

TREND ALMANAC

2019

10 Trends *presenting the ten most important tech and human trends reshaping your world in 2019.*

DRL - The Next AI Frontier

Artificial Intelligence Becomes Even More Intelligent

Making Our Data Great Again

Will Blockchain be the Savior of your Personal Information?

Interlopers in the Boardroom

Is Design Reshaping Corporate Strategy?

Omniscient Healthcare

The Super Connected Brave New World of Healthcare

Mind Your Thinkables

The Future of Wearables?



Bots & Bods

Does Collaborative Intelligence make us Better Together?

**"TO EXPECT THE
UNEXPECTED
SHOWS A
THOROUGHLY
MODERN
INTELLECT."**

- OSCAR WILDE

THINKING FORWARD

The iPhone's launch in 2007 marked a key milestone in the evolution of the digital economy. It unleashed a wave of enterprise apps, which initially were mere cousins of their web pages crushed into a smaller screen. However, since then, mobile phones have graduated into powerful location-aware supercomputers packed with sensors. Smartphones have connected the dots between multiple technologies and capabilities, exploiting expanded network bandwidth and cloud computing. More significantly, in the ensuing decade, they have set off a stampede of disruptive innovations across the world, creating today's digital economy, or the Fourth Industrial Revolution.¹

Metaphorically, the glass of your smartphone is the thin line separating two revolutions taking place in tandem. Below your mobile's glass hood is a glistening tech stack engine. Composed of three critical innovations, together they form the bedrock of the digital economy. First, communication protocols such as 5G occupy the bottom tier. Second, "exponential technologies" reside in the middle tier, such as the API economy, AI, augmented reality and virtual reality, blockchain, microservices, quantum computing, edge computing etc. Third, applications and intelligent devices make up the top tier. In just over a decade, these innovations have coalesced into an ultra-powerful, connected set of capabilities.

Meanwhile, above the glass new digital native business models have formed. These models utilize the capabilities below the glass, generating marketplaces, social media platforms, and other exciting digital businesses. It is this interplay between technology and business that is the central dynamic powering the digital economy.

For an indication of the incredible vibrancy of the digital economy, consider the market cap of the leading digital native firms: the top 20 internet firms alone represent more than \$5.9 trillion dollars.² Needless to say, we are in the very early stages of the digital economy, as more and more of the physical world gets mirrored and then subsumed in the digital universe.

What is strikingly different about this industrial revolution is the speed at which disruptions happens. New businesses emerge at light speed to decimate traditional business models. For example, South Korean challenger Kakao Bank, an offshoot of Kakao Talk (a phone network that covers 93 percent of the South Korean population), attracted two million customers within 13 days of launching. Within a week, \$579 million were deposited by account holders.³ A traditional bank would have taken years to achieve this feat. Similarly, PatientsLikeMe has rapidly scaled a network of 600,000+ patients with more than 2,800 conditions. In doing so, it has gathered 43 million data points in an

enormous data repository,⁴ which should lead to improvements in the drug discovery process. The list goes on.

The digital economy is becoming increasingly connected and intelligent. Its tentacles are rapidly spreading into every corner of our lives from financial services, personalized health management, genomics, travel and logistics. CEOs of traditional businesses across the globe are thinking about how they can leverage the by-products of this digital economy. Examples include leveraging cloud native technologies to become more efficient; probing adjacencies, such as McLaren's foray into digital therapeutic solutions; or launching novel digital business models entirely unrelated to one's core business model, such as the Industrial and Commercial Bank of China which has been successfully operating its e-commerce venture Rong E Gou since 2014.⁵

The digital economy is also helping to solve social problems such as financial exclusion, accelerating the poor's access to government benefits, bypassing ineffective bureaucracy, and driving the provision of secure identities (for example, the Aadhaar scheme in India).

Of course, the digital economy is not without its negative side effects. For example, currently, there is no way for customers to track how their data is being used or to whom it is being sold to. Digital networks may be exploited to spread "fake news", wildfires that can have long-lasting social impacts, such as information cyberattacks undermining democratic elections. Hyper-connected digital networks also increases systemic risks; for example, making critical infrastructures such as dams and power grids more vulnerable. Powerful AI algorithms could be seized to create fake videos and audios to shred your reputation

in a matter of seconds. Because all this is unprecedented, regulators are on the backfoot. The regulatory net that does exist - such as GDPR in Europe, which aims to protect customer interests and data - is still evolving and maturing. Similarly, the law itself is ill-defined. Most countries, for example, don't seem to fully appreciate the gravity of data leakage.

Being successful in the digital economy requires most companies to transform at a fundamental level. It demands a different playbook to the traditional model, hatched circa 2007, that most of us hold today. Being successful in the digital economy requires a design mindset, an ability to understand evolving technologies, a willingness to iterate and experiment, to fail fast and move faster, an awareness of the perils of privacy/security, and many other things.

We know that some companies will be unable to commit to fundamental change and are destined to join the ranks of once-great companies that now only exist in B-school case studies.

Those that successfully make the transition will need to continually monitor the shifting landscape of business, and, as Paul Soffo said, they will need to forecast change - not to predict the future, but to take meaningful action in the present.⁶ With this in mind, our second edition of the Trend Almanac is an attempt to help you get better acquainted with several underlying forces in the digital economy, and to awaken new ideas for business success. Happy reading to all.

Samir Dhir
President of Virtusa

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EXECUTIVE SUMMARY

Welcome to Virtusa xLabs' second Trend Almanac. It goes without saying that a lot has changed in the year since we published our predictions for 2018. Looking back, our hit rate was fairly good. We did see increased interest in the ethical aspects of AI. Over the past year, we have noticed that our conversations with tech and business stakeholders moved beyond how to set-up platforms and access the right data-sets to consider how biases could end up constraining insight or elicit claims of prejudicial treatment.

The impact of some of the more left-field predictions that we identified in our last report have proven trickier to evaluate. Often emerging trends seem to have great potential but turn out to be slow burners. They may be strong technologies looking for killer use cases. Mixed Reality, Augmented Reality and Virtual Reality are cases in point, continuing to appear in tech vendors promotional material, but really featuring more on kids' Christmas wish lists than on CEOs' priority lists.

So, we now come to this year's predictions. The experts in our lab have pondered, wrangled with and, in some cases have had spirited debates about, the trends in their subject areas that will have the greatest impact on the world in the short-term. Again, we have considered tech and human

factors in our trend evaluation as we know that value is only created at the intersection of emerging technology and people's evolving needs, behaviors and attitudes.

This year we see new regulations adding to the momentum of the Open Banking movement. But for financial services companies, compliance is now table stakes, and many are looking at the high cost of compliance and asking how they can generate additional value from their investments. This will mean that Open Banking conversations will shift their focus away from box ticking compliance to fostering out-of-the-box innovation beyond the realm of regtech.

AI has become a ubiquitous topic, materializing on even the most conservative companies' roadmaps in some format. In our AI chapter we look at how Deep Reinforcement Learning has graduated from getting high scores on Space Invaders to generating insight and real business value. The release of new developer frameworks is pushing DLR into the mainstream, bringing us closer to a world in which systems that can learn and act effectively without supervision.

We also look at exciting developments in the health sector. Alongside the rise of devices that amass teraflops of data, monitoring

our existence at the cellular level, health service providers are also leveraging emerging technologies to create a more joined-up experience, whilst removing friction from notoriously labyrinthine systems. Blockchain is being applied to the knotty problem of Provider Data Management, helping patients to access the most suitable (qualified) physicians and reducing the cycle time to verify and execute payment to medical practitioners. If this works, the health industry in the US stands to claw back much of the \$2.1 billion it currently spends on data admin, which, in the long-run, could make healthcare more affordable.

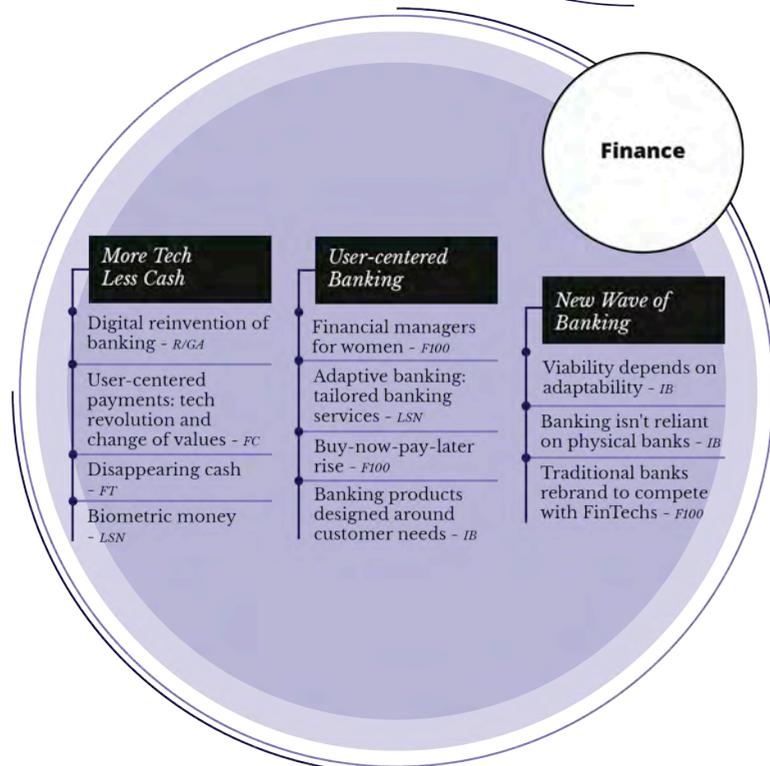
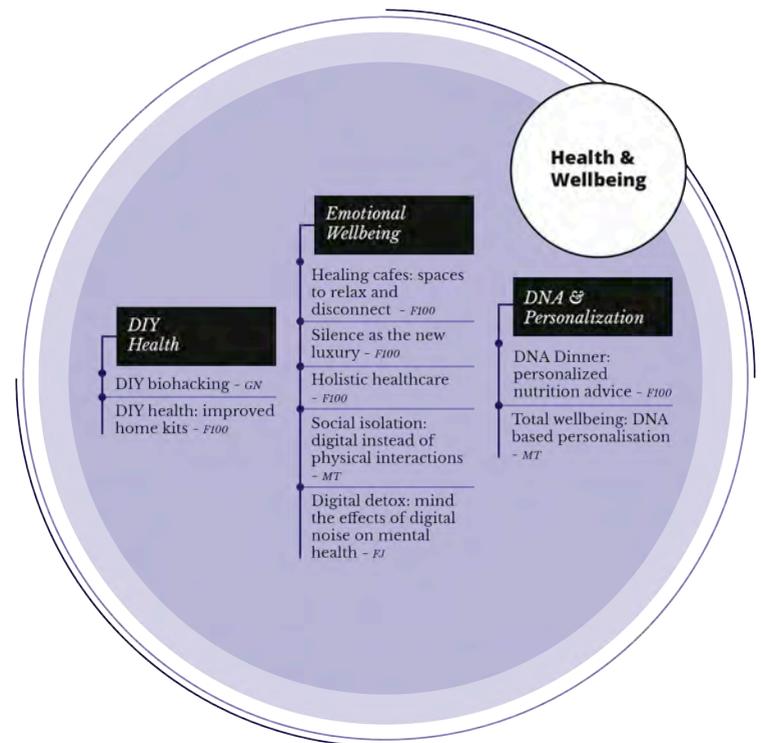
We hope that you find this year's Almanac provocative and, hopefully, a little inspiring. It is important to see these predictions less as edicts from infallible industry experts, and more as ideas to explore and challenge. In doing so, we hope that you'll identify at least one new focus area for your 2020 innovation roadmap.

**IT IS IMPORTANT
TO SEE THESE
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TURBO TREND MAPS

A Bite-Sized Digest of 2019's Trendscape

This trend snapshot, compiled from the weighty tomes published by trend spotters and analyst firms, gives you a steer on the biggest innovations shaping your future. xLabs has trawled through more than 500 trends and divvied them up into two main categories: technology and industry trends. Technological trends drive tech stack development across multiple domains, giving rise to whole industries or flattening them completely. Industry-specific trends shape the trajectory of business, enabling new business models and value propositions.



