churning out new tools that can perform more kinds of operations, expanding feverishly into Asia, and experimenting well outside its comfort zone with cancer diagnostics.

Intuitive has teamed up with China's Fosun Pharma, for instance, in a joint venture to detect lung cancers in their earliest stages, developing a flexible robotic catheter that can navigate into the cavernous regions of the lungs. "The problem with lung cancer today is we don't have great tools to diagnose it," says Morgan Stanley analyst David Lewis, who has covered Intuitive for a decade. "We can't always find it, because it's hard to navigate something in the lung without doing damage to the patient."

Because Intuitive's catheter can be tracked and targeted with pinpoint accuracy, it should make it easier to identify

MACHINE LEARNING: 3 NOVEL TECH IDEAS IN HEALTH CARE

MEDTECH entrepreneurs are taking ideas from science-fiction novels and bringing them to life.

CATALIA HEALTH

A robo-nag for your meds.

What if a cute little yellow robot could help solve a $300 billion health care problem: people failing to properly take their prescription drugs? That's what Catalia Health has set out to do with Mabu, an A.I.-driven robotic medical companion that makes small talk with patients—and gives them timely reminders to take their meds too.

© ROBOTS COURTESY OF CATALIA HEALTH; WOEBOT LABS lesions with precision, Lewis explains. "We think this procedure will revolutionize the treatment of lung cancer," Lewis says.

"SOMETIMES, YOU JUST KNOW WHEN SOMETHING'S BETTER," says Dr. Martin Weiser, an attending surgeon and a vice chair of education and faculty development at the Memorial Sloan Kettering Cancer Center, of robotic-assisted surgery. Such was the case when laparoscopic surgery debuted years ago. In laparoscopy, surgeons thread medical instruments and cameras by hand through small holes in the patient's body. Surgeons, particularly older ones, were slow to adopt the new technology, largely because of the learning curve required. But eventually, it became common medical practice, says Weiser. The same has been true of robotic-assisted surgery, he says. "Whether it's less time at the hospital for a patient or an easier time operating for a surgeon, you just know when it's better."

It isn't clear whether robotic surgery uniformly leads to better outcomes. (Don't look to the extensive medical literature for a clear-cut answer; conclusions differ from study to study.) But surgeons who swear by their robotic arms tend to return to the same words of praise: They tout the "speed of recovery" for patients, who typically don't need to spend days or weeks in a hospital as they might after traditional open surgery. They speak of the "clarity" of its camera, the "flexibility" of its instruments.

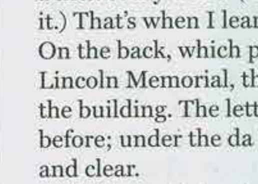
When I get the chance to test a da Vinci Xi training module myself, the word "flexibility" is the last one that would pop to mind. At first, anyway. But after a few minutes' practice, "operating" on a plastic torso replica filled with balloons, pennies, and other knickknacks, even my own comically uncoordinated hands seem nimble, somehow. Within 10 minutes I was able to pick up a $5 bill inside the fake chest with one of the robotic pincers, pass it to the other one, and flip it around every which way with a flick of my wrist. ("It's like having four arms," as Sullivan puts it.) That's when I learned a little something about the $5 note: On the back, which prominently features an illustration of the Lincoln Memorial, there are 26 states listed across the top of the building. The lettering is so small that I'd never noticed it before; under the da Vinci's camera, the state names were sharp and clear.

But in medicine, impressive technology is little more than a parlor trick if it doesn't benefit patients—like James (who asked to keep his last name private), a 42-year-old colon cancer patient who had part of his large intestine removed by Sullivan a few months ago. James chose the robotic option, despite some initial apprehension, after watching some YouTube videos of the machine in action. "I figured this is either going to work out perfectly or it's going to go really bad," he says.

He was discharged from the hospital four days after the operation and was back at work within three weeks. It was a far different experience than the one his father had 15 years ago—for what in theory was the same operation. "They cut him from his sternum to his pubic bone, peeled him open, and took everything out and put it all back," James says. "So his recovery time was much, much longer. Months."

While insurance reimbursement rates for patients are the same, in most cases, whether they opt for robotic surgery or not, there is nonetheless a difference in cost, says Sullivan—to both the patient and the hospital. "What really is never factored in is the fact that you're changing the patient's length of stay," he says. "In a hospital, if your average length of stay is 3.1 days and you take that down to 2.1, that is a real cost savings."

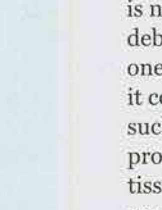
But when it comes to the question of how quickly Intuitive can ramp up sales, particularly in less tech-hungry markets, the machine's nearly $2 million price tag is no small factor. And while the academic debate over patient outcomes is a heated one, a rough consensus does emerge when it comes to more complicated surgeries—such as radical prostatectomy, where the prostate gland and some of its surrounding tissue is removed, usually to treat prostate cancer. Here, the verdict is in da Vinci's favor: Robotic surgery tends to be both better for the patient and more cost-effective.



HOLOLENS

Using VR to train MDs.

Augmented and mixed reality aren't just for gaming. Case Western Reserve University and the Cleveland Clinic are designing programs that use Microsoft's HoloLens to teach med students anatomy. With holograms, students can manipulate organs and bones from every conceivable angle and get an immersive look at the body's internal landscape.



WOEBOT LABS

Chatbot therapy. Couch optional.

For those who can't get an appointment with their therapist (or can't afford one), there's an alternative. Woebot, a chatbot developed at Stanford, will work through your issues 24/7 via Facebook Messenger. It will ask how you're feeling, recommend ways to feel better, and even share the occasional joke. Think of it as talk therapy for the A.I. age.

A BIG PART OF INTUITIVE'S PLAYBOOK is to evangelize that message not just with potential hospital customers, but—more important—with young surgeons who, the company hopes, will represent the next generation of its users.

