

READ ME FIRST!

Geographies of transition



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GEOGRAPHIES OF TRANSITION

We are entering a period where it is, clearly, no longer appropriate to rest on our assumptions about both how the world works and how we do business. It is as if the planet has literally tilted off of its axis.

What we need now is clarity, not confidence. We must re-calibrate our perspectives to this high-volatility environment, and to the new principles, structures, and models that will prove successful as the landscape twists and evolves around us. Regardless of what it is our organizations do, we need to be willing to ask ourselves not just how confident we are of any given scenario or outcome, but how we know what we know. The 2017–2027 Ten Year Forecast was created to aid in this effort.

At the center of this re-calibration are nine urgent futures—major drivers of volatility that will significantly impact every market and sector over the next decade, pushing us into noisier and more uncertain futures. These introductory perspectives will help you align your organizational and strategic priorities with external forces of change, covering issues that we often fail to address within our organizations, networks, and communities.

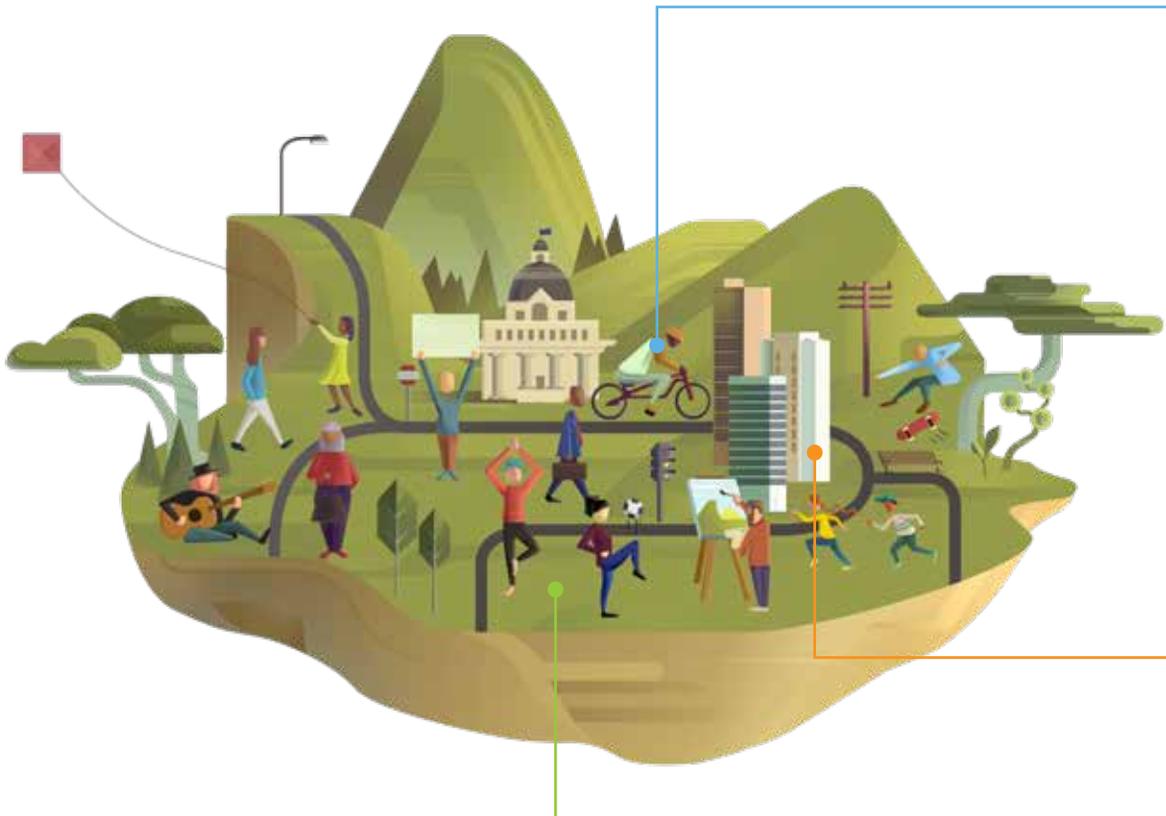
The three guidebooks that accompany this *Atlas of the Decade* were designed to help you dive deeper into the geographies of transition that will transform the way we work, learn, live, and play between now and 2027. They explore what algorithmic innovation zones in Shenzhen tell us about which business models are likely to become deeply uncompetitive, and which ones will ascend. They probe connections between infrastructure entrepreneurs in Haiti and potential new work streams for rural Appalachia. And they discuss diverse topics at the edges of our current thinking, from Quantum Cognition to Special Oceanic Zones to Universal Basic Subscription Services. These 18 forecasts and 12 scenarios for 2027 provide landmarks of what's possible—guideposts with which to populate our future plans.

Before navigating the choppy waters of the coming decade, we must first assess the essential foundation of our maps. Do our traditional geographical assumptions really set us up for the paths we're likely to take?



NATION, STATE, AND COUNTRY

Our ten-year forecast begins with the individual country, the nation-state that forms the foundation of our global perspectives. We tend to use three terms interchangeably to identify this entity that sits at the base of our homes and markets: nation, country, and state. And yet, historically, these words all emerged from separate origins with distinctly different meanings.



The word nation comes from the Latin word “natio,” and refers to birth, but also to species, kind, and tribe. It refers to the peoples that formed bonds through common cultures, beliefs, and histories: nations of immigrants, settlers, and the faithful. These are stories about human communities with shared affiliations.

We derive the word state from “status,” referring to the condition and structure of a place: its rules and laws, its scorekeepers and metrics. The state encompasses our governments and institutions, our currencies and courts.

And the word country sprang from “contrata,” for “the land spread before me.” Country refers to the physical terrain, the country under our feet. The country we discovered and fought for, settled and built our homes on.

In our old maps—for every geographical map we’ve used until now—these three terms have almost always overlapped, to the point where we didn’t

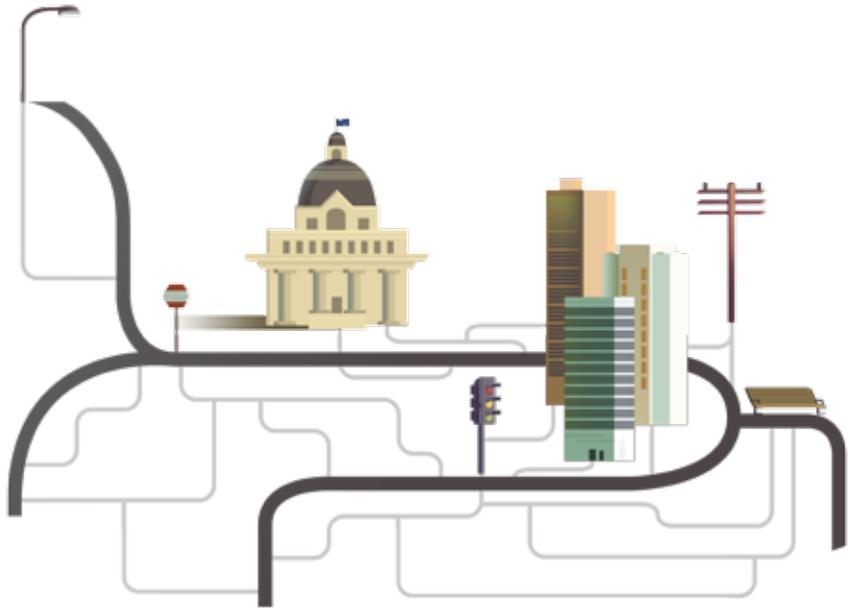
benefit from distinguishing between them. Every country occupies a defined and bordered parcel of land, where a nation of people live and work, who are governed by the laws and regulations of the state. This is Swedish land with Swedish people and a Swedish government.

Ten years from now, when we’re reflecting on what’s happening in 2017, and what will have happened over this coming decade, it’s going to make more sense if we consider the ways in which our nations, countries, and states are becoming, for the first time in history, meaningfully untethered from each other. We are entering an era of post-global nations, countries, and states, all on divergent trajectories. The new citizenships, territories, and societal systems that emerge will in some cases adhere to the geographies and borders we know today. However, many will evolve into unfamiliar new forms, with new capabilities, new reach, and new strategies for navigating and doing business.

Nation



State

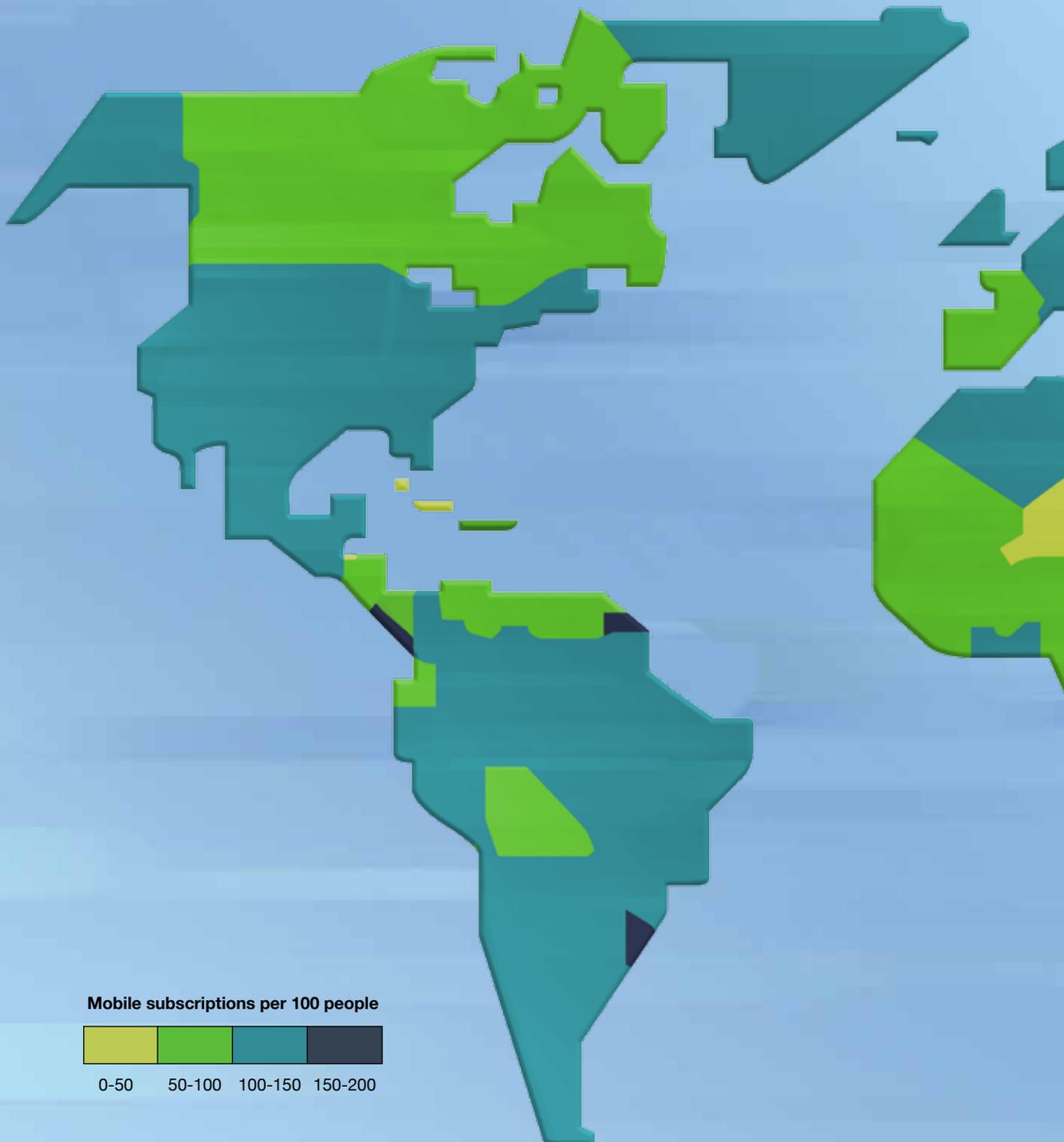


Country



GLOBAL MOBILE PENETRATION

Number of mobile cellular subscriptions per 100 people



World Bank: Mobile Subscriptions Per 100 people, 2015 <http://wdi.worldbank.org/table/5.11#>