- /M Medium
- AIT AI Trends
- DI Designit
- F100 Future 100
- FAB/m FAB Info on Medium
- FB Forbes
- FC Futurice
- FCo Fast Company
- FJ Fjord
- FR Forrester
- FT Financial times
- FTI Future Technology Institute
- GN Gartner
- IB International Banker
- IBM IBM Research
- LSN LSN Future Labs
- MENA/M HackaMENA on Medium
- MIT MIT Media Lab
- MT Mintel
- MUK Mashable UK
- MV Megvii
- MZ/M Mozenix on Medium
- NYT New York Times
- QB/M Quantum Black on Medium
- R/GA R/GA
- TG The Guardian
- WR Wired
- YR YR
- ZDN ZDNet

Subject Area



Themes



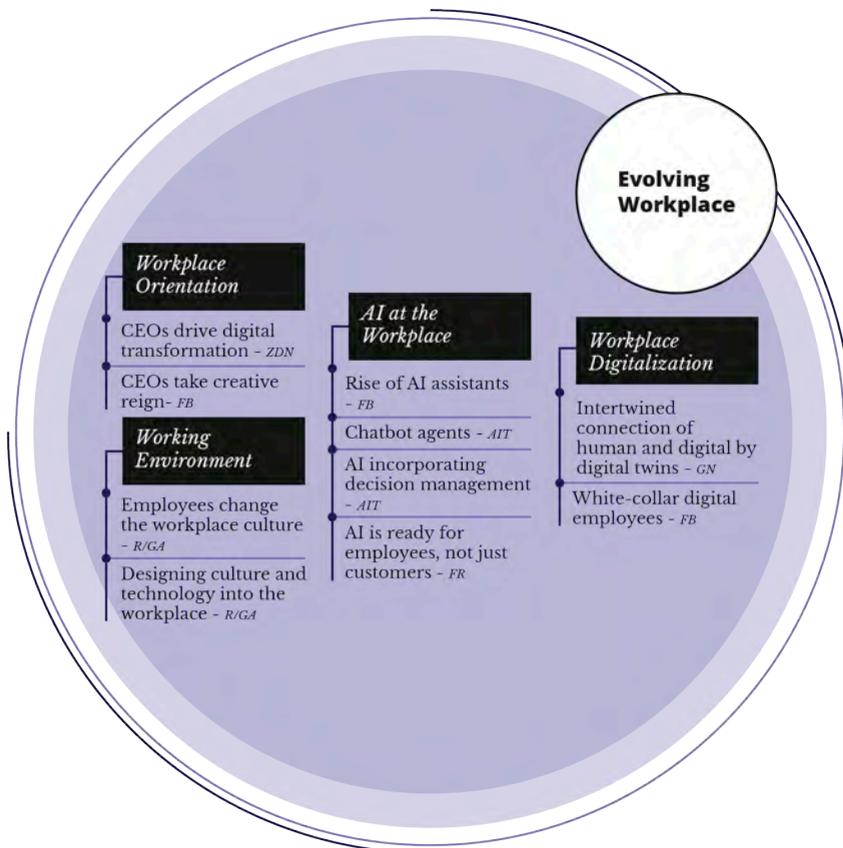
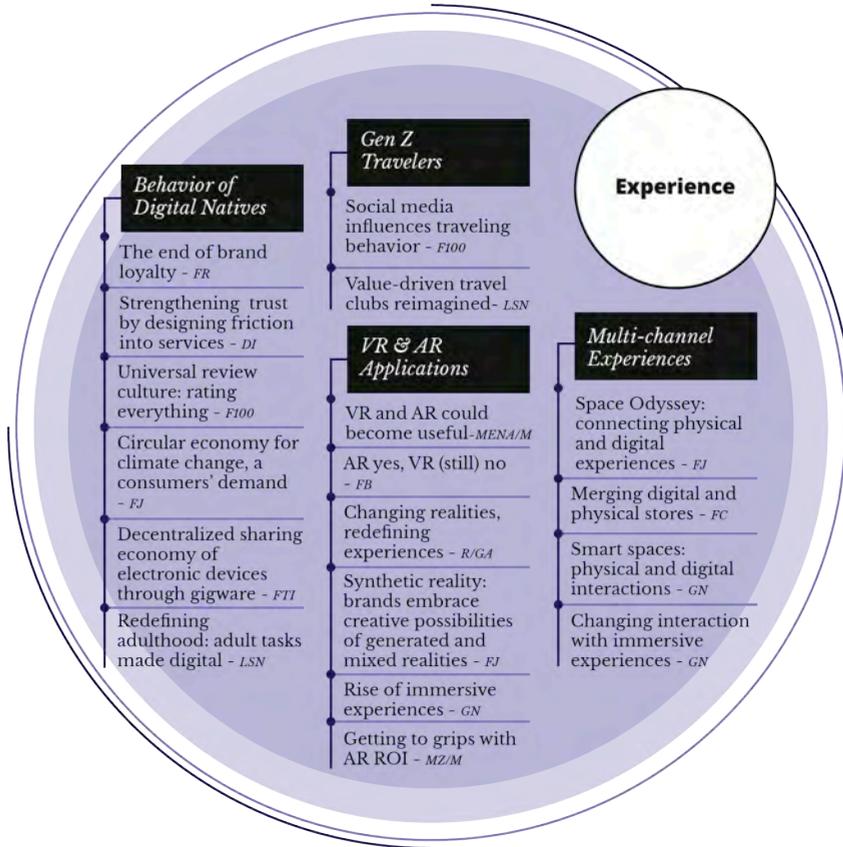
Trends

Text

Tech-specific Trends

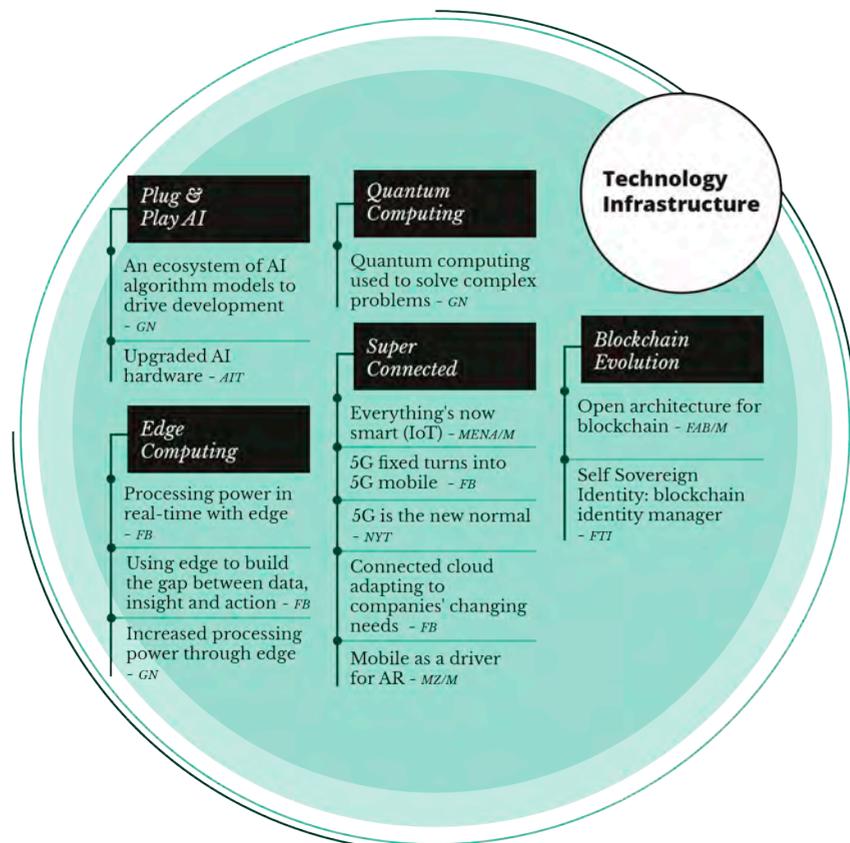
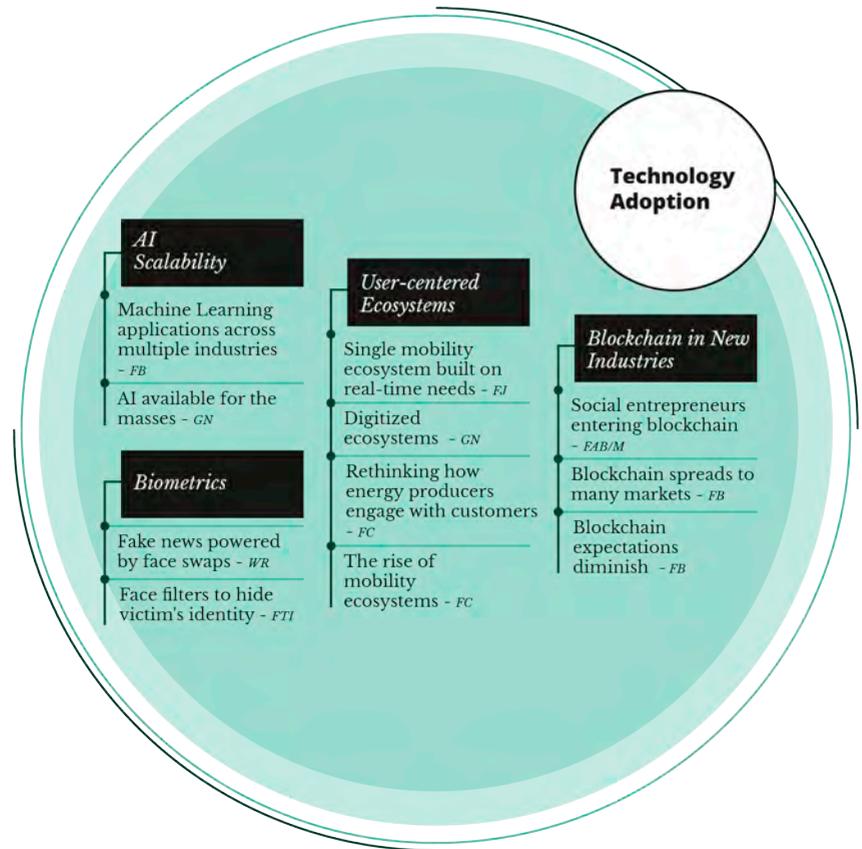


Industry-specific Trends



TURBO TREND MAPS

A Bite-Sized Digest of 2019's Trendscape



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- FT Financial times
- FTI Future Technology Institute
- GN Gartner
- IB International Banker
- IBM IBM Research
- LSN LSN Future Labs
- MENA/M HackaMENA on Medium
- MIT MIT Media Lab
- MT Mintel
- MUK Mashable UK
- MV Megvii
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- NYT New York Times
- QB/M Quantum Black on Medium
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- WR Wired
- YR YR
- ZDN ZDNet

Subject Area



Themes



Trends

Text

Tech-specific Trends



Industry-specific Trends



AI Advances

Augmented not Artificial

- AI changing workplace culture - QB/M
- Augmented processing of data - GN

AI with Emotion

- Working with chatbots - FR
- Rise of voice assistants with emotions - R/GA
- AI recognizing human emotions is maturing - R/GA

Smarter AI

- Chatbots from good to great - FB
- Machine Learning analytics - QB/M
- Machine Learning platforms - AIT
- From data to analytics to Machine Learning to AI - FB
- Improving AI by healthy competition - MENA/M
- Improving AI by testing them against each other - FB
- Enhanced human and machine communication nuances - FB

More Powerful AI

- Improved speech recognition tech - AIT
- Natural language generation - AIT
- AI in autonomous transportation - GN
- AI enabling XRay vision through walls - FTI

New Technologies

Thinkables

- Changing voice recognition for interpreting thoughts - TG
- Transforming internal thoughts into natural language - MIT
- Real-time analytics of biometric and biological data - IBM
- Thinkables helping you to meditate - MUK
- Games controlled by biofeedback - YR

Invisibles

- A remote sleep sensing system uses radio waves to capture data about your brainwaves - FCo

Technology Responsibility

Ethical AI

- Users will demand verified artificially created content - FTI
- Ethical AI: applying ethical principles and setting boundaries - DI
- AI with a moral code - QB/M
- AI bias persists - R/GA
- Digital ethics and privacy: the relation between trust and data safety - GN
- AI ethics, privacy and security concerns - R/GA

Data Safety and Transparency

- Digital ethics and privacy - GN
- Blockchain based identity and privacy - FB
- Reclaiming data ownership - F100
- GDPR evolves: freelance rights in content platforms - FTI
- GDPR forces brand hands - FB
- Blockchain used to protect your data - FB
- Limitless infrastructure thanks to cloud and edge - GN

Accessibility & Inclusion

- The inclusivity paradox: focusing on individuals may exclude others - EJ
- Accessible design going mainstream - F100
- Rise in design for accessibility - DI
- Including the hidden figures: women in tech - F100

TRENDS OVERVIEW



3. Open Banking's Adolescence

2019 is the year when banks and financial institutions will start to take the Open Banking opportunity seriously. A key regulation will be laid down in September, which will mark the beginning of a new era in banking in Europe. Core tenets include interoperability, openness, customer-centricity and innovation. Going forwards, banks will move from a compliance to an innovation footing.



1. Crossing the Next AI Frontier

This year, deep reinforcement learning (DRL), a powerful machine learning tool, will move out of research institutes and into the world of business. The release of open source DRL libraries last year will spur the development of commercial applications. This is exciting because the trial-and-error model is one of the hottest areas of research. It promises huge gains for businesses that can steal an early march with a DRL-powered application.



4. Finnovation for the Developing World

Financial inclusion is about to move into the next phase. The developing world's new digital payment rails has enabled millions to gain access to the formal economy for the first time. Regulators, FinTechs, challenger banks and traditional banks have an opportunity to create the products and services to ride on top of those rails and transform whole communities in the process.



2. Collaborative Intelligence

What if machines could learn from machines, not just humans? This seemingly far-fetched prospect is now becoming reality. Collaborative intelligence imagines a world of multi-machine-human exponential learning. Whilst still in its early days, recent breakthroughs in AI have triggered greater interest in the development of more principled algorithms, which has given rise to some compelling applications. This area promises to be the next big leap forward, and it is starting to happen now.



5. Crypto is Coming of Age

Until blue-chip financial giants help to establish the financial infrastructure for crypto-markets, institutional investor participation will remain weak. This year, the world's biggest banks and financial bodies will start to build those structures. In doing so, they will send a strong signal to market participants, heralding a shift to a higher level of cryptocurrency activity.



6. Making our Data Safe Again

Many organizations are hoovering up large amounts of personal data to “hack the minds” of their consumers, or sell on their insights to third parties. By the same token, organizations are themselves prime targets for cyber-attack. The high-profile data breaches of 2018 have heightened interest in data security and privacy. Blockchain offers individuals and organizations control over their own digital identities. In 2019, we expect to see decentralized digital identity products start to gain market traction.



9. Health Data You Can Trust

Health data management is struggling to keep costs down, remain up-to-date, and support patient needs. The Synaptic Health Alliance, a consortium of leading healthcare organizations, is applying blockchain to improve Provider Data Management. This will be a key test in the uptake of blockchain solutions for the sector. If it proves useful and is rolled-out to other medical data, it could trigger a windfall for healthcare at large.



7. Never Disconnected

5G will deliver the internet at light speed. The process of loading websites and streaming movies will become at least 20x faster than 4G. Whilst not expected to replace 4G until 2020, marquee firms will be launching 5G smartphones this year. Significantly, this communication protocol is an enabling technology that will accelerate progress with other exponential technologies like AI and IoT.



10. Omniscient Healthcare

The connected health market is rapidly transforming. Last year, the Apple Watch Series 4 captivated the headlines with its health-monitoring features. Invisibles, a non-invasive wireless device, is causing waves with its ability to analyze the reams of data that your body transmits in the comfort of your own home. Be it wearables, telemedicine platforms, apps, or other digital healthcare services, the connected health ecosystem is maturing rapidly and will have a much bigger impact in 2019.

