the future of your work
fromto
everything you wanted to know but were afraid to ask
Cognizant
Center for
The Future of Work

Chronicling the Ever-Morphing Nature of Work

Though the future of work will always be in the future, the future of *your* work has never been closer. The rise of robots, machine intelligence, distributed ledgers, quantum physics, "gig" labor, the unexaggerated death of privacy, a world eaten alive by software — all these trends point to a new world that's shaping up quite differently from anything we've ever seen, or worked in, before.

For almost the last 10 years, the Center for the Future of Work has been cataloging and commenting on these developments, as well as a whole host of other extraordinary workplace dynamics. We coined the term "the SMAC Stack,"[1] signaling the combinatorial power of social, mobile, analytics and cloud technologies, which have fundamentally changed every business around the world. We identified the power of "Code Halos,"[2] which have been at the heart of the FAANG success story (Facebook, Amazon, Apple, Netflix, Google) but have now become the seeds of an era of surveillance capitalism. We called out the importance of customer experiences and the potential of augmented reality. And we laid out a game plan for humans (and the organizations they work in) for the coming times *when machines do everything*[3] — including proposing *42 Jobs of the Future*.[4]

But in these 10 years, we've never attempted to pull together all of our analysis and insights into *one* report. This report is that: a collation and synthesis of the most powerful technological, business and societal trends that we see impacting us now and in the immediate future, presented in an easily digestible format, which can act as a central source of a new emerging ground truth.

In short, *From/To* is a state of the union for the future of work.

The name of our report implies its format and structure: "from" describes where we are, and "to" describes where we're going. As the French writer Simone de Beauvoir put it, "To make something good of the future, you have to look the present in the face." Futures are always a reaction to the present; tomorrow is always a judgment on today. By training a microscope on how we work now, we can try to figure out how we're going to work when this day is done.

The report covers 42 ideas organized around five main themes:

- **The Way We Work:** How we do what we do.
- **The Tools of Work:** The apps, systems, networks, tools and processes that we use to work.
- **The Aesthetics of Work:** What work looks like; how it feels.
- **The Issues with Work:** When and why work is work.
- **The Meaning of Work:** What gets us out of bed and makes us proud.

Ranging across technologies (qubits and containers), business models (gigging and decentralization) and demographics (hoodies and privacy), we outline what we consider the most important trends that will change what you do and how you do it — be you a chief executive, a student, a politician or a salary (wo)man.

Whether you're excited by the future or fearful, this is no time to not be paying attention. The future of your work is changing — this report is your field guide.

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Why 42 ideas?

Because as author
Douglas Adams pointed out,
it's the answer to life,
the universe and everything —
and everything surely must
include work.

theway**we**work

From Hierarchy to Wirearchy

THE ELEVATOR PITCH:

Hierarchies are a disconnect in a networked world.

Meet Gary: He works as a production manager in a Fortune 500 firm.

He knows his role well — the tasks for which he's responsible and the number of hours he needs to spend at work. And he's committed to following orders from his seniors. Gary knows there's a defined path for climbing the corporate ladder: a specific degree, X number of years of service and the opportunity to skip some steps (if he's good at office politics). He walks it every day. For Gary, following this path makes it much easier to see, decode and understand the pecking order of the corporate world.

Regardless of size, industry or location, most organizations currently operate using a command-and-control hierarchy. From caste systems to feudalism to royalty and politics, human society has mostly been composed of hierarchies. In fact, power relations exist in most systems involving humans, whether formalized or not: A soldier fighting a war is doing a service for his country; a consultant working on his presentation slides is adding value to the client's business; an educator is teaching tomorrow's citizens. Each of us is busy pursuing a mission as part of the hierarchies around us.

Hierarchies enable our feeble brains to easily process our work contexts through well-defined business roles, and their tight organizational structure keeps the chaos out and the order in.

Although hierarchies have worked for hundreds — if not thousands — of years, they're not working anymore.

Millennials prefer to work in wirearchies (a term coined by consultant and author Jon Husband): dynamic networks of connected nodes, free of predefined priorities or ranks. The agenda of the formal hierarchy is misaligned, and often in conflict, with the realities of the modern wirearchy. In a wirearchy world, making partner or becoming vice president no longer signifies that you've "made it," and it's no longer sufficient to be superficial cheerleaders or promoters for each other. Instead, the new key to success lies in building and nurturing deep, trust-based connections each time virtual connections are combined with real, physical interactions.

This doesn't mean hierarchies will entirely become extinct. The best model is a hybrid of the two, balancing the former's formal organizational chart with more informal and fluid authority structures. In this model, managers like Gary will be empowered with networks and platforms to connect, create, accomplish, work, understand, stand out, fit in and get smarter to help improve their companies' performance.

In the future, giant leaps in workforce productivity will be the result of collective collaboration rather than individual excellence. So, if your company is still applying Industrial Age working practices to the work patterns of the Information Age, it might be time to consider changing direction. **/MB**

THE BOTTOM LINE:

The future of organizational structure is a balancing act between hierarchy and wirearchy.

From Jobs to Tasks

THE ELEVATOR PITCH:

Jobs are deconstructing into tasks. Say goodbye to job titles and hello to job descriptions.

We cling to our job titles as a fundamental piece of our identity.

When we introduce ourselves, we talk about our jobs: "I'm a doctor," "I'm an IT consultant." Our jobs convey who we are, and the shorthand of our titles allows us to judge and be judged, at cocktail parties, in the gym, in the office. When we're young, our job is typically a minor element of our personal identity, and job-hopping is a way of trying on different identities. Maybe I'm a marketing person, maybe I'm a teacher. But as we age, and we settle down into a niche, our identity becomes fixed and fused with whatever we do to put bread on the table.

Is it any surprise, then, that intense fear-mongering is sparked by the rise of robots? People — particularly more middle-aged people — are unable to conceptualize how their work is changing because losing a job element to a machine feels like the death of a piece of their identity. If I'm a doctor and now a machine is a doctor — *a better doctor* — then what am I?

By thinking this way, people freeze their mental model of what work is and limit their ability to reinvent themselves, to morph and change as work does, and even find a better, more meaningful livelihood.

The future of work requires us to think about work far more fluidly and accept lifelong change and reinvention as a fact of life.

The work ahead will shift considerably throughout one lifetime, especially with that lifetime getting longer and longer. The first person who will live to 125 has possibly already been born.

Unlocking the shackles of the "job" requires nothing more than a simple linguistic shift. The next time you read a fear-mongering headline, try replacing the word "job" with the word "tasks." You'll see that it's not whole jobs being automated but certain aspects of the job. That's why we predict that 75% of work will be *augmented* by intelligent machines, not obliterated.[5]

The efficient divvying of work between humans and machines will happen at the task level. Intelligent machines will take on the "science of the job," while humans master the "art of the job." Wave goodbye to repetitive tasks that no one wants to do (think: form-filling) and welcome with open arms the kind of work that deserves that prime spot on our LinkedIn page: brainstorming, complex problem-solving, ideation.

By considering our work in tasks, instead of as jobs, we enable an infinitely more fluid career. We're able to pivot from task to task without being stuck in the outdated notional confines of the job.

The next cocktail party you attend, rather than asking simply "What do you do?", instead ask, "What *tasks* do you do?" **/CS**

THE BOTTOM LINE:

Breaking down work into tasks is the most sustainable way to segue into a fully-fledged human-machine workforce.

From 8x5 to 10x4

THE ELEVATOR PITCH:

The working week is dead. Long live the working week.

The 40-hour, five-day work week is a product of the First Industrial Revolution.

Robert Owen, one of the 19th century founders of the cooperative movement, marketed his radical idea of ending the excessive, abusive work practices of the day with the slogan, "Eight hours' labor, eight hours' recreation, eight hours' rest."

So successful was Owen's campaign that the notion of a standard working week has become ingrained in our concept of what work fundamentally is. The working week *is* five days — 9 to 5, Monday to Friday, followed by a weekend. This seems so platonically right that those who don't work to this rhythm seem to operate in an odd netherworld that doesn't smell quite right. We sort of feel sorry for the nurse on the nightshift; we'd look at someone who chose to work from 2 pm to 10 pm and took Wednesday and Thursday off as a bit of a weirdo.

So normal is the "9 to 5" that we can all hum the song, and most British people of a certain age know that "a Mars a day helps you work, rest and play." (Owen's utopian dream reduced to a slogan of capitalism; how ironic.) Forty hours as the standard unit of human labor was further solidified by the "commute" — another product of the First Industrial Revolution; "going to work" literally implies work is elsewhere. If the commute eats into "our" 16 hours, then work better stay in "its" eight hours. In its five days.

But now, in the latest industrial revolution, work is everywhere and anywhere and all the time — when we're at our desk and in the checkout line. In the conference room and in the bleacher seat watching our kids play sports.

Many of us now work "5 to 9" (am to pm), checking email first thing in the morning and last thing at night — in bed.

Work is literally and metaphorically in the palm of our hands. Unchained from a physical place and a punch clock, we no longer go to work ("on time") at all — work comes to us, at all hours of the day. This diffusion of work — away from the factory, away from the office — breaks the very idea of a standard unit of human labor.

But yet, the 40-hour work week is still so deeply embedded in our sense of the contract between employer and employee that abandoning it altogether feels an unnatural act. The compromise emerging — that recognizes the fluidity of work but also the need to stop it from eating us alive — is the four-day week. Ten hours a day, four days a week. *Some* structure, but more time *unplugged*. The digital Sabbath (Friday naturally) is all the rage. **/BP**

THE BOTTOM LINE:

Every weekend should be a long weekend.

From PAs to RPAs

THE ELEVATOR PITCH:

Robots won't steal your job; their help will make it way better.

From the king's retinue a thousand years ago to the loyal butler Mr. Carson in *Downton Abbey* — assistants have always made work easier for us.

After 1950, every executive from *Mad Men's* Don Draper to MI6's James Bond had a personal assistant.

But by 2000, Microsoft Office made office typing pools, secretaries and personal assistants redundant. Individuals did their own scheduling, typing and printing. Cost-cutting contributed to this trend, but for senior executives back then, getting access to a local-area network and an email address to "do it yourself!" seemed cool. Who needed a PA when you had a PC?

The tradeoff for the "department of do-it-yourself" was, of course, extreme inefficiency. The amount of time you can spend booking travel, doing expenses, getting a presentation template or obtaining a factoid on your corporate intranet is a time-suck. Instead of "Welcome to the future of work," too often it's, "Welcome to the office intranet — your password was denied."

Increment by increment, critical time for thinking strategically gets whittled into 30-minute buckets on your Outlook calendar.

Rather than preserving this status quo, we should be liberating individuals to do more fulfilling, more enjoyable, more lucrative work.

In short, your new PA is going to be an RPA: a robotic personal assistant. The term "RPA" can convey the wrong impression; Robby the Robot or "the Borg" aren't running around the office — yet. Still, "Beat the bot!" remains a battle cry across wide swaths of workers.

And yet we use Siri, Alexa and GPS tools today — they're all essentially robotic personal assistants. Imagine going from LaGuardia Airport to Newark and crossing midtown Manhattan during rush hour to catch a connecting flight. Would you *ever* try this (and catch your flight, on-time) without using GPS?

Marvel's J.A.R.V.I.S. didn't wait for an email to save Iron Man — he predicted needs. As "bots not apps" gathers momentum, a J.A.R.V.I.S-like robotic personal assistant aggregating software layer — with voice as the default interface — will emerge as the dominant model. Already, robotic assistants like Google's Duplex voice bot (for reservations) and x.ai's Amy Ingram (for scheduling meetings) are yielding huge productivity and creativity gains.

When we asked over 2,000 senior leaders what skills they need in five years, without exception, every skill was a *human* skill — and they needed an average of 15% *more* of *all* of them. So why doesn't every doctor, lawyer, teacher or rental car agent start using robotic personal assistants to "find their 15%"?[6]

To beat the robots, we'll need to join them. Robotic personal assistants will help buy back at least that 15% capacity (or more) needed for the skills of tomorrow. **/RB**

THE BOTTOM LINE:

Your new favorite assistant at work will be fueled by ones and zeros, not coffee.

From Buying to Leasing

THE ELEVATOR PITCH:

The cost of ownership exceeds the point of ownership.

Ownership has long been a bedrock of the modern world.

Our house, our car, our land. Ownership is *the* marker of affluence and success for many in Western society. Think of the joy you experienced when you bought your first car (no matter what condition). Or the pride and trepidation you felt when receiving the keys to your first mortgaged home. These are milestones in many individuals' lives that give them a measure of achievement.

Car ownership is often the first signpost on the journey to adulthood and represents a taste of true adult independence. One only has to take a walk down any suburban street to see how this has played out — driveways and garages packed with cars.

Of course, the car is just one indicator of obsession with ownership; Western consumer-based economies have traditionally fetishized the need to own things — watches, paintings, koi carp, houses, software. If you're not buying and conspicuously displaying your trophies, you're either moderately poor, extraordinarily rich or simply not playing the game. In the immediate wake of 9/11, President Bush extolled us all to go shopping. To buy and *own* things.

However, the tide is shifting, and ownership of physical assets is losing its seductive power for those entering the market.

Younger buyers are questioning, why spend $40,000 on something that sits idle for 23 hours a day? Why buy a $1,000 suit to only wear it four times a year? Why strain my finances to rent office space in Manhattan? Why spend the time and trouble running my own servers? It used to be that these things made sense. There was no alternative. But increasingly now there is, and they don't.

When I need a car, I book it on my Zipcar app. When I need to look sharp, I click on Rent the Runway. When I need more space, I speak to my WeWork community manager. When I need an extra terabyte, I click an API.

For a generation of consumers who will never be able to afford their own home thanks to the house-price-inflation/pass-the-parcel game their parents have played in an era of stagnating wages, this model will become increasingly attractive — indeed the norm. Ownership is becoming a bug in late-stage Western capitalism, not a feature.

While many might question how quickly this cultural step change will play out, remember that the move from physical maps to Google Maps, from snail mail to email, and from cable to Netflix happened in the literal blink of an eye. Keep yours open. **/MC**

THE BOTTOM LINE:

The linkage between ownership and wealth is withering. Soon it will be broken.

From Bad Robots to Good Human Beings

THE ELEVATOR PITCH:

Bad robots are running wild. Only good humans can tame them.

If there's one thing all our years of movies, TV shows and video games have taught us, it's that although robots do many good things, they can also do things that are unimaginably bad.

Some shocking examples of bots gone bad include fake videos, fake news, influenced elections, biased results, inaccurate medical recommendations and privacy encroachment. Robots have also perpetrated fraud, gained illegal profits via high-frequency stock-trading and lied to sway results in their owner's favor. Their algorithms encourage *winning* at any cost.

The specter of bots perpetuating errors is tough for humans to take. Consider that while thousands of pedestrians are killed each year by human-controlled automobiles, these tragedies don't make for national or global headlines — as would a fatality caused by a self-driving car. It's frightening to feel helpless when handling issues we can't even see, let alone control.

We still have no idea how bad robots could become, or their potential to develop behaviors that are dangerous, inhumane and beyond our control. However, the reality is that bad robots are emerging everywhere, and we can only sit back and hope we don't get caught up in a preview of the latest *Terminator* movie in the making.

Who's to blame for designing and developing all these emerging bad robots?

Obviously, humans. The creation of AI gone wrong reflects the fact that human bias and mistakes exist in machine learning from the creation of an algorithm to the interpretation of data, and until now, not enough effort has been applied to addressing this problem.

Fortunately, bad robots are the best tool we have for understanding how to be good human beings. We know from experience that making machines look or act more human doesn't work — and that what we really need is to ensure the presence of human norms (and human morality) behind a machine's design.

To make this a reality, humans need to stay in the driver's seat when designing and taming robots. For starters, machine designers could develop clear mechanisms that pass control back to humans when baselines and thresholds are exceeded. Clearly, humans would need to be ready for the hand-off. There should also be greater transparency into how well developers, engineers and designers inject ethical values into intelligent machines that guide outcomes.