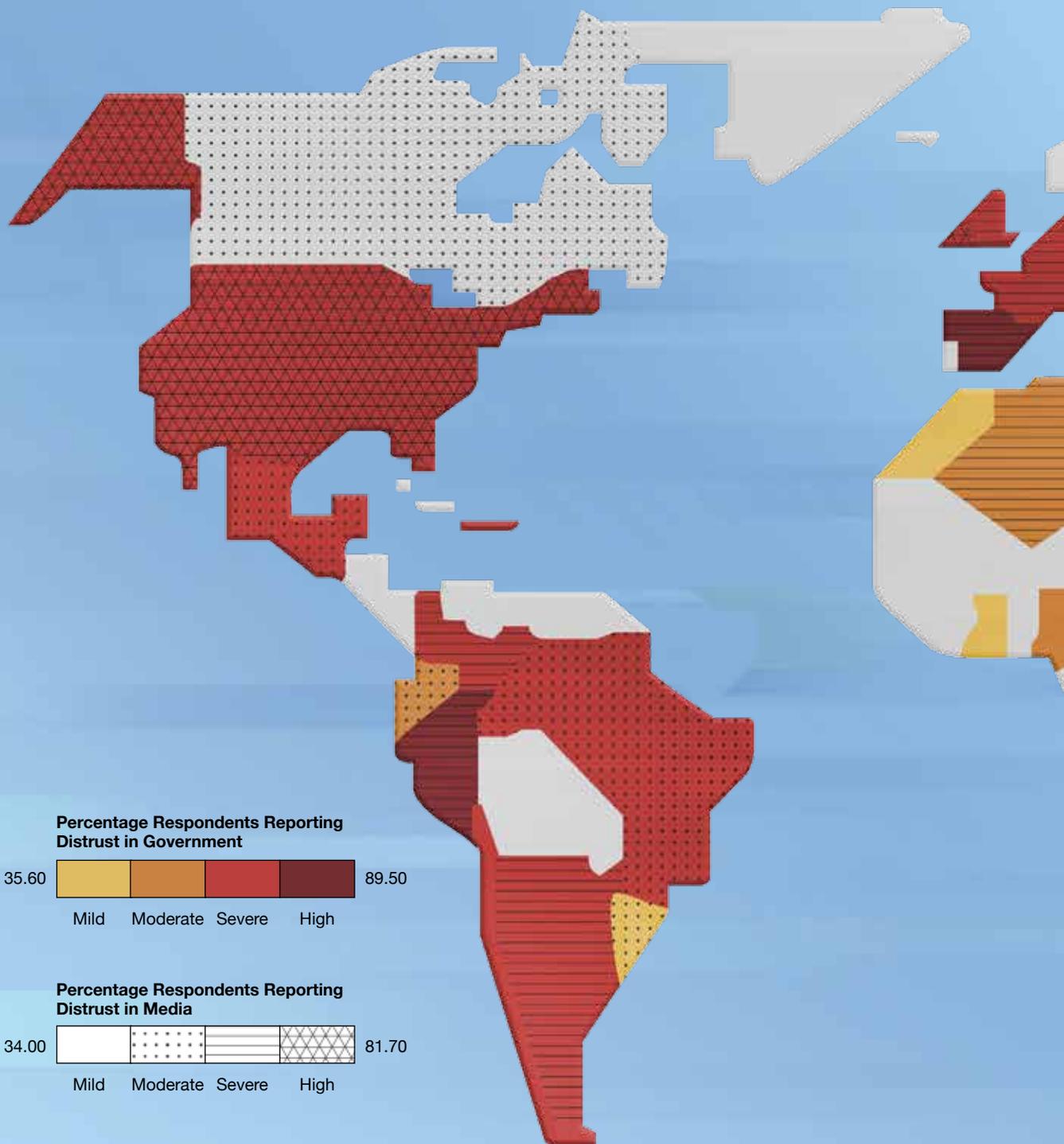
Two major shifts are responsible for the uncoupling of our nations and states from the countries they once found inseparable, and for catalyzing the emergence of new post-global institutions.

The first shift comes from the billions of people relying on global Internet-based services for more and more of their needs. According to the GSMA, there were 4.8 billion mobile subscriptions around the world at the end of 2016. By 2020 this number is projected to rise to 5.7 billion, with growth slowing somewhat as we reach the last 25% of the world's population. These next billion mobile subscribers will emerge from China and India, followed by Nigeria, Indonesia, and Brazil. By 2027, this doesn't just mean six billion people with phones—it means six billion people fortifying their communities through global communication platforms, building economies on global finance protocols, and relying on global subscription services like Amazon, Uber, and WhatsApp for more and more of their needs.



INSTITUTIONAL DISTRUST: MEDIA AND GOVERNMENT

Global regions registering high distrust
in their national governments and local press



World Values Survey, 2010-2014: <http://www.worldvaluessurvey.org/wvs.jsp> Edelman Trust Barometer, 2017: <http://www.edelman.com/global-results/>

The second central shift leading to the rise of post-global institutions is this: by and large, people don't trust their own national institutions anymore, particularly their governments and media. In 1976, three-quarters of Americans reported that they trusted their government to do the right thing. That number's been dropping ever since, and even before the current administration, only one in five Americans retained this trust. According to the Edelman Trust Survey, which has been tracking global trust in institutions since 2000, the same story is playing out across most of the developed world. Across Europe, Latin America, and South Korea, self-reported trust in governmental institutions has dropped sharply from the recent past. Edelman's surveys on trust in media look similar, with less than half of respondents expressing trust in their own press across the globe.

India and China, twin rockets of economic growth over the past decade, offer notable exceptions to this trend. They also represent massive state structures which are already taking advantage of new digital tools to manage and support their sprawling populations.

From diverging geographies—the nation, country, and state of the future—we'll find disparate futures, with new community practices, new territories, and new institutional forms between now and 2027.



NINE URGENT FUTURES

Amplifying these tumultuous environments are nine urgent futures, drivers of volatility, that will fragment our markets and disrupt our business strategies by 2027.

Each of these forces represents a sea change to the way we work and live, and an opportunity to attune our strategies to conscious new priorities. How would you prioritize these nine in order of urgency? How does your organization prioritize them? The *Atlas of the Decade* introduces these nine macro drivers with researched perspectives from the Ten-Year Forecast team. In the accompanying guidebooks, the urgent futures return to offer additional insights into the nations, countries, and states of 2027.



POWER AND TRUST: the authorship of authority

Ben Oppenheim

Over the past few decades, the tools of coordination and communication have become largely democratized across our global society, accompanied by historic levels of distrust in traditional institutions, centralized authority, and the objective truths of our shared reality. Over the next decade, these forces will challenge and redefine the characteristics of our social fabric, media landscape, and power structures.



DESTABILIZING DEMOGRAPHICS: the end of default identities

Tessa Finlev

As large demographic shifts challenge traditional norms and values, new behaviors and group identities will rewrite the social contracts of our communities and organizations. The next decade will see marginalized groups ascend into the mainstream, as incumbent cultures struggle for relevance and authority. In every way, these forces will strain and redefine our conventions around the very definition of “normal.”



THE LABOR OF THE FUTURE: working the system

Dylan Hendricks and Lyn Jeffery

From just about every conceivable angle, the emerging picture of the future of work is fraught. As automation and on-demand outsourcing proliferate, expanding into self-driving vehicles and self-managing processes, the role for humans in the workforce is poised to change dramatically over the next decade. The means of acquiring a job, once attained through formal degrees and skills-based resumes, also looks to new pathways in the digital and dis-intermediated future.



HYPER-GLOBALIZATION: the rise of high-delta markets

Jeremy Kirshbaum

Within the pro-volatility business models of the world’s high-delta markets, nascent technologies, partnerships, and literacies are creating new markets and trade routes that will remap the global economy over the next decade and beyond. The lower opportunity costs and rising access of emerging and transforming markets create challenges and possibilities beyond our existing national borders.



THE SCIENCE OF WELL-BEING: high-resolution health

Kathi Vian

Between the rapidly expanding capabilities of synthetic biology and the proliferation of data-rich sensors across the world, the next decade will force the development of new models, metrics, and markets that can accommodate our growing understanding of our genetics, microbiology, and overall well-being. These emerging literacies will provide ample food for thought, action, and consumption.



PERILOUS PLANET: designing for impermanence

Sara Skvirsky

As the impacts of climate change continue to make themselves felt across the world, rising temperatures and sea levels will increase the already historic urgency of global migration in the coming decades. These forces will necessitate new accommodations and adaptations explicitly designed to endure sudden fluctuations in population, weather, and demographics.



THE AI FACTOR: the era of machine learning

Jamais Cascio

The prominent futurist Kevin Kelly recently proclaimed, “The business plans of the next 10,000 startups are easy to forecast: Take X and add AI.” Within the next decade, general-purpose machine learning will reveal itself as a commodity that can be applied to virtually any situation, spurring bold solutions to long-standing problems, and creating an entirely new set of concerning implications.



SECURITY AND STATUS: incongruous identities

Jamais Cascio

As the hyper-networked world both elevates and fractures our functional markers of personal identity, institutions and individuals alike will face perilous new forms of identity manipulation, obfuscation, and impersonation across emerging and existing mediums. These forces will challenge the policies and basic coherence of our security, privacy, and status.



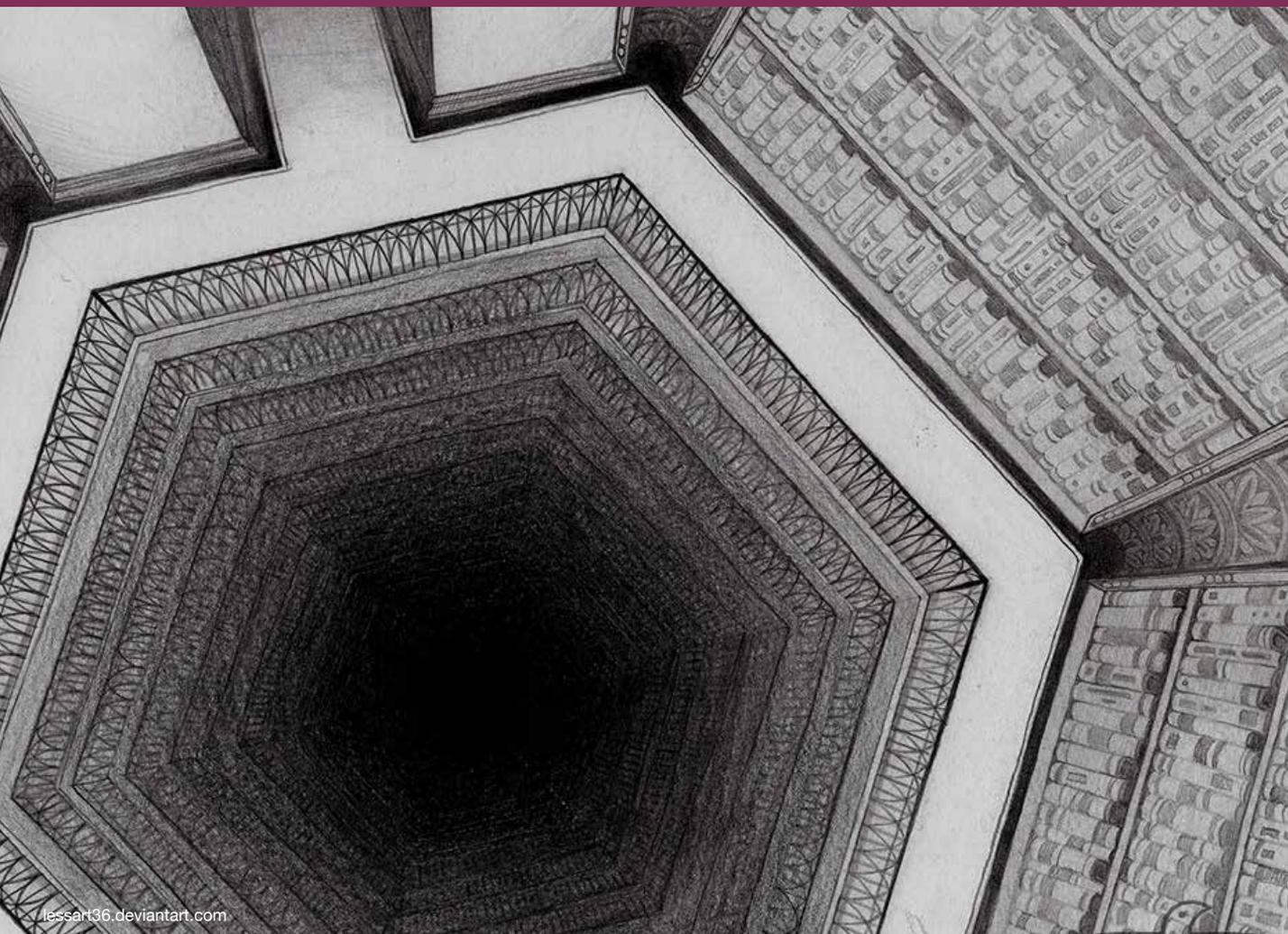
BEYOND BLOCKCHAIN: deconstructing distributed infrastructure

Alessandro Voto

Amidst the tension-filled growth of crypto-currencies like Bitcoin and Ethereum, the long-term promise of distributed ledgers continues to assert itself. Over the next decade, Blockchain-like technologies will disrupt and transform the bedrock infrastructure of global finance, record-keeping, and certifications, challenging existing institutional assumptions and emboldening new ones.