David Lewis, the Morgan Stanley analyst, shares an anecdote about just how quickly the surgical environment is changing. Five years ago, at a prominent meeting for laparoscopic and endoscopic surgeons, he says, "the reception to Intuitive Surgical was extremely poor. In fact you could sort of sense in any given room that physicians were almost frowned upon for their use of the system." Five years later, that same meeting had been overtaken by young surgeons presenting data from their use of Intuitive robots.

A survey by investment and research group RBC Capital last year found that American surgeons think that within five years, 35% of operations will involve robots in some form, compared with 15% today.

With an expanding market, naturally, comes competition. Both Medtronic and Verb Surgical (Johnson & Johnson's joint robotic surgical project with Google parent Alphabet's life sciences arm, Verily) are expected to challenge Intuitive with their own robotic surgery product lines. Those aren't easy names to go up against; they have substantial footholds in hospitals around the world, and they may be able to leverage those long-standing relationships to elbow their devices into the OR.

Richard Newitter, a managing director of the medical supplies and devices research unit at Leerink, is largely bullish on Intuitive's future, however. "We think the competition is a validation of the market and potentially an expansion of it," he says.

Morgan Stanley's Lewis agrees. He envisions three major phases of progression for Intuitive (though he's quick to note that this is his prediction, not the company's). The first phase, which is ongoing, is continuing to establish a presence in more hospitals in the U.S., Europe, and Asia. "European markets in many respects have lagged the U.S. robotic markets by three to five years if not longer," says Lewis. "So taking these kinds of technologies into the European markets, and taking them into new markets like China and Japan, is going to be important."

But Lewis says the following two phases are more compelling—and where the greatest potential growth may emerge. First comes what he calls "platform expansion," in which Intuitive pushes a number of new products that have either just entered the market or that are in the works. One is the da Vinci X, a system recently cleared by the FDA, which comes with a list price $600,000 cheaper than the Xi. Those units could attract hospitals that don't have the deep pockets major cancer centers do.

Another, which Lewis calls a potential game changer, is the da Vinci SP, expected to be released in 2018. "SP" stands for "single port." Rather than the four, spider-like arms of the da Vinci Xi, the da Vinci SP has just one arm, inserted into one hole in the body, through which four different maneuverable tools emerge. Watch a video of the machine in action and you will likely think it's some alien creature. The SP, for instance, could enable surgeons to treat certain oral cancers far less invasively because the port can be inserted through an existing orifice such as the mouth. (By contrast, in some cases, traditional surgical approaches require splitting open a large portion of a patient's neck.) In a May report, Lewis and colleagues estimated that, by 2025, surgeons could perform as many as 170,000 new robotic procedures annually using the instrument.

Then comes phase three, according to the Morgan Stanley analyst: That's where Intuitive could potentially bring together all sorts of buzzy technologies under a single platform, Lewis says. He imagines robotic systems with more advanced imaging that can highlight the body in even greater detail, enabling surgeons to instantly differentiate between individual blood vessels and nerves. Or those that incorporate a patient's medical history right on the console. Or video that allows surgeons to replay past procedures during a current one.

All of that may sound like the stuff of science fiction. But then, 10 years ago, so did the idea of a robot surgeon. ■

50

THE FUTURE 50

331%

INCREASE IN SHARE PRICE

Over the past 10 years for Intuitive. The NASDAQ Composite, meanwhile, is up 138% over the same span.