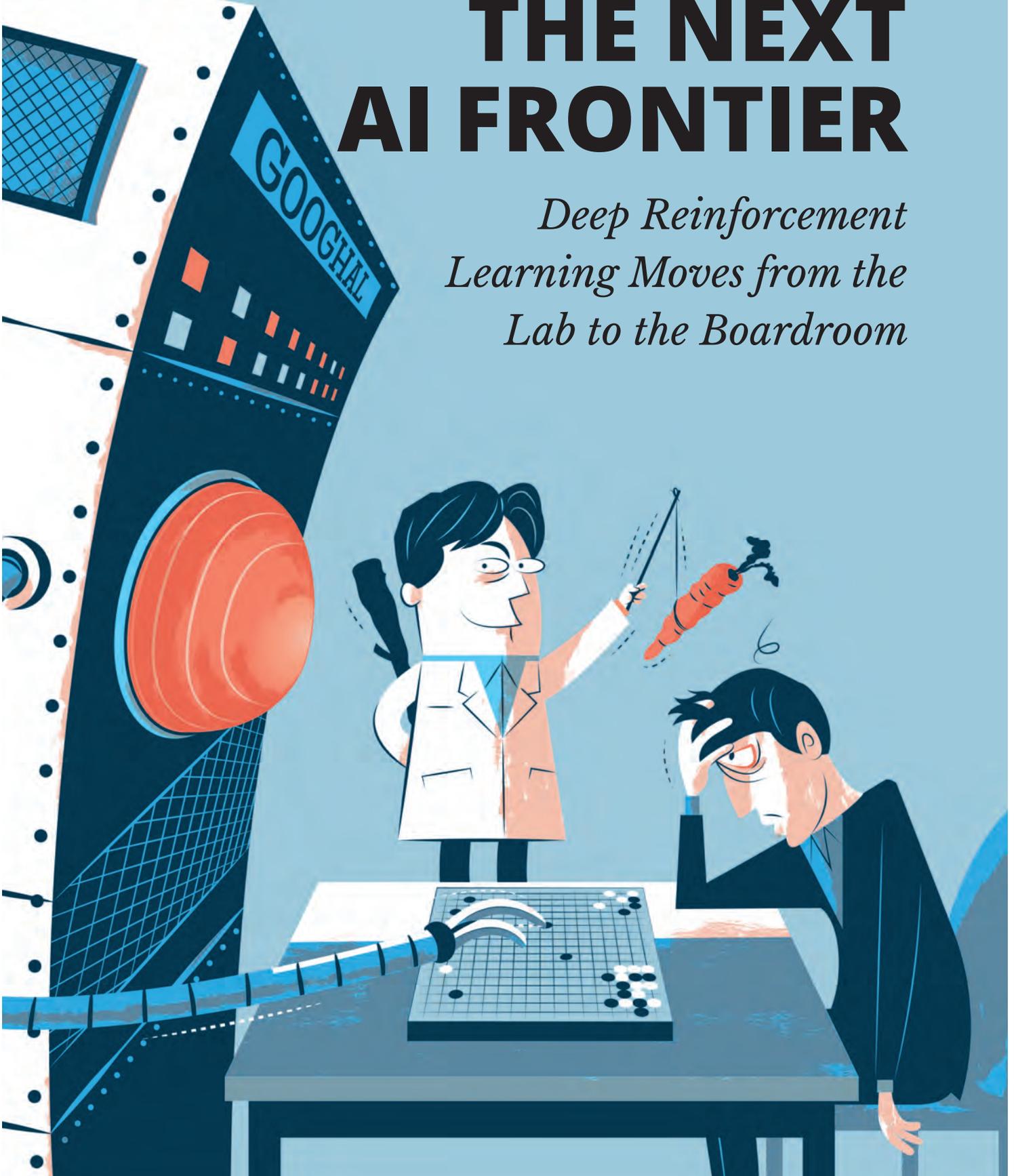


8. Interlopers in the Boardroom

Design is starting to play a strategic role within digital transformation programs. Companies have witnessed the innovations that have arisen from Big Tech’s design-led culture and are now taking stock. They have also absorbed the fruits of the Design Thinking movement, the spate of CDO appointments, and consulting firms’ discourse on the centrality of design to successful digital transformations.

CROSSING THE NEXT AI FRONTIER

*Deep Reinforcement
Learning Moves from the
Lab to the Boardroom*



When AlphaGo defeated Lee Sedol in a Go tournament

in March 2016, the 60 million-strong viewing public was stunned.¹ This wasn't meant to happen for another decade.² But the AI-propelled supercomputer was the clear victor in the ancient Chinese game of strategy, whose cerebral complexity was believed to make it resistant to Machine Learning (ML).³ As a glimpse into what lies ahead, the triumph carried a symbolism that no one could miss: machines are getting smarter than humans, and it is occurring faster than we think.

AlphaGo employs an Artificial Intelligence (AI) model, known as Deep Reinforcement Learning (DRL), which is a powerful decision-making engine. DRL has proven adept at tackling goal-oriented, context-based problems where there is a colossal amount of training data all tagged with the desired outcome.

So, how does it work? In a Reinforcement Learning (RL) simulation, the machine is given feedback to incentivize it to meet its long-term goal.⁴ If the action performed by the machine was good, it receives a reward. If it was bad, it receives a penalty. Over time, using feedback from its trial-and-error decisions, the machine fine-tunes its algorithms to select the most probable actions leading to the desired goal. When RL is coupled with Deep Learning, a

technique that uses neural nets⁵ with multiple layers, the self-learning capability of the machine becomes exceptional, as AlphaGo has shown.

While DRL has been garlanded with praise over its string of technical breakthroughs,⁶ the approach has yet to make a commercial impact. But there are now reasons to think this might change in 2019.⁷

About midway through 2018, Google published Dopamine,⁸ an open source AI framework that has set pulses racing in the Developer community. By this stage, OpenAI⁹ had already published its library of well-tested DRL building blocks, and this rippled through with DeepMind,¹⁰ Facebook¹¹ and Amazon¹² following suit. Without these resources, AI developers (a small community) must engage in the painstaking work of building a highly accurate simulated environment, which includes identifying variables and their interdependencies. However, with these resources, solution developers (a larger community) can use inference to march straight into experimenting and even prototyping commercial AI applications.¹³ In previous years when developer frameworks for Supervised and Unsupervised Machine Learning algorithms (SML/UML) were released,¹⁴ they catalyzed experimentation and industry uptake of SML/UML. We expect a similar burst of activity in DRL solutions development outside the tech companies.

Also not to be dismissed are the strides taken by Industry with traditional AI approaches. Emboldened by the successes

of real-world SML/UML implementations, companies are now feverishly pursuing extensions and adjacent arenas looking to fuel the next stage of growth.

As with industry transformation, customer expectations have also altered in recent years. Taken collectively, the prevalence of computer vision, computer speech, chatbots, virtual assistants, and so on, have normalized AI applications in our digital lives. Going forward, expectations are rising that machines will possess the ability to think for themselves and instigate action without supervision. DRL accomplishes this.

Finally, the combination of proliferating data-sets, the decreasing cost of compute, and the emergence of higher performing, specialized hardware have provided an ideal breeding ground for DRL activity, requiring as it does big data and computation energy.

For the tech giants and digitally advanced companies, AI has become a cornerstone of their business strategy and a key source of competitive advantage.¹⁵ But AI will not be restricted to those at the vanguard. Analysts are projecting that by 2022 global business value derived from AI will total \$3.9 trillion,¹⁶ suggesting that AI will have surged into the mainstream. Now that DRL is becoming increasingly accessible for commercial projects, it is clear it will be an integral part of this story.

*Crossing the next
AI frontier*

HIHEDGE TRADING PLATFORM

Machine Learning is being used in novel ways to optimize investment trading platforms. At HiHedge, using deep reinforcement learning, its AI trader constantly learns and generates trading strategies to advance its investment goals.¹⁷ Personalized, unbiased, optimized and affordable, the AI traders can recognize trading patterns based on news, macroeconomic factors and volumes, allowing traders to crunch those numbers faster and in much larger quantities than would ever be possible manually.¹⁸



*Crossing the next
AI frontier*

AI WIND TURBINES

Bonsai BRAIN is a general-purpose AI platform that has managed to abstract the complexity of Deep Reinforcement Learning to make it accessible to business leaders. The toolset is particularly good at enabling companies to program and control their industrial systems.¹⁹ One application, using the Simulink Wind Turbine model, involves tuning a wind turbine to maximize

its energy output by orienting the turbine to the wind at the optimal angle. Bonsai controls actions within the simulation and receives reward and state as output. When the model is run many times, Bonsai BRAIN learns the optimal policy for the environment provided by the simulation.”²⁰

*Crossing the next
AI frontier*

AMAZON'S DEEPRACER

Amazon's DeepRacer is a 1/18th-scale race car that is unapologetically fun. It is designed to give users a hands-on experience with Reinforcement Learning (RL) while experimenting with autonomous driving. RL is a powerful Machine Learning technique that learns on a trial and error basis in an interactive learning environment. Models can be built using Amazon's Sagemaker and can be trained, tested and iterated quickly in the AWS DeepRacer 3D racing simulator. AWS is also working on a DeepRacer League for competitive races at upcoming AWS events.²¹



COLLABORATIVE INTELLIGENCE

Machines Helping Humans, Humans Helping Machines, Machines Helping Machines



#AI

#algorithms

#machine learning

#machine teaching

#post deep learning

What if machines could learn from machines, not just humans?

This seemingly far-fetched prospect is now underway. “Collaborative intelligence” imagines a hothouse hive of human-machine learning¹ and machine-machine learning. If its precursor “augmented intelligence” typecasts AI machines as the support act, there to enhance human capabilities not replace them, collaborative intelligence conjures a more diverse ensemble piece. Here, machines and humans cooperate as teammates do: metabolizing data faster in service of a common goal; learning and teaching each other at an exponential rate. It is a type of collective intelligence achieved collaboratively. And it will steal the limelight in 2019.

To understand the collaborative intelligence trend, we need to reflect on

the historical context. Back in 2012, a “Cambrian Explosion” in AI was unleashed when Professor Geoff Hinton and his team entered the ImageNet computer vision competition and introduced “Deep Learning” to the world. Around this time, AI researchers were convinced that the best way to advance was to strengthen their algorithms, irrespective of the data. But Professor Fei-Fei Li, puzzled by the halting progress, began to realize that algorithms, no matter how dazzlingly clever, would never learn effectively if the training data did not correspond with the real world. Her attention shifted to building a superior data set.²

Hinton’s team had this in mind when devising their groundbreaking neural network approach.³ Unlike earlier neural networks, their approach involved the analysis of high volumes of Li’s well-labeled data. This enabled them to model complex concepts as never before.

Soon Deep Learning applications stormed onto the scene with Google’s search engine, chatbots, personal assistants, like Apple’s Siri, and Amazon’s recommendation engine becoming part of our everyday lives.

Practically overnight, AI-powered startups had vaulted onto the most valuable companies list. Their famous playbook of “more data = more accurate model = better product = more users = more data”⁴ became received wisdom; their virtuous cycle seduced customers and investors alike. By 2017, Google declared it was moving from a mobile-first to an AI-first strategy. By 2030, the Chinese government pledged it would become the world’s primary AI innovation center.⁵ Everywhere the message to markets was that an increasingly AI-driven world had arrived.

Crucially, in 2016, a Google supercomputer dubbed ‘AlphaGo’ made short work of a legendary grandmaster in Go, the ancient Chinese board game of strategy. Aside from creating “China’s Sputnik moment,” giving it the rocket fuel to transform its fledgling AI industry,⁶ the seminal event spurred AlphaGo scientists to take their work to the next level, culminating in AlphaZero in 2018.⁷ This single, generalized system, which mastered not only Go but also chess and shogi from scratch,⁸ shakes up the current paradigm of machines as single domain optimizers.⁹ Before this, with machine learning (ML) “you could get



a machine to do exactly what you want – but only that thing,’ says Ayanna Howard, an expert in interactive computing and artificial intelligence... ‘But AlphaZero shows that you can have an algorithm that isn’t so [specific], and it can learn within certain parameters.’”¹⁰

The lead researcher of the project David Silver claims AlphaZero demonstrates “that algorithms matter much more than either compute or data availability,” in a way rehabilitating the pre-ImageNet research preoccupation with algorithms over data. He says the algorithm learned entirely by self-play, sidestepping the need for human training data or guidance: “The core idea is that AlphaZero can become its own teacher.”¹¹

“Machine teaching” marks a pivot point from the AI machine as a single domain optimizer to a collaborative, networked player. Where ML is concerned with making learning algorithms better (higher accuracy and performance), machine teaching is concerned with making the task of teaching machines better.¹² It is when “devices communicate gained knowledge to one another,” explains Professor Hod Lipson, who believes it is possibly the biggest exponential trend in AI. He adds, “Data is

the fuel of machine learning, but even for machines, some data is hard to get—it may be risky, slow, rare, or expensive. In those cases, machines can share experiences or create synthetic experiences for each other to augment or replace data. It turns out that this is not a minor effect, it actually is self-amplifying, and therefore exponential.”¹³ In this new phase, we will see a network of collaborating AI machines, teaching and learning from each other at scale.

The Tesla Model S is an early example of the promise of shared knowledge transfer between machines, and the ensuing multiplier effects. Tesla CEO Elon Musk said each driver of the semi-autonomous car would become an “expert trainer” for every other Model S. So, as each vehicle would be learning in real-time from its driver to improve its autonomous features, it would also be disseminating that information to the broader network of Tesla vehicles. As a case in point, “Teslas were taking incorrect early exits along highways, forcing their owners to manually steer the car along the correct route. After just a few weeks, owners noted the cars were no longer taking premature exits.”¹⁴

Thanks to the convergence of big data, growing compute power, and now a

stronger approach to algorithms and inference, ML will accelerate in power. Even more significant is the transition to networked AI. Turbo-charging connected machine-human learning and teaching is expected to give rise to breakthroughs in performance capabilities. The synergy of human-machine “superminds”¹⁵ is akin to the way humans learn in vibrant social groups. For business, the implications are evident: just as traditional ML has translated into multi-billion dollar industries, so too will collaborative intelligence. It is the next leap forward, and it is happening now.