POWER AND TRUST: the authorship of authority



**In 1941, the
essayist Jose
Luis Borges
wrote a short
story set in a
startling world:**

an infinitely vast library, containing all possible knowledge—with a catch. Each book in the library contains a perfectly random assortment of letters; collectively, the volumes hold every possible combination of letters, words, and phrases. Every possible permutation

of gibberish and genius. Every truth that might be discovered. Every lie that could be written. The vast chambers of the library are populated by nomads—people seeking knowledge, but drowning in noise. This world—the Library of Babel—was recently built; realized through a website that procedurally generates randomized text.¹ But like most futuristic concepts, many of us have already been roaming the Library for some time, perhaps without quite realizing it.

Over the past few decades, the tools of coordination and communication have become largely democratized across human civilization. A long tail of websites, blogs, and social media accounts churns out a near-infinite variety of content. News, speculation, misinformation, disinformation, and facts and unverifiable claims of all kinds, are tailored to every conceivable ideology and interest. This explosion of information has been paralleled by declining trust in our traditional institutions, with governments and popular media among the hardest hit. The erosion of trust has no single, shared cause: political polarization, accelerating economic and cultural change, and rising inequality all play a role. But the collision of distrust and democratized information has been catalytic: for many people, it has never been more difficult to know what information to believe, or who to trust.

Little wonder, then, that our consensus reality—the basic set of shared facts and explanations that help us navigate and make sense of the world—is fragmenting, as people turn to increasingly disparate sources of facts and interpretation. And over the next decade, consensus reality may shrink further still, as new technologies intersect with old cognitive biases.

¹ | The Library can be accessed at: <https://libraryofbabel.info/>

DRIVERS OF DISTRUST

How will citizens, communities, and corporations operate in a world in which truth is increasingly scarce and contested? We first need to understand the factors that drive this disruption.

The deepest threat to consensus reality are the biases wired into our minds

The human mind is magnificent, but is not without its bugs. Our neural wiring is designed with a set of cognitive shortcuts: heuristics and tools that we use to filter down otherwise unmanageable flows of information. Most of the time these systems are running in the background, and so they're typically unconscious and inconspicuous, at least to us. But our biases deeply shape the way that we judge incoming information. Or whether we even notice it at all.

The central issue? Knowledge is social. We unconsciously prefer ideas that affirm our identity—that remind us we're part of a larger community, and that are accepted by our group. We suffer from availability cascades, the tendency to remember and accept ideas that we've heard before, and have heard recently. We orient toward fears and threats, tending to adopt information that addresses our anxieties. And we drift towards confirmation bias: the tendency to notice and accept information that fits with the things we already believe, and to ignore or dismiss ideas that don't quite accord. None of which means that human beings are inherently irrational or dishonest; merely that we're all misled by our own minds, at least some of the time. In those moments, we're apt to sift through the Library until we find the truth we prefer.

Our cognitive systems were built for a very different world than the one we now inhabit—a world of smaller, tighter-knit communities. And their functions remain intact; social sharing and reinforcement can help small groups become more cohesive and more close-knit, and can spread useful information quickly. But it's hard to imagine a more problematic set of tools for navigating post-modern life. The search and social networks that we use to find and share information are a near-perfect mirror to our biases. Our machines echo our minds.

Algorithmic media will radically reinforce our cognitive biases—while also lending us tools to transcend them

In one sense, we're lucky. Our Library of Babel comes equipped with helpful librarians: search engines that adapt to our behaviors and anticipate our needs. Social media feeds that react to information we like and learn to obscure stories that don't, spark our interest. Without these assistants, we might be lost in the deluge of exponentially growing data. But these technologies are also our unwitting accomplices, helping us construct filter bubbles that define the information we see and the reality we experience online. This is a present-tense problem. But it will intensify as media becomes increasingly adaptive and personalized.

Over the course of the next decade, the news we read will just as likely be written by an algorithm as by a human reporter. And for many of us, AI-generated news will be a lot more enticing than human-curated media. Computationally-generated reporting is already widespread in finance and sports. These topics are low-hanging fruit, because outcomes are easy to measure: stocks go up and down, basketball teams win or lose. But algorithms excel at fitting patterns to data. Over the next decade, they'll begin to provide narrative and editorial interpretation in fields ranging from health to foreign affairs, using filters and tones designed for specific groups and readers. These systems are low-cost and scale free: once unleashed, they'll generate an infinite flow of auto-generated content, written to suit every potential ideology and point of view.

As we move further toward 2027, we might find that algorithmic reporting evolves even more, shifting from supplying content through brute-force mass production, toward more personalized reporting. Machine learning tools will dynamically map not only our interests and beliefs, but our cognitive style. How we argue. How we debate. These systems could be designed to match our tastes and preferences through precisely tailored media. Or, rather than reinforcing our beliefs, these models could be trained to surface and stress our biases, slowly building awareness of our own cognitive blind spots.

STRATEGIES FOR RESILIENCE

Cognitive hackers will engineer doubt for strategic advantage, in both politics and business

By the time that algorithms start to exploit our cognitive foibles, they'll be following in well-established footsteps. Savvy marketers have always known that some messages stick better than others. The 20th century saw the widespread adoption of behavioral science tools—focus groups, public opinion surveys, experiments—to design better ways to persuade, nudge, and sell. The coming decade will see the use of far more sophisticated methods to map and hack our heuristics, deploying messaging to maximum effect by leveraging our biases.

The actors behind this—we might call them cognitive blackhats—will be interested in persuasion, at least some of the time. But many will also be playing a much longer game. Researchers studying authoritarian governments in Eastern Europe have noted a pattern: the targeted use of misinformation, rumor, and innuendo not to persuade, but to sow confusion. Over time, repeated exposure to plausible but unverifiable information tends to herd people towards what the journalist Amanda Taub has described as the “prudent hypothetical”: the tendency to treat any unverifiable information that’s *compatible with our worldview* as potentially true, at least until we (or our social networks) find out otherwise. Taub suggests that a protective impulse is at play: better to be prepared than surprised. The real problem? Repeated exposure seems to build tolerance to the unfalsifiable, not immunity. People become more susceptible to innuendo, more doubtful about fact, and less cohered around a consensus reality. All that’s needed is a map of our worldview, and a germ of truth. Or at least plausibility.

The technique is well-established in politics, where it has been used—most recently in the Wikileaks case of 2016—to dissuade and demoralize voters. But as we move towards 2027, we may see targeted misinformation campaigns migrate to the private sector, as companies use weapons of doubt to vie for market share, compete for key demographics, and try to establish a brand dominance by destroying a competitor’s.

SO WHAT? How will your organization adapt to a world in which truth is increasingly difficult to detect?

LAUNCH a bias audit, at both an individual and an organizational level. What cognitive shortcuts are most common or consequential? Can decision-making processes be redesigned to identify the effects of these biases sooner—or to mitigate them?

IDENTIFY areas where technology is amplifying your personal or institutional biases—for example, through information gathering, synthesis, or analysis—and engineer in competing points of view.

EXPERIMENT with falsifiability. When confronted with ambiguous, unverified, or unverifiable information, consider asking: what would provide solid proof that this is true? Or untrue? What would convince me?





DESTABILIZING DEMOGRAPHICS: the end of default identities



diasporamessenger.com (Kenyan first family) and wikiwand.com/ (Turkana people)

What does it mean for someone to be considered American?

Or Kenyan? Or Jewish? Today, the answer can only be “it depends.” Migration patterns are changing, as are the birth rates, death rates, and other factors we consider when categorizing and describing the people who make up our communities, regions, and

markets. We are redefining what unites us within a national context. Where do you belong? Who says?

As noted by Karen Brodtkin in *How Jews Became White Folks and What That Says about Race in America*, “Assignment (of ethnic identities) is about popularly held classifications and their deployment by those with national power to make them matter economically, politically, and socially to the individuals classified.” Default identities, defined as the perceived prototypical resident of a country, are generally defined by those in control of that country.

America’s default identity has historically been cisgendered, white, and Christian. The default identity in Denmark has been blond, blue-eyed, and Christian. For anyone tasked with telling stories about a country and its people, problems arise as default identities are often at odds with subgroups that sit outside national power structures. As global influences proliferate, the default identities projected onto communities by external entities gain additional weight. Outside of Africa, the default identity of Africans is homogenous, black, poor, and uneducated; yet that generalization is at odds with the self-proclaimed default identities found in each African nation and micro-nation.

Throughout modern history, independent countries have built their nations on default identities based on unifying the overlap of language, religion, and cultural groups. Yet colonized countries have had their national identities ripped apart, replaced by states that didn’t represent their inhabitants at all. In these cases, the power holders wielded strong political ideologies to unify people beyond micro-nations and traditional territories. Julius Nyerere, Tanzania’s first president after independence, promoted a strong socialist leaning to overcome micro-nation conflicts common among former colonies. This allowed Tanzanians to develop new default identities based on the political ideology of their nation instead of language and cultural similarities.

Today, we are witnessing a massive transformation of our default identities, through seismic changes in our ethnic origins, and our scientific understanding of the genetics that constitute those origins.

DRIVERS OF VOLATILITY

Between now and 2027, these global shifts will find us questioning the tools and ecosystems available for defining our identities, and what they mean to the future of our communities, politics, and markets.

Racial, ethnic, and religious demographic shifts

Immigrants from Latin America, Asia, the Middle East, and Africa are boosting the U.S. and European populations, radically transforming the ethnic, racial, and religious demographics of those regions.

Default Judeo-Christian Identities in Europe

The war in Syria has indeed propelled Muslims into Europe, but the continent was already undergoing a fundamental and permanent shift in its racial, ethnic, and religious structure. For a decade, steady Muslim migration into the EU, as well as higher birthrates within Muslim communities, have been shifting cultural structures there.

Despite historically low birth rates within Europe, the Pardee Center for International Futures estimates that the EU's population will increase by 10 million people by 2060, primarily increasing the percentage of European Muslims. Austria, whose population consisted of 90% Catholics throughout the 20th century, is expected to shift towards a majority Islam population (particularly with young people under 15) by 2050.

Default White Identities in the United States

“As a demographer who has followed the U.S. population trends for decades, even I was surprised by the sheer scope of racial change that came to light in the 2010 census. The story that the data tells is not just more of the same. I am convinced that the United States is in the midst of a pivotal period ushering in extraordinary shifts in the nation's racial demographic makeup.” – William H. Frey, *Diversity Explosion: How New Racial Demographics are Remaking America*

Every day the United States grows by 8,000 people, and nearly 90% of that population are people of color.

Changes in Age Structures

By 2050, the Pardee Center for International Futures forecasts that a majority of countries globally will have aging populations. India and China will be making this demographic transition much more rapidly than the United States, Europe, and Japan. For them, this demographic transition becomes a race against time. China is going to see a large drop in working-age adults as early as 2025. Can

they become wealthy enough to support an aging population that may want to retire before their replacements have been identified and trained?

As we approach 2050, one in four workers globally will be African, and they will seek work wherever they can find it around the world. Growing global mobility has already led to incredible migration flows, but by 2050 there will be strong push-and-pull factors that support redistributing working-age adults from parts of Sub-Saharan Africa, the Middle East, and Central America to the rest of the world.

The rise of ethno-nationalism

We've already seen modern states leverage political ideologies to develop a national mythology that pulls people together beyond ethnic identities. For example, concepts like liberal democracy in the United States and Europe, socialism in Tanzania, and communism in China have provided unifying structures beyond race and culture. However, growing distrust in government institutions has led to a drop in identifying with those kinds of unifying ideologies. Driven by that distrust, many people are reverting back to older identity markers as a rallying cry for who deserves to get a piece of what is perceived as the ever-shrinking economic pie. According to the Guardian, “Almost everywhere in 2016, polls registered an upsurge in nationalism, xenophobia, and overt racism, as well as a growing hostility to global institutions and supranational blocs such as the European Union.” Everywhere from the United States and UK to France, Holland, and Hungary, there is an upsurge in ethno-nationalism, attempting to reaffirm what it means to belong in these countries through narrow ethnic and religious definitions.