71%

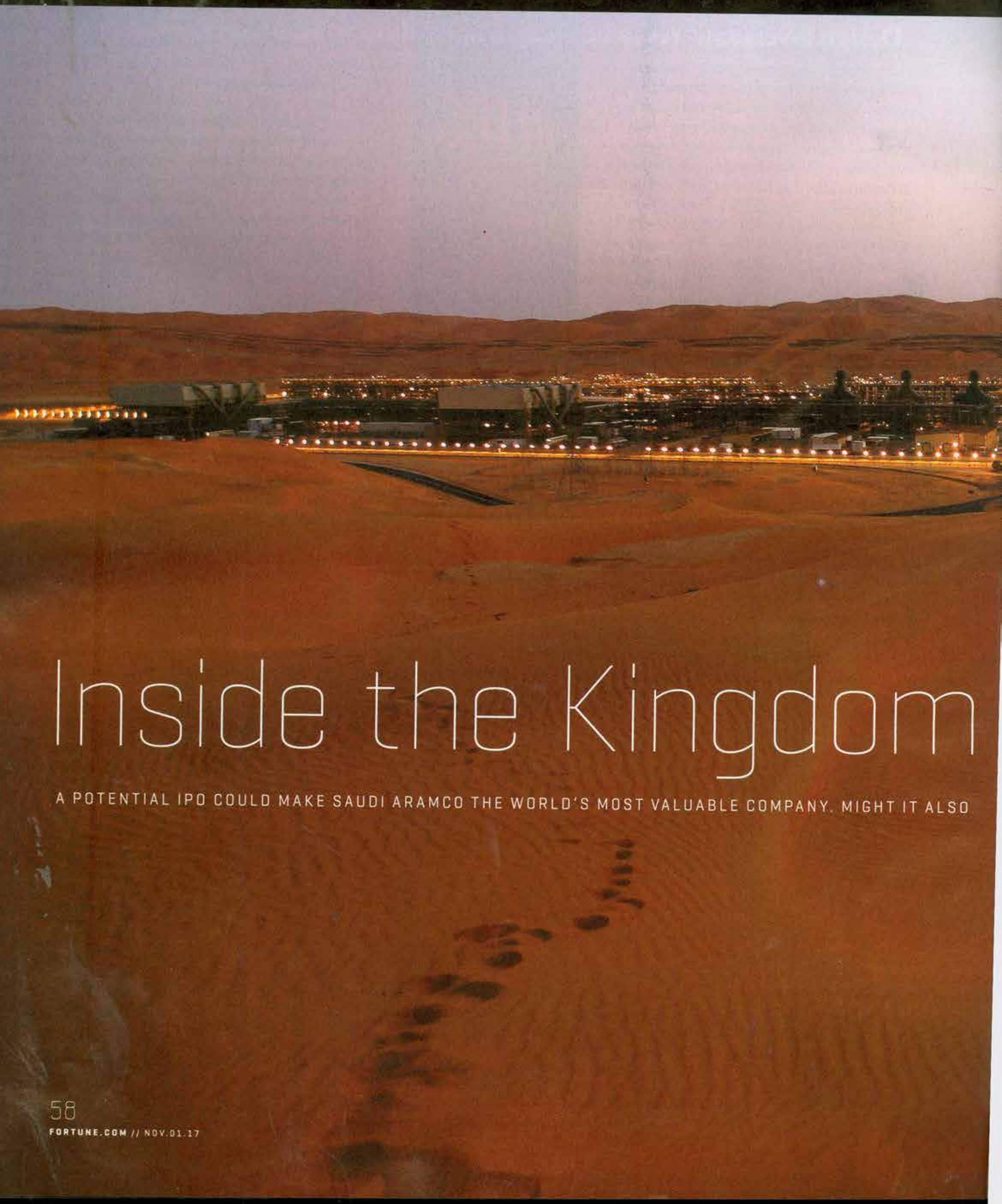
RECURRING REVENUE

The company's base-and-accessories business model means plenty of income from return customers.

753

THOUSAND

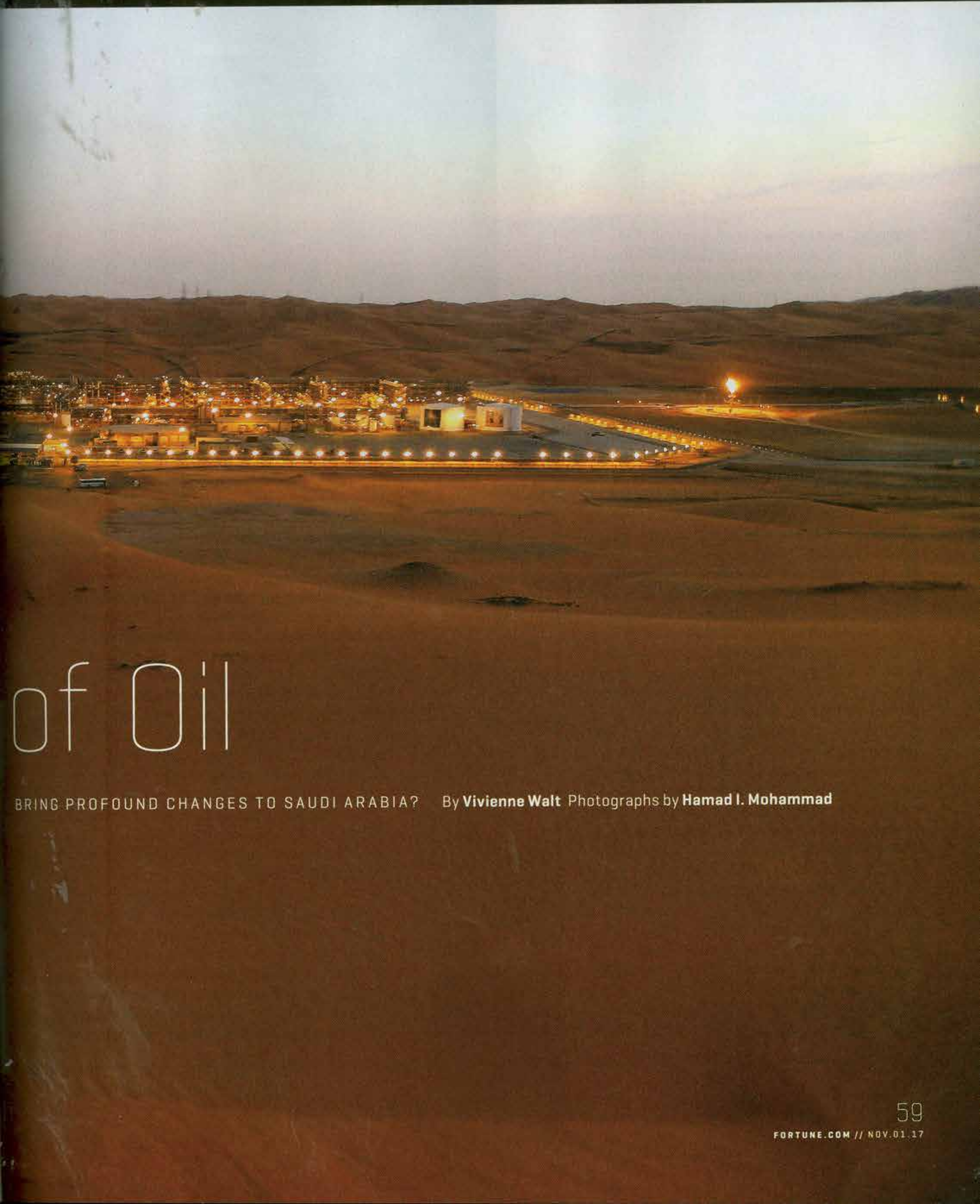
Number of surgical procedures performed with da Vinci tech in 2016.