It's time to figure out how intelligent machines fit into a world that is and will ultimately remain a human domicile. It's not enough to expect people to simply trust machines. Instead, trust must be developed by enabling us to understand the humanity behind the machine. **/MB**

THE BOTTOM LINE:

Good humans are still needed to avoid good robots turning bad.

thetoolsofwork

From the Thumb to the Voice

THE ELEVATOR PITCH:

This may be the digital age but digits are becoming superfluous.

The graphical user interface innovations of Xerox in the late 1970s gave birth to the mouse, which combined with the keyboard to become the ultimate tag team in computing.

We've been tapping keys, clicking and scrolling ever since. With the rise of smartphones 30 years later, those inputs gave way to thumbs furiously typing and swiping on touchscreens. As phones grew ubiquitous, touchscreen interfaces expanded to our cars, restaurants, banks and any other instance that calls for digital interaction. The intuitive design of touchscreens enabled computer literacy for young and old, as well as unprecedented mobility and accessibility to computing — so much so that the rest of our lives began to bend to the will of it.

As a result of our phone addictions, "sore thumbs" don't stick out at all anymore. Pain and stiffness of the thumb has become a fact of life for some and a recurring nuisance for others. Our vision is worsening, and our posture grows more hunched and stooped by the day. The hand-eye coordination required to use touchscreens prevents us from engaging in other activities while using them. After a decade of zooming, pinching and swiping right, the future of computers calls for a resounding thumbs down on these tactile interfaces.

Did you ever see Captain Kirk type?

Of course not! He just talked to the computer. In our unending search for convenience, the clickable interface is old hat, replaced by voice-activated interactions with devices that listen to us, enabling operations without touching or even looking at them. Personal home assistants led the charge of voice-activated appliances, but the technology is swiftly expanding to all manner of devices. Mics are now tinier and cheaper than ever. Voice processing technology is steadily improving. The most advanced systems are able to discern specific voices amid the cacophony of a crowded room.

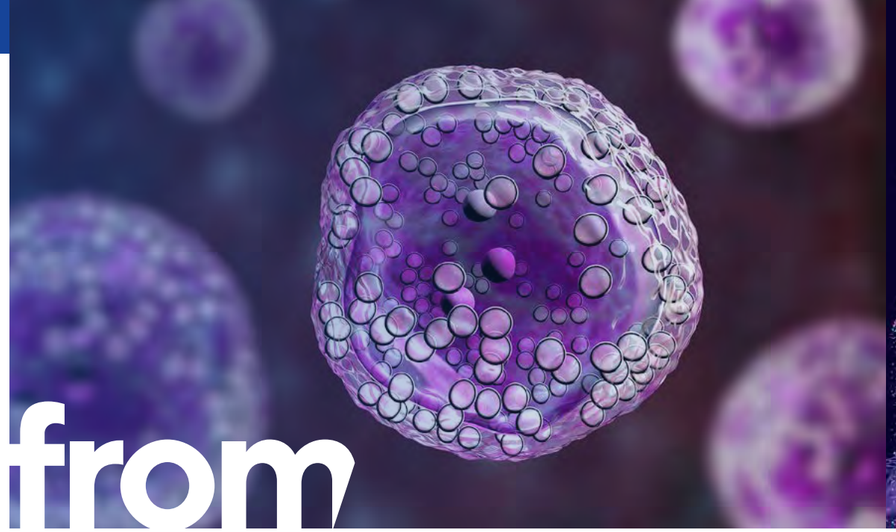
Major appliance makers already tout their intentions to fashion all their products with microphones. Voice UX designers will need to forge the path forward by designing interfaces that account for accents, colloquialisms, differing languages and all the other idiosyncrasies of the human voice.

Fully shifting to a screenless, touchless future will return our attention to things that matter most and return a modicum of safety to activities like driving. But what does a world of always-on microphones sound like? Ubiquitous voice activation further erodes any sense of privacy remaining from the smartphone era. No need to whip out your phone and hit "record" when the refrigerator is already fixated on every uttered word. Now if a tree falls in the forest and nobody hears it, we'll just ask Alexa if it actually happened and what it sounded like. **/DD**

THE BOTTOM LINE:

The winds of change are blowing, and your devices hear it all.

From Microscopes to Datascopes



THE ELEVATOR PITCH:

Just as microscopes changed medicine, AI is a "datascope" that will give new insight to solutions previously thought unimaginable.

In 1831, Manchester Royal Infirmary in the UK used 50,000 leeches per year to treat ill citizens of the first great industrial city.

Twenty years later, John Leonard Riddell of Tulane University invented the first practical binocular microscope. By 1930, Manchester Royal Infirmary finally closed its leech aquarium.

Why? Riddell's technology allowed doctors to see — at a cellular level — what was truly causing the problem. A microscope could detect the bacteria causing illnesses like tuberculosis, an intestinal infection that would lead to cholera, a cell mutating into a cancer. The medical microscope not only made the leech redundant but also created an industry that today employs millions of people around the world, and in the process made the world a better place.

In the transformation from leeches to microscopes, did Riddell destroy anyone's job? Yes, probably. But microscopes were central to the explosive growth of healthcare that led to the population and economic growth that made the modern world.

Nobody today would argue that we should have stayed in a leech-based paradigm. Of course, if your current business model is a modern version of leech breeding or retailing, then AI *is* bad news. You may be able to eke out a living for a generation or two, as leech magnates did until 1930, but nobody mourned their passing, and nobody will mourn the passing of their modern equivalents.

Just as Dr. Riddell's microscope yielded new things to do, our new AI tools will function as "datascopes" — in medicine and every other industry — allowing businesses to see more data, integrate it with other data and make decisions faster than ever before.

The next generation of lawyers will likely argue that doctors who don't use AI tools are guilty of medical malpractice.[7] In another generation, using non-AI-infused technology will seem as anachronistic as using leeches does today.

AI will allow radiologists to see more data (e.g., pixel biopsies), integrate that with other information sources ("multilayered data" in medical parlance) and make faster decisions. This approach is also transferable to many more disciplines and business processes.

Think of AI not just as a tool that reduces the labor component of a process, but also as a means to increase the overall scale of the process. AI will allow us to grapple with a world awash with information that is denser, more complex and coming at us faster than ever before. It will open new opportunities for commercial growth and levels of employment for billions, and make the world an even better place. **/BP**

THE BOTTOM LINE:

New tools don't just "automate people away;" they allow people to do things they've never been able to do before.

From Code to (Nearly) No Code

THE ELEVATOR PITCH:

Software is eating the world. Including software.

From the dawn of cyber time, the computer world has pivoted around code — and coders.

Way back when, before handheld devices, packaged software, client/server and cloud-based server/client computing models became *de rigueur*, there were two choices: hire experts to roll your own code or contract with expensive third-party specialists to build enterprise-grade software. Either way, the development process was arduous; it took weeks or months for coders to thoroughly understand the requirements, and then months — if not years — to build, test, pilot and then deploy production code.

In those days, coding was a bit of a solitary affair. Sure, it was performed by groups of coders, each hoping their bits and bytes neatly fit into the cohesive whole of a multi-megabyte program. But once IT received the programming order and documented the need, there was little coordination or collaboration between the programmers sitting just outside the basement data center and the business "suits" toiling upstairs in corner offices.

In recent times, Agile methodologies have changed the coding equation. Programmers now engage early and often with business experts through a series of "Scrums" and "Sprints" to rapidly prototype and build industrial-strength software. Yes, the outcomes are often achieved more quickly and result in more fit-for-purpose code. But what if organizations could bridge the expertise gap that divides business guru from coder extraordinaire?

Now, platforms are emerging that allow developers and non-tech professionals to rapidly create software without writing much more than a stitch of code.

These platforms provide WYSIWYG editors, drag-and-drop components and models for visualizing workflow that accelerate app design and assembly (known as RAD). Some focus on specific business areas, such as accounting; others tackle more grandiose challenges, such as full bodied e-commerce software suites. And in many ways, they represent the future of software development.

Interestingly, it's not just fairy-dust unicorns that are pushing the no- to low-code RAD agenda. Household names such as IBM and Salesforce.com are on the front lines of the nearly no-code game.

While devotees of less code see their initiatives as a highly effective way of automating, modernizing and simplifying app dev, a more meaningful selling point is its ability to translate ingrained business insights into more purpose-fitting, business-advancing software. In fact, these methodologies could well be the elixir for turning "zombie IT" into a force for good, as more and more functional experts overcome their app dev fears and apply their knowledge in more business-productive ways. As such, low- to no- code RAD could tear asunder long-lingering operational silos that separate those who write code from those who benefit from it.

Of course, if less code is good for business people to glom onto, professional developers won't be far behind. But they'll need to get with the program, culturally speaking. Gone will be their ability to hide beyond syntactical nuances and programmatic structures that have long separated coders from the rest of us. **/AA**

THE BOTTOM LINE:

Low- to no-code apps are democratizing how enterprise systems are built, deployed and extended.

From Insecurity to Security

from

to

THE ELEVATOR PITCH:

The future of work rests on flimsy foundations.

We are on the cusp of a "great digital buildout," in which technology becomes embedded in, and central to, every aspect of modern society.

This wave of development rests, though, on one fundamental assumption: that the technology on which the future is built is safe.

One would have to be a very good advocate to argue that today. The 2016 U.S. election was hacked. Pentagon satellites have been hacked. North Korea's missile launch program is repeatedly hacked. Film studios are forced to pay ransoms to stop criminals releasing movies before their official launch. Pacemakers are hacked. Cars — both of the human-driven and autonomous variety — are hacked. It is clear that the computer technology we are using today is entirely unsafe.

Fortunes and fates rest on the flimsiest of foundations; even the bluest of blue-chip corporations (and the most deep-pocketed) admit (off the record) that they have been (and continue to be) repeatedly hacked. Our ability to function amid this truth stems from our individual and collective ability to ignore and deny it.

Personally, most of us take comfort in "security through obscurity." Collectively, most of us take comfort in, "That's John — or Vivek's — problem, not mine." No one and nothing is really safe. If you're wondering if you've been hacked, you probably have been.

As Aaron Levie, CEO of Box, put it, "If you want a job in five years, study computer science. If you want a job for life, study computer security."

Making our connected homes, buildings, planes, operating theaters, parliaments, bank vaults, classrooms and virtual reality environments safe and secure is the most important (and limitless) job of the future. How do we do that? Well, start by taking your cybersecurity budget and quadrupling it.

You may think you're spending a lot of money already, but you're not. Large banks spend hundreds of millions of dollars on cybersecurity — which sounds good — but in truth, those amounts are typically less than 1% of their entire IT budget (which in turn are typically less than 10% of annual revenues). Given that market capitalizations of hundreds of billions of dollars rest on these foundations, this makes no sense.

Unless you're long on pigeons and Faraday cages (or your play is simply to have a high-end crisis management firm on retainer) you have no choice but to upgrade your cyber defense. Next step: Ask your local friendly Mossad agent for the contact info of one of the leading Israeli service providers and arrange an after-hours sales call. You'll be horrified by what they tell you (from an exposure and remedial cost perspective), but a drop of prevention is still worth an ounce of cure. As it is, the future of your work rests on quicksand. You need some graphene rebars pronto. **/BP**

THE BOTTOM LINE:

You can't spend enough on cybersecurity; quadrupling your current number is a start.

From Petascale to Exascale

THE ELEVATOR PITCH:

Modern computers have never been so fast. But will never be so slow again.

The first commercial computer, the ENIAC, just celebrated its 74th birthday.

ENIAC was fast, by mid-20th century standards: It could calculate 5,000 instructions per second. That was a technological marvel that helped win the Second World War and develop nuclear energy.

Fast-forward to today, though, and the ENIAC looks like a protozoan crawling out of the primordial soup. Operating at *one million billion instructions per second*, the Sunway TaihuLight, the Blue Waters, IBM Sequoia and a small number of other petascale computers move at literally unbelievable speed. Magnificent feats of engineering skill, these computers have required enormous leaps in computational science, algorithm design and hardware miniaturization, which have enabled breakthrough work in areas such as climate science, quantum chemistry and brain simulation.

The scale and trajectory of the development curve from the 1940s to the present day can only really be comprehended relative to other technological developments — planes were already flying at over 700 mph by the 1950s (faster than most commercial airliners today), and Malcolm Campbell's Bluebird hit 300 mph (faster than today's Formula One racing cars) in *1935*. Imagine if the computers we had today hadn't really sped up much since then. The world we are living in simply wouldn't exist.

Though petascale computers are still mainly the domain of governments and research universities, the underlying technology is filtering into the tools many of us have in our hands — an iPhone 6 can process 3.36 billion instructions per second.

But we ain't seen nothing yet.

The next frontier of speed — exascale computing — is already in sight, and pioneers are showing up to stake a claim. Aurora, a project led by Intel and Cray, and set to be installed at Argonne National Laboratory, will run 1,000 times faster than today's petascale machines. Breaking the *quintillion* threshold (a billion billion instructions per second) Aurora will be the world's most super supercomputer. Exascale computing will be another step toward futuristic science fiction visions becoming real: the Artificial Superintelligence from *2001: A Space Odyssey*, the "pre-crime" system from *Minority Report*, the Proteus submarine from *Fantastic Voyage*.

With computers this fast, the only limits on the future will be our imagination. Speaking of which, the most exciting target of exascale computing is the processor inside our heads. The Human Brain Project, a European Union-funded initiative involving a who's who of neuroscientists, technologists, philosophers and biologists, seeks to crack one of the greatest mysteries of life: how the brain works. With everything up to exascale technology, this search has historically been the natural province of artists and theologians; with Aurora and other exascale computers, we may finally have the machines that, in the manner of an Escher painting, have the power to let scientists understand how we understand. **/BP**

THE BOTTOM LINE:

A new frontier of the future of work based on an exaFLOP of power is dawning.

From 4G to 5G

THE ELEVATOR PITCH:

The latest bandwidth spectrum will be the next phase of the digital revolution.

The higher the G, the faster the connection.

1G phones let us talk to each other on the move, 2G phones let us send messages, 3G gave us the mobile internet, and 4G made it a whole lot faster. We use 4G networks to stream music, listen to podcasts and watch live TV on the commute home — all unthinkable 10 years ago. Even the simple Facetime app that beams cousin Susan in New Zealand onto your phone? Impossible until the arrival of 4G.

The promise of blazing-fast data transmission speeds 10 times faster than 3G is the reason we addictively watch, tap, poke, pinch or swipe our smartphones as much as we do. Beyond the consumer experience, businesses understand the benefits of 4G. The speed of decision making in the field means much higher rates of productivity across departments, with sales, customer service or logistics citing the financial benefits from always-on connectivity at 4G speeds.

For those who can remember the hiss of a dial-up modem, 4G speeds have been astonishing. But in time, G's 4 through 1 will come to be regarded as quaintly as the Flying Scotsman train was in the middle of the aeronautical age.

The advent of 5G massively accelerates the data transmission speeds generated from a 4G network.

5G networks will be 10 times faster than today's cable internet, and 100 times faster than our current 4G phones. Imagine streaming your favorite Netflix movie in HD to your phone vs. streaming 400 of your favorite moves in 8K (16 times the resolution of HD) all at the same time. 4G connectivity gave so much, but more is to come.

5G supercharges every action, device or place with zero-lag interactivity. Brace for a wave of innovation as 5G data fuses with machine learning and sparks a world of incredible possibilities. Real-time interactions and synchronous processing will run with no lag whatsoever. The data transmission and its interpretation will happen instantaneously — you won't just see cousin Susan on a screen; you'll be sitting next to her avatar, in a shared virtual home and watch her speak.