The growing inequality within wealthy countries around the world is pushing us towards protectionism and exclusion. Populist political factions have built their platforms on open skepticism as to whether trade and international institutions like the EU, NAFTA, and NATO are delivering on their promise to create peace, stability, and economic well-being for the general public. The rich-poor gap may have decreased in many countries, but within others we face some of the most intense inequality in modern history. Groups that belong to the traditional default identities throughout Europe and the United States fear for their future, picturing a world of declining economic and political power.

STRATEGIES FOR RESILIENCE

Finding your genetic cousins

How will this story play out over the coming decade? Stunning advancements in genetic sequencing technologies may provide new perspectives. On the heels of the human genome map, we can now use biotechnology to dive into basic questions about our macro-history and the earliest human migration patterns. On an individual level, an explosion in new personal genomics services enable us to ask, and scientifically answer, where do I come from?

Companies like 23andMe, National Geographic's Genographic Project, and Ancestry.com offer increasingly affordable at-home DNA kits to analyze individual genomes and map genetic ancestors. The Genographic Project alone has mapped close to 1 million individual genomes from around the world, and the more data we gather from individuals, the more accurate and nuanced our collective human story of migration and evolution becomes.

Analyzing Mitochondrial DNA, a smaller subsection of DNA that is passed down through females, scientists have been able to locate our root mother, the most recent modern female whose DNA we all share. Sometimes referred to as mitochondrial Eve, our root mother was found by tracking mutations across generations. Once a mutation has occurred, it is passed down in perpetuity, allowing scientists to trace its origin through the mitochondrial DNA of thousands of samples running parallel models of its evolutionary journey. Using this process, scientists recently discovered that 200,000 years ago a group of women existed with the same familial DNA, and that DNA is what has led to the mass diversity we see around the globe today. In other words, we are all distant cousins from the same place.

The DNA Discussion Project out of West Chester University in Pennsylvania supports new conversations around race, ethnicity, and identity based on individual DNA ancestor maps. Dr. Anita Foeman, the founder of the DNA Discussion Project, found that while DNA tests don't fundamentally alter someone's identity, they do soften how we otherwise talk about diversity and shape our understanding of default identities.

SO WHAT? How will your organization navigate the fragmentation of your audience and communities as demographic shifts and new identity markers intensify in their impact?

PROVIDE on-the-job training for new entrants and reskilling for older workers.

RECOGNIZE and affirm the multiple "nations" that people belong to, whether geographical or conceptual, and develop skills to move between them.

DESIGN infrastructure and systems so they eliminate or lower opportunities for ethnic and racial bias.

PURSUE unifying mythologies that transcend culture, race, and religion.

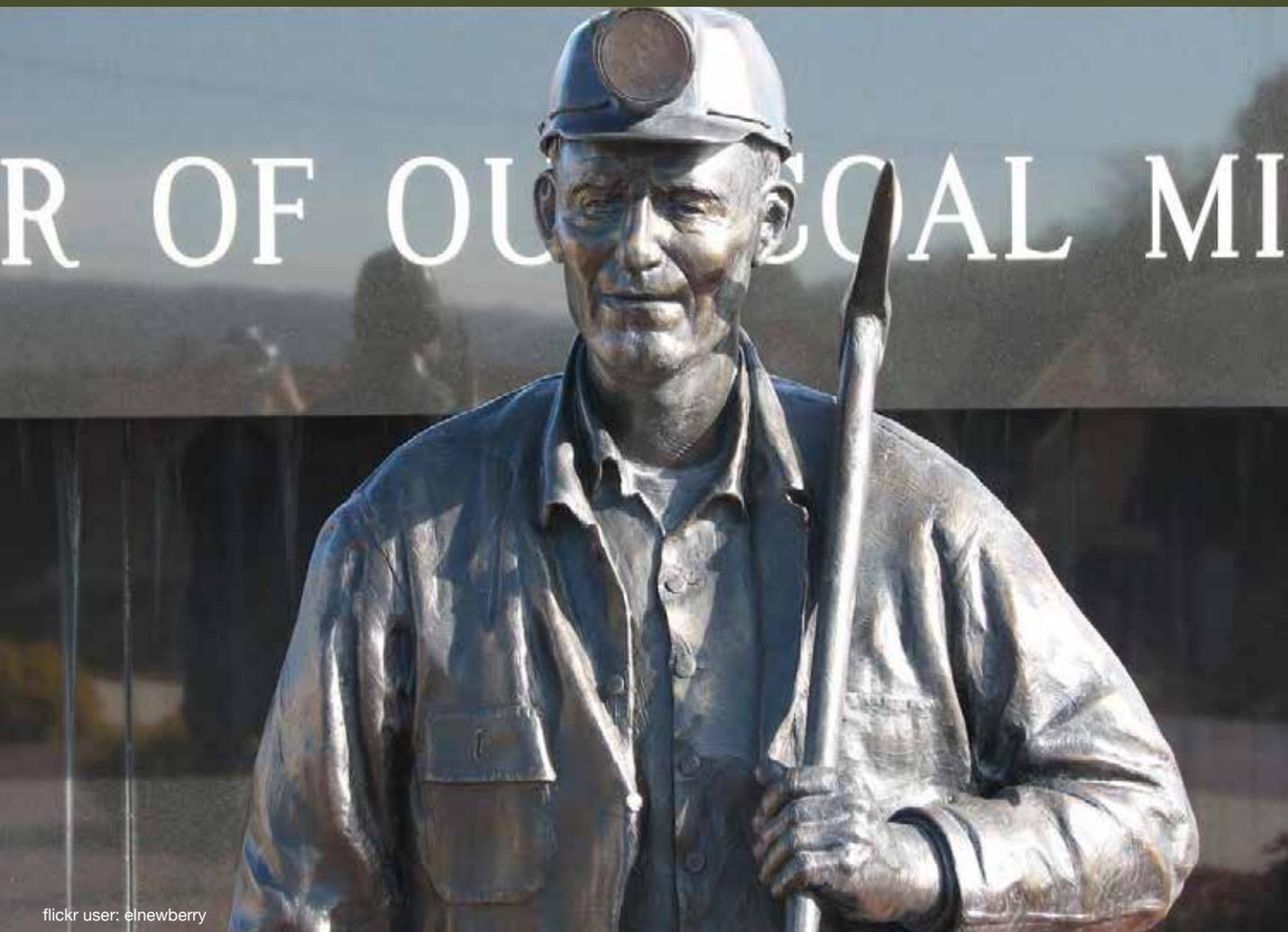
Our genetic makeup is often far more complex than we think. After hundreds of thousands of years of human migration, we are already much more multi-ethnic than we often think we are. The multi-ethnic aspects of our DNA are not always apparent in our skin.

As we walk farther into the next decade, will we develop new ways to build unifying mythologies that go beyond traditional default identities? Or will we leverage emerging systems to fragment our global communities across ever-more-specific markers of identity?





THE LABOR OF THE FUTURE: working the system



**Whenever futures
thinking surfaces
in mainstream
culture, it usually
does so by means
of tropes—**

iconic landmarks of humanity's future made famous by decades of science fiction stories, movies, and TV shows. As the technological infrastructure of our world has transformed over the past 50 years, our collective imaginations have been

guided by visions of flying cars, holograms, and bountiful guilt-free energy sources. But of all these tropes, perhaps none has become more ingrained in our shared consciousness than the rise of intelligent machines and the promise that one day robots would relieve humans of all the meaningful activity of running our society.

Most of us are now all too aware that this far-off dream of handing our work over to robots is significantly less far off than it used to be—that, in fact, it's already happening in earnest. And you'd think that after a century of promise we'd be more prepared for this moment's arrival than we seem to be. But our lack of preparedness belies a problem for which futurists are probably largely to blame. Every day that we inch closer to a world of ubiquitous automation, the science fiction tropes we grew up with become significantly less useful for understanding the reality of how automation is playing out, and how it's likely to affect our organizations and societies over the next several decades.

DRIVERS OF PRECARIETY

To prepare ourselves—our organizations, our workers, our communities—for the future of automation, we need to deconstruct some of our old tropes and identify the true shape and scope of this disruption.

Robotics and machine learning won't replace as many jobs as people think, but they'll replace more kinds of jobs than most assume

Like climate change, automation is one of those ideas that's so big it's difficult to reach popular consensus on whether it's going to transform our society overnight, or whether it's even really happening at all. Politicians still win votes by suggesting that the missing manufacturing jobs have all just moved overseas, and can be brought back in roughly the same form as when they left. On the other hand we have Elon Musk, famous proprietor of self-driving electric vehicles, warning us to get Universal Basic Income ramped up as soon as humanly possible.

The reality, as always, is somewhere inbetween. It's true that machine learning systems and advanced robotics can perform many tasks more quickly and consistently than humans. The most common job in most American states is truck driver, and millions of truckers are right to feel threatened by the advancing capabilities of autonomous vehicles. But it's also true that not every job is on the chopping block. Hundreds of millions of people on this planet perform social and piecemeal work that is not likely to be automated any time soon. Janitors, food cart vendors, nurses, and teachers probably have little reason to fret that robots are going to overwhelm their industry in the near term, or that any aspiring robots could perform their work more cheaply than they currently do. And for every thousand jobs that are creatively destroyed, we do create the need for new high-skilled positions to support, develop, and build on the extra capabilities we gain through automation.

You'll notice that the list of relatively safe jobs do not include many positions that our tropes would lead us to believe are harder to automate: doctors, mid-level managers, lawyers, accountants, artists. As sophisticated robots compete for low-skill jobs, our emerging artificial intelligence systems are learning to collect, synthesize, and assess information faster and more comprehensively than any human expert or knowledge worker could ever dream of. A team of highly trained leukemia doctors in Tokyo was recently stumped by a patient's condition until IBM's Watson correctly identified an obscure form of the disease that they'd missed. Unlike the specialist doctors, Watson is able to read and internalize the many thousands of relevant studies that are published each year, and never suffers from insomnia or fatigue.

By and large, the kinds of jobs that are prime candidates for near-term automation are those that offer repetitive or predictable tasks. If a job can be reduced to a formula—whether that formula involves bending steel or recognizing obscure patterns—then there's likely a lab somewhere already working on the algorithm to automate it. Jobs that require social interaction, cultural buy-in, or constantly emergent responsibilities will perhaps change or become a little easier, but are not likely to disappear any time soon.

The most immediate threat to our society will not come from millions of unemployed humans, but from institutions that fall tragically out of sync with their environment

Bill Gates recently suggested that we should create a tax on robots to slow the adoption of automation and to raise public funds for supporting replaced workers. This is an appealing idea in theory, but it plays directly into the trope that human jobs are being swapped out one-for-one by individual, human-like robots. The reality is much more subtle, larger in scope, and potentially scarier. Consider Uber. Uber has automated away many of the tasks of a traditional taxi company, including the dispatchers who used to assign cars to pick up specific passengers. Uber didn't replace these dispatchers with robots, however, but with a single piece of software that runs on a network of millions of phones across the world. For Gates' purposes, does the Uber app represent one robot, or is every version of the app its own robot? To complicate matters, Uber has grown to become the third-largest private employer in the world despite these eliminated positions (that is, until they get their own self-driving fleets off the ground).

As robotics and software fundamentally change the processes by which we accomplish tasks, they also change the shape of the institutions and industries that perform those tasks. The global microwork market, of which Uber is just one offshoot, is growing at a startling and accelerating rate, and is poised to become a \$25 billion-dollar market by 2020. In this emerging ecosystem, jobs are broken down into discrete tasks, which are then assigned to the right human, robot, or algorithm in real-time. The work of many traditional centralized institutions is giving way to work that is distributed across global digital networks, and the needs of those networks—the skills they require—are constantly in flux.

STRATEGIES FOR RESILIENCE

Well before we get to the point where there just aren't enough jobs for humans to perform, we will—and currently do—experience larger employment gaps from a workforce that has not been properly trained for the high-skill jobs that are still available. Our learning and retraining institutions were not designed for the constant churn and continuous upskilling that today's workforce demands, and have struggled to connect available workers with good jobs they may be qualified for if they just knew how to pursue them. When displaced workers do find new revenue streams in the burgeoning gig economy, traditional institutional safety nets like health insurance and retirement funds remain more elusive than ever.

In both cases, the near-term woes of the precarious gig worker and the recently unemployed are still largely avoidable, and lagging institutions shoulder more blame than automation itself.

Beyond today's conversations about degrees and certifications, one of the biggest disruptions may come in the permanent blurring of work and learning

One of the biggest conversations happening right now around the future of work and learning concerns the transition away from formal four-year degrees to new forms of credentials and micro-certifications. How do we recognize the learning that millions of people do on YouTube every day, or provide appropriate credit for the lived experiences people have that demonstrate valuable competencies, if not specific skills?