Inside the Kingdom

A POTENTIAL IPO COULD MAKE SAUDI ARAMCO THE WORLD'S MOST VALUABLE COMPANY. MIGHT IT ALSO

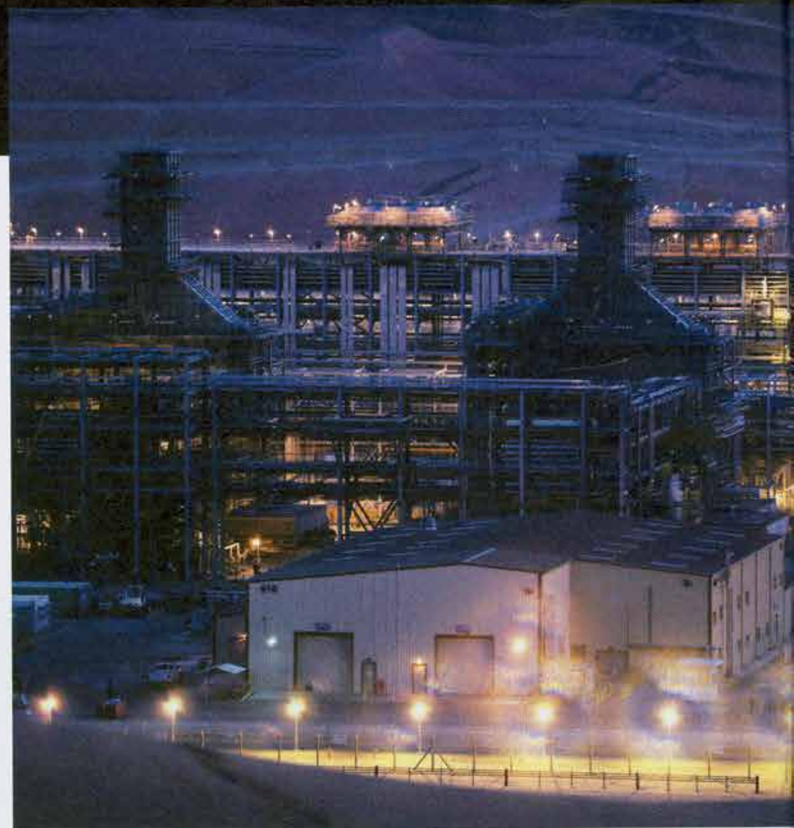
A Saudi Aramco gas-oil separation plant in the remote Empty Quarter desert.



# of Oil

BRING PROFOUND CHANGES TO SAUDI ARABIA?

By **Vivienne Walt** Photographs by **Hamad I. Mohammad**



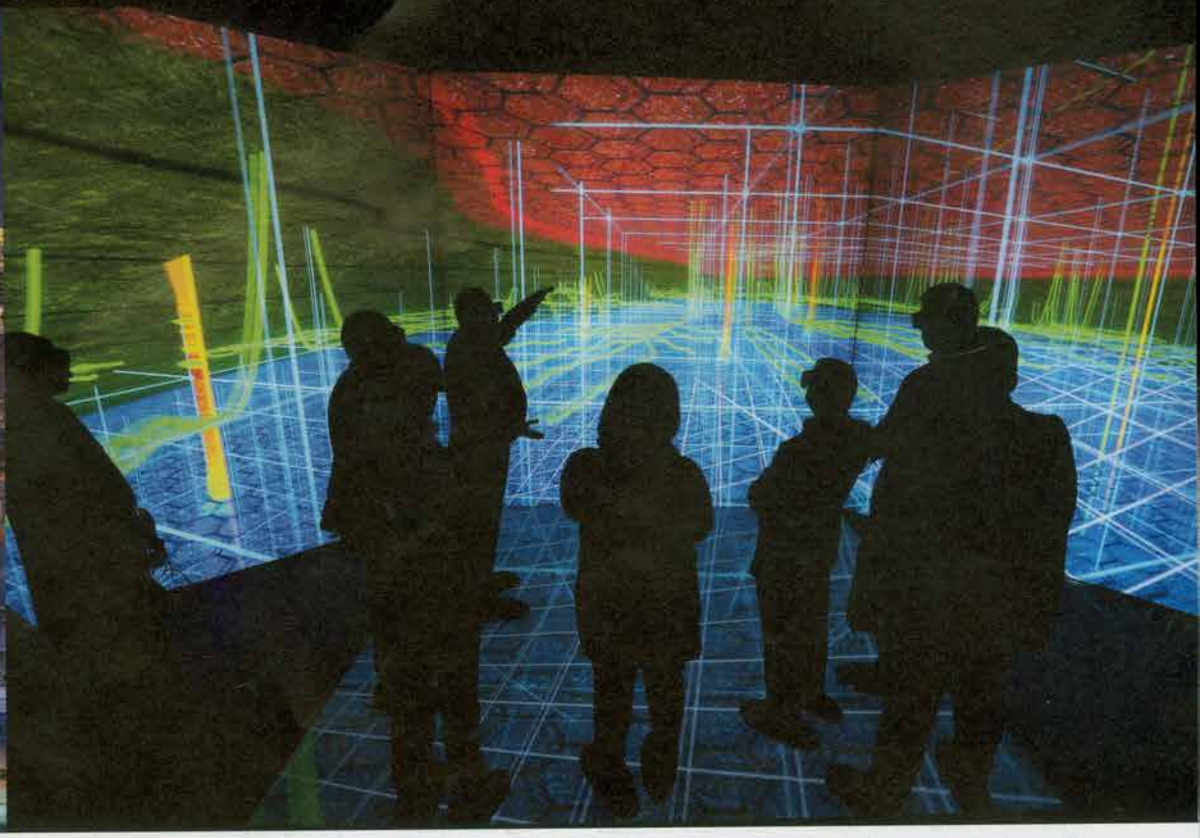
F**ROM THE WINDOW** of our small plane flying low over the desert, Saudi Arabia's Empty Quarter looks as remote as the name suggests, with burnt-orange dunes stretching into infinity under the blinding sun. Not even the Bedouin nomads with their camels are visible, because there are too few of them amid the vast landscape. It's only when the plane bumps down on an empty runway at an outpost called Shaybah that it is clear that the world's biggest sand desert is not, in fact, empty. We are hundreds of miles from the nearest Saudi town. Yet rising out of the sand between the dunes is a state-of-the-art labyrinth of metal pipes and cylindrical tanks, which day and night pump the crucial commodity that keeps our modern world ticking: oil. "We generate our own electricity, we have our own water supply," says Khalid Al-Jamea, manager of the Shaybah oilfield, after he meets our plane on the desert strip and hands us chilled face towels to dull the shock of the 110-degree heat. "We are cut off from the world."