Imagine putting on your headset and driving a car, piloting a train or controlling a robot on the factory floor as you sit on the other side of the country. You could be a farmer for the 21st century, commandeering a fleet of drones and soaring over the plains of the American Midwest, using sensors on the ground to sort, pick, feed and water every single individual plant. 5G will usher in a revolution in how value is created and how work gets done. **/ED**

THE BOTTOM LINE:

Fusing 5G with AI superscales the Internet of Things.

From Artificial Intelligence to Machine Learning

THE ELEVATOR PITCH:

AI is Hollywood's POV. Machine learning is Wall Street's.

To many, a sci-fi dystopia out of the deepest imaginings of Hollywood is upon us.

Technology luminaries worry about "summoning the demon" of artificial intelligence, "our biggest existential threat," with Stephen Hawking himself warning that AI could potentially be "the worst mistake in history."

We've been conditioned by decades of science fiction to think of AI as an anthropomorphic entity, with human characteristics like free will and enmity. So just when we celebrated fun AI moments like IBM's Watson on *Jeopardy!*, a morose existential angst opened in popular culture. The perils of artificial intelligence to humans were suddenly everywhere, from *Ex Machina* outwitting and gruesomely killing a man, to *Automata* and its classic, foreboding line: "Just a machine? That's like saying that you are just an ape."

But artificial narrow intelligence (ANI) is already being used to read X-rays and MRIs. It's at the heart of stock trading. Chat with Siri or Alexa, and you're using AI. Perhaps you've avoided a traffic jam using Waze or scheduled a meeting using x.ai. AI didn't kill you; it helped make your day easier (with no Terminators in sight).

Even as Hollywood, futurists, tech titans and philosophers debate these apocalyptic futures, the business end of AI — machine learning (ML) — is silently and dispassionately stripping out costs, speeding decision cycles and opening new vistas of creative possibility. Making money — big money.

The decidedly pragmatic ML of this type — without the alluring sci-fi elements — is our future. The algorithms that ML comprises are leveraging vast amounts of data, mostly in service of improving personal or business tasks, such as mortgage processing or claims management.

Yet still you may fret: "What about DeepMind's AlphaGo thrashing Lee Sedol, the human Go master? That's really bad for us humans, right?"

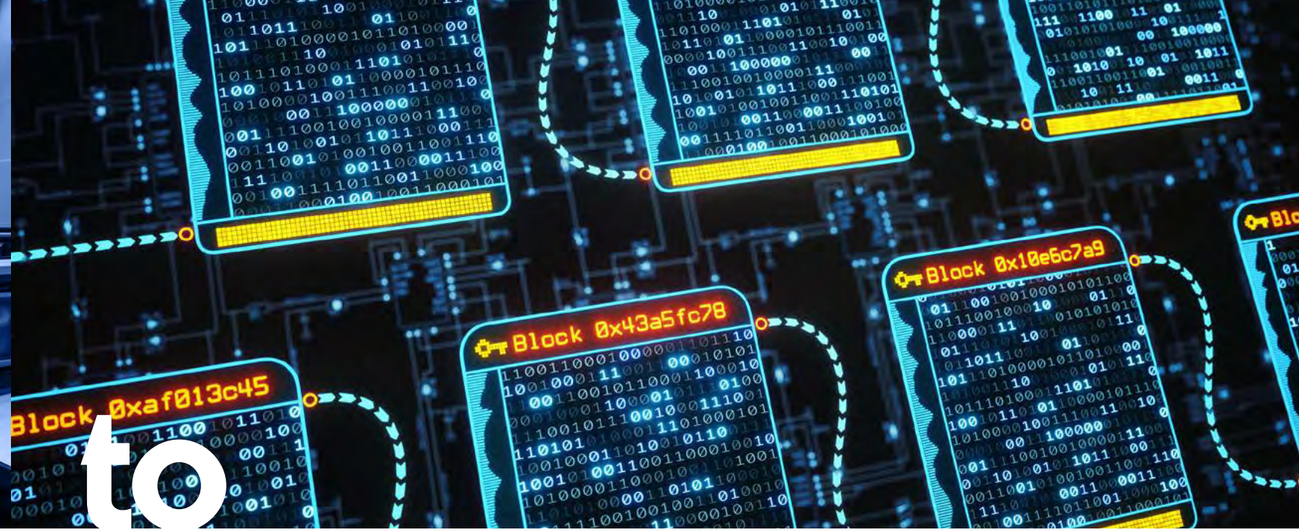
Au contraire: DeepMind's variant AlphaFold is geared toward diagnosis and treatment of diseases like Alzheimer's. Kebotix in Cambridge, MA, is synthesizing molecules that battery scientists might use to fight global warming. The Nature Conservancy is developing machine learning facial recognition software — for fish — to help threatened fish stocks. Your dad's sick with prostate cancer? You'll want his doctor diagnosing it with fractal-level ML from Google AI's team.

What's after that? It's artificial general intelligence (AGI) — machines with the same general intelligence as a human. But Stanford's Andrew Ng, who works directly on AI has said: "Worrying about [AGI] is like worrying about overpopulation on Mars before we've even set foot on it." Now *that* sounds like a plotline for a great new Hollywood script. **/RB**

THE BOTTOM LINE:

A post-Singularity future with super AI-based Terminators running amok is a mirage. Businesses full of machine learning software are a nailed-on cert.

From Centralized to Decentralized



THE ELEVATOR PITCH:

In the wake of the internet, new platforms threaten disruption, but decentralization will help the center to hold.

Modern technology gave people, businesses and societies tools for greater centralization and (especially) control.

But centralized anything — whether bureaucracies, governments, planning or governance — is often disjointed at best, and disruptive at worst.

Take the advent of ERP software: It promised to connect "islands of information." But with the elongated timelines to meet such ambitions, the initiatives tended to fall short of their intended benefits. And breaking that rigid, centralized legacy became tough in the aftermath.

Meanwhile the internet appeared, and sought to decentralize and open *everything*, be it in business, society or government. It's nearly 2020. Look around. You've never been surrounded by more technology. But has it bred optimism — or just "optimization?" How do your co-workers or neighbors — or *you* — feel about it?

At work, LinkedIn became the *de facto* org chart, but it also opened an escape hatch for the departure of great talent. At home, the family reunion's now on Facebook, but so are Uncle John's divisive politics. At city hall, Twitter keeps constituents informed of potholes but also blows up into vitriol and corrosive comments.

Nobody — yet — has gotten a handle on how to respond to the speed, intensity and breadth of change spawned by these digital usurpers. When the inability to respond is compromised, resilience is too. And when businesses, societies or individuals aren't resilient, you get "disruptions" and even outright chaos.

Decentralized expressions of free will, hope and trust are what make liberal democracies — and confidence in commerce — work.

And without them, the digital economy will fall apart.

Uber, Lyft and Airbnb succeed because of their convenience and cost-effectiveness. They also eliminate intermediaries. Peer-to-peer platforms like TransferWise for currency exchange, or GitHub for sharing computer code, are following a similar trajectory.

Meanwhile, blockchain may infiltrate the typical Fortune 500 company's operations — like finance — and eliminate the need for the "middle man." Entire industries — like banks, brokerage houses, insurers or legal firms — also lay in its path.

Playing out at massive scale, millions — billions — of times per day, how do you police bad behavior? If the "block" in the "chain" isn't verified, it's nullified. Among Gen Z online gamers, transgressors on platforms like Steam get exiled by community-initiated VAC bans that are permanent and non-negotiable. With potentially thousands of dollars in gaming fees at risk, it's enough to put a damper on any malefactor's plans to "disrupt."

As top academics Andy McAfee and Erik Brynjolfsson put it, "Overcentralization would create an economy that is simultaneously Orwellian and Kafkaesque." Like Newton's third law, technology is also empowering countervailing innovation and regulation that will render the "middle man/business/government" less relevant. Our future opportunity with decentralized platforms is to keep the best and junk the rest. **/RB**

THE BOTTOM LINE:

Decentralization — done right — will be the antidote to the polarizing disruption of the digital age.

From Software Development to Software Engineering

THE ELEVATOR PITCH:

It's the end of coding as we know it.

Just as pearls and rubies ignite a thrill in a jeweler's mind and heart, the precious programming languages Perl and Ruby have ensured the world of software development has never been short of excitement.

The world of programming has proved to be an unambiguously awesome-for-everyone career field with zero downsides.

From wearables alerting us to a calcium deficit or change in our stock market portfolio, software development has infiltrated every twist and turn of our lives. In the past, slow and steady software development was valued because it produced quality products from the ground up. While 80% of code is written in 20% of the time, the remaining 20% takes 80% of the time.

C language is roughly as old as you are; Fortran is as old as your parents. We've come a long way. The tactics used to develop software today have evolved significantly. Take the mountains of code behind the success of the 1969 Apollo 11 spacecraft — today it would have been written in a fraction of the time thanks to Agile disciplines and cloud-native application development, which are rewriting the rules of software development. Soon enough we will just need to ask, "Hey Siri, can you help develop that software for me?"

Today's biggest challenge for software developers is keeping up with the continuously widening gap between software complexity and the speed of development required to match the speed of market change.

Traditional product development release cycles take 18 to 24 months — far too slow to compete successfully with startups that use Agile development tools and processes. Due to pressure to match the speed of change, software flaws that cause airspace closures, credit card data theft and auto recalls have become so ubiquitous that we often roll our eyes and think, "Here we go again."

Many of the challenges that will be faced by humanity in the next decades will require software that works at completely different scales and completely different constraints than today's software. In order to meet these challenges, organizations need standards and frameworks that democratize the tools required to develop new solutions more quickly while maintaining or improving quality, security, user experience and more.

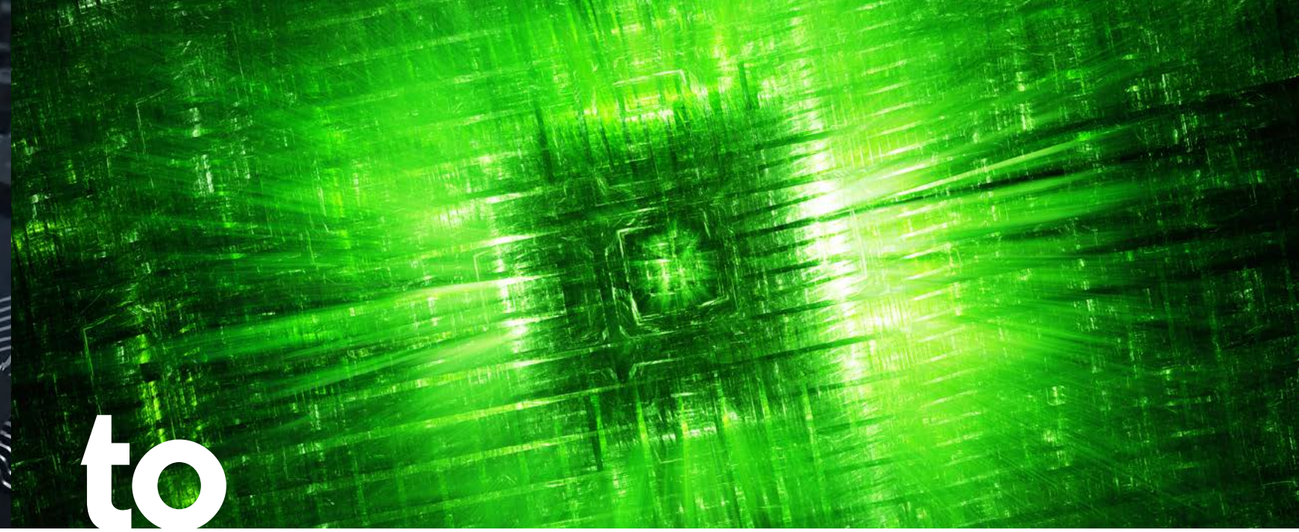
By applying engineering principles and frameworks to development, software engineering focuses on reusing, refining and repeating what has already been developed in order to make it faster and more efficient. A transition from coding to maintaining and integrating large, complex systems is the future of software.

While past decades of software engineering created innovators and generalists, future decades will produce specialists with in-depth domain knowledge and functional expertise. **/MB**

THE BOTTOM LINE:

Software engineering makes software development fit for the digital economy.

From the Bit to the Qubit



THE ELEVATOR PITCH:

The future is more than just ones and zeros.

The Z1 created by German scientist Konrad Zuse in his parents' living room in 1938 was the first electromechanical binary programmable computer.

From these humble beginnings began the greatest technological revolution in human history. This revolution has allowed humankind to achieve some of its most noteworthy achievements, from reaching the moon, to exploring the depths of the ocean.

Today, nearly every interaction we undertake is in some way influenced by binary computing power; think of the systems that run our cars, manage our social lives and make modern business possible. We would simply not be able to live as we do without them.

But for all their seemingly unlimited potential, these computers operate according to the simplest of concepts. Binary computers consist of individual transistors that are no more than on/off switches, represented as either 1 or 0.

The number of transistors on these chips indicates the processing power available, which has traditionally adhered to Moore's law, which stipulates a doubling in how many of them will fit on a CPU every two years. However, even with modern technology, CPU manufacturers are struggling to make transistors any smaller.

The question is, will binary computing be sufficient to drive forward the new wave of technological revolution, including advanced AI and data modeling, that is forecast to change the way we live?

Cometh the hour, cometh the technology.

Quantum computing — long scientific theory — is becoming a reality. These computers go beyond bits or binary by using quantum bits, or qubits, which are quantum mechanical states of subatomic particles. Simply put, a bit can only be either 1 or 0. A qubit can be both 1 and 0 at exactly the same time.

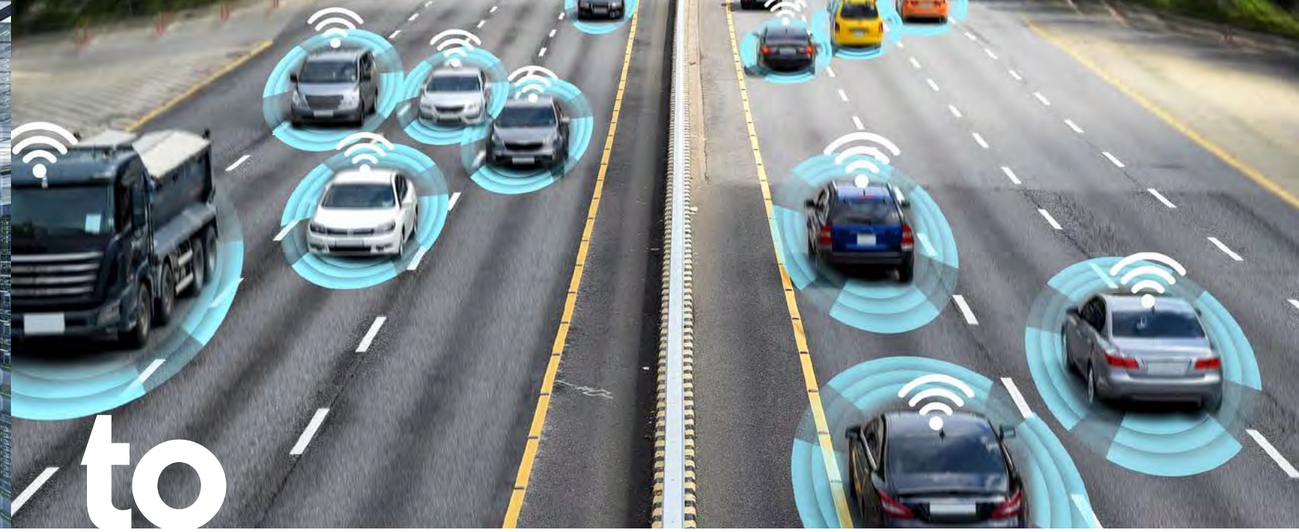
With this step function in computational power, a whole new class of processing power is revealed. Predicting traffic 45 minutes in advance, completely solving prime numbers or modeling the molecular interaction of drugs with almost 100% accuracy — these are some of the scenarios that binary computers will never achieve but will be in reach of emerging quantum computers.