Microwork platforms like Upwork solve this by combining working and learning into a single platform. Anybody can post a job on Upwork, and across the millions of tasks requested throughout the year the platform gains real-time insight into what skills are currently in demand. They then partner with third-party services to provide relevant skills-testing for their vast network of gig workers. When combined with the reputation scores and portfolios that these workers develop over time, Upwork offers a robust two-sided platform for keeping the supply and demand of digital labor in sync with each other, even as needs continuously evolve. This is a recipe that will prove difficult, but necessary, to extend into the messy fabric of our formal learning institutions.

SO WHAT? How will your organization adapt to fundamental changes in the nature of work, while providing transitional pathways for automated functions?

IDENTIFY which organizational processes lend themselves to automation on a near-future timeline, and begin transition strategies for potentially displaced workers.

INVESTIGATE relevant upskilling pathways for current and potential employees to increase their lifetime value to the organization and to the changing workforce.

SUPPORT policies that will ease the transition away from institutional dependence for workers, including portable benefits and innovative retraining.

As we wade further into the decade, we may find that this kind of ambient competency assessment and upskilling becomes embedded in the connected devices and environments that surround us. Sensors in our workspaces and on our bodies will track and algorithmically certify our capabilities across thousands of dimensions, evaluating our abilities as we perform them. Rather than enforcing our traditional silos around working and learning as separate institutions and life stages, this emerging world will likely find us receiving an income from earlier ages on microwork platforms, while earning disparate new certifications throughout the duration of our work lives.

Regardless of what policies we pursue to address the coming wave of automation—Universal Basic Income or something else—the future of work is not going to be a story about individuals losing their jobs, but about the failure and reformation of our foundational social contracts. Before the decade is over, our public institutions and organizations will be forced to confront transformative new assumptions for how we manage productivity and the distribution of society's resources.





HYPER-GLOBALIZATION: the rise of high-delta markets



flickr user: zouzouwizman

There are many areas of the world where volatility is nothing new—

where assumptions around constant change and unpredictable circumstances are the norm. These are regions we may refer to as “frontier” or “developing markets.” Here, some combination of

institutional dysfunction, insufficient infrastructure, and civil conflict have prevented traditional western business practices from succeeding. Despite this, businesses not only exist in these areas, but often thrive. In the coming decade, as we seek to adapt to volatile conditions emerging in our own business contexts, we don’t necessarily need to reinvent the wheel; but we may want to reconsider the geographies and strategies that we model and emulate.

To begin, let us abandon the pre-global distinctions between “emerging” and “developed” markets. Instead, think in terms of the market’s orientation to change. Is the market itself pro-volatility or pro-stability? Markets that are high in volatility—whether anchored in the high-frequency stores of the Balogun Markets in Nigeria or the crypto-currency markets in the United States—will emerge as prosperous zones of growth and innovation in the coming decade. The business models that thrive in these “high-delta markets” not only survive under volatile, fragmented conditions, but actually require volatility to propel themselves forward. Likewise, as traditionally stable markets and industries become more fractured and disparate, these high-delta markets will teach us how to build pro-volatility business models that take full advantage of the powerful disruptions already underway.

In high-delta markets, innovation is emergent, distributed, often ownerless, and incredibly fast. Open, opt-in systems win in these environments. High-delta markets attract many small retailers with an entrepreneurial, flexible, and insecure workforce. Regulation is generally fragmented and emergent—not necessarily more or less stringent or even more corrupt, but less consistent or predictable. Income levels in high-delta markets may be high or low, defying traditional geographies of development. In fact, these markets almost certainly don’t correspond to official geographical designations, but are more likely to be neighborhoods or regional networks—physical and virtual—than cities or countries.

MARKETS OF PRO-VOLATILITY

Regardless of whether they refer to a local industry or an urban sector, the business models that succeed in high-delta markets demonstrate consistent patterns that can be modeled and replicated.

Shenzhen, China

Consider Shenzhen, China, which has earned the moniker as the “Silicon Valley of hardware.” It’s an accurate designation, but not in the way you might expect. The comparison recalls the early days of Silicon Valley, when the design and manufacturing of silicon microchips put the region on the map. Shenzhen occupies a similar space for circuit board design and device fabrication, but with an expansion of scale and diversity of offerings that Silicon Valley could never have dreamed for itself.

Outside of its manufacturing companies, the Hua Qiang Bei hardware market offers a non-intuitive center of gravity for the Shenzhen ecosystem. Hua Qiang Bei houses thousands of stalls and rooms, all selling hardware ranging from finished computers, phones, drones, and cars down to individual transistors. In our on-the-ground investigations, one local claimed this market fills 25 skyscrapers. Within these vast structures, you’ll find every variation of product or component you can name, and many you can’t. From “USB-powered lamps shaped like little hoverboards” to “self stabilizing selfie sticks,” Hua Qiang Bei is the source for memetic variants of any global fad of the past, and any yet to come.

There’s another, more hidden face of Hua Qiang Bei: much of the market doesn’t exist inside the skyscrapers but on thousands of interlinked WeChat groups and virtual storefronts, which are variously private and public. These platforms allow virtual actors to invisibly swarm among people within the market, connecting them to buyers and sellers across the world. Hua Qiang Bei market, in reality, cuts orthogonally through physical and virtual spaces, and touches places and people in geographies around the world simultaneously. To mistake Hua Qiang Bei for a collection of stalls in Shenzhen is a grave mischaracterization.

Like other high-delta markets, Hua Qiang Bei offers market characteristics that differ from traditional western industries:

1. There are many small retailers, as opposed to a few large retailers, that sell the majority of products.
2. Innovation is emergent, iterative, piecemeal, fractured, and extremely fast.
3. Labor is entrepreneurial, flexible, and distributed, as opposed to salaried and full-time through a single employer.

Lagos, Nigeria

With these characteristics in mind, let’s look 12,000 miles to the west, on the African continent. Amidst the thronging streets of Lagos, Nigeria, we’ll find another epicenter of high-delta innovation.

Superficially, Shenzhen and Lagos have much in common. Both cities are hot and muggy for much of the year. Both have grown dramatically in the past couple decades. But the way this growth has been handled in Lagos is dramatically, visibly different than in Shenzhen. Lagos is not significantly more dangerous than any other major city, but it does suffer from extensive waste problems, bad road networks, and a power grid that barely functions. Despite this, Lagos (and Nigeria more broadly) is growing economically with a lurching, spasmodic perseverance. Even outside the neighborhoods of Lagos that house millionaires and billionaires, the entire country is, with significant ups and downs along the way, beginning to be recognized as a global economic center.

Lagos offers many contemporary malls and grocery stores, but most commerce still transpires in crowded, vast, and informal markets like Balogun Market, Makoko, and Lagos Island. In these markets, tomato and meat sellers intermingle with hawkers of cleaning products, Bibles, prayer mats, spices, clothes, machine parts, and electronics. Cell phones are easy to buy and fix, and nearly everyone has at least one or two. The products are more varied than Hua Qiang Bei, and the markets are organized differently, but the same essential business model drives Balogun Market as its Chinese counterpart. Small retailers and stalls distribute goods piecemeal and in bulk. Bespoke products and fresh, locally-grown food are visible alongside the immediately recognizable food brands. And as in Hua Qiang Bei, only part of the commerce in Balogun Market happens in the physical market itself. Invisible rings of WhatsApp groups and Facebook messages garland the products on the shelves, tell the motorcycle riders what to deliver, and coordinate orders for more goods both domestically and abroad.

This kind of market, in Nigeria and other countries around the world, is where many of the electronics in Hua Qiang Bei eventually find their home. Purchased in bulk by traders in Guangzhou, or brought to Nigeria by Chinese people themselves, the full range of both white-label and branded goods are on offer. And increasingly, products designed locally but manufactured in Shenzhen are visible in the stands.

STRATEGIES FOR RESILIENCE

Crypto-currency markets

Let's look at one more example, this one a little closer to home: Silicon Valley. Despite the shared characteristics of entrepreneurial risk, Silicon Valley as a whole is not really a high-delta market. Though the venture capital and startup ecosystem are a far cry from the traditional corporate world of the United States and Europe, the business of Bay Area innovation has stabilized considerably over the past several decades. The top players are predictable and the environment they live and work in is sedate. The region's business models, and the models of innovation that accompany them, are more centralized than distributed, more corporate than networked. In this reasonably stable environment, low-delta business models often succeed more easily.

But even as Silicon Valley as a region offers few high-delta characteristics, high-delta industries still thrive within it, including the ever-volatile crypto-currency market. Having emerged originally out of the cryptography, hacktivist, and anarcho-libertarian communities online, and bolstered early on by gold collectors and other fiat currency skeptics, the Bitcoin/Blockchain industry now represents an eclectic mix of established corporate professionals, entrepreneurs, investors, communists, capitalists, anarchists, policy nerds, technologists, snake-oil salesmen, and consultants.

Despite Bitcoin's perceived dominance in the space, the crypto-currency market is rife with alternatives. These software-based coins, tokens, and assets are traded on a variety of online platforms. The platforms, in turn, are hosted across a maze of charts, forums, and spreads. They are reminiscent simultaneously of penny-stock exchanges and online gambling sites. Names like DarkCoin, Monero, ZCash, Nxt, and Omni hint at these crypto-currencies' origin and purpose, and many of them offer specific use cases or functionalities. Monero is privacy-centric. MazaCoin promotes the native sovereignty of the Northern Cheyenne. Ether drives the distributed computing platform Ethereum. Dodgecoin started as a joke. And so on.

Emerging through the fog of information surrounding the coins, however, are the familiar characteristics of the high-delta business model: many small sellers interplay instead of a few large ones. Innovation is rapid, emergent, and often ownerless. Information flows are organic. The market is both physical and digital.

SO WHAT? How will your organization adapt your distribution and service models to better serve the volatile and emergent landscape of the coming decade?

CREATE methods for entrepreneurs to opt-in and distribute on your behalf, whether you have a physical product or a service.

FORGET about protecting IP and just move as fast as you can.

DIVIDE markets by shared characteristics, not by country.

AVOID designing separate "digital" or "electronic" business models, but look for the natural digital behaviors that exist within the market already.

DON'T PANIC. There's still a lot of value in being the one who sticks around when others get skittish. In this world, trust and familiarity beat delight.

Because crypto-currencies work well in low-trust, low-infrastructure environments, their earliest successes were found in illegal online markets for purchasing illicit goods like drugs and weapons. But as the decade unfolds, they may well find their natural home in other high-delta markets. Although the value of crypto-currencies is itself volatile, they are easy to hold and spend with relative anonymity and security. In areas like the Balogun Market, where people are trading the quickly depreciating naira, or in Hua Qiang Bei, where buyers from every walk of life across the world are welcome, crypto-currencies offer important affordances. Despite the great geographical and conceptual distances between them, Hua Qiang Bei, Balogun Market, and California crypto-currencies are finding each other in the post-global world of high-delta, high-volatility markets.





THE SCIENCE OF WELL-BEING: growing bodies of knowledge



**Every
civilization
has had its body
of knowledge
about the
human body.**

The ancient Greeks had a mythic medical system that linked the body to the gods and their visible emissaries, the stars and planets. This was the astrological body. The Persian medical system of the 16th century gave us low-resolution views of human anatomy—the anatomical body—and this body has grown in complexity and resolution to become the *Gray's Anatomy* that still guides modern medicine today. In the past couple of decades, this anatomical view of the body has gained even greater resolution, with full-body digital scanning that can portray the body in hundreds of slices of pixel-resolution images, vertically and horizontally, front to back and back to front. And now, genetic sequencing has revealed that, in addition to the estimated 10 trillion cells that make up a human body, 100 trillion bacterial cells form an inseparable ecosystem of organisms that uniquely define each individual human body. These individual microbiomes interact with vast external microbiomes to shape how we experience health and well-being, or the lack of it, moment by moment. This is the microbial body.

By these measures, today's medical practice and personal wellness routines are almost primitively low-resolution approaches to the high-resolution information systems our bodies actually represent. Over the coming decade, the task of molding this vast expanse of human health data into a coherent, actionable, and widely accepted body of knowledge about how to be well in the world will challenge existing paradigms and practices. It will likely lead to a collapse of trust in contemporary medicine that's in many ways analogous to the collapse of trust in the politics of states. It will threaten entire health economies that are built around the prevailing, but increasingly outdated, body of knowledge that guides today's health care and wellness regimens.