In more ways than one, Saudi Arabia's apartness from the world may be on the verge of ending—with major consequences for this deeply conservative Islamic kingdom, and for global financial markets too. More than 80 years after American wildcatters pitched their tents in the Arabian desert in a hunt for oil, the government-owned Saudi Arabian Oil Co.—Saudi Aramco for short—is considering whether or not to sell about 5% of the company to outside investors. The long-planned IPO, tentatively set for 2018, would end 38 years of total state control, in which the world's biggest oil producer has had exactly one shareholder: the Saudi king.

TECH IN THE DESERT
Left: Aramco's plant in the Empty Quarter at night. Right: At Aramco's headquarters, the training facilities include a virtual reality model of the Shaybah oilfield that takes people inside the well, 5,000 feet below the desert floor.

The scale of the operation is colossal. Saudi Arabia claims that its proven oil reserves are a head-spinning 260.8 billion barrels—13 times as large as the reserves booked by Exxon Mobil, the biggest independent oil company in the world, and the most of any country other than Venezuela, where much of the reserves are unreachable. Saudi Arabia also claims it has more than 298 trillion cubic feet of natural gas. Based on those resources, Wall Street analysts have estimated Aramco's market value between $1 trillion and $1.5 trillion. That would easily make Aramco the world's most valuable company, surpassing Apple and its recent market cap of $830 billion. The Saudis have said that Aramco should be valued at $2 trillion.

Even at the low-end estimate, floating 5% of Aramco would represent the biggest IPO in financial history by far, at least double the current record set by Alibaba when it went public in 2014. Banks such as Morgan Stanley and HSBC, which have received requests for proposals, stand to earn fortunes in the process. So big is Aramco's potential impact on any single stock market that London and New York have engaged in a gloves-off contest to become

Aramco's main foreign listing, while the royals in the capital of Riyadh have kept their decision a tightly held secret behind the palace walls.

Indeed, when Saudi Arabia's Crown Prince Mohammed Bin Salman, commonly known as MBS, unveiled his plans in January 2016 to take some of Aramco public, it stunned even the company's own executives. The IPO, as it turned out, was the centerpiece of a radical blueprint called Vision 2030 that the 32-year-old heir to the throne had crafted in order to overhaul the country over 14 years. Aramco's dizzying oil production—more than 10 million barrels a day—generates about 90% of Saudi Arabia's revenues and most of its foreign earnings. The proceeds from an IPO—a 5% slice of $2 trillion would be $100 billion—could potentially turn the government's Public Investment Fund into a global financial player.

The young prince aims to transform his country from the world's most powerful petrostate, whose glitzy wealth is evidenced in many Western capitals, into a diverse economy capable of employing millions of youth, attracting tourists to brand-new Red Sea resorts, and fostering innovation and entrepreneurship. Private health care and education are also in the works. If all that pans out, the country could become something resembling a normal economy, for the first time since the Al-Saud dynasty created a nation called Saudi Arabia in 1932. "Vision 2030 is a transformation into a more sustainable economy and job creation," Aramco's CEO and president Amin Nasser tells me over fresh-roasted Arabian coffee, in his executive suite at the headquarters in Dhahran, in the country's eastern province. "And Aramco is at the heart of it."

ARAMCO EXECS AREN'T WORRIED ABOUT A MOVE AWAY FROM FOSSIL FUELS. "IT WILL TAKE DECADES, NOT YEARS," SAYS ARAMCO CEO NASSER.

[redacted]

If the Saudis decide to move forward with the IPO—recent news reports have suggested that they are weighing their options—the transformation could be profound indeed. For decades, Saudi Arabia has hewed to a severely restrictive form of Islamic rule—the only country in the world that banned women from driving (until this September) or traveling abroad without a male relative's permission. Selling shares will require not only a deep shift in Saudis' expectations but also a willingness to allow outsiders into a closed world. That is one reason Aramco agreed to let *Fortune* visit its oil operations in early October, lifting the shroud that typically shields the company from outside scrutiny.

RAMCO PUMPS ABOUT one in every nine barrels of oil in the world and ships some 130,000 barrels every hour; it is the only producer capable of quickly upping output if a war or natural disaster, for example, rocks global supplies. Yet what Aramco wanted to show *Fortune* went way beyond oil; visiting an oilfield seemed almost an afterthought. In fact, driving into the gated Dhahran headquarters, you could almost mistake Aramco for a tech company, with its low-slung buildings housing banks of computers, and engineers strolling along paved paths under palm trees. The compound is called "camp" by Aramcons, many of whom have been raised "in camp" as kids of Aramcon parents.

Through several hours of presentations, managers show off whiz-bang innovations on wall-size screens, all aimed, they say, at exploiting Saudi Arabia's gargantuan natural wealth more efficiently than any other oil company on earth. Through one set of locked doors is the nerve center—Oil Supply Planning and Scheduling, or OSPAS. It is off-limits to most staff, since it contains the company's most sensitive data. Along a wall the length of a football field, screens track in real time every barrel pumped, piped, refined, stored, and shipped, across the kingdom and from offshore facilities in the Arabian Gulf and Red Sea, giving an instantaneous snapshot of all operations. Click on any rig, and a number counter shows how much crude is flowing at that moment. A schedule drawn up 45 days in advance lists each order, and images of tankers show barrels being loaded, including what grade of oil and where it is headed.

But this is the easy part for a company that has shipped giant quantities of crude for nearly 80 years. Far more challenging is Aramco's bigger goal: sharply increasing its ability to extract oil from any single reservoir—potentially making the company much more valuable to investors. The aim is to increase recovery rates from about 50% to 70%—an increase that Aramco believes could add another 80 billion barrels to its reserves. Nasser has told the industry that he also aims to increase Saudi Arabia's total discovered reserves within a decade from about 800 billion now to about 900 billion barrels, a figure that includes crude that's not reachable with current technology.