With quantum computers, much of what is academic theory or science fiction — particularly in the realm of general AI — could soon emerge as reality. Companies such as IBM, D-Wave and Alphabet are all working at developing usable quantum computers, as are organizations in China and Russia. Governments around the world are scrambling to invoke national security concerns (*The Quantum Spy* by David Ignatius is a fun primer on this shadow world). The short-term goal of proving quantum superiority — i.e., that quantum computers can complete mathematical calculations that binary computers cannot — is in sight. The longer-term goals that qubits will achieve are out of sight. **/MC**

THE BOTTOM LINE:

AI and society's future rests on the rise of the qubit.

From the Cloud to the Edge



THE ELEVATOR PITCH:

The cloud supercharges distributed computing, but the next vista is at the network's furthermost reaches.

"The network is the computer," exclaimed the pioneers of the network computing movement.

And boy, were they right.

Cloud computing is today the lifeblood of our personal and professional existence. Nearly every transaction and interaction traverses some form of private, public or hybrid cloud. Cloud computing economics are indisputable. There's no need to buy, support and update hardware; the cloud vendor shoulders the burden. And for application services and storage, users only pay for the amount of computing resources consumed.

As cloud service providers prove their facilities are as secure as the most hardened corporate data centers, if not more so, the rush from on-prem to cloud computing — happening for the last 20 years — continues to accelerate. In the process, it's created the world's richest person, Amazon's Jeff Bezos, net worth of about $150 billion, pre-alimony settlement.

But now, the Internet of Things has set the cloud on fire.

As more and more internet-connected devices — augmented/virtual reality headsets, health trackers, toothbrushes, thermostats and doorbells, etc. — come online, more compute power and intelligence are needed to overcome the latency imposed by the internet's many on-off ramps. Enter edge computing, which turns these devices, like the web servers before them, into full card-carrying members of the IP address fraternity.

In industrial environments, edge analytics makes it possible to gain actionable insights in real time, where data is generated. Informed by data streamed from closed-circuit television and sensors, edge analytics can predict if/when remotely operated industrial machinery will fail, without a field engineer's preventative maintenance visit.

In the not-too-distant future, geodistributed machine learning (GDML), or artificial intelligence on the edge, will enable organizations to meet governance challenges posed by data that is born in geographically distributed places or used in dispersed locations. Country-specific regulatory challenges around data sovereignty could apply GDML to audit data stored at regional data centers, worldwide.

Edge capabilities, leveraging 5G transmission rates of 10 gigabits per second, will supercharge the streaming of everything from video to music, and facilitate the concept of the digital twin, where a replica of a physical "thing" can be created virtually to simulate real-world applications. The cloud has been big, but the edge will be bigger. **/AA**

THE BOTTOM LINE:

The shift from the cloud to the edge will speed up and virtualize the world to an unprecedented degree.

From the Internet to the Splinternet

THE ELEVATOR PITCH:

The internet's global village is fracturing into the splinternet's local tribes.

It probably doesn't need saying, but would life today look like it does if the internet didn't exist?

In a word, no. Software would still be shipped on CD-ROMs. CFOs would still write multi-million-dollar checks to build data centers. Blockbuster and travel agencies would still exist. And dating would still be a hit-and-miss affair conducted through sly glances in the supermarket aisle. Swiping right on an app would literally mean nothing to anyone.

The spread of the internet has been as magical and mysterious as it has been swift. From the first clunky websites in Illinois and Switzerland in the early 1990s, the internet has become a global phenomenon accessible from virtually anywhere and owned by virtually no one. In 1919, the population of the world was 1.7 billion people. Now, 2.3 billion of us are on Facebook.

Though the internet seems stateless, closer examination shows that really, it is American. While evangelists have championed its role in creating a "global village," its real point of origin — and ongoing control — was (and is) the academic-military complex of the U.S. Given this heritage, it isn't surprising that the internet has exported American ideas about regulation (or lack thereof), winner-takes-all philosophies of "greed-is-good" American capitalism, and an underlying philosophy of "move fast and break things" and "data wants to be free" (and don't stop us from monetizing it).

But after 25 years of regulatory-light experimentation, this first phase of the internet has come to an end.

Different approaches to regulating privacy and the use of personal data are fracturing the U.S.-led global village into three different regulatory frameworks: the U.S.'s, China's and Europe's.

In short, the internet is splintering into the splinternet. In contrast with U.S. "Wild West" principles, in China, "Wild East" principles prevail — the belief that central planning works and that state control of leading-edge technology is key to righting the wrongs of the "great humiliation" (i.e., Western dominance) of the last 100 years and the creation of the next 100 years of *Pax Sinica*. The European "Middle Way" model is borne from memories of surveillance states in the Cold War. Europe's General Data Protection Regulation (GDPR) signals that the continent no longer wants to take marching orders from Washington or Palo Alto.

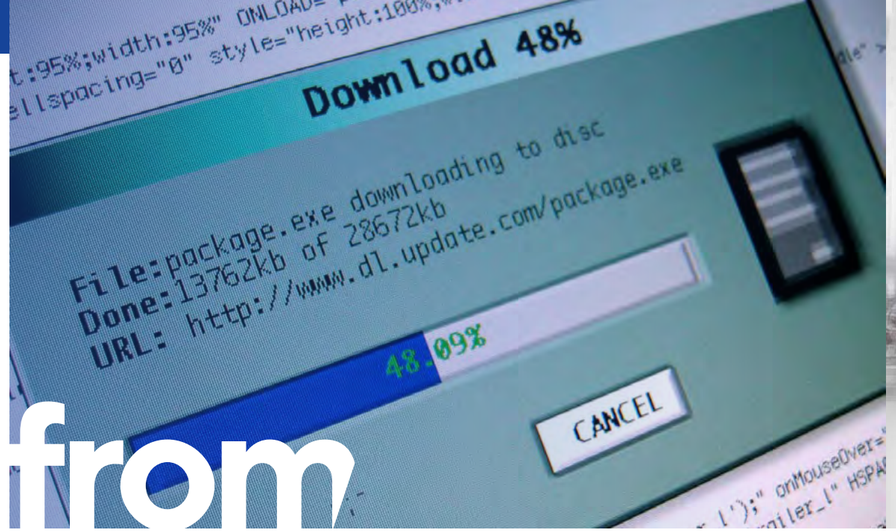
Which view will win? Or will all three co-exist? Too early to tell. But one thing is clear: For the foreseeable future, governments — not businesses — are back in the driver's seat. The next chapter of the Great Game will be fought with internet rules. As a Chinese tech executive reportedly said at the World Economic Forum's Annual Meeting in Davos, "You (i.e., the West) have already lost. You just don't know it yet."

A global consensus of business and societal rules of the digital road was always a chimera, and is further away than ever. The dream of a global village resting on a global network was probably always just that, a dream. Phase II of the internet will see if nightmares await. **/RB**

THE BOTTOM LINE:

The internet is over. The splinternet has just begun.

From Active to Ambient



from

to

THE ELEVATOR PITCH:

You don't have to learn how tech works — you need to learn how we work (and live).

When was the last time you opened a computer manual?

A generation ago, a shiny new piece of tech came with a *War and Peace*-length ring-bound folder, ostensibly in your native language, but really in Greek (or simply Geek). Fast-forward to today, and manuals have disappeared, usurped by DIY YouTube videos.

But lots of tech, purporting to be idiot-proof, is still confoundingly complicated. Roughly 90% of a laptop's functionality is still not used by the Average Joe. Cars are now stuffed with whizz-bang tech that would impress Han Solo, but most of it is never used. It may seem "intuitive" to developers, and it sort of made sense when the kid in the store explained it, but now, a month later, Joe's forgotten how everything works, and sticks to the radio on/off button.

Apps, platforms, systems and websites now permeate every hour of our waking day. Everywhere, people have their heads down, reconfiguring this, reconfiguring that, looking for an instant dopamine hit — all seeking a microsecond of distraction.

Our tech overlords — no Average Joes — have bamboozled and seduced us. The promise of ease has led to the tyranny of choice and a new inertia of ignorance. Figuring out what we want — from the gazillions of configurable possibilities — is exhausting. Understanding how everything works is a full-time job.

But now a new aesthetic is emerging: contextual products and services effortlessly tuned to our needs.

Freed from the app and tiny phone interfaces, smart things "just know" how we want them to work. A wave of sensory and environmental instrumentation drives productivity at work and calmness at home with ambient technologies that blend into the background. Smart lighting guides the workforce around a factory floor or warehouse location, or tracks free desks and conference rooms and custom-configures them precisely.

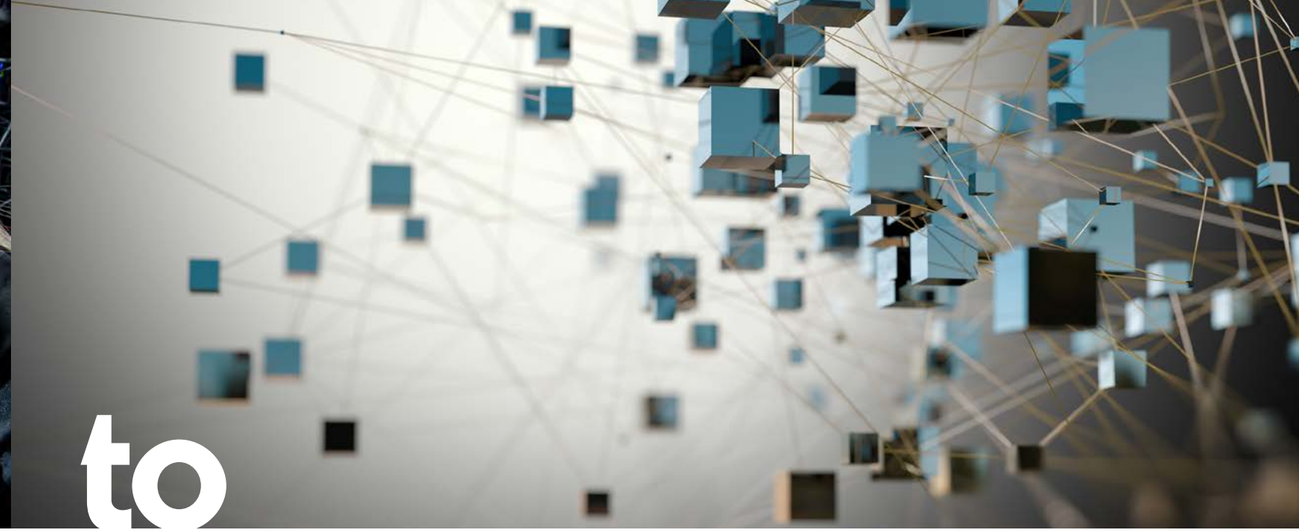
Ambient technology means a walk into the workspace of the future will see the elevator automatically speed you to the correct floor, configuring your hot desk exactly how you like it in the quiet zone, with the talkative person from accounts purposely seated in another pod. Co-working spaces will adjust to personal seating preferences for light, air and productivity.

At home, our serene spaces will "know" exactly what we need, whether returning from a tough day at the office (gin in the fridge) or a night out with your significant other (soft lights, music). Tiresome jobs become a thing of the past — our cars for example, will self-schedule a tune-up with that mechanic who instinctively "gets" the car's lithium problem with its charge point. These personalized and instrumented approaches to the physical world will free people up from the more addictive nature of the apps that rule our lives. We no longer need to figure stuff out — stuff just figures us out. **/ED**

THE BOTTOM LINE:

Freedom (and huge $$$) from tech means heads up, not down.

From Server to Container



THE ELEVATOR PITCH:

Changing architectures render swathes of IT infrastructure unfit for purpose.

Client/server was the architectural model of enterprise computing for 90% of people reading this sentence.

Unless you're in your late 50s or early 20s, IT professionals have never really known anything else.

Though the dawn of the World Wide Web made some think c/s was going away, it turned out that at the middle of the internet were a bunch of servers (just somebody else's, not yours). Even Amazon Web Services is *really* just a server (a pretty big one, mind you).

Client/server came to the fore with the ERP software wave of the early 1990s. As midrange systems and desktop computers gained popularity, ERP software was built to run on distributed networks and deliver applications that knit together departments and business units. Throw in a relational database or two, and the rest is history — familiar names to any corporate technologist of a certain age, most prominently SAP and Oracle, assumed the commanding heights of the IT industry.

Though the internet has been the more visible part of the IT iceberg for the last 30 years, supply chain management, HR and financial software have made the modern world tick. Not many global corporations run their manufacturing processes on Facebook.

Now the client/server model is being transmogrified by the rise of virtualization software that's changing the very nature of what a server is.

Containers are replacing hardware components (and the manual management of that hardware) with lines of code. Software such as Docker and Kubernetes reduces the need for specialized hardware and operating level software, and creates isolated "portable" computing environments that can live on in any underlying computing infrastructure.

Containerization also allows improved scalability, easier and faster deployment, higher levels of security and plug-and-play optimization that reduces the nightmare of ongoing maintenance. The abstraction of application software from its underlying foundation has been such a breakthrough that trying to compete as a pre-container software purveyor is like a horse and buggy trying to outmaneuver a modern car. *Not doable.*

Though client/server remains the overarching concept of modern computing, the underlying reality of computing is quite different from even five years ago. In another click or two, containerization and full-on virtualization of computing resources — allied with low-code development approaches and citizen developer armies — will mean a dollar of computing cost will be had for 10 cents. If you're a buyer of computing functionality (and who today isn't?), this is a very good-news story. If you're a seller of computing functionality, this is a far more challenging story. Embed containers into your offering, and you're good — ignore the trend and you're toast. **/BP**

THE BOTTOM LINE:

It's a container-driven world, and you just live in it.

theaestheticsofwork

From the Suit to the Hoodie

THE ELEVATOR PITCH:

The suit no longer fits these disruptive times.

The "office" and the "suit" have gone together like Laurel and Hardy since, well, Laurel and Hardy.

Picture someone sitting at a desk in an office in virtually any part of the modern world, and your mind's eye goes to a jacket on the back of a chair, a slightly loosened collar and tie, a yellow sticky note — "don't forget the milk" — placed on the edge of the computer screen.

The suit — from the Latin *sequor* "I follow" — has been ubiquitous for as long as any of us can remember. A serious, somber, professional wears a suit. Can you imagine a senior director at Dawes Tomes Mousley Grubbs Fidelity Fiduciary Bank (*ref* Mary Poppins) not wearing a suit? Impossible. Even David Brent — hardly a serious, somber professional — wears a suit in *The Office*.

Take a random walk down Wall Street (or the financial district of any major capital), and the masters of the universe are wrapped in their Brooks Brothers, their Armani, their Ozwald Boateng. The suit is armor. The suit is a signifier (if you can't recognize Brioni across a conference table, you can't be worth knowing), the suit is a symbol that I'm considerably richer/smarter/hipper than you.

The Japanese salary man is the epitome. Squeezed into a too-crowded, too-hot subway carriage for a two-hour commute to a nondescript office building, these workers' suits represent the high-water mark of allegiance to an ideal of hard work, competence, results, relevance, belonging — *following*.

Except that "exceptional following skills" is the last thing Acme, Inc. is now hiring for.

In these post-digital disruptor days, Acme doesn't want to be stuffed with suits but with innovators, mavericks and creatives who are building the future of work (even if that work is offering mortgages, a la George Banks). Suits are for "suits" or awards shows, as long as they're matched with Yeezy Boost 700s. Creative, mold-breaking leaders don't wrap themselves in the conformity of an idea or a drape. The suit no longer fits.

Take a peek inside Goldman Sachs. Sure, you can still spot Tom Ford and his pals Domenico and Stefano (that's Dolce & Gabbana to you). But the real power is now off to the side of the room, invisible behind a 27-inch Mac, clad in a hoodie. Spending 70 hours (minimum) a week writing Perl in a grey flannel suit does not compute.