DIMENSIONS OF VOLATILITY

Three disruptive bodies of knowledge will drive volatility in households, markets, and health policies as people struggle to make sense of more data than even our medical experts are prepared to interpret.

Microbial bodies of knowledge

The amassing of microbial knowledge about the body and its environment is already well underway. The efforts of NIH, as well as private and crowdsourced initiatives, to genetically identify the human microbiome have led to maps of 28 separate microbiomes linked to different zones of the anatomical body.

At the same time, the ability to sense and analyze microbial data is rapidly moving out of the laboratory and into commercial and household products. The most significant of these products is likely to be the toilet. Some innovations take 20 years to become an overnight success, and the microbe-sensing toilet may be one such innovation. Japanese toilet manufacturers are leading the way with electronically controlled toilet functions that use touch screen interfaces for individual settings for different household members. With the addition of genetic sequencing devices in the toilet itself, these smart toilets should be able to display the day-to-day microbial profiles for individual users, reporting these profiles to smartphones or computers for further analysis. This is the vision of the quantified toilet.

Where does this lead? Visionaries in the space imagine the potential of public toilets to capture individual toilet “behaviors” for real-time data and personal health analysis. Imagine that as you pass through airports, you could get a readout from a public toilet of how your microbiome is shifting as a result of exposure in an airplane or consumption of airport food. Imagine that all those readouts could add up to public profiles of each airport around the world. And also imagine the potential for surveillance at the level of the individual microbiome, which is an identity marker as distinctive as a fingerprint.

Whether or not quantified toilets are widely adopted in the next decade, more and more people will be sampling at least some of their 28 microbiomes and looking for ways to manage them for better health. Current medical approaches to bacteria focus on one-to-one bacterial combat—antibiotic or viral phages designed to eradicate a particular bacterium. But in a world of high-resolution microbiome mapping, the therapies will need to be equally high-resolution and diverse, challenging both established medical advice and the broader wellness marketplace.

Neuro-realities

Over the past several decades, neuroscience has been probing our gray matter in an attempt to build a more comprehensive model of how we think, act, and sense the world around us—and ultimately how we evolve as conscious beings. With the introduction of fMRI technologies, we are gaining high-resolution views of how everything from medication to social interaction shapes our thoughts, emotions, imagination, and compassion. At the same time, these insights about our central nervous system have also inspired our models of computing and artificial intelligence, driving everything from robots to virtual digital assistants.

But this exploration of our central nervous system appears to be only the tip of the iceberg of our neural-realities. Recent research points to multiple nervous systems that coordinate our experience of the world. Explorations of the human gut suggest that we have an independent enteric nervous system that may hold the key to understanding—and alleviating—neural-degenerative diseases like Parkinson’s and Alzheimer’s. With the legalization of marijuana and increased research into its impacts on mind and body, we’re also beginning to create a high-resolution map of the endocannabinoid system, with its neuromodulatory lipids located throughout the brain as well as the central and peripheral nervous systems. In what may be the next frontier of pharmaceuticals, scientists and citizen-scientists alike are beginning to map the characteristics of thousands of strains of marijuana and their impacts on the various receptors in the human body.

At even smaller scales, we’re discovering that we can stimulate the so-called quantum microtubules within the cells of neurons to activate an entirely different kind of information processing system—one that follows the rules of quantum physics rather than the mechanical physics of digital processing. Some scientists speculate that this quantum nervous system is actually responsible for what we call consciousness, and they are already experimenting with it to modify both memories and moods. These experiments point not only toward new models for quantum computing systems, but also new modes of achieving human well-being.

STRATEGIES FOR RESILIENCE

Medical personas

Finally, we come to the broadly disruptive blockchain technologies, in which every transaction, whether it's an exchange of coins or an exchange of information, is stored and verified in a ledger without necessarily revealing those engaged in the transaction. This basic capacity signals the potential to radically change how we manage medical records, and indeed all records linked to a specific human identity.

Over the coming decade, we're likely to see the evolution of medical personas: smart pseudonymous medical profiles that can interact with insurance companies, medical practitioners, government health agencies, and even employers and financial institutions to manage individual well-being and the well-being of entire communities. In place of highly bureaucratic records management, algorithms will manage the flows of medical data, protecting personal identity while compiling only the pertinent information for a particular decision or transaction.

Pseudonymous medical profiles will also allow individuals to "tokenize" their personal medical data to build new flows of value—whether they are selling their information for research and advertising, or contributing to a high-resolution knowledge commons about community health in which they earn citizenship tokens in exchange for portions of their medical history.

SO WHAT? How will your organization take advantage of the budding ecosystem of high-resolution health data and services, while still navigating legacy structures and assumptions?

High-resolution wellness

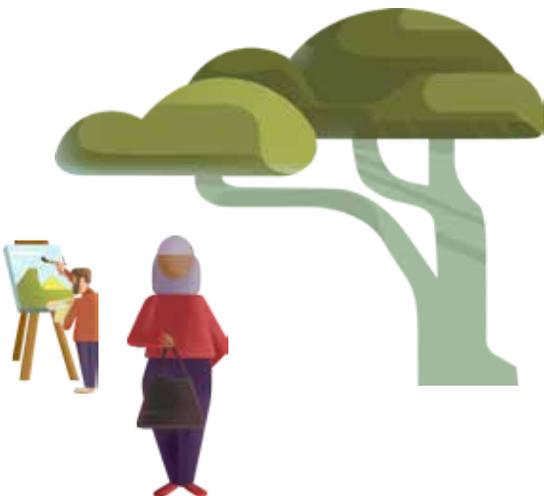
These ultra-high-resolution bodies of medical and health knowledge are poised to disrupt our already frayed medical and health-care systems. It's easy to imagine that, in the face of overwhelming data, medicine will follow the route of journalism, with highly contested "facts" and the emergence of an "altmed" narrative to challenge contemporary science-based medicine, which itself will struggle to incorporate the rapidly evolving science into medical practice. Meanwhile a medico-technical elite may achieve high-resolution wellness with machine-augmented medicine that enhances the human nervous system to deliver personalized, precision health interventions.

In the face of this volatility, three strategies for resilience seem essential:

FIRST, we need to build high-resolution data literacies across the population. Data science should not be the province of a technical elite, but should be built into the basic curriculum, starting with grade school. Just as young students learn to use browsers and search engines to gather knowledge, they should learn to use, and eventually construct, algorithms that can interpret complex data sets.

SECOND, we need to reorganize our institutions to automate the iterative cycle of the classic scientific method. Specifically, we can combine three emerging capacities of the high-resolution world: crowdsourced science, human task routing, and blockchain-based smart contracts and DAOs. Humans need machine augmentation to process this high-resolution world, and these innovations can deliver it at transformational scales.

THIRD, we can leverage high-delta market models of innovation to rapidly evolve medical devices and practices tailored to niche applications. The benefits of high-resolution knowledge accrue most dramatically to local or small-scale applications while tapping the new scales of knowledge worldwide. This is precisely the sweet spot of HDM models—and perhaps the best opportunity for rapidly integrating high-resolution medical knowledge into everyday practice.





PERILOUS PLANET: designing for impermanence



flickr user: Break Free

In just a few decades, the conversation about climate change has moved

from prevention to mitigation to adaptation to resilience. We're in trouble. Since 2000, the planet has experienced nine out of the 10 hottest years on record. Between 2011 and 2013, the United States suffered through 32 catastrophic weather events that each caused at least \$1 billion of damage, according to the U.S. Environmental Protection Agency. Last year, the United States saw its first "climate refugees," residents of Louisiana and Alaska towns forced by rising sea levels to uproot their lives and find somewhere else to live. Climate change is now the context for humanity for generations to come. Permanence is fading.

Right now, the impermanence driven by climate change is uneven. People in poorer regions with weaker infrastructure are often hit the hardest, or have the most difficulty bouncing back, and are forced to move. But even those who are able stay at home often find themselves lost, baffled by changed landscapes and unfamiliar weather patterns. Climate philosopher, Glenn Albrecht, calls this *solastalgia*: "the distress within an individual or a community about the loss of 'endemic sense of place' and the loss of a sense of control of its destiny."

This loss of place and lack of persistence is a massive turn from the national and civic identities many of us were raised with, which urged us to invest for multiple generations in the communities, towns, and land where we grew up. Yet fewer and fewer people will be able to live out these dreams without being impacted by a climate disaster, or the repercussions of one, over the course of their life: war, influxes of refugees, food shortages. If we continue to build our lives, identities, institutions, and infrastructure based on current ways of thinking, we are setting ourselves up for disappointment, heartbreak, confusion, anger, and failure.

Instead, we must start with an assumption of impermanence.

DESIGN PRINCIPLES FOR VOLATILITY

With impermanence as the new reality, how might we design our society, culture, identities, governments, institutions, and families differently?

Standardize in order to customize

In the face of climate disasters, there is often little time to architect custom recovery solutions. As populations of environmental and political migrants grow both quickly and erratically, it behooves us to favor infrastructure options that can be easily modified, customized, and even hacked for each unique situation. Design standards that support interoperability and modularity will provide better resilience and adaptability to the needs of communities and customers in the coming decades.

In 2013, IKEA revealed Better Shelter, a lightweight, modular, adaptable, flat-pack temporary shelter meant to replace UNHCR tents and other temporary housing solutions. One can add or subtract components to change the size of the Better Shelter, including the location of the windows and doors. And since it's modular, failed parts are easily replaceable. They are now being deployed in emergency situations, in the hopes of providing a more dignified, easy to construct, and easy to modify starting point for displaced people.

Unlike closed-loop systems like Apple where many of the pieces only work with other proprietary parts, impermanent design relies on standards that are open source and accepted universally, like nuts, bolts, lightbulbs, and USB ports.

In a 2000 study titled “The Role of Standards in Innovation,” Robert Allen and Ram Sririam conclude that, “Although standards can inhibit innovation by codifying inefficient or obsolete technology, and thus increase the resistance to change, standards generally spur innovation directly by codifying accumulated technological experience and forming a baseline from which new technologies emerge. Standards also spur innovation indirectly because they increase global competitiveness, which in turn spurs innovation.”

The need for standards and interoperability goes beyond provisional housing, however. In terms of data, you need parallel data sets to be able to draw inferences from past disasters and to react swiftly and in concert with others. With cities and systems, it's about being able to expand or contract as needed. Being able to react to an influx of people by quickly building out schools, social services, and more, and being able to scale down accordingly as people leave. Business can benefit from developing a similar sense of flexible expansion and contraction. Within cities, people have experimented with

shipping containers and other forms of temporary infrastructure, but we need to design with that modularity in mind from the start. From our smallest components to our most robust, high-end systems, this modularization will prove an essential asset as we look to our second strategy for resilience.

Master the art of transitions

With impermanence as the norm, we must all become comfortable with the discomfort of transitions. Here, we can learn from military families. In the United States, the 1.2 million children of active duty service members move an average of nine times over the course of their school years. The vast majority of them attend public schools which often aren't set up to handle temporary schooling needs. This can lead to poor academic performance and higher incidences of behavioral issues compared to the general population. The Department of Defense Education Activity Schools have achieved much better outcomes by serving this population of students directly, creating their own schools with uniform curricula, support systems, and enrollment processes designed to aid people moving in and out of the system. By designing with an assumption of constant transitions, instead of singling out these kids and families as anomalies, these schools have been able to mitigate many of the issues posed by geographical disruption.

Designing for transitions also involves distributing risk. This is something that companies have designed around for a long time but it is something that individuals will increasingly need to consider as well. However, for many people, having a backup plan—an alternate source of income, an alternate place to live—is beyond their reach, which is why the World Bank currently predicts that climate-related events could push an additional 100 million people into poverty in the next 13 years. Many people are just a paycheck or a disaster away from not being able to provide for themselves and their families.

So backups and redundancies need to be built on a community and systems level in order to build resilience. Community-level resilience could help smooth over climate-related transitions, so that eventually, transitions will no longer be jarring or destructive, or slow down our business and economies. But with so much in flux, it is those who are able to build community, and quickly, who are poised to thrive on a perilous planet.

STRATEGIES FOR RESILIENCE

Catalytic Action is a UK-based non-profit that leads community design processes to create communal spaces—from playgrounds to schools to community centers—in refugee camps and other makeshift housing developments. Their goal is to provide space and tools for building community quickly amidst constant transition: facilitating people working together to come up with a plan, giving them new common ground and experience, and ultimately providing the spaces where these relationships can grow.