**THE SYNERGY OF
HUMAN-MACHINE
"SUPERMINDS"
IS AKIN TO THE WAY
HUMANS LEARN IN
VIBRANT SOCIAL
GROUPS.**

Collaborative Intelligence

COBOTS

Robots, once “dumb” industrial machines in manufacturing, are morphing into astute, content-aware “cobots”.¹⁶ They are collaborative robots, uniting complementary human and robotic qualities, that work side-by-side with human operators.¹⁷ Taking this idea, Hyundai has developed exoskeletons for the factory floor. Industrial workers can wear robotic garb to give them superhuman strength and endurance.

Not limited to industrial applications, cobots are also being used as medical

devices to endow patients with greater strength and balance, enabling them to stand and walk.¹⁸

Perhaps the most advanced application is the Crew Interactive Mobile Companion (CIMON), which is “the first space-flying artificial intelligence robot to join astronauts on the International Space Station.”¹⁹ Designed to team-up with astronauts and complete routine tasks, CIMON has facial expressions and a voice, and can learn and problem-solve thanks to its neural network.²⁰



Collaborative Intelligence

AI AGENTS

We live in a social world so it stands to reason that AI agents comfortable in team environments will do well. Traditionally, in arenas like the internet that are heavily populated with AI agents, each agent will seek to maximize its own reward, and hence performance, in competition with other agents. However, this can lead to sub-optimal outcomes. To illustrate: picture a bunch of self-driving cars in a car-parking

lot all competing to exit first.²¹

Silicon Valley company, AI Incorporated, has developed “collaborative AI agents that are open to teamwork and see other agents as potential collaborators.”²² Its Collaborative Artificial Intelligence Technology (CAIT) equips robots with the ability to team-up with other robots to maximize both their individual and collective performance, a skill that is highly valued by employers.



DO HUMANS HAVE ANYTHING TO TEACH DEEP LEARNING MODELS?

Rahul Kharat leads the Virtusa xLabs AI team in India, looking at AI opportunities across industries in banking, insurance and healthcare.

Recently, I attended a family get-together where I spent time with my three-year-old nephew. He recognized me as soon as he saw me, despite only having met me once before. His brain is absorbing more new data now than it will at any other time in his life but, despite this, he still recognized me. This made me think, how can this boy make a complex evaluation based on minute amounts of data instantly when Deep Learning Models (DLM) require enormous amounts of data to make far simpler decisions? Is there perhaps scope to apply the tactics that humans use to DLM to accelerate learning and increase the accuracy of predictions?

How Humans Learn

Humans learn by applying three basic tactics: Construction, Cognition, and Community.²³

Construction: Do, Learn then Refine

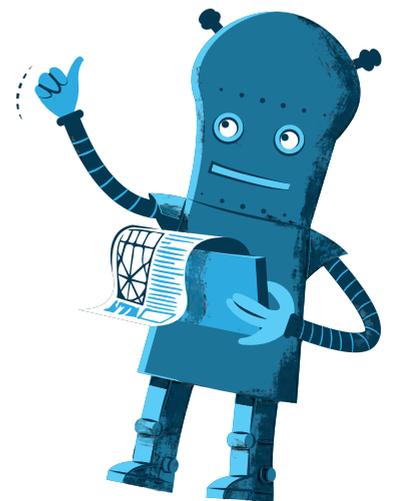
Construction learning involves learning through doing or building. From the experience of construction and the context in which it happens, we build mental models or frameworks to help us understand what works and what doesn't and, by extension, the relationship between things.

From one perspective, we could argue that DLM already uses Construction learning tactics. DLM uses a knowledge model, the Machine Learning (ML) version of mental models in human psychology, to review data-sets to identify relationships in hidden neural network layers. As more data is processed, the amassed feedback loops optimize the model by changing the weight ascribed to variables within the algorithm to improve the accuracy of prediction.

But there is one material difference between our Construction learning approaches and those applied by DLM. Traditional DLM only uses data from a single system to refine its model, whereas we are able to recall frameworks from unrelated domains to problems, identifying homologous, analogous, or complementary models that help us accelerate the pace at which we learn and the accuracy of our predictions.

It is possible for DLM to approximate this tactic with a technique called Transfer Learning, which uses pre-trained models to enhance a new model. Think of it as the "pre-fab" of Constructed learning tactics.

For a good example of Constructed learning in DLM we can look at the Sarcasm Detection Model. This uses Deep Neural Networks, or Convolutional Neural



Networks, to analyze text to evaluate whether the message is sarcastic or sincere. Over a significant period of time, the DLM has analyzed considerable volumes of data to build a model that has a good detection rate.²⁴ However, getting solid results from this model involves evaluating a large dataset over a lengthy time period.

Typically, human models for evaluating sarcasm take a complex approach. Rather than merely focusing on the utterance, humans combine this with other inputs, such as facial expressions, body language and tone of voice. By combining three different models to evaluate a single scenario we disambiguate statements, ensure that we attribute the correct meaning, and take appropriate action.

Ideally, we could apply this complex approach to learning to DLM, but with current approaches this is extremely difficult. Combining knowledge models from discrete domains involves ensuring that the models have similar reference sets. This equivalence enables models to contribute to decision-making in a way that creates better results rather than knotty bias problems, but getting parity is not easy to achieve.

Cognition: Watch and Map

Cognitive learning involves creating a model from scratch based on the evaluation of real life data, identifying patterns, and then converting these into mental models. It is what happens when we observe something, think it through, and then form an evolving heuristic or rule of thumb. This tactic builds models based on both positive outcomes, which progress us towards our goal, and negative outcomes. As this approach is evidence-based, our models are constantly optimized from the feedback we receive. The human Cognitive approach is similar to Reinforcement Learning (RL) models. In contrast to DLM approaches,

which solely focus on positive outcomes (knowns), RL models factor negative results (unknowns) as well as positive results into the way they optimize the weighting of algorithm variables. For example, self-driving cars use RL rather than DLM to ensure they learn from negative outcomes (accidents), rather than just looking at the positive experiences (getting to their destination). This is a clearly a good thing. Unfortunately, building a really effective RL model involves exposing it to the widest possible set of scenarios, and providing exhaustive data for each scenario.

Once again, it is currently difficult for AI to adopt a near-human approach to Cognitive Learning. For RL systems to be effective, they need to be able to receive and explore feedback from as many scenarios as possible. For example, if we were using this paradigm to teach a system to play chess, we would have to expose the system to Grand Masters and inexperienced players to ensure that predictions were not only based on gold standard moves. Again, simulating the range of scenarios that enables effective learning involves significant investments of time and budget to create reasonable results.

Community: Learning from the Mistakes of Others

Humans also learn by interacting with their peers and developing collaborative intelligence. Through the social distribution of knowledge, we become more collectively intelligent. This is a concept that DLM has yet to adopt; however, the spread of the Internet of Things and hyper-connectivity will create foundations that will enable wider data and model sharing.

Putting Learning Models into Practice

Let's look at an example that integrates all three forms of learning to build one hybrid

model: a product recommendation engine. In this case, our objective is to build a knowledge model that represents a commercial banking relationship manager. The banks' IT systems have recorded all the data that human relationship managers have produced since they started their job.

Bots + Bods = Better

Now, if we train a DLM using this data, will we have captured the full knowledge of the relationship manager? No. We will not have taken into account the historical data-the relationship manager's accrued experience gained before joining the firm-which will influence their decision making. So, we will have an incomplete Construction Learning paradigm. We also have not captured Community Learning - the knowledge shared by peers, family, and friends. This also influences their decision-making. By thinking through this example, we see the difficulty of trying to impose human learning models on an ML system beyond simple Cognitive Learning.

With the development of methods like Deep Reinforcement Learning, we are coming closer to replicating human-level intelligence. However, as we aspire to create increasingly accurate predictive models, we will need to consider DLMs as complex entities, combining multiple tactics for learning with collaborative knowledge models that bring together data from multiple devices, entities and people.

However, if we are to achieve human-level accuracy by applying human learning tactics into a ML context, we will continue to be challenged by the requirement to train models at scale and create complex, connected hybrid models. Ergo collective intelligence is the way to go.

OPEN BANKING'S ADOLESCENCE

*Shifting from Compliance
to Innovation*



#API

#data

#finance

#open banking

#payments

#regulation

Few in the banking community remain silent

on the topic of Open Banking. Some commentators advance carefully constructed arguments about the looming FinTech insurgency and how the days of traditional banks are numbered. Others wonder if this is just an unrevealing distraction. Whilst this debate fulminates and rages, a lot of progress is being made. Open banking is putting the entire industry on the precipice of change.

This year, a piece of regulation will come into effect that will transform the banking and financial services landscape across Europe. On September 14, 2019 regulated banks will have to expose, through APIs, the accounts and transaction data of their customers to regulated third parties at the customer's behest. In addition, regulated third parties will be permitted to initiate payments on their customer's behalf. The remit extends to all banks and financial institutions that offer payment accounts and have a digital banking offering.

So, what does this mean in practice? Essentially, by the September date a PSD2¹-compliant API framework will need to

be in place, as defined by the Regulatory Technical Standards (RTS) of the European Banking Authority.² Six months prior to this on 14th March, banks will be obligated to “make available technical specifications, and provide support and a testing facility.”³ In other words, banks will have to furnish a sandbox where regulated third party providers (TPPs), such as FinTechs, can test their solution offerings. This important staging ground enables participants to iron out bugs and strengthen the stability of their API systems.

Along with this technical security framework, facilitating cross-institutional collaboration and integration, regulatory bodies European-wide are implementing a TPP accreditation system.⁴ If FinTechs wish to create offerings using PSD2 APIs they will be required to undergo such a certification process. And it is no light matter: splayed out on the examination table, FinTechs will be scrutinized for their financial health, business continuity arrangements, data protection measures, and technical maturity. When combined with the RTS framework, these significant initiatives will bolster the confidence of banks to partner with FinTechs on Open Banking innovations.

The trend of greater openness and interoperability is not confined to Europe. Australia's regulator, the Australian Competition and Consumer Commission,

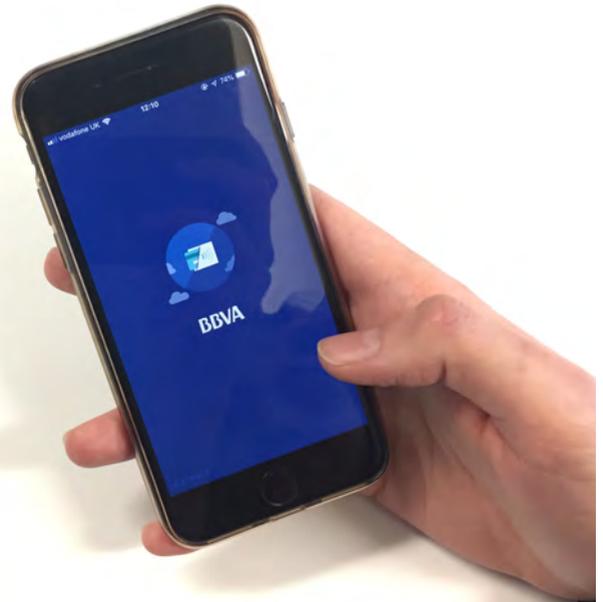
has circulated its regulatory roadmap for Open Banking, which is slated to take effect in February 2020.⁵ Encompassing Australia's “Big Four” banks, with the smaller banks to follow a year later, the regulations represent something of a milestone for the industry. In its wake, it is expected that the perimeters will expand considerably to include new banking products and services, in addition to new entrants.

As the Open Banking movement diffuses to other regions in the world, we will see industry shake-ups aplenty and many stakeholders put to the test. For Open Banking is Janus-faced: bankers and other participants can either seize or surrender the opportunities before them. On one side, the commercial mayhem triggered by the new rules will cause a great “land grab” to take place, in which banks will be jostling for a customer-facing role. Everyone involved is aware that this is a fight for market share. On the other side, with the gates lifted on customer data (provided there is customer consent), some stakeholders will be galvanized to partner with collaborators, throw themselves into product development, and build new innovation and monetization engines. At any rate, this year's regulations will occasion a new orientation in the banking industry. Going forwards, banks will now be able to graduate from a compliance to an innovation footing.

Open Banking's Adolescence

BBVA: BANKING AS A SERVICE

Spanish bank BBVA has launched a Banking-as-a-Service platform, “BBVA Open Platform”, for the US market. Third parties can gain access, through APIs, to a range of core banking products and services such as identity verification, card issuance and account origination.⁶ This will eliminate the need for them to develop their own offerings for customers. It enables BBVA's clients to integrate complementary banking services for a seamless customer experience. Furthermore, with these ready-made solutions, clients can innovate and bring to market new products much faster. The initiative is in line with BBVA's larger ambition to fully leverage open APIs for financial services.⁷



Open Banking's Adolescence

NORDEA'S PREMIUM REPORTING API

At the close of 2017, Nordea launched its Open Banking platform in Finland when customer data became accessible to third party developers for the first time. More recently, it has extended its offering to the Swedish market. Developers are now in a position to develop applications for both Finnish and Swedish customers.⁸ And they have been flocking in droves: some 2,500 developers have registered to

test Nordea's APIs.⁹ Next up are planned extensions of the service into Denmark and Norway. Most importantly, Nordea has launched Instant Reporting, an Open Banking solution that goes beyond the PSD2 minimum requirements as it is one of the first monetized APIs. The API offers corporate customers access to their own accounts, whilst integrating real-time data with their own systems.¹⁰

Open Banking's Adolescence

FROM MESSAGING APP TO BANK

Kakao Bank branched out of its parent company, Kakao Talk, a South Korean messaging app, and took its first steps into financial services in 2017. In doing so, it became the first purely mobile bank in South Korea's banking sector. Although Kakao Talk was already offering KakaoPay as a FinTech service, it wanted to push more banking services to its customers. Last year, the digital bank unveiled a beta version of a customer service chatbot. It expects the chatbot to enhance its unmanned operation, given that 80 percent of the Bank's customer queries are fairly simple and can be dealt with by the chatbot.¹¹ The Kakao Bank platform was built from the ground-up, and is plugged into Kakao via APIs, extensively leveraging its customer data.¹²



Kakao Bank card¹⁵

AN API ECONOMY BUILT ON THE OPEN BANKING ECOSYSTEM

Head of Platforms at Virtusa xLabs, Chamindra De Silva builds platforms that help accelerate the innovation lifecycle for our clients focusing presently on platforms for Open Innovation, FinTech Integration and Open Banking.