LEADING FIGURES
Saudi Aramco CEO Amin Nasser [left] is investing to increase his company's oil reserves. Crown Prince Mohammed Bin Salman [right], known as MBS, wants to use proceeds from an Aramco IPO to fund an overhaul of the kingdom's economy.

O RIGHT: MIKHAIL METZEL—TASS/GETTY IMAGES

On the Dhahran compound, there are glimpses of how Aramco is trying to pull this off. In the "geosteering section," a wall-size screen tracks up to 90 oil wells at a time, displaying moment-by-moment operations, while a group of geoscientists sit at computer monitors in the room, directing the drilling to the most oil-rich fissures in the stone. The fishbone-shaped drills 5,000 feet under the desert floor at Shaybah are directed from this room, some 460 miles away. Next door, teams of engineers from across different disciplines analyze new reservoirs, determining how best to drill there or even if it is worth doing.

Even as oil prices have plummeted in recent years, from about $108 a barrel in 2014 to about $50 a barrel this year, Aramco seems to be doubling down on its efforts to find new reservoirs—in contrast to many oil companies, which have reined in their high-priced exploration. In the company's Exploration and Petroleum Engineering Center, Aramco recently rolled out new technology called TeraPOWERS, which allows scientists to run countless simulations with pinpoint accuracy. "We will keep adding resources to exploration even in the downcycle," says Nasser. "It is important to the rest of the globe [for us] to maintain significant amounts of reserves."

All this R&D should keep the Saudis pumping oil for generations. The question is, Will the

LARGEST CRUDE OIL PRODUCERS (2017)

SOURCES: RYSTAD ENERGY, SAUDI ARAMCO

LARGEST GLOBAL IPOs

* PLANNED

SOURCE: S&P GLOBAL

world keep buying it? That is an increasingly urgent issue for Saudi Arabia, which has seen its economy hit hard by sinking prices; the International Monetary Fund estimates near-0% growth in the kingdom this year. What's more, there is mounting pressure on governments to cut carbon emissions, and renewables are proliferating far faster than oil consumption. In the global climate talks in 2015, Saudi Arabia agreed to ramp up solar power and curb its gas-guzzling habits. Oil-powered air conditioners blast out 24/7 in the broiling heat, and one-third of Saudi oil never leaves the country: Locals consume it at highly subsidized, rock-bottom prices. "Saudi Arabia is like a very wealthy individual who is 100% invested in a very volatile commodity," says Hilal Halaoui, a Riyadh-based partner of the U.S. consultancy Strategy&. "Any wealth manager would tell you that's really stupid."

Aramco believes that the world will make a slow energy transition. "It will take decades, not years," Nasser says. Even so, it is racing to prepare for a changed future. It has sharply increased its natural-gas production over the past two years, including in Shaybah, whose new plant generates electricity for the remote field. And in a joint venture with Dow Chemical, Aramco opened a $20 billion plastics plant last year. To diversify beyond oil production, Aramco has expanded the Red Sea refinery it runs with China's Sinopec, and in May this year it took full control of the biggest refinery in the U.S., in Port Arthur, Texas, which had been a joint venture with Royal Dutch Shell. Engineers in Dhahran are also retrofitting cars that capture exhaust and store it inside the trunk, to use for other purposes. And another team is working on transforming crude directly into ethylene and polyethylene, without refining it. That could save billions and hugely increase Aramco's petrochemicals business. All those new industries will require pumping more oil, however, and maybe even adding new reserves. "We develop fields to last for centuries," says Aramco's chief petroleum engineer Nabeel Al-Afaleg.

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HARD AS IT MAY BE to believe now, early prospectors almost gave up looking for oil in Saudi Arabia. Back in 1933 the king gave Standard Oil of California (the forerunner to Chevron) exploration rights in the Arabian desert, in an area twice the size of Texas that was largely unmapped and had no roads or communications. The Americans, with their Bedouin guides and camels, found nothing for years. One early explorer (and later Aramco CEO), Thomas Barger, remembered his bosses in California concluding that "we were throwing good money after bad, chucking it down a rat hole in a country half a world away from San Francisco."

How wrong they were. Standard Oil's first gusher, in Dhahran in 1938, made it clear that Saudi Arabia had vast oil reservoirs at far deeper

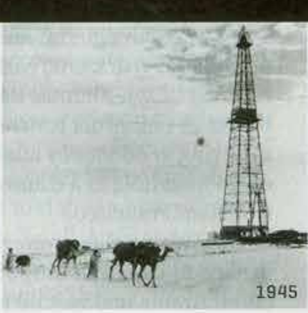
levels than elsewhere in the Middle East. The Americans set up the Arabian American Oil Company—Aramco, for short—with drilling rights. The Saudis gradually took increasing shares of Aramco and fully nationalized it in 1980. (The government added Saudi before Aramco, but left the "am" for American.) Even today, top Aramcons are largely U.S. trained, and the Dhahran headquarters feels like small-town USA, with street names like Rolling Hills Boulevard. In contrast to life outside, women here jog in sweatpants and T-shirts, families play baseball and go bowling, and the Tex-Mex restaurant has the Temptations on its playlist.

Despite Aramco's American flavor, Saudi Arabia's priorities in the oil market are regularly at odds with U.S. needs—and its power is immense. Aramco's supergiant reservoirs include Ghawar, the world's biggest oilfield by far, which pumps 5 million barrels a day. That dwarfs remote Shaybah in the Empty Quarter desert, which produces 1 million barrels a day. Anywhere else, Shaybah would be considered huge; its stated oil reserves are a whopping 14 billion barrels. In all, Saudi Arabia pumps triple the oil of the second-biggest producer (Iraq) within OPEC, which the kingdom cofounded in 1960. It has remained OPEC's de facto leader ever since.