Create islands of persistence

Living in constant flux is exhausting. Even if we do get better at transitions, moments of familiarity and regularity are still essential to happiness. Islands of persistence could include online learning hubs that let you pick up where you left off, digital lockers for your important documents, biometric IDs that cross regional systems, and even augmented reality experiences of your home and keepsakes as an overlay on a temporary shelter. In an unstable and disjointed world, these systems of momentary stability and continuity become even more important.

In particular, the platform economy—everything from ridesharing drivers to Airbnb hosts to freelancers and high-level consultants—carries within it the potential to provide persistence through work. One of the advantages of many kinds of platform work is that it can be done remotely, and reputation and work history is tracked on the platform. This allows people to continue their work and build a persistent identity as they move from place to place. If, from the start of one's career, occupational achievements were tracked in a digitally verifiable way—like many digital freelancing platforms are already doing—the disruptive impacts of dislocation could be better mitigated while providing a more coherent infrastructure for global microwork ecosystems and personal identity management.

Persistence can also come in the form of keeping your communities or relationships alive, even after you move away. Today, WhatsApp, Facebook, and other messaging services allow people to remain in touch in unprecedented ways, a trend that will amplify as these technologies become more sophisticated, immersive, and mobile. Alexa, Amazon's intelligent personal assistant, now comes

SO WHAT? Where could your organization begin applying the principles of impermanence to your products, services, or internal logistics?

How might your organization standardize in order to customize, master the art of the transition, and create islands of persistence in this new era of planetary uncertainty?

How might you find fulfillment, organizational stability, and resilience by designing for impermanence?

in app form, and can go with you wherever you are. She, and other AI agents, just might prove to be a grounding, humanizing thread in an era of constant change, providing continuity across our learning and working careers, and algorithmically match-making refugees to the relevant communities and services in their new geographies.

In his book, *Migration and the Search for Home: Mapping Domestic Space in Migrants' Everyday Lives*, Paolo Boccagni states that “While the ideal home may turn out to be elusive anyway, its systematic postponement is a particularly visible pattern in the life trajectories of international migrants ... In a homing view, the materiality of home is less a given and natural fact than the outcome of a process of sense-making and emotional attribution.” While a house exists in one place, “home”—as an emotionally-driven and relationship-based concept—can be, in fact, mobile. Home is a process—and one that we need to empower people to take on.





THE AI FACTOR: the era of machine learning



The next decade will see the rapid deployment of artificial intelligence-based software into an ever-expanding list of systems,

devices, and objects, while algorithmic intelligence will be added to a wide variety of once-narrow processes. When Kevin Kelly argued that “the business plans of the next 10,000 startups are easy to forecast: Take X and add AI,” he wasn’t simply talking

about adding “smart” software to equipment already based on digital technologies (such as televisions or automobiles). The transformation now underway will be far more inclusive than that, leading to this urgent question: will we be able to trust that the decisions offered by learning systems will be better than those we would make ourselves?

There’s no question that the breadth of disruption will be profound. We’ll see it in the embedding of machine intelligence in our material tools and surroundings. What could “smart clothing” do? How about a “smart doorway?” Or a “smart suitcase?” Think about any basic object in your home or office—what could it do if it could sense, learn, and respond? At the same time, machine learning-based AI will also transform the nature of existing software, from game opponents that learn to counter player tactics to financial planning tools that offer better advice than a human advisor.

The next 10 years will see the accelerating proliferation of artificial intelligence into our everyday lives, our businesses, and our physical environment. Such technologies will by no means be perfect, and the resulting inconveniences and missteps of our “smart” world will, at the very least, be ongoing fodder for comedians and Facebook complaints. If those missteps are significant enough, they could become the catalysts for a loss of trust in machine decision-making that maps to the loss of institutional trust we’ve seen across so many other arenas. The era of machine learning arises not because the systems are complete, but because we think they’re finally just good enough. We may be right. We may not.

AUTONOMOUS DRIVERS OF ALGORITHMIC VOLATILITY

As AI systems increase dramatically in capability and reach, we will be confronted with overlapping second-order effects that will shake our assumptions about privacy and security.

Big data

The proliferation of artificial intelligence and learning algorithms throughout our physical environment is both driven by and a source for what's often called Big Data. AI can sift quickly through reams of data in order to find highly specific and context-appropriate information. Big Data allows smart systems to better recognize details and to generate responses more fitting to a particular user or situation. The capacity of AI to search and analyze nearly every piece of relevant data gives it an enormous advantage over humans, especially in fields where the amount of useful or critical information is beyond any one individual's comprehension.

This is already having an impact in the world of diagnostic medicine. Google's machine learning project is able to spot the presence of breast cancer in gigapixel microscopic images of mammograms with 89% accuracy; the typical human pathologist achieves a 73% accurate result. Not surprisingly, a 2016 article in the *New England Journal of Medicine* argues that algorithmic learning systems will soon displace human radiologists. These developments aren't just happening in observational diagnostics; AI-based systems have begun to see success across a wide range of medical issues. Earlier this year, a Florida State University system demonstrated the ability to predict with 80-90% accuracy the likelihood of a patient attempting suicide up to two years in the future.

But machine learning is dynamic. Alongside the expansion of Big Data analysis, smart technologies will add their own information to Big Data collections, improving the capacities of related systems. As individual devices gather useful information, every device relying on that collection benefits. This points to one important advantage of AI-based systems over simpler responsive technologies: intelligent systems can adapt to changing patterns or behaviors. They rely on learning algorithms, watching for indicators of success and failures, changes in the environment, and building on previously gathered information in order to come up with appropriate actions.

Always listening

In order to do this, smart systems will very often rely on sensors to capture data about ongoing conditions—even when the systems are not in active operation. A device may rely upon constant sensing of vibration, temperature, or sound to know to “wake up” when someone has entered a room. Voice-activated technologies rely upon the continuous capture, analysis, and recognition of ambient speech in order to know when to respond to an “OK Google” or “Hey Siri” (or “Alexa,” “Xbox,” “Hi TV,” or myriad other voice triggers). This has significant privacy implications; although the initial voice trigger will usually be recognized by secure hardware in the local device, the translation of the command or request that follows currently requires the use of dedicated remote servers. These, in turn, require regular human evaluation for quality assurance.

In late 2016, police in Bentonville, Arkansas requested that Amazon turn over possible evidence about a murder that took place in a home with an Amazon Echo, a responsive device running Amazon's Alexa software. Amazon fought the request, claiming that turning over any Echo voice recording from the device, particularly without a very specific subpoena, would violate the privacy rights of its customer. After weeks of courtroom battle, the suspect agreed to allow the search, so the underlying legal question remains unresolved.

But the Amazon device isn't the only smart system in the suspect's home that the police have investigated. According to NPR, the investigators also pulled information from the home's smart water meter, arguing that an unusual use of water late at night is evidence of an attempt to clean up after the murder. It's not difficult to see how a variety of current and near-term smart systems could be used to gather information about individuals. A Nest thermostat could register a shift in temperature from a door left open, or from an abnormally large number of people being present; a home security setup could capture video based on sensing noise and motion outside of the household norms. As the variety and capabilities of smart systems expands, so too will their potential as tools to capture personal information about users.



STRATEGIES FOR RESILIENCE

Which lessons will be learned?

This constant gathering and analysis of information clearly has many benefits. In autonomous vehicles, for example, learning algorithms experiencing and responding to novel situations on the road can add that new information to the larger body of learning accumulated by every vehicle using that system. All autonomous cars relying on that data can benefit from what any one car has experienced. This already happens with translation software, shopping recommendation bots, and other programs intended to be able to respond correctly to a large variety of unique conditions. With learning algorithms, an increase in use means an increase in capability.

These systems will still be improving over the course of the next decade, but they are increasingly “good enough” for customer acceptance. The problems that remain are often seemingly minor (but complex to solve), subtle, or slow to become apparent.

For example, intersecting systems with very different priorities will become more commonplace, such as a medical diagnostic system suggesting a procedure that the hospital or insurance administration system won't approve as cost-effective. Machine decision arbitration will fall on human shoulders, at least at first.

Who's liable if a self-driving car gets a speeding ticket? What happens if a bank's loan approval software engages in apparent “red-lining?”

Humans in the machine

This last one suggests a less obvious problem arising in the form of software bias. Although a learning algorithm, by definition, figures out best-fit solutions to queries and conditions, the rules under which the algorithm acts, such as the weight given to various data points or the definition of what success looks like, remain driven by human demands and requirements. Software may decide how to fit pieces of information together, but human choices still determine *which* pieces the software should use. The seeming objectivity of an answer from a machine learning system can blind users to the potential for underlying biases.

One consequent dilemma that will become more common over the next 10 years will be the challenge of distinguishing between an erroneous

SO WHAT? How will your organization take advantage of the incredible affordances of AI-based systems while avoiding the potential pitfalls of security, privacy, and erroneous behavior?

LOOK at a fundamentally inert or dumb object and consider what an AI-enhanced version of that object might do. A smart fence? A smart lampshade? A smart spoon?

INVESTIGATE which additional (and potentially unexpected) sources of Big Data might add to the ability of machine learning systems in development.

TAKE NOTE of which information sources the learning systems you use rely upon. What's missing? Which inputs might be necessary, but would change what the AI does?

CHALLENGE the assumptions of learning systems. Who decides how success or failure is measured? What implicit biases might exist in the code?

result and an unexpected (but correct) result. We've already seen software-based evolutionary design (an early form of learning algorithm) come up with working hardware—antennas, for example—that operated in ways that were not immediately apparent, or even explicable, to the engineers using the software. As machine learning becomes a more commonplace part of our technological environment, we will repeatedly face situations where software produces unexpected or seemingly nonsensical results, and we must decide whether to trust the software or our own instincts.

The early indicators suggest that we may be more willing to trust our machines than we might expect. Ford Motors has reported problems with tests of self-driving cars where the engineers behind the wheel—observing, but not physically operating the vehicle—fall asleep. More pointedly, a 2016 Georgia Institute of Technology experiment demonstrated that test subjects would follow a robot to escape a hazardous situation, even when the robot was clearly leading them away from visible exits.

But how many mistakes would it take for that apparent trust to collapse? One underlying complexity of machine learning AI is that, as it learns from its results, it may not use the same solution twice. Esther Dyson once said “always make new mistakes”—will we give our learning software that luxury?



SECURITY AND STATUS: incongruous identities



In a globally networked world, the mediated representations of ourselves often carry far more importance than our self-perception.

Such representations can be quite narrow, whether by choice or by structure, but they are the versions of ourselves most visible to others. Unfortunately, these same mediated representations are comparatively simple to manipulate, alter, and steal. There's no sign of this phenomenon reversing; over the next 10 years, our

mediated selves—our identities—will continue to increase rapidly in number, complexity, and vulnerability.

Even as they multiply, our identities remain contextual. As Esmeralda Santiago said, “tell me who you walk with and I’ll tell you who you are.” In many ways, how we represent ourselves is meaningless when divorced from the audience for that representation. And because the audiences for our varied representations can and will overlap, the ways in which our identities corroborate or contradict each other matter. This has long been true, but the difference now is persistence. Self-representations and identities we embraced in our past no longer evaporate over time, especially for many Millennials and Generation Transitioners who have grown up in a world of constant observation.

As the hyper-networked world fractures our existing markers of personal identity even as it offers complex new techniques, institutions and individuals alike will face perilous new forms of identity manipulation, obfuscation, and impersonation across emerging and existing media.

PERSONAS OF VOLATILITY

Over the coming decade, digital identity systems and pervasive new media technologies will challenge the policies and basic coherence of our identities—particularly our privacy, security, and status.

Code-switching

At its root, identity is the face shown to particular audiences. As a result, it's extremely common for one's visible identity to vary—sometimes considerably—in front of different groups, even if one is unconscious of the shift. In linguistics, this is termed “code-switching,” the adaptation of dialect and vocabulary to match social expectations. As the number of groups we encounter multiplies (as our mobility and our access to social networking technologies increase), so too does the number of identities through which we code-switch.

Over the next 10 years, for reasons of mobility, economics, and the continued growth of social networking tools, individuals will find themselves embedded in a growing number of persistent social relationships. Some will be narrow, demanding strict limits on the forms of interaction or focusing exclusively on a specific subject of interest. Others will expressly serve as an adjunct to—or even a partial replacement for—one's “real” life. Code-switching will be a fundamental aspect of how we manage this multitude, and it's likely that generations growing up amidst a diversity of types of social connections will learn how to code-switch in highly subtle and complex ways.

Historically oppressed groups have long employed code-switching as a way of maintaining legitimacy within their own community without alienating the majority or dominant community. As an online behavior, code-switching is often seen on social networks in the form of alternative accounts or filters for different audiences—parent-facing versus friend-facing accounts on Facebook, for example. In a similar vein, people often use “throw-away” identities on social networks as a way of protecting anonymity by avoiding any connection between their normal accounts (which may or may not link to their real names) and a controversial opinion or awkward confession.