That a DJ (DJ D-Sol) now runs the world's most powerful financial institution is proof (if proof is needed) that every company is now a technology company, and every company now dresses like a technology company. Or should. Hoodies (the $3,500 type from Loro Piana, not $19.99 from Target) rule. **/BP**

THE BOTTOM LINE:

Software rules the business world, and the suit is collateral damage.

From the Cubicle to the Couch

THE ELEVATOR PITCH:

Workers of the world, awake. You have nothing to lose but your cubicles.

As I write this, I'm stretched out on the family room couch, listening to the soaring melodies of Mozart's "Symphony No 24 in B Flat Major."

At the turn of the 21st century, I would have been accused of loafing or, worse, employment heresy. Now, this is just a regular shift at my particularly coalface.

Back in the day, getting to work was a serious matter. We arose early, showered and suited up. We ate on the run, while dashing to a city center high-rise or exurban office park via crowded train or bus, or circumnavigating clogged highways and byways in gas-guzzling cars. The maniacal monotony of Monday through Friday commuting and overtime became increasing expensive, contributed significantly to the depletion of the ozone layer, and took immeasurable years off our lives.

And once we arrived (senior leaders not withstanding), we took our place among the vast rows of desks and cubes where keeping your head down and focused on work was mentally challenging amid the cacophony of incessantly ringing telephones, clacking computer keyboards and drive-by co-worker tittle-tattle.

The upside was that we were part of a work culture tribe — but one, sadly, where misery loved company. We arrived beat-up and exhausted, wondering why we put ourselves through the death-defying rigmarole of the twice-daily commute to and from home to office.

There had to be a better way, we lemmings woefully noted. Technology could be the tonic — but only if our top managers entrusted us to work differently.

Today, we toil from anywhere with a laptop, mobile or tablet computer in the coffee shop, the airport lounge, the hotel room, the TV room. Even the office.

And forward-thinking managers don't miss our physical presence, or us leaning in in our cubicles — as long as we deliver the goods. The explosion of cloud-based functionality, used properly, made us more productive than our in-the-office colleagues. In sickness and health, horrendous or gorgeous weather, our work tools accompany us — from home office and bedroom to couch (and if it's nice outside, on a lawn chair). Caregivers (primarily women) can remain gainfully employed. Older workers can extend their careers from the comforts of home.

Collectively, work from home saves money and gives us more time and consciousness to contribute business value. It helps shrink our personal carbon footprints and lessen road congestion.

In some cases, there will be no substitute for intimate office settings. Remote tools often miss or mask our hypercritical paralinguistic cues, hindering effective collaboration. And we still don't know how the march of digital nomads across the workplace will impact organizational culture and collaboration over the long term.

But veal fattening pens are going the way of the Dodo, and being seen to be stuck in one might mark you as a dodo, too. **/AA**

THE BOTTOM LINE:

Just as farms of old emptied out, so will our modern cubicle farms.

From the Suburb to the City

THE ELEVATOR PITCH:

Looking for the Fourth Industrial Revolution? Head downtown.

The opening title sequence of the original British version of *The Office* is a classic.

Overlaid with the mahogany piano tones of Rod Stewart's *Handbags and Gladrags*, we see sidelong shots of the forlorn, boxy and beige Slough Industrial Estate, headquarters to the fictitious Wernham-Hogg. In real life, it was the Crossbow House in Slough, an archetype of the midcentury suburban office parks of West London's Home Counties.

Slough is one of those English cities, like Swindon or Hull, that make all-too-easy targets for jokes ("A guy types 'Hell' instead of 'Hull' into his GPS but still arrives …"). In fairness, in white-hot Silicon Valley, there are scores of office parks of a "certain age" that are just like that too, built-out in the early-to-mid-'80s, low-slung and boxy, with spindly redwood trees — a constant of Northern California suburbs — framing their parking lots (a contrast to Slough's skyline of nuclear cooling towers).

Suburbs arose when postwar urban decay and urban flight came to cities throughout the Western world. New York gave rise to Levittown. San Francisco gave rise to Sunnyvale. Los Angeles begat the San Fernando Valley. Frankfurt fostered its adjacent Rhine-Ruhr region. And so on.

But the suburb as a feature of work — a role it's consistently played since the mid-20th century — is no longer the future of work. City centers are where the action is.

Formerly desolate, downtown brownfield sites in urban cores are thriving.

You see them everywhere: London's Shoreditch, San Francisco's SoMa, New York's Hudson Yards, Barcelona's Poblenou, Berlin's Silicon Allee. As often as not, they're places of business for the tech-fueled digital economy and attracting the young, cool hipsters that big companies need. (Indeed, young people may wonder why a suburban workplace was *ever* appealing).

Coupled with plummeting crime rates, the allure of the bright lights of the big city also remain about the buzz, the energy, the networking potential, the hot startups, the hot restaurants, arts and nightlife. Conversely, who needs the absurdity of hours-long commutes to maintain the suburban lifestyle?

At the same time, the UN estimates 55% of us live in urban areas today, which will increase to 68% by 2050 — making long-range municipal planning critical. Reams have been written about the tech boom in the Bay Area, putting everything from housing prices, commutes, business locations and homelessness into an unsustainable pressure cooker. (Imagine that: "Silicon Valley, the place that couldn't scale itself.")

Meanwhile, the evocative title sequence of *The Office* in the UK offers businesses everywhere an instructive lesson: a turn-of-the-21st-century, suburban totem to the past of work. Offices in the heart of London are for losers — said no one, ever. As a real-life victim of time and trends, Crossbow House was demolished in 2013. **/RB**

THE BOTTOM LINE:

The suburb as a feature of work is no longer the future of work.

From Glass and Steel to Bricks and Wood

THE ELEVATOR PITCH:

New ideas come from old buildings.

The Swiss/French modernist architect Le Corbusier proposed an incredible 1925 plan for Paris: Tear down the historic Right Bank and replace it with 18 identical glass towers, all over 650 feet tall and with elevated highways for cars.

Thankfully for Paris, it didn't happen. But looking at The Bund in Shanghai or the stunning audacity of the Burj-Khalifa in Dubai, and they're as close to Le Corbusier's dream as you can get. Glass and steel stretching upwards, outwards, onwards.

Shanghai is the epitome of the modern city, built to impress and signal China's economic resurgence. The once narrow streets lined with shops have been bulldozed for a 10-lane boulevard, stuffed with cars crawling through an incredible forest of glass and steel that snakes out to the horizon. The Bund at night is spellbinding, but these monolithic structures of steel and glass represent the high-water mark of modern globalization — not just China.

Priorities that occupy city planners and building owners everywhere are density and efficiency rather than humanity. They create a playbook for modern cities everywhere. Whether in Shanghai or Dubai, they're constructed the same way, using the same materials and design techniques, with the same CAD software and probably the same clutch of statement architects. There might be a twist or curve here, or an atrium added there, but outside the old historic quarters, our cities look the same.

What counts for cool now isn't glass and steel: It's reclaimed, reconditioned and rejuvenated.

The redevelopment of Hudson's Yard in New York, Granary Square in London's Kings Cross or Station F in Paris — all once derelict — are now abuzz with hipsters hanging out at the independent coffee bars and taking lunch at the latest pop-up eatery. Rather than glass and steel, it's the West's once-derelict factories, rail yards and warehouses, left over from a once proud industrial era, that act as a magnet for the digital in-crowd.

These spaces attract the startups of the 21st century like they did the industrial entrepreneurs from before. Western de-industrialization bequeathed scores of empty buildings in cities that once housed manufacturing and heavy industry. The next step in the story is familiar: Regeneration takes hold, the pressure for housing (and profit) rises, and if the former industrial structures don't get knocked down, they're turned into stylized high-end housing, offices and restaurants. The WeWork aesthetic is everywhere, with exposed brick, steel and wood dominating, and an eye for ergonomic design encouraging people to hang around, chill and work.

Our built environment expresses the transformation of work culture and vice-versa. The future sees a reaction against the overwhelming digitization of our lives, with design mores rooted in the past making a comeback — and with them, the desire for makerspaces, workshops and fabrication labs where the cools kids are. **/ED**

THE BOTTOM LINE:

To find the future, look for where clicks originate from bricks.

From Originals to Digit-alls

THE ELEVATOR PITCH:

The IT industry has never been more important. Now it's breaking in two.

Roughly 20% of the global workforce develops or builds high-technology products and/or services.

But with technology central to almost every aspect of business, society and life itself, the once homogeneous IT "tribe" is breaking in two.

The first tribe — the "Originals" — are those tending to the servers, databases, compiler code and Ethernet cables that make the techno-centric world tick. They are the proverbial nerds, the geeks, the math savants who loom large in the public imagination whenever the phrase "IT" is uttered. Think the "PC guy" in the Apple adverts, think Steve Wozniak, think Bill Gates.

This group provides something we take for granted, like electricity. The only time we pay it (and them) any attention is when it vanishes. Then we grumble, but not that much, because we know it will soon be there again. This is the paradox of success — the better you get, the more invisible you become. And the more anemic your price-to-earnings ratio becomes.

The Originals find this all somewhat confusing. On the one hand, they're glad that geek is suddenly chic. But on the other, they're disappointed that the Cobol seeds they planted turned into Twitter and sexting apps. The Originals are still important. Of course they *matter*, the world wouldn't function without them.

But the new tribe — the "Digit-alls" — matters a lot.

They're the folks writing dating apps, music distribution platforms, accommodation websites, augmented reality filters, e-games and machine learning algorithms.

They're the new masters of the universe, dating the girls who used to date movie stars and rock 'n' rollers. Think Daniel Ek (Spotify), think Brian Chesky (Airbnb), think Evan Spiegel (Snapchat). Meanwhile, the Originals are sinking into the bowels of the IT infrastructure, embedding deeply into the electric utility industry.

The Digit-alls are moving up the food chain, increasingly shaping the *zeitgeist* and, in the process, becoming part of the fashion industry. Thirty years ago, the 4.0s flocked to management consulting; 20 years ago to banking; 10 years ago to private equity. Now, they're all on Route 101 or in ZIP codes 02138 through 02238. To paraphrase Willie Sutton, they're writing code because that's where the money is. The Digit-alls are building the future — of work, of business, of growth, of society, of human beings. The Digit-alls are doing stuff that has never been more important; you know the riff — IT used to support the business … now, IT is the business. The Digit-alls tribe is taking over everywhere and everything. **/BP**

THE BOTTOM LINE:

The Originals will be with us until all the world's infrastructural workloads are automated. The Digit-alls will be with us until they go out of fashion.

theissueswithwork

From WYSIWYG to WYSIWYG Beware!

THE ELEVATOR PITCH:

Digital manipulation is forcing us to question what is real.

We live in the Screen Age.

Bring someone dead for 100 years back to life, and what they'd notice straight away would be the cars and the phones — the athletic shoes and jeans and sailor's tattoos would probably raise an eyebrow or two, but "my oh my," our reanimated Victorian would proclaim, "everybody is behind a screen or looking down at one. How curious."

A big reason for the ubiquity of the Gorilla Glass in our hand is the fidelity of the leap from the virtual to the real. We can create things online that appear "true" offline. To digital natives, this may not seem such a big deal, but digital immigrants can remember what computing was like before Xerox's Bravo. Having to guess what the printed version of the document on your computer was going to look like was a major drag — and a major inhibitor to computing being useful for anything more than calculating payroll or ballistic missile ranges.

"What you see is what you get" (WYSIWYG) was a breakthrough that set the foundations for Apple and the UX of the modern world. So complete is our faith in our screens in 2019 that our lives are mediated through them. Life offline hardly counts now. Restaurants and hotels and airlines — and people — design their products and services to look good on Instagram. How they look in real life is kind of beside the point.

A generation ago, we wondered, "Is it real, or is it Memorex?"

Now that we and everything around us are simply pixels, we're wondering, "Is it real, or is it a deepfake?" It that really President Obama? Or Jordan Peele? Is that Jennifer Lawrence or Steve Buscemi? Or both? Is this post from a friend of a friend of mine or from a Russian bot? Digital manipulation — powered by graphic processing units and AI — is poison seeping into our digital well, a well we all draw water from every day.

And just as the poison ("collateral debt obligations") that seeped into the global financial system did untold damage to our confidence in the infrastructure of finance, deepfakes are undermining our confidence in the infrastructure of technology — infrastructure that underpins the modern world.

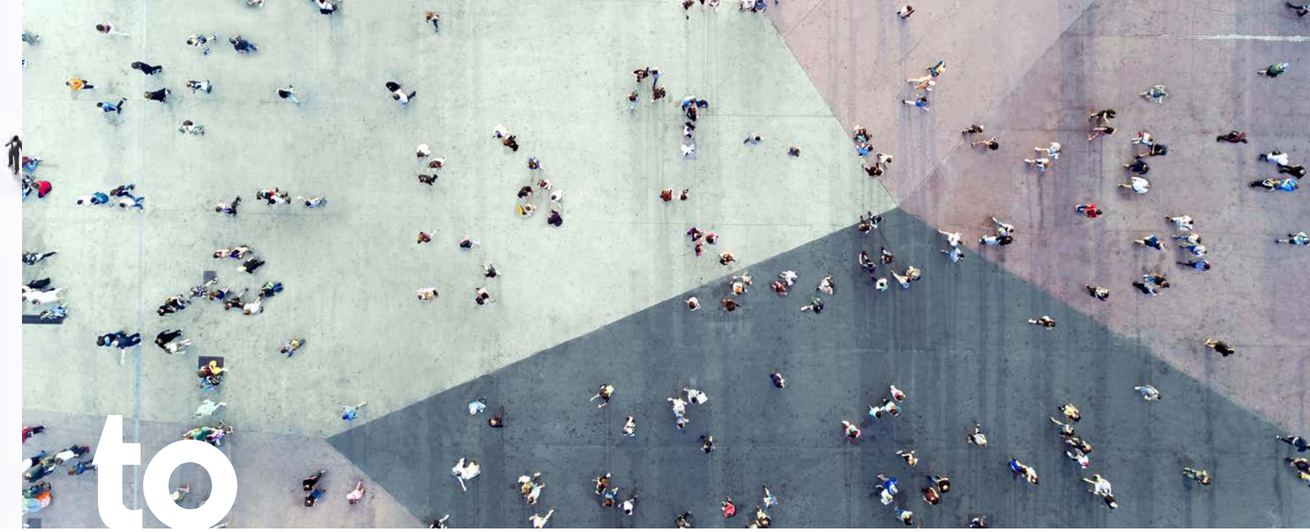
Much attention has been directed at combating hacking and security breaches; very little has been paid to stopping technology developed to put Forrest Gump next to JFK, and Zelig next to Hitler, and from putting words into your boss's mouth on the next videoconference, "I want you to change the routing number for that $10 million payment we need to make."

Deepfakes are at the point on the technology assimilation curve where they seem funny and dumb. But as soon as a U.S. President appears to say, "We begin the bombing in five minutes" it won't seem so funny. "Is this for real, or is this a deepfake?" **/BP**

THE BOTTOM LINE:

Deepfakes are poison in the digital well.

From *E Pluribus Unum* to *E Pluribus Pluribus*



THE ELEVATOR PITCH:
Personal technology is undermining belief in a common identity.

"Out of many, one" has been the calling card for the U.S. for 200-plus years.

Generation after generation has left its place of birth worldwide to re-root itself on foreign soil and become American. The heart of these journeys and these transformations was work. America was where the work was, where the opportunities were, where a better world awaited. Work hard, and the American Dream could be yours, the implicit promise went.

Technology, central to this work, has played a leading role in forging American identity: The railroads and telegraph wires brought California closer to New York; the radio brought farmers and ranchers in the west into the library of the White House; television studios in Manhattan and Burbank drove water-cooler conversations coast to coast; 106 million people watched — simultaneously — the last episode of *M*A*S*H*.