Despite its vast capacity, Aramco's leverage has been weakened in recent years by the booming shale-oil industry in the U.S. By 2014 the U.S. was pumping about 9 million barrels a day, not far behind Aramco's output. World oil prices began plummeting, accelerated by a slowdown in the other mega-economy and key Aramco customer: China. In Riyadh, Saudi officials, accustomed to being awash in cash, faced a very rare situation: a fiscal deficit. They opted to keep pumping huge quantities of oil in order to defend their world market share, rather than cut production to try to push up prices. The IMF estimates the country needs oil at about $77 a barrel to balance its budget. With prices stuck far lower than that, Saudi Arabia finally persuaded OPEC to cut output last November.

BUILT ON OIL
A new cultural center (left) opened in September in Dhahran, one of many projects built by Aramco. The "prosperity well" (right) on Aramco's campus pumped oil from 1938 through 1982.

A BRIEF HISTORY OF ARAMCO



1945

1933

Saudi Arabia's founder, King Abdulaziz, gives exclusive drilling rights to Standard Oil of California for 60 years, across 320,000 square miles of desert.

1938

American explorers strike the first oil in Dhahran, in the eastern province, after nearly abandoning the search and form the Arabian American Oil Company, or Aramco.

1948

Standard Oil of New Jersey and Socony-Vacuum take stakes in Aramco, which evolved into a joint operation between Exxon Mobil and Chevron.

Aramco itself has little say in how much oil it pumps. Like many decisions, that's left to officials in Riyadh. In fact, as Aramco prepares for the IPO, much remains uncertain about the company, whose operations are tightly entangled with the government.

That dynamic could change with the IPO, as investors demand hard facts—if the offering goes through as planned, that is. In October, unnamed sources told the *Financial Times* that Aramco might prefer selling a stake privately. A few days later, Reuters reported that Chinese energy giants PetroChina and Sinopec had offered to buy 5% of Aramco directly—an option that could allow the Saudis to raise capital without making its financial details public.

Aramco is certainly not accustomed to answering probing questions. The company declined to confirm to *Fortune* several details, including the number of its rigs, the percentage of reserves already produced, or how much oil is left to pump—all details that shareholders might want to know.

Also unknown is how much money Aramco spends on nonessential work like overseeing high-profile building projects. The government has for years handed such tasks to Aramco, which has a reputation for first-rate project management. "These people are world-class athletes, and the most meritocratic organization in the Arab world," says Sam Blatteis, a U.S. business consultant in the region. When the late King Abdullah decided to create the country's first co-ed university near Jeddah a decade ago, he tapped Aramco to manage the $20 billion construction. Aramco also oversaw the construction of a petroleum research institute outside

1957

Geologists reveal the mammoth size of Ghawar, in Saudi Arabia's eastern desert. It remains by far the world's biggest conventional oilfield.

1980

The Saudi government buys Exxon Mobil's and Chevron's stakes in Aramco and renames it the Saudi Arabian Oil Company.

2018

Saudi Arabia has announced plans to sell 5% of Aramco next year in potentially the biggest-ever IPO. But will the Saudis actually go through with it?

BOTTOM: DMITRI KESSEL—THE LIFE PREMIUM COLLECTION/GETTY IMAGES

Riyadh, designed by famed architect Zaha Hadid. And in Dhahran, company staff excitedly led me through the spectacular new King Abdulaziz Center for World Culture, built by Aramco, with a theater, library, and art museum. Journalists have widely reported that it cost $800 million, but Aramco refused to reveal the price. The company has in the past said the government reimburses it for these projects, though it has offered little information about the financing.

And yet another question remains: Does Saudi Arabia really have 260.8 billion barrels of recoverable oil reserves, as it has stated for decades? That detail will greatly impact the IPO, when investors decide what Aramco is worth. Under SEC rules, the company must have an independent audit of its assets, for which Aramco has hired two Texas companies, according to Reuters. But experts question Aramco's reserve figure. "The reserve figure has been constant for decades," says Kate Dourian, an energy analyst for the International Energy Agency in Paris. "No one really knows for sure as there has not been a published audit." When I ask CEO Nasser to explain, he says the number is unchanged because Aramco has discovered new fields while it pumps oil. Besides, he says, whoever needs to know, knows. "You always need to be transparent with your shareholders. We have one shareholder," he says, referring to the Saudi king, with whom he was flying to Moscow the next day. "When we go public, we will be more than happy to share all the data, as soon as we are listed."

FOR ALL THE OPAQUENESS in Saudi Arabia, the country is changing fast. That is clear from the moment you land. In late September, Saudis watching the state-run evening news suddenly saw an official reading a proclamation they never dreamed they would hear: Starting in June next year, women will be allowed to drive. The response was electric. By the time I arrived one week later, driving seemed about all people wanted to talk about. "Things are totally changing," Nelly Attar, 27, a fitness instructor, told me in Riyadh; she opened a gym this year after the government finally granted women gym licenses.

"WHEN WE GO PUBLIC, WE WILL BE MORE THAN HAPPY TO SHARE ALL THE DATA," SAYS ARAMCO'S CEO OF ITS RESERVE FIGURES. "AS SOON AS WE ARE LISTED."

Powering the change is MBS, the young prince, and his ambitious vision plan—of which Aramco is the lucrative centerpiece. At 82, MBS's father, King Salman Bin Abdulaziz Al Saud, is believed to be headed to retirement soon, and when he picked MBS as his successor in June, the more cautious old guard was pushed aside. Now there are countless small changes underway. Developers say they are building shopping malls with movie theaters ready to open—just as soon as the government makes it legal to have cinemas in the Kingdom. "For the first time there is an alignment between what society wants and what the economy needs," says the Strategy& consultant Halaoui.