Banks will be looking to leverage the secure and regulated Open Banking framework coming into force this year to innovate and align their digital strategies for improved customer experiences, revenue growth and operational efficiencies. Platform providers in this space already have powerful offerings. These include full API management, FinTech curation and assurance, solution bundling, ideation engines and minimum viable product (MVP) catalogs, as well as product commercialization through API monetization.

With such powerful digital platforms at their disposal, incumbent banks will look to collaborate with FinTechs to streamline and become digitally leaner. This will complement their banking expertise and product offerings, making them highly competitive leaders in the Open Banking ecosystem. Meanwhile, customers should benefit from a better digital experience that promises to deliver quicker turnarounds on their financial transactions. All this will allow banks to focus on customers' real needs rather than on the movement of funds necessary to make that happen, while offering them the security of funds that they have come to expect from banks. Digital banking will have truly arrived.

Now let us examine a few scenarios where Open Banking has the potential to truly revolutionize the world of Financial Services.

Portfolio Management for the Masses

Imagine an app that manages all your bank accounts, deposits, individual savings accounts (ISA), mortgages, and investment portfolios held with multiple banks, in one place. It creates your risk profile and asks for your goals. Say you are a Londoner and your goal is to own a property in five years' time, and you are looking to save for a deposit. Based on this information, the app will present a list of available Property ISAs, tell you how much you would need to allocate to it each month, and how that will impact your overall portfolio and savings. Once you choose an ISA, the app connects with the ISA provider to instantly subscribe you without any extra steps or paperwork, opens your ISA account and adds it to your app dashboard. Moreover, it sets up a regular payment of the agreed amount into the Property ISA each month.

A few months down the line, you get an app notification saying you have some spare





cash that has been growing each month but is sitting idle and not earning interest. It suggests a medium risk investment strategy to create a custom portfolio where it recommends an investment fund, an equity, and a cryptocurrency asset. You like the investment strategy's historic performance and choose to subscribe. The app connects to an investment platform API to create a portfolio, whereupon it buys the funds, equity, and cryptos at once on your behalf. You can view the performance of your assets any time you like, rebalance if your risk appetite changes, or even sell if you decide to cash out – all in real-time from a single app.

Real-times Treasury Management

As we know, managing capital and liquidity are fundamental to the smooth functioning of all organizations and especially banks. In recent years, new regulations, such as BASEL III, require that banks hold even more capital than before. Traditionally, banks have depended on point-to-point connections and batch processes, often running on an end-of-day basis. Enter PSD2 and Open Banking combined with the power of real-time instant payments.

The Account Information Service APIs will give treasurers an up-to-date view of balances across multiple accounts, making reconciliation and transaction reporting fully real-time. The Payment Initiation Service APIs combined with real-time payments will support instant funds disbursements. This becomes of special interest when treasurers are dealing with multiple banks and their systems, making the management functionality possible through a single portal.¹³ Real-time sweeps

could replace overnight ones in a single bank or cutoff time based on multi-bank scenarios. Of course, cutoff time based sweeps often mean that buffer balances are left in local bank accounts. This would lower the risk of local overdrafts as well as the cost of local cash buffers, resulting in better cash flow forecasting. Add to this big data based, AI-assisted liquidity advice for Treasury, and we could see a sea change in the operations of the Treasury function. Eventually, we will see regulated third parties, who offer specialized Treasury services, taking over the entire operations of treasury functions, thereby liberating corporates to enable them to focus on their core businesses.

Smart Insurance

The insurance pipeline is a complex one involving customers, brokers, insurers, reinsurance brokers and reinsurers, each with their own role to play. Brokers often connect customers to insurers, at times providing value-added services such as Business Continuity Planning and Risk Management. Insurance companies take on part of the risk-sharing of premium and claims, often passing on residual specialist risks such as excess of loss, stop loss, and catastrophe excesses onto reinsurers.¹⁴ Premiums and claims need to be shared between various insurers and reinsurers, with commissions paid out at the appropriate points in the chain. This takes time with checks, calculations and payments at various points – a lot of it spent in operational processes resulting in delays.

Blockchain combined with Open Banking and instant payments promises a bright new future. A customer's identity with

details of the insured item, including policy details, premiums and conditions of claims, can all be incorporated in a smart contract. Additionally, AI-assisted rule-based decisions can assign the relevant insurers and reinsurers to a policy, with sharing of premium and claims apportioned. Every time the premium is paid, API-based instant payments processing will make the appropriate payments to the brokers, insurers and reinsurers, at the same time paying any necessary commissions in the chain. Claims and supporting evidence checks will be done once, with all the details available as part of the smart contract accessible to any party in the chain on-demand, and fully compliant with data protection regulations such as GDPR. Open banking APIs will enable real-time collection, aggregation and disbursement of claim payments, resulting in a dramatic reduction in turnaround times for claim payments. Insurers, reinsurers and brokers will see a big change, with an up-to-date view of their positions, including risks, claims and premiums all near real-time.

The new Open Banking ecosystem will see banks collaborating with other financial and regulated non-financial institutions, creating a cross-industry paradigm shift. Banking services will become an integral part of larger solutions that are focused on solving customer's problems from a holistic perspective. This will create new challenges as well as a world of new opportunities for innovation and revenue generation for banks and non-banks alike. Early entry, a good understanding of market needs, and innovative commercial products will be the deciding factor in the success or failure of many organizations.

FINNOVATION FOR THE DEVELOPING WORLD

Regulators Adopt an Iterative Approach to Move from Access to Usage



“The basic plumbing to enable commerce is lacking” -

is the sort of refrain heard with respect to economically impoverished areas within the developing world. This withering assessment remains true, but in recent years bright spots have emerged. Today, some of the “plumbing” of the digital economy is crisscrossing developing countries in the form of low-cost mobile networks. These digital networks have rendered financial inclusion (FI) possible (the notion that individuals and businesses should have access to affordable financial services such as savings, payments, loans and insurance).¹ But it has done more than provide the on-ramps to FI for the poor and marginalized. The spread of mobile networks and mobile phones have radicalized hopes for FI, with growing recognition of its significance for individuals, countries, and the global economy. This year, FI will start to shift to a new phase. Previously, FI was all about *access*. Public and private sector activity

centered on building the mobile money infrastructure to allow value to be moved around digitally. These mobile money platforms offer electronic payment and storage services.² And, notably, they have proven spectacularly successful at helping “unbanked” people gain access to these services. Here, the shining exemplar is M-Pesa. Launched in 2007 in Kenya by telecommunications giant Safaricom, the mobile money transfer service snatched up two million users in its first year of operations.³ Since then replicator models have flourished. And the figures remind us just how much has been achieved: between 2014 and 2017, 515 million adults obtained an account with a financial institution or mobile money provider; that’s a jump from 54 to 63 percent in developing countries.⁴ As for the pervasiveness of mobile phones: today, more people have access to a mobile phone than clean water or electricity.⁵

If you unpack it, this digital infrastructure comprises several capabilities, according to Professor Ignacio Mas.⁶ First, the identity capability: establish that the owner of the funds is who they say they are, and the intended recipient is correctly designated. Second, the accounting or ledger system capability: balances may be tracked, and transactions authorized. Third, the

messaging capability: transactional data from the payment initiator is compiled and conveyed to the authorizing entity, and confirmations are given. To date, this third capability is the real breakthrough of mobile money: “we now have an increasingly inclusive and ubiquitous real-time messaging fabric.”⁶

What of the other two capabilities? And what are regulators, legislators, banks, challenger banks, FinTechs and other financial stakeholders doing in this space today? There’s no doubt that FI has become a flash point in conversations about inequality, economic development and resource distribution. On the international stage, FI is a chief interest of the World Bank,⁷ as it is of the UN, surfacing in eight of its 17 Sustainable Development Goals.⁸ Turn to developing economies, and you see its imprint in national digital development strategies.⁹ But amid swirling debates, policymakers and business have been getting the message. Whilst access in FI remains an ongoing priority,¹⁰ it has become apparent that having a bank or mobile money account is not enough. Globally, as much as one fifth of these accounts are inactive, with no deposit or withdrawal made over the past year.¹¹ So, the governing preoccupation of the

next phase in FI will be *usage*. Greater financial activity is needed to bed down the digital rails and accelerate inclusion. This year, banks and FinTechs will be focusing on the services and products riding on top of the rails. They will be building out bundles of financial services to strengthen the customer proposition. Even just a few years ago, the risks of doing so would have been nerve-jangling for most. But today, the business case is strengthening. Some of the barriers that had existed with respect to the “identity” and “accounting” capabilities, or the problem of figuring out the credit worthiness of a thin-file or no-file customer (someone with a limited or non-existent credit history) have been solved by FinTechs, to some extent. For instance, FinTechs have been experimenting with alternative credit financing options based on a person’s Facebook “social graph” or the data from their phones to calculate the credit score. In addition, it has long been the case that the unit economics never stacked up – how do you scale micro-sums from people to make it viable? Here, too, some novel business models have been formulated, to do with skillfully deploying pay-as-you-go schemes, freemium models, and so forth. Having ironed out these big kinks, and thanks to the proliferation of the number and type of account holders, the risk dynamics have changed, making it a more attractive business proposition. To stir more usage, however, financial players

will be getting more customer-centric this year in a bid to design products and services that will make a difference to their customers’ everyday lives.

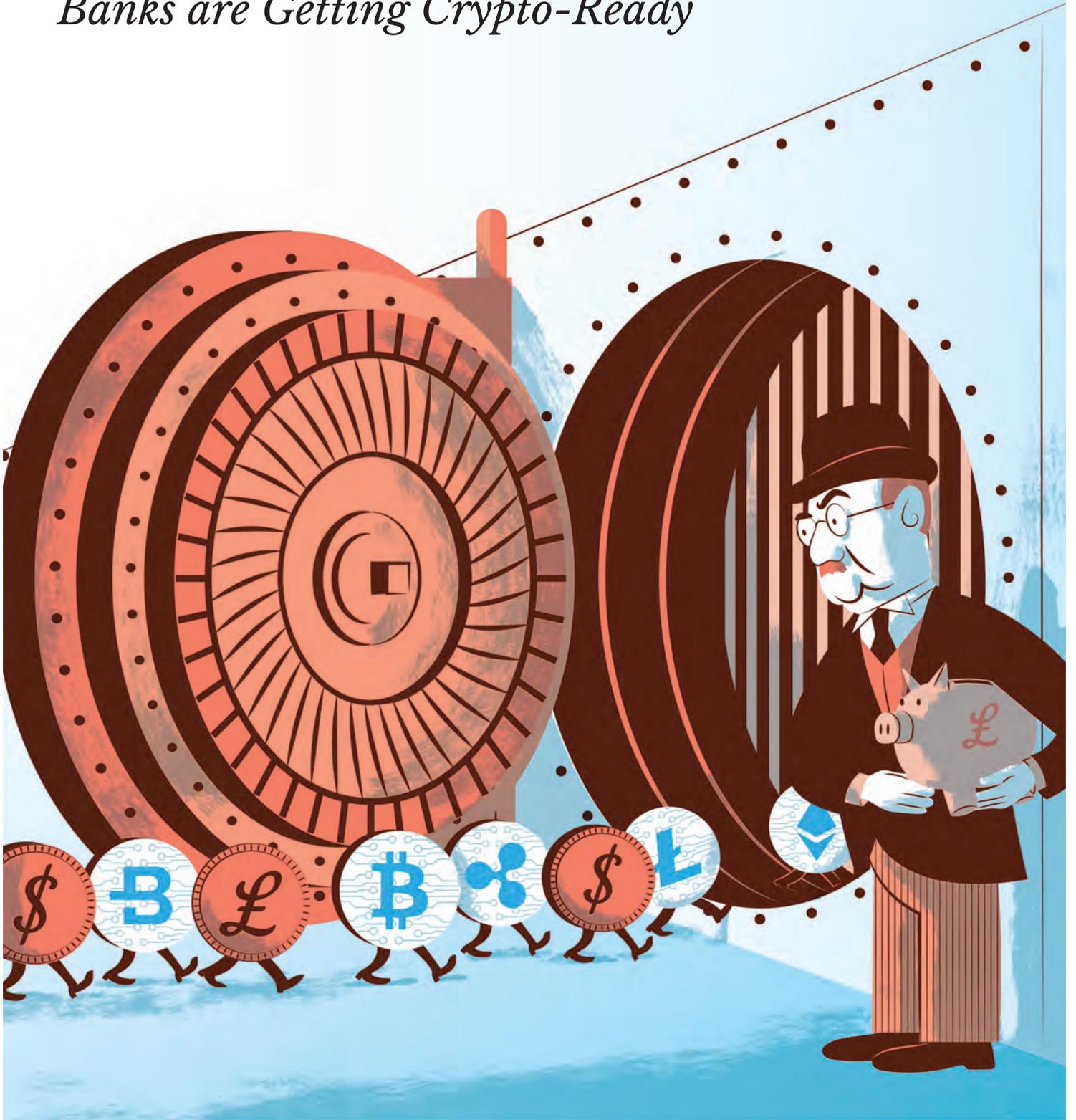
Regulators will also play a critical role in fostering usage. Without question, regulators taking a sustained look at this area could not miss the blazing trail of FinTech innovations across the developing world. In turn, they are starting to move towards a more open and iterative approach to this fast-evolving digital ecosystem. This is a big shift when you consider that the laws and regulatory tools, to say nothing of the mental models and attitudes, were conceived in an analog world. But if the goal is to protect and nurture the delicate ecosystem of FI, new approaches are demanded.