When Pierre Eugene du Simitiere proposed *E Pluribus Unum* as America's motto, the country's population was a little under four million. The "melting pot" — core to this identity and its differentiation relative to the rest of the world — has expanded to accommodate over 300 million people; laptops and cellphones and the cloud tie families and friends and colleagues together as though they were in the same room, though they may be as far apart as Attu, Alaska and Key West, Florida.

Now though, new technology is bringing the melting pot to a boil.

In fact, the water is spilling over. Layer after layer of *personal* technology has facilitated you/me/us to place you/me/us at the center of the/*our* world. In this world, my identity is paramount; my "reality" is what I/we think it is. If you disagree, well, that's simply your reality.

Notions of objectivity, fact and consensual, Platonic actuality have withered in the face of multi-generational waves of individualism and relativism. Now, these notions are set to be further molded by a new generation of technology that will alter reality in even more profound ways — *virtual reality* (VR). Political tribalism — spurred on by the recommendation engines of social media creating echo chambers of partisan realities — is soon to be supercharged as we retreat behind VR goggles. We'll grow further untethered from the "real" world — from "one world" to "many."

An America of *e pluribus pluribus* will be a very different place from just a few years ago. If these dynamics play out similarly in other parts of the world — as they seem to be doing — Planet Earth will be unrecognizable to those of us who have inhabited a shared reality during our ride on the merry-go-round. If technology — not exclusively, but prominently, VR — further supersizes a drift away from *reality* to *realities*, a reality that none of us will recognize may be made real. **/BP**

THE BOTTOM LINE:
In the coming Wonderland of VR, the very fabric of America and the real world will come under further and further strain.

From Free WiFi to WiFi Free

THE ELEVATOR PITCH:

WiFi-free spaces restore calm and sanity to our addled brains.

A mere few years ago, the first thing we looked for as we walked into a café or a bar or a hotel was the "Free WiFi" sign.

Now, we no longer look because we know it's there.

We are surrounded by WiFi. Trillions and trillions of data bits fly around our heads as we calmly hook up to the internet, input a code, click and connect, anywhere and everywhere we go. Who needs an office or a movie theater? We can work or relax where we are, rather than where we used to be trying to get to.

The explosive growth of work café culture and the rise of the digital nomad all correlate to ubiquitous free WiFi. Silent people, headphones in, laptops open, beavering away, all free from the annoying distractions of the noisy office. Kids nearby in strollers, glued to *Dora the Explorer* while their parents scroll through bottomless oceans of Instagram pictures or email.

Free WiFi is a marvel, bringing us instantly into our digital environment precisely where we last left off, and never leaving us forlorn and alone in the real world.

But this very ubiquity is now starting to drive us mad.

24x7, heads-down connectivity (for working or playing) is sucking the life out of us and creating a digital panopticon — uncontrollable and inescapable. Humans are beginning to recognize the need to detox, free from the never-ending digital distraction of modern life. Some of us now opt for a digital Sabbath to give our addled brains a break from the constant distraction of texts, requests and funny memes or the sheer horror from the MailOnline or *Washington Post* comments page.

Many places are now experimenting with WiFi-free zones to enrich the customer experience. Amsterdam's Rijksmuseum actively discourages visitors from using their phones and cameras, and encourages them to sketch the artwork they're gazing upon (with free pen and paper) rather than sharing selfies on Instagram or Snapchat. Self-locking Yondr bags are given out at concerts to break the temptation of watching a live event through a screen. It might sound Pollyanna, but more WiFi-free zones will emerge to restore our concentration levels and calm our hectic lives.

So, walk into the workplace of the future, and check your device at the door. The mindless talk about what to have for dinner and the endless Whatsapp chirps would disappear. The move could spark a "back to the office" movement, restoring workplace concentration to 2010 levels before they were shot to pieces by the barrage of app notifications. Go further, and perhaps we can imagine WiFi-free cafes, streets, towns and even cities. "Come to the beautiful Guatemala City, proudly WiFi-free forever, where you can be sure to relax thoroughly. That's our Guatemalan promise to you." **/ED**

THE BOTTOM LINE:

WiFi is like whiskey. Too much of a good thing is a bad thing.

From Privacy Is Dead to Long Live Privacy

from

to

THE ELEVATOR PITCH:

Big tech is in the crosshairs as the clamor for privacy grows.

Subscribing to newsfeeds and doing online quizzes shines a light on the hidden corners of our personalities.

The simple act of loading a webpage generates information about us, and the result paints a sophisticated picture of what makes us tick. Cameras scan the crowds at football matches, and facial recognition technologies pick out the trouble-makers and predict the hotspots where police need to be deployed.

Amazon, Facebook, Google, Netflix, Instagram, etc. know more about our lives and our nearest and dearest than we do — and we let them. Our *Code Halos* (as we describe it) — or *behavioral surplus* (as Harvard Business School's Shoshana Zuboff describes it) — have been the wellspring of some of the greatest fortunes ever known to humankind.

This model has been at the core of the internet's explosion (so far) because we happily hand over our likes, swipes and thumbs-ups in exchange for free stuff — email, music (with ads) and content tuned exquisitely to our tastes. It's our data (so we're told), and as long as it's free, well, no need to dive too deeply into how and why it's free.

The demise of privacy has been a gradually, gradually, suddenly thing, and we've been following the advice of Sun Microsystems cofounder Scott McNealy: getting used to our zero privacy. Short of deciding to live "off-grid" on a remote Scottish island without the accoutrements of Western living (smartphones, Netflix, ATMs, UberEats), we've come to accept there's no way that we, as individuals, can prevent marketers, governments or malicious actors from knowing who we are.

But now, the wheel is turning, and people are beginning to question (if not yet reject) the data free-for-all.

The clarion call for more digital privacy gets louder and louder as proof grows about the downsides of *surveillance capitalism* (Zuboff again). People don't want ads following them around the web; they don't want their data exposed in a breach or to experience some form of identity theft. And they certainly don't want their data to propagate misinformation, discrimination and polarization.

New movements are gaining traction, with the growing realization that something has gone wrong. None other than Tim Berners-Lee, inventor of the World Wide Web, now believes that the web needs to change the world *again*. He's launched "Solid" (Social Linked Data) to radically change the way web applications work, returning privacy and control to the user.

This is a positive step. Consumers don't necessarily feel they have anything to hide — but they don't want corporations excessively profiting from their personal information, or being unfairly treated through misuse of that information. Now, politicians are gearing up to take the fight back to the data barons.

The French data protection authority has imposed record-breaking fines on Google for failing to abide by regulatory requirements for transparent, adequate and accessible information concerning data consent. Other countries are stepping up to follow the UK's lead in charting and codifying the ethics surrounding the use of personal data for profitable gain. Ultimately, users are slowly waking up to the Faustian bargain they unknowingly struck a decade or two ago. A great reckoning awaits, for us *and* our digital overlords. **/ED**

THE BOTTOM LINE:

Privacy's not dead. It's just resting.

BACK TO INDEX

From Human to Cyborg

THE ELEVATOR PITCH:

To our grandparents, we're already superhuman. But our grandkids will think us simpletons.

False teeth: 700 BC. Prosthesis joint: 1890. Pacemaker: 1958. Copper IUD: 1960.

We've been upgrading our bodies with machines — extending beyond natural human limitations with mechanical components — for centuries. But smartphones have taken the trend to a whole new level.

Now, it's not just our bodies we're upgrading but our minds too. Metaphorically glued to us (our eyes, our thumbs), our brilliant machines have impacted our natural cognitive capabilities in profound ways, giving us more knowledge, capability and power than we've ever had before. So well-adopted is this extension that we feel for it in our pockets even when we didn't receive a notification. There's even a medical term for obsessively checking your phone and the associated feelings of anxiety when you can't find it: nomophobia.

For the 20% of the U.S. population with access to a smart speaker today, that twitch is slowly subsiding. Instead, the phrases "Alexa" and "hey, Google" are uttered as naturally as if calling your beloved dog. Those who no longer sound like they're presenting the news or speaking to their semi-deaf mother-in-law when they engage with a smart speaker are those who are well on their way to becoming a fully-fledged cyborg.

Today, we access information via our smartphones and Alexas. Tomorrow, the answer will be delivered directly to our minds.

Whether this is through chip implantation or Elon Musk's Neural Mesh is yet to be determined. The need to retain knowledge is subsiding, as information is best stored online. The skills we should focus on are not *retaining*, but instead processing, interpreting and communicating knowledge. Exams that require memorizing a bunch of facts and regurgitating them are way out-of-date.

The upgrade cycle ahead as we inch toward "the Singularity" is precipitous. Ever fancied seeing in the dark? Taking a picture with your mind? Zooming in on objects to make them appear larger? (If you've ever sat in the back row of a stadium, you'll know what I'm talking about.) Smart contact lenses can do just that and are one of the most exciting examples of bodily upgrades we can expect in the near future. They're already in development by a number of organizations, including Verily (Alphabet), Sony and the U.S. Department of Defense.

We resist the term cyborg to describe our increasingly hybrid lives. Instead, we cling to our identity as "naturally human" and insist that we can put the phone down whenever we choose. But new technologies — that are less easily removable — are coming and will have the power to change how we define what being human means. Those unwilling to ride this escalator will begin to look like Neanderthals at the birth of Homo sapiens. **/CS**

THE BOTTOM LINE:

We're all quietly becoming cyborgs. One day our kids will stop to wonder what it was like to be a PTH — a "pre-tech human."

themeaningofwork

From Mind Your Language to Speak Your Mind

THE ELEVATOR PITCH:

We're cutting the pleasantries. Prepare to clutch your pearls.

You enroll in the requisite Business Communications 101 course to refine your writing for the workplace, debate the merits of the Oxford comma, memorize Strunk & White's *The Elements of Style*.

You even match the tone of your resume to that of the company website, picking up on corporate jargon along the way. All to prepare yourself for rubbing elbows with the *literati* and working professional class. The preparation and attention to detail lends an air of credibility to your *bona fides* and maintains a tone of seriousness in the workplace.

Such strict adherence to proper linguistic conventions in business has historically formed a proverbial moat to keep out the uninitiated. Minding your language has long been a way to cross that moat. The formal, staid communication protocol bleeds into the rest of the work day — formulaic, predictable, consistent, uniform. And what could be more important than uniformity with the team culture? Rocking the boat puts you at risk for reprimand or ostracism.

Speaking through a filter, diminishing your eccentricities and hiding your quirks for one-third of your waking hours can wear down even the most loyal company man or woman. But for the sake of social graces and decorum (and a paycheck), we have typically learned to just grin and bear it. Cover the tats, mind your language, pay your dues. That's the formula, traditionally, for career advancement in the corporate world.

LMAOOO WTF happened?!

Now we are awash in a sea of emojis, abbreviations and GIFs that convey breadth of emotion and thought with far greater nuance and lightness than the King's English could ever come close to replicating. While traditionalists wring their hands and gnash their teeth over the diminishing seriousness of workplace communication, the shift leads to employees who more comfortably express their viewpoints and ideas. This process enables greater diversity of thought in ideation sessions and drives innovation. Communicating in more natural language requires less effort so people can focus more energy on solving relevant problems at work.

This transition to authentic and transparent communication styles at the office gives a sense of ownership to the urgent work at hand and purpose behind the tasks of the day. The chief planning officer will harness that energy to galvanize organizations and the public at large around mission-driven work. Coworkers and consumers alike expect you to take a stand. Whether it be a stand for ethics in AI, equal pay or data privacy, the challenger mindset is the ethos of the era.

Empty promises and pleasantries are a thing of the past. With so many voices vying for attention, heartfelt communication cuts through the clutter. The rules of rhetoric are being re-written. Let your inner maverick flourish because speaking your mind is more valued than ever. **/DD**

OMG!

THE BOTTOM LINE:

With our stoked appetite for authenticity, dry dialog is done.

From TGIF to TGIM

TGIF!

THE ELEVATOR PITCH:

When #MondayMotivation isn't just "drinking the Kool-Aid," you know the future of work is here.

In 1978, promotional posters for the disco-soaked film *Thank God It's Friday* captured a mood: "After 5,000 years of civilization, we all need a break."

TGIF meant work's done — and thank God, because maybe it's a job you abjectly hated.

Until recently, work was work, play was play, and the weekend, darn it, was made for the discotheque. If Canadian hair band Loverboy hadn't convinced us we were "working for the weekend," TGIF mania underscored that everyone was — well — *working*, nobly employed, putting food on the table, improving lifestyles, enjoying physical or mental pursuits and, of course, maintaining our own identities.

Yet far too often, the reality is that work can be depressing. Millions of people have jobs that lead directly or indirectly to poor mental and physical health. Most of us have experienced the Sunday night blues, and some have even endured work-related diseases like coal workers' pneumoconiosis (Black Lung) or sustained a serious workplace injury.

So why is it that with the arrival of new digital tools like AI and automation — which could help free workers from the monotony of rote tasks and from the risk of dangerous work — a pervasive sense of doom surrounds the idea of moving to a future of work you may genuinely like?

Numerous variables offer clues as to what's shifting the *zeitgeist* from TGIF to TGIM.

Number one is the echo of the Great Recession. How many people, caught in its nadir, thought: "Thank God it's Monday … that means I still have a job." For those who stopped looking for work, TGIM may be an unobtainable dream, as they confront the sheer, cold reality of being underemployed in the first place.

Number two may be the *primo* social media "King of Hustle" himself, Gary Vaynerchuk. Twitter hashtags like #MondayMotivation seem born, Athena-like, from his head. Gary V insists his rapid-fire "hustle harder" mantra is *not* about drop-dead burnout, but rather time optimization, taking the long view and finding the thing you love — for real money.

So, don't lose sight of who you are, and don't ever imagine a world *without* fulfilling work. If robots really *did* take our jobs, it'd be existential. According to *Wired*: "The scariest possibility of all is that only then do we figure out what really makes us human is work."

What *do* we do when machines do everything? Two choices: Go to the disco (maybe). Or, in an increasingly competitive world, differentiate yourself with #TGIM over those who have the Boomtown Rats' "I Don't Like Mondays" on their Spotify playlist. If you're engaged in meaningful, purpose-driven work, be grateful, and thank goodness it's *today*. **/RB**

THE BOTTOM LINE:

Forget the terror of robots taking all our jobs; the surprising possibility may be that what really makes us human is work.

From Services to Experiences

THE ELEVATOR PITCH:

What comes after the service economy? Get ready for the experience economy.

Unless you're a roller coaster designer, competitive gamer or professional Instagrammer, you've grown up in your career in the service economy.

That includes wait staff, travel, hospitality, tourism and IT services.

In the 1980s, coal, steel and many manufacturing industries suffered a massive decline, resulting in serious unemployment. The new jobs of the service economy arose, and by the 1990s, more than three-fifths of the working population had transitioned to the service sector.

Yet monotone clichés that signpost late-stage "service" are everywhere, and threaten to collapse the service economy under its own leaden weight: "Your call is important to us, but we're helping other customers." "Would you like your burger and fries supersized?" "Following the call, please take a short survey on our service."

Really, what's more life-affirming than taking a few minutes of your life to give a net promoter score? To use a medical analogy, the SLA lights for many aspects of the service economy in the operating room may all be green, but the patient is at risk of death.

So what comes after the services economy? Get ready for "the experience economy."

AI, big data analytics and augmented reality may offer a remedy to the ennui.

The potential of the experience economy to fuse industries together is massive. Take the automotive sector: Today's car companies could be tomorrow's leading game companies. Imagine if Tesla had invented *Pokémon Go!* and suggested different street routes to rack up points, and working with Waze, picked apart the Gordian knot of commuting traffic? Autonomous vehicles offer imminent canvases for in-cabin, captive viewing. Say you're a huge fan of George R. R. Martin on a long road trip — what if you could plug into your *Game of Thrones* immersive channel and dynamically interact with different characters, settings or kingdoms?