Relentless waves of influence

Despite the use of “throw-away” accounts and other anonymizing tools, a connection between representations of ourselves can and sometimes will be done without our consent. At its most extreme, it's known as “doxxing” (the act of uncovering an individual's personal information, or “documents”). In communities where anonymity can be a form of personal protection, doxxing is an

aggressively hostile act. In less fraught situations, doxxing may simply be a way of showing a link to a larger community, even when no formal connections actually exist. As technologies intimately mediate more of our sensory inputs and environments, we will have to work harder to decouple our individual experiences from automatic comparisons and connections.

We are also increasingly aware of the profound effects our social connections have on our selves, both behaviorally and physiologically. Research on the social contagion process demonstrates the communicable nature of attitudes and actions like happiness, obesity, even divorce (the so-called “suicide contagion” is, in particular, a globally recognized problem). As a result, the increasing tide of connectivity means relentless waves of influence. By 2027, these social contagions will be more readily spotted and categorized, potentially allowing individuals some measure of control over their impact.

Shifting masks

One of the more profound interplays between human and machine comes from the growing number of ways in which we can use our tools to alter our visible identities. This can be an ongoing effort to present a very different face to the outside world than one shows in person; a transient experiment to explore interactions not available to oneself, or an opportunity to act out and break social taboos in ways that would otherwise lead to imprisonment. Such alternative personas operate in parallel to real-world identities, and one individual may make simultaneous use of a wide variety of alternate selves.

Gamers have long taken advantage of opportunities in online games to present as the opposite sex, sometimes going as far as to pretend to be male or female (as appropriate) during online play. While in most games the gender choice is entirely cosmetic, offering no in-game bonuses or penalties, the behavior of other gamers towards female-appearing players can be profoundly different. Players portraying female characters often report increased attention from male-presenting gamers, both positive (in-game gifts and assistance) and negative (gendered slurs and abuse).



STRATEGIES FOR RESILIENCE

Non-game social interactions (such as online communities) also enable users to present an identity completely different from their “normal” selves, albeit usually without a visual avatar, and often (but not always) in parallel to a more conventional online identity. Some users take advantage of the perceived privacy that extra identities offer them to explore aspects of themselves they feel unable to develop in “real life.” Others use these alternatives to make political or social statements without endangering themselves. Many people use anonymous or pseudonymous identities to provoke others (“trolling”), believing themselves safe from repercussions. Trolling is more than simple bullying or insults; “swatting,” the act of calling in a hoax emergency intended to bring heavily armed police to a target’s location, has become a common tool for online trolls, and has resulted in multiple accidental deaths.

Sock puppetry

By 2027, all of these alternative identities may be significantly more elaborate, meaningful, and disruptive. The use of the “substitute self” technologies to manage complex social networks can easily be subverted to make behaviorally believable alternative selves.

But the biggest divergence between real-world identities and virtual identities is the opportunity to create a wide array of digital personas able to operate simultaneously. Crude forms of this phenomenon already can be found in online political discourse, where so-called “sock puppets” (fake identities speaking up in support of an argument) may be employed to make unpopular opinions appear to be more widely held. By 2027, this kind of activity will be far more sophisticated, with false personas displaying much more nuanced and complex identities, even when operated by software agents. Some political debates may be dominated by sock puppets battling with little or no actual human participation.

This points to what may be among the larger social challenges of the 2020s: being able to distinguish between actual and manipulated representations of someone. We can verify someone’s identity in interpersonal situations through personal knowledge or the testimony of a mutual connection. In the digital realm, the “testimony” aspect becomes somewhat abstracted, and we increasingly rely upon algorithms to assure us that

SO WHAT? How will your organization take advantage of the incredible personalization opportunities afforded by digital identity systems without sacrificing the privacy and security of workers and customers?

INCREASE reliance on multi-factor security. Passwords and biometrics together are stronger than either one alone. Biometrics can mean more than fingerprints, too: ear shape, teeth shape, even gait and motion analysis can be used.

TRUST media with a diversity of sourcing. A single video or image is supremely easy to fake. A dozen videos or images, each taken from a different angle, on different kinds of media, at slightly different times, is far more difficult to fake.

LOOK for fingerprints. It may turn out that our personal variety of identities, and the ways in which we code-switch, will provide a unique “fingerprint” that we can use to establish our legal identity in a way that would be very difficult to copy. However, this would require that the underlying connection between different identities be explicit, undermining personal privacy.

we’re talking to whom we think we’re talking to. But many of the tools that enable this conditional trust have become easy to hack, even in basic ways. It’s easy and relatively inexpensive to buy followers on Twitter, up-votes on Reddit, and entire *accounts* to use as virtual advocates.

Virtual unreality

It’s also become startlingly simple to create plausible representations of unreal events, behavior, even people. This is far more than using Photoshop to add John Kerry to a picture of Jane Fonda (as was done in 2004). It’s presently possible to alter what a person on video appears to say, where they appear to be, even what they appear to wear. As machine learning systems become more fully integrated in the realm of computer graphics manipulation, this difficulty will increase dramatically.

This leads to a challenging question: in a world where manipulated data and visual representations can be indistinguishable from “real” material, how will it be possible to recognize the difference between the two? We will need to develop new skills and habits to be able to have meaningful levels of confidence in what we know about a person or an event. Such a task will be difficult.



BEYOND BLOCKCHAIN: deconstructing distributed infrastructure



Over the next decade, communities will bypass centralized government bureaus

to establish, manage, and mediate their own economic and social contracts digitally. Peers will judge and track others' actions according to explicit, machine-verifiable protocol conditions. These shared protocols will reach across social,

corporate, and national borders, creating extra-jurisdictional relationships that defy censorship. They will manage the flow of critical services and assets securely, and hold them as collateral to prevent access by bad actors. Tomorrow's rule-based systems—from currency to contracts to democracies—will eliminate the point of failure that leads to fraud, unequal enforcement, and outright corruption. We'll take ourselves out of the loop.

For millennia, we have used rules and contracts to “program” our society and commerce. From legal doctrine and trade agreements to religious scriptures and shared culture, we've managed and distributed these records to promote consistent behavior and issue swift punishment for noncompliance. The challenge always arises when these rule-based systems rely on humans to interpret and enforce them, resulting in dysfunctional incentives and biases that reliably creep into top-down decision-making processes.

By contrast, today's emerging systems empower peers to host records of each contract and interaction they engage in, through a shared database that is resistant to tampering. The blockchain, a database structure introduced as a way to track digital currencies like Bitcoin, will be among the first technologies we'll harness to distribute and protect these records.

Blockchain software stores digital records in sequential order as “blocks” of transactions. These blocks are validated by a group of online peers, ensuring that they meet the protocol guidelines. They are then copied to a distributed set of peers and protected with encryption so that the records cannot be targeted for deletion or manipulation on just one person's machine. Blockchains and other decentralized software will give anyone with Internet access the ability to manage their own agreements and access trusted services, such as those offered by a government.

Over time, decentralized services provided through blockchain-like infrastructure will come to challenge established governance authorities, replacing individual functions of what might be thought of in computational terms as a “National Stack.” In some cases, these tools will augment the capabilities and efficiency of centrally-provisioned government services. In others, they will eliminate the need for government intervention between peers entirely, building open and modifiable templates for coordination to catalyze new kinds of virtual state structures.

DRIVERS OF TRANSFORMATION

As blockchain-like systems mature, they will offer a suite of new affordances for restructuring our legal, contractual, and governmental services for a world of hyper-connected populations and high volatility.

Frictionless economies

Decentralized infrastructure, like that provided by blockchains, will help reduce the need for centralized authorities in overseeing exchanges between parties, and for negotiating on-demand access to sensitive assets such as electricity, money, and personal information. At the same time, shadow economies built on these same technologies will prove resistant to existing forms of governmental regulation, making criminal profiteers more difficult to control.

Digital forms of currency like Bitcoin will give rise to a truly global financial system, where no individual bank or government clearing service is necessary to store and transmit value. A host of local and purpose-built currencies will evolve from shared code, each with their own hyper-specific rules of exchange. By providing specifically customized value to niche circumstances, these currencies will incentivize blockchain participation and fuel the rising global gig economy.

As real-world assets and complex financial products are tied to these currencies to form a kind of value token, personal wealth will shift in unprecedented ways. For example, the People's Republic of China is already discussing the possibility of developing its own digital currency and an IoT "blockchain of things" to help track and move global finances and physical devices efficiently. Bitland is providing a land title registry system as a body of evidence in areas where government records are inaccessible or insufficient for land ownership. Microsoft, Bank of America, SKUchain, and the Commonwealth Bank of Australia used a blockchain to securely track custody of commodities through the supply chain, simplifying and securing international trade finance.

Distributed witnesses

Blockchain structures can also be used for much more than tracking ownership of assets. They can actually be used to establish facts. Each digital record space can hold static information about personal identity and reputation, votes and political promises, civic IoT infrastructure conditions, and more. Since blockchain systems already copy data throughout a network in such a way that no one person can delete or change records, anyone who holds the records can reference them to prove facts or audit activities.

Already, Tierion uses extra message space in Bitcoin blockchain transactions to notarize documents held elsewhere. This allows anyone to validate that information they are holding was not manipulated or changed since its original authorship. In one high-profile case, a DEA agent known as "French Maid" was caught stealing money from suspects while investigating the Silk Road online marketplace. How? The Bitcoins he stole were visible on the publicly auditable Bitcoin blockchain.

Services like Uport, by Brooklyn-based Consensys, are storing identity credentials on the Ethereum blockchain so that users have complete control over how that identity is used, taking back power from centralized platforms to give everyone a self-sovereign identity. Similarly, the Edublocks project uses decentralized identity services to store academic achievements inside and outside of traditional educational institutions. For the many facets of our personal and professional identities, the blockchain offers a unique blend of security, control and portability that will prove transformative for our global human systems.

STRATEGIES FOR RESILIENCE

Collaborative execution

Advanced blockchain systems can even go beyond storing static information, holding executable computer code known as “smart contracts.” Users submit smart contract code to the blockchain, where it begins to act like an independent, unwavering robotic third party. Thereafter, other users who agree to the contract’s terms can send assets and signed messages to the smart contract, which will faithfully update the computational “state” of its agreements and assets on all parties’ computers.

Ethereum provides a simple tutorial on its site for creating just this kind of smart contract-mediated voting system. Hermicity, a software structure for hermit colonies built on the Ethereum blockchain, may soon allow people to pay for drone deliveries of necessary supplies without interacting with urban service providers. Tezos is a next-generation smart contracting platform that lets users formally prove their contracts are secure using mathematical proofs.

As our physical and digital worlds blend, governance by smart contract may extend into the virtual, changing the stakes for in-game economies or augmented reality experiences. In the coming decades, the benefits of these systems for distributed, trusted collaboration promise to transform the way contributors share revenue, data access rights, intellectual property, and liability.

While these systems have the potential to support exchanges that don’t require trust between parties, those affordances don’t come without other risks. Structural policies always offer the potential for opportunistic loopholes, and self-enforcing systems could leave less room for people to exit contractual terms they have cryptographically signed up for. It will take years for these services to mature and develop a strong design ethos to protect and support the citizens of de-facto distributed states.

As we deconstruct the National Stacks taken for granted across centuries, it will become clearer that governance is not a one-size-fits all solution. The best government may well be hacked together from many intersectional agreements beyond old borders. Democratized record-keeping is likely to

SO WHAT? How will your organization take advantage of new distributed systems to navigate the shifting landscape of trust, authority, and hyper-global commerce?

LEARN to establish contractual logic that can be interpreted and acted upon by anyone, even machines. This logic should be transparent to all parties involved, and even to those who may not be involved directly but who could provide critical perspective to resolve disputes.

DETERMINE the role of privacy or transparency when interacting with distributed contributors. In some cases, services can be provided without formal partnership or identity of any kind. In others, identity must be strong and immutable to hold participants accountable so they cannot evade contractual repercussions.

DEVELOP opt-in governance models that ease civic processes, enabling anyone to form lightweight and modifiable structures that fit their needs. Help to build new protocols across silos with others who share your needs and hold assets you would benefit from sharing under a trusted system.

blur the roles played by governments and organizations, creating competition in previously settled spaces such as degree certification and financial auditing. With the ability for anyone to freely enter and exit these systems, inescapably bearing the consequences of their decision, the quest for a more perfect society will discover new tools and tactics by 2027 and beyond.