Fortunately, regulators have some new ideas. Inspired by the pioneering work of the Financial Conduct Authority in the UK, whose regulatory sandboxes and informal, creative collaborations with industry participants have set a new industry benchmark, regulators elsewhere will be thinking laterally about their regulatory models.¹² While the particulars will vary across jurisdiction, we think that in 2019 regulators will be experimenting with new instruments and modalities to encourage collaboration in the financial sector to drive progress with FI.

**THE GOVERNING
PREOCCUPATION OF
THE NEXT PHASE IN
FI WILL BE USAGE.
GREATER FINANCIAL
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TO BED DOWN
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AND ACCELERATE
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CRYPTO IS COMING OF AGE

Banks are Getting Crypto-Ready



“The structures of the new [crypto] era will become clearer in time, but, whatever form they take, digital currencies will be here to stay.”

- Stratfor, 2018¹

The appetite for alternative financing is growing.

In 2019, the world’s biggest banks and financial bodies will edge closer towards crypto by introducing some of the financial infrastructure necessary for its mass adoption. This will include wallets and custody services (enabling ownership), exchanges (for facilitation), and even futures and derivatives (for risk management). Together, this will herald a shift to a higher level of activity around cryptocurrency, increasing its popularity within the broader financial services ecosystem.

To date, institutional money has not flown into cryptocurrencies. Until blue-chip financial giants establish the financial infrastructure for crypto markets - a move that should help solidify the reputation of crypto-assets - participation by the asset management sector will likely remain limited. And without serious institutional money, the retail side of the market cannot progress.

Following the astonishing bull-run of late 2017 that saw the total crypto market cap reach \$700 billion, 2018 was the year of the Great Crypto Crash.² Media pundits crowded about the speculative mania, the currencies’ anarchic volatility and regulatory warnings,³ in line with the outspoken denunciations from banking

magnates of the likes of JP Morgan Chase’s CEO Jamie Dimon.⁴ Countering this, 2018 also marked the 10th anniversary of Satoshi Nakamoto’s groundbreaking whitepaper on Bitcoin,⁵ forged in the shadow of the 2007-08 global financial crisis. Bitcoin and its crypto-cousins continue to prevail both in markets and the public consciousness, defying the charge that they are nothing but a fad.⁶

2019 will mark an inflection point in the growing legitimacy and maturity of crypto as an investment asset class. Where poor behavior has been witnessed, it has largely related to sloppy custodial practices by exchanges and speculators, such as storing keys on computers with enabled network access, or ignoring proper signature schemas, etc. In fact, it is these very practices that will be addressed in 2019 insofar as the systems required to support secure custody services are concerned.

Already we have witnessed early signs of the institutionalization trend. Behind the scenes, traditional custodian incumbents such as Citigroup,⁷ Goldman Sachs,⁸ and Morgan Stanley⁹ have been developing crypto-specific custody solutions. Within the crypto community, some players already offer fully licensed crypto custodial services.¹⁰ But the movement of traditional financial players from contemplation to active development, as they prepare to enter the crypto market, is a critical milestone. Their retooling will build confidence in this emerging asset class, laying the groundwork for mainstream adoption.¹¹

There is plenty of other evidence of their

elevated state of readiness: Barclays has been reportedly gauging client interest in a digital asset trading desk.¹² Bank of America has filed a patent for managing cryptocurrency storage targeting large-scale institutional investors.¹³ Meanwhile, Goldman Sachs has set the record straight with CTO Michael Chavez rebuffing claims that the bank is deprioritizing its cryptocurrency trading desk plans, calling it ‘fake news’. On the contrary, it is actively considering Bitcoin-related services.¹⁴ Since late 2017, the Chicago Mutual Exchange and the Chicago Board Options Exchange have been offering Bitcoin futures.¹⁵ More recently, one of the world’s largest investment firms, Susquehanna International Group, declared its intention to open a crypto trading desk.¹⁶

On the regulatory front, a new Bitcoin ETF is being reviewed by the Securities Exchange Commission (SEC), with the decision pending at the time of writing.¹⁷ At the state level, a Singaporean state-owned entity, Vertex Ventures, has invested in Binance to create a crypto fiat exchange.¹⁸ As more and more banks and financial incumbents create scalable on-ramps to alternative finance, the tension between regulatory authorities and banks will heighten. This interaction will shape the legitimacy of cryptocurrencies to the broader institutional market.

Crypto is Coming of Age

THE FIRST CRYPTO ETP

The institutionalization of cryptocurrency hit a new milestone when SIX Swiss Exchange, Europe's fourth largest exchange, approved the listing of the first multi-cryptocurrency exchange-traded product (ETP) in November 2018. An ETP is a security that derives its price from an underlying asset. In this case, the "Amun Crypto ETP" tracks an index based on the movements of the top five cryptocurrencies in terms of market cap and liquidity.¹⁹ Significantly, the decision has enabled both retail and institutional investors to indirectly invest in cryptocurrencies, permitting further diversification of their portfolios. This, in turn, will lead to greater liquidity and growth in crypto markets.



Crypto is Coming of Age

CRYPTO YEN

The stablecoin, backed by the Japanese yen, has been developed by Digital Garage (Japanese fintech) and Blockstream (main Bitcoin developers),²⁰ and approved by the Japanese Financial Services Agency.²¹ The project's chief goal is to confirm the security and transparency of crypto-assets. This cryptocurrency has been granted a one-year license under a newly created legal sandbox, and only exchanges (traditional and crypto-exchanges) with a Japanese Virtual Currency Exchange License will have access to the product. Released at

the end of January 2019, the project was actually started at the end of 2017 when the FinTech Proof-of-Concept Hub of Japan was released. The government's official approval is a stamp of legitimacy for the newly created cryptocurrency, signalling to the traditional financial ecosystem that it is a safe place from a legal standpoint. Significantly, others are starting to follow suit, with the second biggest bank of Japan planning to release its own stablecoin in March.²²



Crypto is Coming of Age

SWEDISH E-KRONA

Most central banks are working on distributed ledger technologies to issue their own central digital bank currencies (CBDCs).²³ Thanks to the rise of digital payment systems like PayPal and the waning use of cash, CBDCs have become the talk of the town, with everyone from IMF Managing Director, Christine Lagarde, to prominent academic, Nouriel Roubini, discussing their strengths and weaknesses.²⁴ On top of eliminating the need for cash, CBDCs are believed to help fix monopoly distortions, reduce operational risks, increase cost efficiency, improve financial inclusion, and create new monetary policies.²⁵ Swedish central bank, Riksbank, is leading the initiative to build technical solutions for CBDCs with the piloting of “e-krona”. If it goes ahead, it will facilitate the government’s ambition to become a cashless society, with the direct provision of state-guaranteed means of payment.²⁶



Riksbankshuset, headquarter of Swedish National Bank³¹

MYTHS AND REALITIES: IDENTIFYING BLOCKCHAIN'S REAL CHALLENGES

Enrique Alcázar is Virtusa xLabs' Blockchain Lead. He is focused on pushing the blockchain ecosystem and fixing current challenges with corporate blockchain platforms.

Institutional investors are attracted to crypto because it is a new speculative asset class that has generated far better returns than other asset classes. Their entry into crypto markets is not only inevitable, it will happen sooner rather than later - perhaps even as early as 2019.

Increasingly, large financial bodies are becoming acutely aware of the opportunity that lies in facilitating this process. In building on- and off-ramps between fiat currencies and cryptocurrencies, banks stand to gain massively; but so too will crypto markets because volatility will reduce as giant trading volumes are unlocked.

In this short piece, we'll first debunk some common myths associated with creating new market infrastructure, which may be holding back some Wall Street players and then focus on business and technical issues that warrant closer attention.

Myth #1: It is Unsafe

Cryptocurrencies are unsafe and have been hacked.

Reality: A year ago, Bitcoin reached a peak in market capitalization of over 300 billion USD, and Ethereum reached 130 billion USD. Guess the number of times they were hacked: not once. News about hacks or attacks, where the asset has been stolen, actually relate to poor custodianship models, not poor security on the blockchain front.

Takeaway: Properly developed and implemented custodial solutions are not vulnerable to these attacks; and assets like Bitcoin have proven to be safe to hold from a cybersecurity standpoint.

Myth #2: AML is Impossible

Anti-Money Laundering (AML) processes, designed to stop illegal income generation, are impossible to perform for crypto-assets due to the anonymity of the actors.

Reality: Most crypto-assets are not as anonymous as people think.





The key to AML processes is provenance. In this respect, we can categorize crypto-assets into three types, the first two of which account for the lion's share of industry investment - 88 percent of market capitalization:²⁷

1. UTXO assets (e.g., Bitcoin, Litecoin, Bitcoin Cash): This transaction model, based upon unspent outputs,²⁸ enables users to track the asset from the start of a transaction to its completion, with full visibility of all the wallets storing the asset. This makes it more traceable than traditional fiat currencies. We can identify if the asset has been used for nefarious purposes (since the address for payment is visible to all). Most of the capitalization belongs to this group.

2. Balance change assets (e.g., Ethereum and Ripple): In this model, transactions do not exchange a blockchain asset, they change a value in the blockchain instead. Whilst we cannot track where a particular asset comes from, we do have a registry of all wallet-to-wallet transactions; that's still better traceability than cash. This is the group with the second highest capitalization

3. Private assets (e.g., ZCash, Dash, Monero): Some of these also belong to one of the other categories, but unlike them, they hide most of the transaction information, making traceability close to impossible. This accounts for around 12 percent of market capitalization.

Takeaway: Most cryptocurrencies are more amenable to AML than we might think.

Myth #3 High Volatility

Cryptocurrencies are too volatile to be added to regulated markets.

Reality: This has been true for a long time but, since October 2018, volatility for Bitcoin has drastically decreased. Nowadays, some assets on Nasdaq trade with more volatility than Bitcoin.²⁹

Takeaway: Current Bitcoin products are demonstrably more stable than a range of other financial products. It stands to reason that if products were to be created for other cryptocurrencies with high liquidity, they would become stable over time as well.

Understanding the Real Challenges

Reality: The cryptocurrency ecosystem is still immature. We see this when we consider regulation, and the available pool of trained professionals.

Regulatory agencies have to deal with a completely new model of asset and understand it in minute detail in order to create laws around it. Since the technology is so novel, it is difficult to find suitably trained, competent practitioners. This talent shortage is slowing down adoption. It is worth noting that, since 2017, all major universities offer at least one course related to blockchain.

Entrepreneurs have to contend with a barrage of conflicting messages when it comes to cryptocurrencies. Amid this noise, it has become extremely difficult

for businesses to identify safe assets, "best practices" when dealing with them, as well as how to best leverage them.

Reality: The valuation of cryptocurrencies is highly complex.

Due to the nature of crypto-assets, there is no fixed price index and they can be traded at different prices in different exchanges. In addition, as some exchanges have been caught lying about liquidity, calculating the real price of cryptocurrencies is much harder. These bottlenecks are often cited as the reason for big arbitrage opportunities between various exchanges; and for the rejection of ETFs by the SEC, as proposals on valuation are not sufficiently convincing.

Reality: Cryptocurrencies are susceptible to market manipulation.

Since there is barely any regulation governing investor behavior, a sub-set of actors are manipulating the markets. Examples: a high-profile investor might say that asset x will collapse and then "buy the dip"; bots will post and delete tons of orders to artificially drive prices up or down; "pump and dump" schemes; "whales" (large cryptocurrency holders) make major moves and generate fear of missing out; and insider trading cases where the perpetrators cannot be punished since there is no legislation in force.³⁰ The larger problem is that the task of regulating cryptocurrencies, at a global level, appears to be beyond the bounds of possibility. However, inroads could be made at the national level by creating regulated markets

where investors could feel safe; or increasing liquidity to a point where executing the strategies mentioned above would require a prohibitive amount of resources.

Reality: There is a big stigma around using cryptocurrencies. 20 years ago, big companies and governments declared that the internet was a place for terrorists and bad people. Companies said that packet switching was the most interesting aspect. Back then, the only internet application people had in mind was email, and to send one took over two hours of configuration and over a day to reach the other side. They said that fax machines were faster and easier to use. They said email was never going to catch on. This is not the only example: the same thing happened when motorized vehicles were introduced in the UK, or alternating current in the US. Right now, cryptocurrencies are in that exact phase, so we should consider this as an opportunity. In the next year, we'll see who is betting for the future and who keeps sending faxes.