What will be the currency of the experience economy? What's of value? What will be gifted and bartered? Will it be "likes," numbers of views, plus-ups? Will it be gold, euros, dollars? Maybe even ... *frisson*? In a Maslovian world where needs are met, what would 2X more frisson in your life be worth? What about 3X? 10X? 100X? Now *that* experience — to some — would be more valuable than gold. **/RB**

THE BOTTOM LINE:

AR + VR + AI + XR will open the door to creativity, self-actualization and immersive experiences.

From Career to Careers

THE ELEVATOR PITCH:

A one-career mindset is becoming a liability.

"I have over 20 years of proven experience as a banker."

This is the kind of sparkling resume headline that gets recruiters' attention and hopefully results in a job interview. Starting in childhood, people grow up dreaming of their ideal job and set out to pursue it until they retire. As they acquire the needed skills and gain more experience and tenure in their various organizations, they move up the ladder, getting promotions and making more money. Finally, after several decades and a nice watch "in appreciation of 40 years of service," they ride off into retirement to live a peaceful life.

This mentality has been the norm in social and business circles for decades because jumping careers meant having to start again at the bottom of a new ladder — tough for a middle-aged person with a family's spending needs burning a hole in their pocket. The logic led to the one-career long haul.

The rise of automation and AI is set to make the traditional linear model of education-employment-career inadequate.

As these trends invade our working lives, many individuals will need to adapt to changing work tasks or switch to new occupations entirely and point themselves in multiple career directions. These days, skills have become like mobile apps that need frequent upgrades, making multiple careers (rather than just jobs) the norm for a 60-year span of labor.

A generation ago, management thinker Charles Handy wrote of the "empty raincoat," a symbol of the drudgery many people feel climbing a career ladder, unable to jump to a more purposeful direction. Soon we'll see CEOs leave the corner office to teach high school. (Lucy Kellaway, ex of the *Financial Times*, is evangelizing this path currently in the UK.) Imagine an accountant who is also both a drone operator and a ski instructor.

While automation will take away some job possibilities, many more new jobs and careers have yet to be created (who's game for becoming a flying car developer?) that will provide tremendous opportunity for workers to create a diverse portfolio of careers and roles.

The new world of work demands that our roles be continually augmented. To get the most out of their careers, people are now exploring new ways to broaden their horizons by increasingly making use of sabbaticals, secondments and educational time-outs. Today's career path options seem so endless that one day even our grandchildren will laugh at the idea of spending their entire work life in just one career. **/MB**

THE BOTTOM LINE:

There's more than one way to be successful — it just might take a few careers to make it happen.

From Green Is Red to Green Is Green

THE ELEVATOR PITCH:
Capitalist, meet Conservationist. You're going to get along just fine.

Renewable energy. Recycling. Public transit.

These are just a few of the known levers to mitigate the danger posed by climate change. We know their benefits. We feel good using them. So, why haven't these approaches taken off?

In a dollar-driven world, these solutions simply don't make sense. There are cheaper or more convenient alternatives. This paradigm is especially critical in emerging economies. After decades of polluting policies drove activity in developed economies, emerging economy nation-states can't afford to play by industrialization's new rules. Ethical waste disposal, responsible emissions reductions and sustainable sourcing of raw materials challenge the budget for businesses everywhere.

The inertia of acting sustainably is so strong that forward-thinking investors are already funding businesses that benefit from the calamity of climate change, like designers of flood walls for rising sea levels and desalination technology for drought-ravaged regions.

The cost of sustainable practices is a burden to companies and consumers alike. The emissions-friendly switch to public transit comes at a significant price of lost time for commuters in most cities. And the electric vehicles that reduce carbon footprints are still priced beyond the range of most municipal budgets. Environmentally-safe consumer goods cost more and are more difficult to find in stores. Living green for the sake of tomorrow puts us in the red today.

Thankfully, new technologies and shifting public sentiment on sustainability are making green business initiatives more attainable than before.

The rise of conscious capitalism shifts the narrative from strictly a profit and loss discussion to one that considers the broader global community as key stakeholders in large corporations.

The jobs popping up in the sector also bring value to all stakeholders while putting dollars in the pockets of individuals. Carbon farmers use technology to help corporations turn their emissions into useful carbon inputs for ecosystems. Solar panel installation has become one of the fastest growing blue-collar jobs in recent years. And as the cost of solar energy continues to fall, entirely new business models arise for the utilities industry. Capturing the value of the most powerful known energy source poses significant opportunities and challenges.

Entire business models now exist around recycling, and the resulting products are items that consumers already clamor for. Adidas has developed a shoe made entirely from recovered plastic sea waste. Waste collectors in Seoul, South Korea, convert food waste into biogas for additional revenue.

The desire to reduce emissions also drives innovations that are not as readily aligned with sustainable business practices. Plant-based protein proprietors see health as a top consideration, but their products also aim to cut back on the significant carbon footprint of the traditional animal farming industry. The value of recycling and green business initiatives has moved beyond the $0.05 or $0.10 per bottle saved and advanced into a full-on economic driver. **/DD**

THE BOTTOM LINE:
Sustainability is finally making sense (and dollars).

BACK TO INDEX

From Mass-Produced to Me-Produced

THE ELEVATOR PITCH:

Rapid prototyping and short-run production paves the way to personalized, print-it-yourself products.

One of the first recorded uses of school uniforms in England was 1222.

Uniforms indicate participation in a system, organization or institution: retail workers, police officers, armed forces, medical staff. They can also denote a hierarchy; managers wear a collared shirt instead of a T-shirt, a general's insignia shines brighter than an officer's, even older school kids find ways of customizing their uniform to show the young who's boss.

But hang on a second. Is anyone *not* wearing a uniform? Aren't a person's age, status, income and even political views made clear by their clothing? While our High Street clothes have been designed by the Dior's, McQueen's and Balenciaga's of the world, they're still mass-produced.

Except for the few who make their own clothes or have the luxury of a personal tailor, we march to work, to the shops, to the party, wearing the same clothes — the same uniform — as the next follower.

Now, recent trends are indicating a shelving of the uniform once and for all.

We want uber-personalized, one-of-a-kind, perfectly tailored clothing that also fits with our budget needs.

Nike has famously started using 3-D printing for customized sport shoes. Adidas customers can take a picture via an app and have their body measurements taken and the data sent to the nearest Sewbot (a mixture of AI, robotics and 3-D printing), which will create the item of clothing to fit perfectly. No more ordering three versions of the same item to test the size and sending two back. Returns will diminish as will the retail supply chain.

The hope for a more environmentally sustainable model of clothing and footwear production is fast becoming a reality. Shoetopia, a project similar to the Adidas model, allows consumers to take pictures via an app and have shoes custom-made in a local digital fabrication center. The shoes are even biodegradable.

The next step is to bring these production centers into our own homes, with personal 3-D printers. Imagine a 3-D food printer in the kitchen, a clothing printer in the walk-in wardrobe and a toy printer in the kids' playroom.

Forgot about that upcoming birthday party? Print a gift yourself. Can't find the right shade of foundation to match your skin tone? Print it yourself. Forgot your sports socks at the gym? Print them on your portable 3-D printer in the locker room. Never again will we be without our very own just-for-me, ready-to-wear, purpose-fit goods. **/CS**

THE BOTTOM LINE:

Print-it-yourself is the eco-friendly future of manufacturing and retail.

From Recycling to the Circular Economy

THE ELEVATOR PITCH:
Sustainability is going full circle.

A thousand years ago, Japanese manufacturers produced the first recycled paper.

Efforts to improve the process and expand it to other materials have crept along since. We reached an inflection point in the 1970s with the global introduction of Earth Day and the U.S. campaign to "reduce, reuse, recycle." Somehow, the first two imperatives of the latter initiative have been lost along the way as recycling took center stage.

Spurred by curbside pickup programs, the U.S. reached a 25% recycling rate by 1996. In Europe, ecological innovators created infrared sorting machines to improve recycling processes. The Environmental Protection Agency in the U.S. provided a further imperative for recycling initiatives by confirming the link between global waste and global warming.

But with minimal focus on reuse initiatives and reducing waste in the first place, even increased recycling can't stop landfills from continuing to grow. The rise of consumer packaged goods and fast fashion in retail led to an economic system predicated on purchasing items with short lifecycles that largely end up in those landfills.

There's clearly a limit to the recycling-heavy approach to sustainability. In 2018, China swung the "National Sword" and cut off almost all imports of recyclable materials. Now, waste is piling up faster than ever before. Our oceans are filled with micro-plastics and floating blankets of detritus. Initiatives promoting recycling continue across the world, but the infrastructure to actually do so is falling short of demand. Recycling is a last-minute resolution to an entire supply chain worth of waste.

As the trash piles up, we must look to new approaches.

One place to seek solutions is in nature itself, where waste doesn't even exist: Everything is a resource for something else. Produce and other organisms that reach the end of their existence simply provide inputs for the next cycle of living things.

That process is replicated by the "circular economy," a framework for designing products and processes with the end in mind. With this approach, each item is produced with forethought for how its components can easily be reconfigured as raw materials for new products.

A circular economy is achieved through both technological and cultural change. Modern design technology allows products to be created that minimize waste, and chemical processing innovations enable these materials to be broken down into useful components for further production.

The processes and components required for this system require new skill acquisition and use of techniques that incur higher upfront costs. Policies must be enacted to monetize the value of a less wasteful economy and incentivize businesses to lead the way. Businesses need ethical sourcing officers to provide guidance and navigate the procurement process using a circular economy roadmap.

As old items become new components, we can bring joy to the end of life for products instead of lamenting the need for new purchases. **/DD**

THE BOTTOM LINE:
In the circular economy, every day is Earth Day.

From Information Wants to Be Free to Information Wants to Charge

THE ELEVATOR PITCH:

The "free-dom" train is screeching to a halt; subscription services offer salvation.

With the completion of ARPANET — the academic and defense research precursor to the commercial internet — the race was on to unlock information from the shackles of proprietary data formats, page description languages and communications protocols.

This purist notion of forever-free information was, no doubt, overly idealistic. Why shouldn't data be free and easily accessible to everyone from every walk of life and point of presence on the global internet? It sure seemed easy: Just sprinkle a few data seedlings on a web-connected server, add a little eye candy and tracking, and *voila* — watch traffic bloom. As noted author Stewart Brand is said to have once declared: "Information wants to be free."

YouTube has turned video into a free-for-all view-fest. Other social media sites like Facebook, LinkedIn and Twitter act as algorithmically-attuned content curation gateways that place relevant information on our online navigational paths after decoding the digital footprints we leave behind.

Until recently, most internet surfers still expected information to be free, and if they encountered fees and gates (i.e., requests for personal information in return for information access), they cut and run to find what they wanted elsewhere. But as the internet turned from fringe to mainstream, many information services proprietors realized that "free" was a race to the bottom without a sustainable business model.

"Free" gutted much of the traditional daily newspaper business, but *The New York Times* and *The Wall Street Journal* are illuminating a profitable path forward.

Their survival is dependent on freemium services (some content is free, other sections or levels are fee-based) or monthly subscriptions.

Thanks to the so-called "Trump bump," the *Times* counted roughly three million paid digital-only subscribers as of Q3 last year, a net annual increase of 203,000 subscriptions. The *Journal* — the digital newspaper pioneer — claimed 1.6 million digital subscribers as of June 2018.

Meanwhile, Statista has made information curation a major subscription business for fact-and-figure junkies. With 1.5 million registered users and 22,500 information sources, users can find data on nearly any topic. While the basic account is free, it only provides a surface-level view. Individuals, academic institutions and businesses that want deeper insights must dig deeper into their pockets for fee-based access.

As subscription models proliferate, the value of information is magnified. Historically, individuals may have undervalued the bits and bytes contained in their personal Code Halo, but the FAANG companies (Facebook, Amazon, Apple, Netflix, Google) didn't. They shared and monetized consumers' personal data to the degree that regulatory agencies the world over are fervently seeking to tighten privacy protections.

And as the tech-backlash grows, the internet's rallying cry has shifted from, "Information wants to be free" to, "What price privacy?" **/AA**

THE BOTTOM LINE:

Subscription services have revived the information business, but there may be no free lunch — at least from a privacy point of view.

From Retired to ‘Re-Tired’

THE ELEVATOR PITCH:

The age of 65 used to be work’s finish line. Now we need to go a few extra laps.

For the last century, the arc of a working life has been pretty clear.

Go to school, get on a career ladder, knuckle down for 40 years, relax for a decade or so, and then die. Most of us have worked to live rather than lived to work, hoping to save enough to enjoy our sunset years and reward ourselves for the long years of work.

For millions of people, this model has worked pretty well. Rising stock markets and house price inflation have created a wealth explosion that the “greatest generation” and now the baby boomers are all too happy to enjoy. Cruise ships are full, Venice is closing its doors, and surgeons are keeping the young at heart artificially hip.

An unintended consequence of this wealth and ease (not to mention medical advancements) however, is that today, we are living longer — with the century mark well within the grasp of people with good genes, good luck and healthy lifestyles. Now retirement, a phase of life that used to last 10 or 15 years starting in the early- to mid-60s age range, stretches out ahead for 30 or 40, with a later induction age. If we quit work in our 60s, have we saved enough money to last us that long?

For many people, the answer is no.

The cost of living — housing, healthcare, insurance, leisure activities, food — has soared, leaving our already fragile nest eggs in danger of cracking before their expiration date. If there ever was an existential challenge, this is it. Live long enough to live forever, says Ray Kurzweil. Sure, but how am I going to afford it?

Fortunately, the rise of the gig economy offers a potential lifeline. With flexible work setups that suit shorter term projects, occasional hours or ones requiring specific skills, we never need to fully retire, or we can un-retire as circumstances dictate. Gigs can put food on the table as long as we can keep in the game.

“Re-tired,” we can seize the types of work opportunities that are blossoming across the gig economy. Ride-sharing services such as Uber and Lyft, platforms such as Upwork (for writing, accounting, design and other such services), Guru (for IT and engineering skills), Amazon’s Mechanical Turk (for expert business skills) all offer the post-65 crowd a way to keep the money coming in.

With unemployment figures at near historic lows (at least in the U.S.), the expanding talent cloud that powers the gig economy shows no sign of drying up. A 2018 Gallup study sized the U.S. gig economy at 57 million people, roughly 36% of the total workforce. Globally, the gig economy was estimated at $3.7 trillion in 2017 by Staffing Industry Analysts.

The golden age of retirement —1950 to 2000 — is over; defined benefit pensions are a thing of the past. We can lament that, but we have to deal with the facts. Solutions have emerged, just in time. **/AA**

THE BOTTOM LINE:

The gig isn’t up when retirement dawns.

From CEO to She-EO

THE ELEVATOR PITCH:

By the time I become a CEO of a huge public company, maybe it won't hit the headlines.

I went to the same all-girls school in the remote English countryside as my mother.

When she left in 1981, less than 10% of her class went to university. When I left in 2011, 95% of my class did. There, the student population was 52% female, 48% male. When I graduated, I didn't consider the fact that I was applying for the same jobs as men. I'd been raised and educated to believe that men and women were equal.

Then I started work, and reality set in.

The working world was built by, and for, men. As an extroverted, passionate and self-deprecating female, I do not fit in. I've had to learn to be more serious, less emotional and more arrogant in order to succeed. "Professionalism," it turns out, is inherently masculine.

To make it even more difficult, I chose to work in tech. The average percentage of women in the top 10 tech companies is 36%. The percentage of women in actual tech jobs in these companies is 23%. Far from parity.

This industry was built from scratch in the last few decades and has proved to be the most transformative for humanity, period. But it was also built by men and is still led by men. Every corner of the tech industry is littered with gender inequality — from the biased products we build, to the salaries we're paid and the STEM educations we receive. How did we let this happen?

So, what can I aspire to over the next 40 years of my career?

What does success look like for me? Maybe I'll become a female founder or a "She-EO." Who should I look up to on this journey? The 25% of senior leaders who are female? The 4% of She-EOs in FTSE 500 companies?