Those wants are urgent. Among Saudi Arabia's 32 million people, an astonishing 60% are younger than 25. The official unemployment rate is about 12%, but the IMF estimates it's more than double that for youth. For the government to keep that next generation from leaving Saudi Arabia—or revolting against their rulers—they need to create millions of jobs in a vastly expanded private sector. MBS's vision does not include Western-style democracy. What's more, the government will cut subsidies on basics like gas and trim the bloated public sector. All that will need a ready injection of cash from Aramco. "The economic diversification program hinges on the success of the IPO," says Dourian of the International Energy Agency, who regularly visits Saudi Arabia.

The world of malls and women's gyms in Riyadh is a galaxy away from the remote desert field of Shaybah, where 1,200 Aramco workers toil in virtual isolation and climb the high dunes once a month to eat dinner under the dazzling stars. And yet the future of these two worlds are closely intertwined. Having carved out a supergiant field in the sweltering desert of the Empty Quarter, Aramco has proved it can keep pumping oil under almost any conditions. The company has even created a wildlife sanctuary on the land, with desert gazelle, ostrich, and oryx. Since opening in 1998, the facility now pumps crude from about 300 wells, then sends it across empty land through 397 miles of pipes and out on to the world market. "These are the moneymakers for us," Shaybah manager Al-Jamea says, pointing to the computers that count the oil pumped each day. That money, with Aramco's IPO, may be the making of a changed company—and maybe also the country itself.

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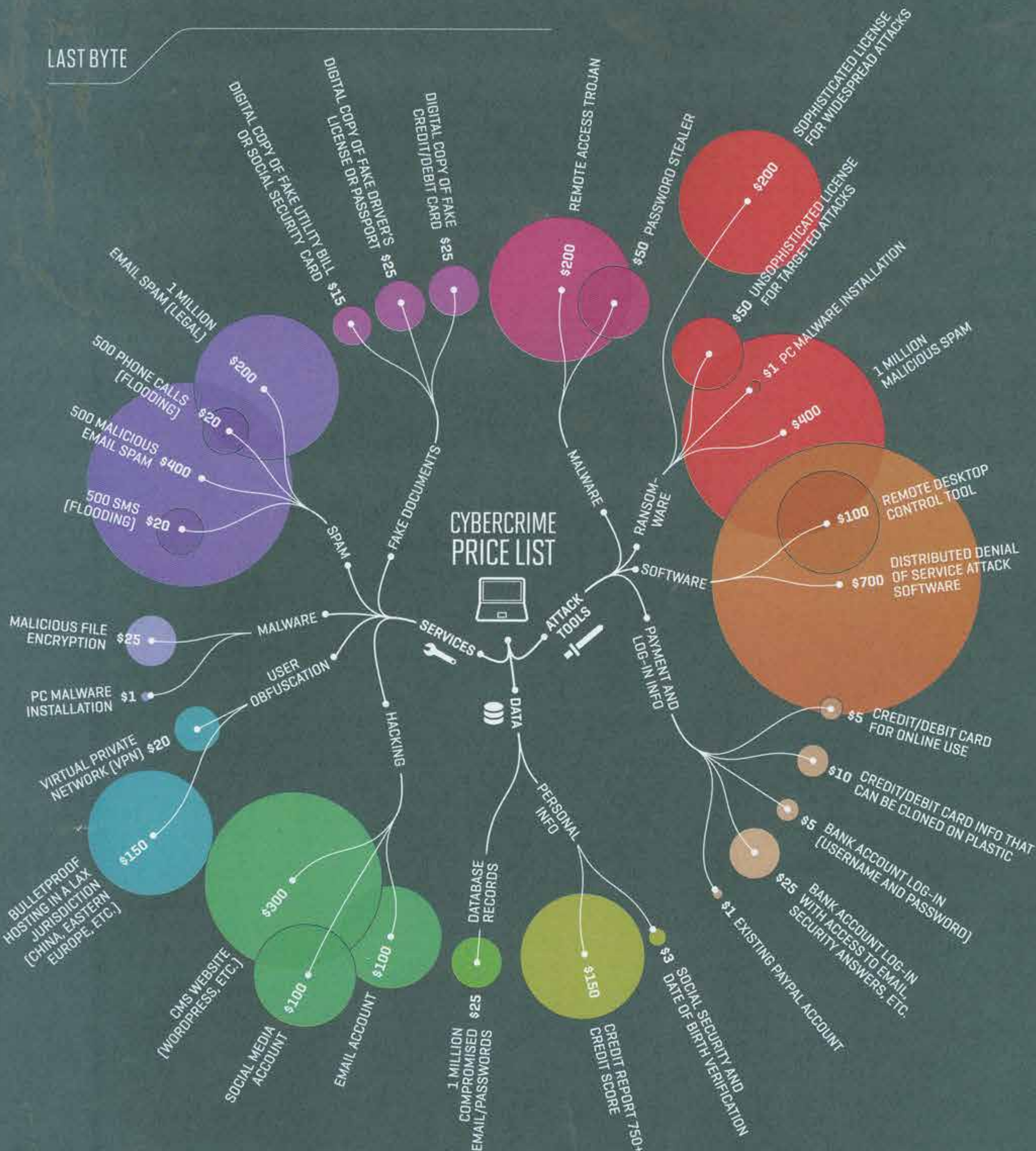

A HACKER'S TOOL KIT

CYBERCRIME IS growing ever more pervasive—and costly. According to researcher Cybersecurity Ventures, the annual cost of cybercrime globally will rise from $3 trillion in 2015 to $6 trillion in 2021. Enabling this boom are thriving marketplaces online, where hackers sell tools and services to criminals. Virtually anything is available for the right price, points out Andrei Barysevich, director of advanced collection ("a fancy name for 'spy,'" he says) at threat intelligence firm Recorded Future. A former consultant for the FBI's cybercrime team in New York, Barysevich trawled the shadiest corners of the web to compile the cybercrime shopping list above, exclusively for *Fortune*. In the market for some basic malware? It'll cost you as little as $1. **—ROBERT HACKETT**

SOURCE: **RECORDED FUTURE**

GRAPHIC BY **NICOLAS RAPP**