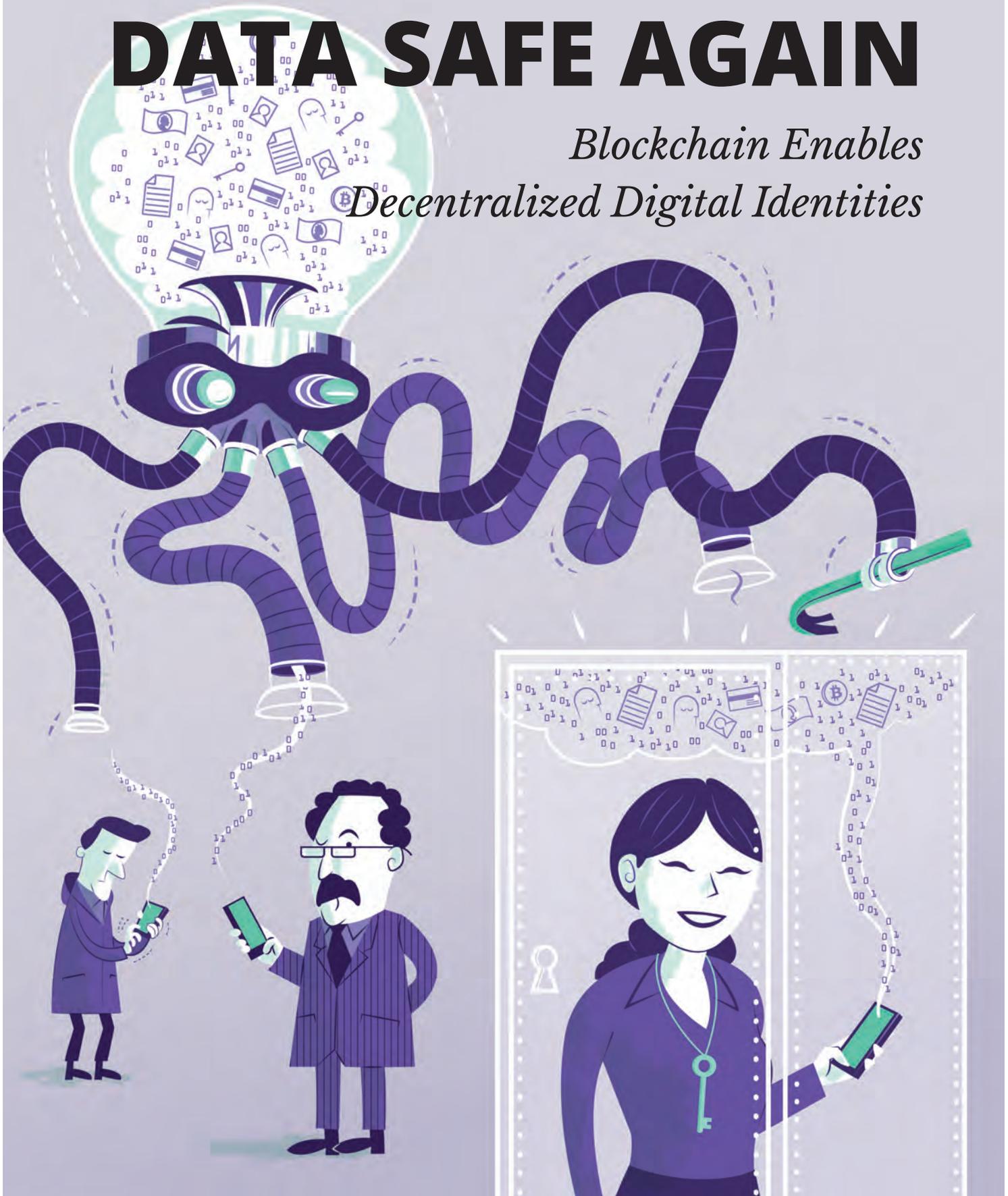
Crypto markets represent a golden opportunity for incumbent banks and financial bodies to support their institutional clients. But there are also dangerous risks, as has been well-documented. Therefore, it is critical not to get sidetracked by phantom issues that have little basis in fact. Instead, the focus should be on resolving or mitigating the real risks, which is now possible with today's skill-sets and technologies. These considerations will be important in 2019 as leading banks and financial organizations create the digital infrastructure necessary for institutional investors to participate in crypto markets.



**IN BUILDING ON- AND
OFF-RAMPS BETWEEN
FIAT CURRENCIES AND
CRYPTOCURRENCIES,
BANKS STAND TO
GAIN MASSIVELY.**

MAKING OUR DATA SAFE AGAIN

*Blockchain Enables
Decentralized Digital Identities*



#blockchain

#consumer empowerment

#cyber security

#data

#decentralization

#technology application

“The fact that a breach at one company can impact tens of millions of users is troubling.”

- USA Today, 2018¹

We live in a data-obsessed world.

To the public it seems like organizations are turning into surveillance machines, harvesting extensive amounts of personal information to “hack the minds” of their customers, or to sell their insights to third parties so that they may do so. It has become the fulcrum of their business strategy. Yet, ironically, these very organizations are proving to be soft targets of manipulation and attack. And it is a big deal. They are forking out billions on cybersecurity, and the figure is climbing.²

Even so, in 2018, a cascade of high-profile data leaks and cyber heists erupted across the Internet. After revelations of foreign meddling in the 2016 US Presidential election by Russian trolls, Facebook crashed into the headlines with a fresh scandal involving alleged electoral interference. In this case, Cambridge Analytica, a political consulting firm, obtained psychographic data about millions of Facebook users, without their awareness, for campaign targeting. The embattled Facebook CEO, Mark Zuckerberg, was marched before Congress. Massive budget hikes were pledged, privacy practices overhauled,³ and

its platoon of security experts doubled.⁴ Yet for all that, Facebook’s security apparatus was breached again just a few months later,⁵ in perhaps the largest hack to date.⁶

It would be comforting if we could confine this risk to Facebook or social media data. But in our hyper-connected era, all data-guzzling, centralized organizations are potential honeypots for fraudsters and hackers. “Attackers go where the data is,”⁷ in the words of Forrester analyst, Jeff Pollard. Typically, individuals will bear the brunt of these raids. As more of their personal data is sucked up, aggregated and shared by online businesses, their own risk-exposure will magnify. What’s more, public-sector institutions are unsafe, having also fallen prey to costly hacking sprees.⁸ These trends will only intensify in the future as our digital presence deepens through social media, in step with the explosive growth of the internet, and the cloak-and-dagger sophistication of cyber-criminals.

The most worrisome situation is when the theft relates to an individual’s personal identity data.⁹ On this matter, blockchain proponents point to the inherent security vulnerabilities of centralized identity repositories.¹⁰ Too often, individuals and organizations have no control over their own identities. Moreover, the current set-up is inefficient and complex. Since

today’s identity systems are proprietary to the organizations that provide them, individuals may wind up having scores of online personas at scores of organizations. An individual’s digital identity is always linked to these systems.¹¹

The paradigm of decentralized digital identity is fast emerging as a way out of this fix. It starts with the concept of self-sovereign identity. Here, individuals and organizations own their identity data - not the online organization they have registered with. The data is stored on an “identity wallet” on a private device. And it could be accessed by third parties for validation purposes, or to add information into a wallet - subject to the owner’s permission.¹²

Previously, this was nothing more than theory. Now, with advances in Decentralized Ledger Technology, all this may be operationalized and secured. For example, a person’s legal and financial data could be locked in a vault on blockchain, which only the holder of the key to the vault could fully access. In 2018, the first decentralized digital identity products began to be developed to appeal to the early adopters, for example Uport¹³ and Sovrin.¹⁴ 2019 may well be the year of market growth, with new use cases built to meet the growing requirements.

Making Our Data Safe Again

WORLD FOOD BANK'S BLOCKCHAIN

When fleeing persecution and conflict, refugees often lose their legal identity documents, if they have any to begin with. To address this, the UN's World Food Program (WFP) has pioneered the use of blockchain, which is a secure, decentralized digital ledger that provides an immutable record of transactions visible to all on the network. Besides making it less vulnerable to tampering by central authorities, the technology enables refugees to build up records over time that may be used as a form of identity.¹⁵ By using blockchain and biometric authentication, the WFP

helped over 100,000 Syrian refugees in Jordan to access services and develop alternate identities. In this model, a refugee wanting to buy food has her iris scanned at the supermarket, and her identity is authenticated by a traditional United Nations database; she then redeems her WFP food vouchers via an Ethereum blockchain, all without using cash.¹⁶ The initiative is saving WFP money since it removes transaction fees that incur in the traditional banking model. In the long-run, it is believed that it will help refugees regain their legal identities.



Syrian refugees in Iraq ²¹



Making Our Data Safe Again

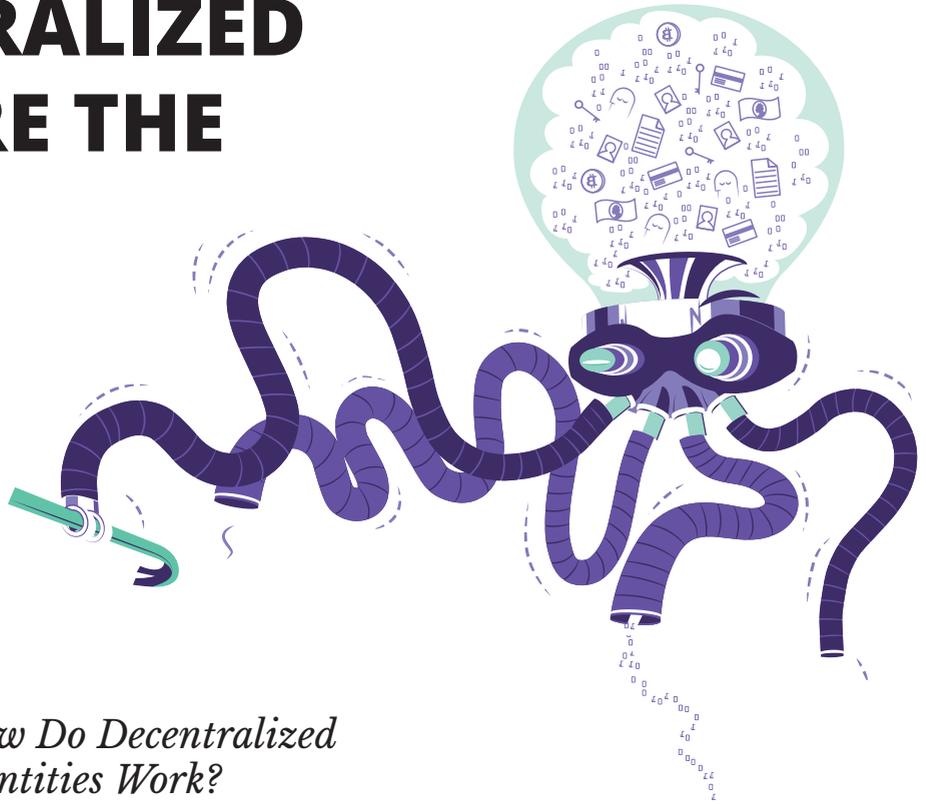
BIOMETRIC BORDER SYSTEM

The Dubai government is working on a pilot, with UK startup ObjectTech, that uses blockchain along with biometric verification to help beef up security at its airports. The “biometric border” system creates a digitized passport for the traveler, which goes beyond the data currently found on e-passports to include other types of data, such as that gained from iris scans, fingerprints and facial recognition software. This data is stored on blockchain and is owned by the traveler - known as self-sovereign identity - meaning privacy

is protected and the traveler controls who can see their data. Accordingly, the risk of identity fraud is reduced and the basis is there for more detailed information to be added in the future. Blockchain-based technology should improve the user experience of the traveler at passport control, given the system can accurately identify the traveler as she walks. For airports, as traffic increases and the demands on them grow over time, it should improve their security and efficiency.¹⁷

WHY DECENTRALIZED IDENTITIES ARE THE NEXT STEP?

Enrique Alcázar is Virtusa xLabs' Blockchain Lead. He is focused on pushing the blockchain ecosystem and fixing current challenges with corporate blockchain platforms.



Let's think about the current internet giants, Google, Facebook, Twitter, and so on. How did they get so big? How are they so powerful? Well, it is mainly because they all deal with the exact same resource: data. Most of their business models are based on selling ads, with their differentiating factor being that they can offer precision-targeted ads at monumental scale. They can do that because they own all of our data. Another quickly growing model is data licensing, where Big Tech companies directly sell all our data to third party companies. Clearly, the value of the internet, since its inception, lies in data. It is one of the main metrics used when valuing new websites: the number of users on the platform and the type of data we can retrieve from them is sometimes more valuable than transactional profit or losses.

Digital identity will completely change how data is stored and managed and, due to low barriers to entry in the web industry and the recent technical breakthroughs around decentralized identities, this may well happen very soon.

How Do Decentralized Identities Work?

Ten years ago, before Bitcoin was released, storing value on the internet was impossible. As there was no way to track double spends,¹⁸ there was no way to track who owned the value. Therefore, some companies took on the role of custodians, just as a government custodies the identity of its citizens. Thanks to the invention of blockchain protocols, we can now associate value to blockch addresses; and with digital identities, we can now associate that to people. Put simply, you will be able to own your personal data, and decide how it can be used.

Decentralized identities involve a number of constituent characteristics:

1. Tokens
2. Owners
3. An approved third party who creates records
4. Data - e.g. name and ID number.
5. A recovery mechanism preventing irrevocable losses.

A decentralized identity encompasses all these points, and in some cases has even

stronger safeguards. Let's see how they are addressed. The most popular way to create a decentralized identity is to do so on a blockchain:

The owner of the identity creates a token (token). Since they used their private key to generate the token, only they can use the identity (ownership). Other entities, for example, the government, can make attestations about any identity, registering them in the same blockchain (approval by third party). Those attestations can be about some information which identifies the owner (name). If they lose or compromise their private key, they can designate a user or set of users who can restore it (recovery mechanism).

Why Is this Better for My Business?

Data is valuable, but can also be dangerous - we have talked about how attackers always go after value. Defending against these attacks is getting more expensive. According to a Gartner study, in 2016 businesses spent \$81.6 billion on data security.¹⁹ There's also the issue of data breach risks: no amount of money spent on security will remove all risks, and the cost of an average data breach is estimated to be around four million dollars.²⁰

So, how can businesses guard against these attacks in a safer, cheaper way? One tactic is to decentralize data, in the same way that Bitcoin decentralizes value. In this model, no individual point offers malicious agents sufficient reward to warrant an attack. If an attacker stands to gain ten dollars, he will gladly invest nine dollars to steal it; but if he can only steal one dollar, he simply will not do it.

This is evident in the Bitcoin network, where the network value can be worth billions, but because attackers can only realistically pick-off individual wallets one-by-one to steal Bitcoins, they have less of an incentive to do so. A decentralized digital identity replicates this structure. With it, individuals can store and protect their personal data in a decentralized vault and prove its validity through blockchain transactions. For businesses, users who interact with them in this manner are more cost-effective to deal with, since they do not need to store and protect the users' data, but just access it with the users' permission. This results in an ecosystem where businesses may retain value because they can still obtain the information, while at the same time data security and privacy is enhanced - the only way to compromise the information is to target the individuals who holds it.

It is important to note that, at present, the process of creating a decentralized identity is cumbersome, and some of the access logic resides on the business side. This is not optimal from a security perspective. The ecosystem is working to solve these challenges, and there are already some promising designs that solve them.

Why Is It Better for Users?

It is better for users because of convenience and profit. Right now, when users exercise their GDPR rights (access, data portability, correction, erasure and consent), it is inconvenient for all parties. It would be far more practical if all users could manage the data themselves in a single place. Signing up for new services would then be expedited since we could expose the data with which we wanted to identify ourselves

without filling any forms, automatically. As users are the ones holding the value, some part of their personal information might constitute value for certain companies. The companies could pay those users to access information for a period of time. It might also mean paying with value: for example, to use Facebook, a user would need to provide Facebook access to their pictures; or maybe, if a user was a popular influencer on the network and drove people to the site, they could be rewarded for it.