Here's what I want out of my career. I want to be paid the same as my male colleagues who have the same responsibilities and produce the same work. I never again want to attend a conference and have someone tell me I look hot. I want it to be normal for my husband to take the same amount of parental leave. I shouldn't be expected to work like I don't have children and to raise my children as if I don't work.

When my daughter enters the workforce, I want her to be allowed to be herself. I want her to have loads of powerful women in leadership roles who she can aspire to. I want her jaw to drop when I tell her stories about being a woman at work in 2019. In the same way that my jaw dropped when my mother told me that maternity leave was called disability leave when I was born.

In short, I want it all. Give me one *good* reason I shouldn't. **/CS**

THE BOTTOM LINE:

Work is still a man's world. Enough already.

From the West to the East

THE ELEVATOR PITCH:

Western economic dominance is fading as the data era begins.

Two hundred years ago, a damp corner of the Northwest of England became the epicenter of the modern world.

The city of Manchester found itself at the beating heart of a new industrial revolution as religious governance weakened, and space in society opened up for a new type of alchemy between money, innovation and markets. Western dominance began.

Innovation crept along the newly dug waterways of Britain and spread around the world. John Cadbury of Birmingham, Joseph Rowntree of York — many early industrialists in Britain became household names whose products we still consume today. American entrepreneurs followed the model, out-performing Europe with better technology and innovative approaches to organizing and managing labor. American industrialists like Andrew Carnegie, Henry Ford and John D. Rockefeller fundamentally altered the U.S. economy and cemented the West's lead over the rest of the world.

Western countries created a unique set of social mores — rule of law, deference to modern science, unique work ethic, thriving consumer society — that enabled the West to surpass its non-Western counterparts. Institutions were created, enshrining the successful ingredients of a modern market economy. The six killer apps of the West, as identified by historian Niall Ferguson (competition, science, property, medicine, consumption and work ethic) created a potent force to exploit the technologies of the modern era.

Steam power, railways, oil and mass manufacturing and early computerization put the West in pole position. The West easily won the last 200 years of history.

Now, data is the new oil, and it's shifted the economic axis of the world from the West to the East.

The West's six killer apps have been copied and deployed by the East and are coming together, fast.

The astonishing Chinese model for digital innovation copies and augments good ideas with a diligent, entrepreneurial mindset and floods everything with data. (Can you imagine an equivalent to Europe's GDPR happening in China, where the state generates a social citizen score for its people?) The tech metropolis Shenzhen, once the place to build and ship cheap, low-quality products, is now a high-quality, fast-prototyping hub for makers and startups from all over China. The money for innovation is staggering, with Asia's SoftBank Vision Fund stuffed to the gunnels with $100 billion ready to splurge on AI startups and other wonders from the East.

Beyond China, India's strong economy and a burgeoning middle class make another hot destination for the next chapter of commerce. Look toward Dubai and Abu Dhabi, where the future is emerging from the desert. Check out Elon Musk's Hyperloop transportation service, due to open in 2020, which is expected to reduce travel time between the two cities from 90 minutes to 12 (pods will reportedly move at a dizzying 1,200 kilometers per hour). Since the dawn of human civilization, give or take a few hundred years, Asia has been in the lead, economically and technologically. Now it looks to be again. **/ED**

THE BOTTOM LINE:

The West won the first three industrial revolutions but could lose the fourth one.

From Diversity to Belonging

THE ELEVATOR PITCH:

The token approach to diversity has run its course.

Diversity and inclusion. It's top of mind. It's tip of the tongue.

Every university touts its diverse student body on admission brochures and social media posts. Every Fortune 500 company promotes the inclusive policies and procedures meant to increase the diversity of its workforce. And with good reason. The world is growing ever more diverse.

Minority populations and women want to see themselves represented in the messaging of their favorite brands. And the organizations that hire more diverse teams have been shown to be more profitable than non-diverse organizations. But much of that value slips right through the cracks. Underrepresented minorities are 3.5 times more likely to quit than their colleagues in the majority, taking with them all the business value gains of diverse teams.

Affirmative action and Title IX launched modern efforts on diversity — and all the criticism that comes with it. Complaints of quotas or hypothetical "lowering the bar" for underrepresented candidates are the most common refrains. Despite a great deal of wailing and gnashing of teeth over diversity in recent years, not much has changed. "Manels" (panels composed entirely of men) are a mainstay of professional conferences. Black and Latinx workers combined represent less than 7% of the tech workforce in Silicon Valley. We've tried diversity and inclusion, but it hasn't worked.

For lasting results, our efforts must aim higher. What good is an invite to the party if you're not asked to dance, and the bouncers glare at you the whole time?

Unfortunately, workplace dynamics for women and underrepresented communities can often feel like a snobby club.

All the hype and excitement to be there never lives up to legend, and you're left feeling like you wasted your time and talent. As a result of that dynamic, fatigue has set in. People are tired of talking about diversity and seeing no meaningful progress on the subject.

The diverse workforce isn't enough. Lack of diversity at the executive level is the first indicator that underrepresented talent groups will not be taken seriously for advancement or given the types of assignments that groom them for growth. Organizations must strive to instill a culture of belonging among all members.

Belonging is that sense that you can bring your authentic self to work — that feeling of comfort in contributing your opinion and individual perspective, even if it doesn't tightly hew to the established cultural norms of the organization. We are wired at our most primal levels to seek this state. Research shows that fostering a strong sense of belonging for underrepresented team members reduces their stress levels and improves performance.

So while so many businesses continue to flounder in diversity efforts, leaders can take the next step by establishing programs for diversity, inclusion *and* belonging among the workforce. **/DD**

THE BOTTOM LINE:

No matter the demographics, we all long to belong.

Ideas to take you from
“um” to “om”

Endnotes

1 “Don’t Get SMACked: How Social, Mobile, Analytics and Cloud Are Reshaping the Enterprise,” Cognizant, November 2012, www.cognizant.com/InsightsWhitepapers/dont-get-smacked.pdf.

2 Malcolm Frank, Paul Roehrig, Ben Pring, *Code Halos: How the Digital Lives of People, Things and Organizations Are Changing the Rules of Business,* Wiley, 2014, www.wiley.com/WileyCDA/WileyTitle/productCd-1118862074,descCd-buy.html.

3 Malcolm Frank, Paul Roehrig and Ben Pring, *What To Do When Machines Do Everything,* Wiley, 2017, www.amazon.com/What-When-Machines-Everything-Algorithms/dp/111927866X.

4 “21 Jobs of the Future: A Guide to Getting and Staying Employed Over the Next 10 Years,” Cognizant, November 2017, www.cognizant.com/whitepapers/21-jobs-of-the-future-a-guide-to-getting-and-staying-employed-over-the-next-10-years-codex3049.pdf, and “21 More Jobs of the Future,” Cognizant, www.cognizant.com/whitepapers/21-more-jobs-of-the-future-a-guide-to-getting-and-staying-employed-through-2029-codex3928.pdf.

5 *What To Do When Machines Do Everything.*

6 “The Work Ahead: Mastering the Digital Economy,” Cognizant, 2016, www.cognizant.com/whitepapers/the-work-ahead-mastering-the-digital-economy-codex2115.pdf.

7 *What To Do When Machines Do Everything.*

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Ben Pring co-founded and leads Cognizant's Center for the Future of Work. He is a co-author of the best-selling and award-winning books *What To Do When Machines Do Everything* (2017) and *Code Halos; How the Digital Lives of People, Things, and Organizations are Changing the Rules of Business* (2014).

Ben sits on the advisory board of the Labor and Work Life program at Harvard Law School. In 2018, he was a Bilderberg Meeting participant.

Ben joined Cognizant in 2011 from Gartner, where he spent 15 years researching and advising on areas such as cloud computing and global sourcing. Prior to Gartner, Ben worked for a number of consulting companies, including Coopers and Lybrand.

At Gartner, Ben was the lead analyst on all things "cloud"; he wrote the industry's first research notes on cloud computing (in 1997!) and Salesforce.com (in 2001), and became well known for providing provocative but accurate predictions about the future of IT. In 2007, Ben won Gartner's prestigious annual Thought Leader Award.

Ben's expertise in helping clients see around corners, think the unthinkable and calculate the compound annual growth rate of unintended consequences has made him an internationally recognized authority on leading-edge technology and its intersection with business and society. His work has been featured in *The Wall Street Journal, Financial Times, The London Times, Forbes, Fortune, MIT Technology Review, The Daily Telegraph, Quartz, Inc., Axios, The Australian* and *The Economic Times*.

Based in Boston since 2000, Ben graduated with a degree in philosophy from Manchester University in the UK, where he grew up.

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His freelance articles have appeared in *Datacommunications, Datamation* and *Venture* magazines, as well as *The Improper Bostonian*. Alan cut his teeth in the daily newspaper business at the *Albany Times-Union* and *Saratogian*, and served as news editor at *The Wyckoff News*, a weekly newspaper in Wyckoff, New Jersey. After finishing college, Alan interned for Jack Anderson, the world-renowned columnist.

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Manish Bahl is a Cognizant Associate Vice President who leads the company's Center for the Future of Work in Asia-Pacific. A respected speaker and thinker, Manish has guided many Fortune 500 companies into the future of their business with his thought-provoking research and advisory skills. Within Cognizant's Center for the Future of Work, he helps ensure that the unit's original research and analysis jibes with emerging business-technology trends and dynamics in Asia-Pacific, and collaborates with a wide range of leading thinkers to understand how the future of work will take shape. He most recently served as Vice President, Country Manager with Forrester Research in India.

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Michael Cook

Senior Manager, Cognizant's Center for the Future of Work, EMEA

Michael Cook is a Senior Manager in Cognizant's Center for the Future of Work in EMEA. In this role, Mike identifies the changing dynamics that will shape the business ecosystem of the future, delivering original research and analysis of work trends in Europe. Mike also collaborates with a wide range of technology thinkers and academics about what the future of work will look like as digital changes many aspects of our working lives. Mike is an established speaker with broad experience across the services market, including customer experience management, buy-side advisory, talent and workforce solutions, and cybersecurity.

Prior to joining Cognizant, Mike served as Global Research Director with HfS Research, where he worked across multiple research topics and led HfS's buy-side focused research program. Mike earned his bachelor's of economics and econometrics and postgraduate qualification of international trade and development from the University of Johannesburg.

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Caroline Styr

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Caroline Styr is a Research Analyst in Cognizant's Center for the Future of Work in Europe. In this role, she develops thought leadership to challenge perceptions of the future of work. Above all, she is dedicated to demystifying what the individual needs to succeed in the modern organization.

Prior to joining the CFoW, Caroline was part of Cognizant Consulting, working in international digital services and transformation across the retail and healthcare industries. She has a bachelor of arts degree (Hons.) in German from the University of Bristol, alongside which she certified in theatre and performance at Bristol Acting Academy.

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Desmond Dickerson

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Desmond Dickerson is a Manager within Cognizant's Center for the Future of Work. Leveraging his experience in digital transformation and marketing, Desmond consults with clients on optimizing digital strategies that prioritize user experience and engagement. His research with the CFoW focuses on the human impact of decisions related to technology development and deployment. He has an MBA (data analytics) from Georgia Institute of Technology, and an undergraduate degree in marketing from Georgia State University.

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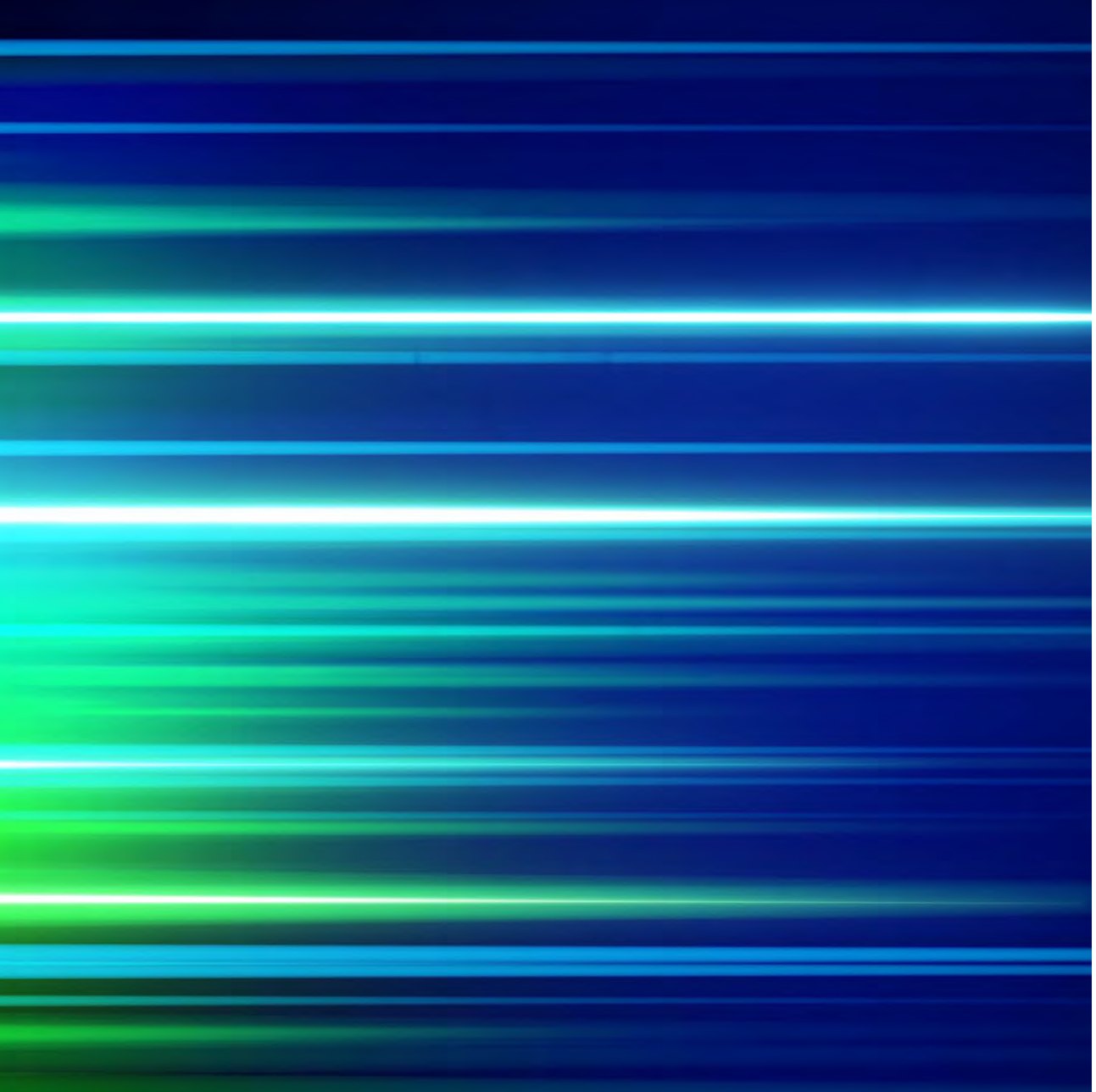

About the Center for the Future of Work

Cognizant's Center for the Future of Work™ is chartered to examine how work is changing, and will change, in response to the emergence of new technologies, new business practices and new workers. The Center provides original research and analysis of work trends and dynamics, and collaborates with a wide range of business, technology and academic thinkers about what the future of work will look like as technology changes so many aspects of our working lives. For more information, visit www.cognizant.com/futureofwork, or contact Ben Pring, Cognizant VP and Managing Director of the Center for the Future of Work, at Benjamin.Pring@cognizant.com.

About Cognizant

Cognizant (Nasdaq-100: CTSH) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses. Headquartered in the U.S., Cognizant is ranked 193 on the Fortune 500 and is consistently listed among the most admired companies in the world. Learn how Cognizant helps clients lead with digital at www.cognizant.com or follow us @Cognizant.

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