Decentralized digital identity is just one form of data that could be put on blockchain. In the future, your medical history might be stored on chain, where everyone could see who has put it there, ensuring that no one has compromised it, whilst giving you the freedom to show the contents to whomever you want. The next time you would visit a new doctor, you would only need to give them permission to access your data. The next time you set up a new bank account, the laborious know-your-customer and anti-money laundering processes would be minimized. The next time you upload a picture, view your search history, consume an ad - namely, every time you generate data - you would be able to own the data and control what you give away and what you may receive in return.

NEVER DIS- CONNECTED

*5G Enables the
Internet of Everything*



#AR

#hyper-connectivity

#IoT

#smart cities

#telecommunication

#VR

The approaching arrival of 5G

or 5th Generation mobile networks, promises to bring about a paradigm shift that will move us one step closer to a seamlessly digital world.

While 4G technology, which is now prevalent in developed countries and urban environments worldwide, provides an average speed of about ten to 20 megabits a second, 5G is 100 to 250 times faster at 20 gigabits per second. This compares to streaming a movie in HD on your phone, to streaming 400 movies in 8k resolution at the same time. On top of that, 5G's remarkably low latency rate (the amount of time between sending and receiving information) of one millisecond means that data is transmitted in almost real-time. Human reaction time averages at around 200-300 milliseconds.¹

A study by the UK Communication Service Provider Three, suggests that due to 5G's heroic speed and increased capacity, it is set to replace broadband in people's homes as it is rolled out over the next two

years.² While the government is currently pursuing full coverage of fibre broadband across the country by 2033, 5G could present a cheaper and faster alternative sooner.

As a powerful enabler, the tidal wave of 5G will cause changes far beyond the telco industry. 5G-powered, next-generation IoT networks will affect urban infrastructures, public safety, energy and utilities, retail, media and entertainment, transportation and financial services, to name a few. It is estimated that cities, smart bins and intelligent lighting could save councils £2.8 billion a year.³ Another principal improvement will happen in the development of autonomous cars: 5G will enable communication with other cars, traffic lights and road sensors in real-time, which may eliminate accidents and traffic jams.

Needless to say, these changes will not happen overnight, as a multitude of improvements need to be made to the current state of 5G networks. Using shorter waves and higher frequencies than its predecessor 4G, 5G signals travel much shorter distances (300 meters as opposed

to 10 kilometers) and are easily disturbed by weather or large vehicles. While telco providers are working on improving this,⁴ materially more transmitters will be needed to guarantee stable connections given the current state of the technology. On the other hand, the shorter frequencies allow for more devices to connect in smaller areas: 4G allows connectivity to a million devices in 500 square kilometers, while 5G will enable a million devices to connect within 1 square kilometer.⁵

In 2019, telcos will start rolling out 5G services, and businesses and telcos alike will explore creative use cases for 5G. In combination with AI and Machine Learning, we will see new products, services and business models emerge, which will move across industries and re-define our understanding of the Internet of Things.

Never Disconnected

REMOTE SURGERY

5G could be instrumental in providing millions of people in remote locations with health care, as well as training doctors in surgical specialties.⁶ A team of innovators and researchers at the Ericsson 5G Tactile Internet Lab at King's College London, which is supported by Ericsson technology and infrastructure, are tackling the crucial need for better healthcare.

Using 5G network infrastructure, the team has developed a remote healthcare solution that utilizes the world's most sophisticated surgical robot arm and virtual reality (VR) equipment. Using a haptic feedback glove and virtual reality (VR) equipment, a surgeon or doctor can carry out a diagnosis or potentially operate on a patient anywhere in the world via a robotic counterpart.

Never Disconnected

INCREASE IN 5G ENABLED HANDSETS

Smartphone manufacturers are working on 5G ready devices, aiming to launch in 2019. Deloitte Global has predicted that about 1 million 5G handsets will be shipped by the end of 2019.⁷ Samsung is set to launch the first 5G device onto the market this February with their Samsung Galaxy S10. OnePlus are also set to follow suit with plans to release their 5G ready device in May. Fitted with Qualcomm's new processor "Snapdragon 855", this promises to be 45% faster in terms of CPU, and 20% faster for graphics.³



Never Disconnected

SELF-DRIVING CARS

A consortium called the Automotive Edge Computing Consortium that includes Intel, Toyota and Ericsson amongst its members, is developing a Cellular Vehicle-To-Everything (C-V2X) system to improve road safety, traffic efficiency and the future of autonomous driving.⁹

Complementing sophisticated advanced driver assistance system (ADAS), C-V2X taps into the ecosystem surrounding the vehicle and provides 360-degree non-line-of-sight awareness, whilst providing an evolving path for autonomous driving.



INTERLOPERS IN THE BOARDROOM

Design Now Has a Seat at the Table



Looking around the boardroom,

many companies are now seeing a new face at the table: the face of the Chief Design Officer. The rise of design as a participant in strategic discussion is tied to an increased focus on digital transformation. However, we are yet to see whether this will deliver material business value, or just strong PR messages for companies desperate to flag their commitment to a digital future.

From lofty boardrooms, executives have watched successive waves of digital disruption head their way. The first wave came from the up-start start-ups. Boards turned to their CIOs, who, chanting the mantra “Digital Changes Everything,” proceeded to bolt-on digital to their existing tech stack in the name of “Digital Transformation.”

The second disruptive tsunami has come from Big Tech. This wave is materially different from the first. Its speed and scale could not be ignored and, more importantly, the wave threatened traditional business models, disintermediating companies from their consumers, and in the worst case, relegating them to low margin, commodity positions within value chains that they once owned. Organizations once again looked

to their CIO, assuming that fighting tech with tech made sense. But companies that studied what made their new competition so effective saw that although tech definitely created a competitive edge, Big Tech also gained an advantage from a complementary tactic: design. Big Tech also viewed design differently than most firms, placing it in a central role where it was used to solve wicked business problems and assure that products constantly evolved.

For traditional firms shifting the paradigm of digital transformation from tech project into a design and tech pincer movement has been a gradual process, but today we can see signs that design is moving away from playing a token role, toward a position where it has a more strategic influence over digital transformation. The decision about baking design into digital transformation programs is no longer a question of “if,” it is a question of “when?”

The Design Ladder maturity model is a useful starting point for identifying the stage when companies incorporate design into digital transformation programs.¹ The four rungs on the ladder represent different levels of design influence, ranging from the superficial, where design is involved at the last moment to put lipstick on the proverbial pig and generates the least value, to the fundamental, where design

participates in early-stage analytical and strategic discussions and generates the most value.

- **Rung One:** No formal design approach.
- **Rung Two:** Design is only applied to customer interfaces, such as apps or packaging.
- **Rung Three:** Design is a process focused on business problems with a human context.
- **Rung Four:** Design is a driver and enabler of strategy.

It is worth noting that, in general, most businesses classify themselves as occupying the lowest rung of the Design Ladder.² Most tech projects do better than this, given two decades of influence from the Human Computer Interaction movement. UI design has evolved into UX, where design extends beyond boxes, colors, and fonts to draw on ethnographic research and behavioral psychology to improve engagement levels, outcomes, and the user’s experience. If digital transformation programs were to reflect this paradigm, we would expect it to occupy a rung somewhere between two and three. But this is not the case. Recently companies began

stating that design sits atop the lofty fourth rung within their digital transformation programs. And these are by no means what we'd traditionally think of as design-led businesses. They're old school banks.

In 2017 Australian bank ANZ appointed a Chief Design Officer³ and months later Lloyds was the first UK bank to appoint a Chief Design Officer.⁴ Although the CDO role has been around for some time, they have traditionally only existed in consumer product organizations, such as Philips, Johnson & Johnson, and Apple and have reported into either the CMO or CEO. These new roles report directly into the heads of digital transformation signifying that both guys' primary objective is to leverage design to help the banks win as their industry undergoes a seismic shift.

These two appointments are symptomatic of a more profound trend: businesses are taking design seriously at the most senior levels. Specifically, they communicate two things to the market. First, design is critical to the success of the banks' major transformation program, and second, design is now directly influencing strategy. It is an unequivocal statement. This leads us to question what drivers have influenced traditional banks to appoint CDOs and, by extension, will these forces encourage all organizations to welcome designers into the boardroom?

Alongside witnessing the success that Big Tech's design-led approach has generated, two additional factors have promoted digital transformation projects to the fourth rung of the design ladder.

Design's progress into the boardroom is inextricably linked to the rise of the Design Thinking movement. Independent of whether we view Design Thinking as an innovation catalyst, or Post-It fuelled "bullshit",⁵ what's undeniable is that the prominence of the methodology has raised the topic of design on corporate

agendas. We have also seen design shift from being the remit of selected "creatives" to be a core topic taught to our next-generation executives as part of MBA courses,⁶ reflecting its legitimacy as both a boardroom topic, and as a problem-solving approach that can tackle burning strategic issues.

The influence of the consultancy industry is also codifying the way that organizations are positioning design within digital transformation programs. As the topics of innovation and digital disruption gained prominence at the board level, both strategy and tech consultancies saw design as the logical bridge between their traditional niche and a rapidly growing source of revenue. Notably, amongst the strategy houses we have seen, McKinsey consolidated its three recent design acquisitions into a new entity, unambiguously named McKinsey Design, and then placed this under the control of the head of McKinsey Digital Labs. The other strategy houses have not rested on their laurels and in the past two years we have seen BCG acquire design studio Maya, and Bain create a human-centered design team within its digital practice. As each firm works with its clients' board members to articulate what digital transformation should mean for them, design is positioned squarely in the mix.

System Integrators (SIs) have also assimilated design, but they have been more aggressive. For SIs, design is an upstream activity that precedes large and lucrative implementation projects. This means that running design activities increases the probability of ultimately building and running solutions. In the past five years, SIs have accounted for over a third of all design firm acquisitions. Again, watching where these firms land post-acquisition reaffirms the fact that design is viewed as an inseparable part of SI models of digital transformation. In the UK, we have seen

Accenture physically bring its Interactive practice together with its acquisitions, Fjord and Karamara, creating a more holistic digital offering and joint go-to-market approach.⁷ IBM, which initially opted to build rather than buy its design capability, positions design as a foundational play in its bid to become a "Digital Reinvention Partner" for clients. Given that the firm has rapidly built a team of 1,300 designers and pledged \$100 million to its design program, this significant commitment will shape its articulation of digital transformation and ultimately will influence the views of senior client stakeholders.⁸

As well as shaping the discourse of digital transformation, with design featured as a central tenet, we have seen consultancies publish a number of reports quantifying the value that design can generate when it is applied in the right way and at the right juncture of programs. These figure-heavy reports are perfectly placed to contribute to the quantitative business cases beloved by the C-Suite and remove another objection to the presence of design on the fourth rung.

As the legacy of the Design Thinking movement creates advocacy for design within companies, which is reinforced by the consulting industry's digital transformation discourse, it becomes less odd to see design beginning to gain influence at a strategic level. While the appointment of CDOs may be more of a symbolic commitment from firms wishing to mark themselves out as leaders in the digital field⁹ than the emergence of a new core member of the C-Suite, it is still significant: The appearance of the aluminum Eames chairs around the dark wood Chippendale board tables signifies that firms are now recognizing the real value that design can bring to their digital transformation programs.

**THE DECISION
ABOUT BAKING
DESIGN INTO
DIGITAL
TRANSFORMATION
PROGRAMS IS
NO LONGER A
QUESTION OF "IF",
IT IS A QUESTION OF
"WHEN"?**

WHAT IS DESIGN'S ROLE IN DETERMINING DIGITAL STRATEGY?

With over 20 years of experience in leading and directing innovation teams, Head of Design for Innovation at Virtusa xLabs Stephen Wood is an expert at applying Design Thinking to drive Innovation.



Design has the potential to add material value to digital transformation programs. However, the extent to which it will generate value will be determined by where it is asked to focus and the span of control that it is granted. In this piece we will identify three things that companies need to do to enable design to contribute effectively to strategic discussions, ultimately driving better returns from digital initiatives.

For the purpose of this article, we'll equate the concept of the strategic influence of design with the role of the Chief Design Officer (CDO). This is not to say that appointing a CDO is necessary for design to exert a positive influence in the boardroom. To achieve this outcome, companies need to achieve three foundational steps:

1. Clearly articulate how the CDO will operate within the existing organizational dynamics of digital transformation projects
2. Empower the CDO to explore longer-term, left-field objectives
3. Establish design governance to ensure the long-term credibility of design within the organization.

We will tackle each of these points in turn.

Clarifying the CDO's Role and Remit

Let's imagine a CDO's first day. Sitting at the board table they set out their approach for contributing to the existing digital transformation program, starting with providing deep research into the shifting behaviors, attitudes and needs of the company. The CMO flags that its department already has this covered. The CDO shifts to talk about moving to an iterative approach for ideation, prototyping and validating new digital services. This time the CIO and the CMO raise their hands. The CIO's organization has embraced iterative design and had been working with the CMO who, according to the law of the four Ps of Marketing, retained control over Products, (which now means services and experiences). Both stakeholders also already manage studios of designers including UX designers, UI designers, brand specialists and graphic designers.

As the CDO works through each of the areas where design is supposed to help shape strategy, they encounter incumbent

owners.¹⁰ This is unsurprising. Few digital transformation programs are greenfield projects these days and many design methods have been reflected in ways of working in technology, marketing and operational fields. This highlights the risk of the CDO being appointed as a minister without a portfolio. As such, there is a significant risk of them being forced downstream into traditional tactical roles where they add no strategic value.

Given that digital transformation projects are one of a number of ongoing initiatives, it does not make sense to build up, or carve out a new organization for the CDO. As has been seen in many matrix organizations, the dual team approach leads to internal competition and the duplication of cost and effort. What may prove more effective is articulating the remit of the CDO in three sections:

1. Leading the development of the digital transformation program's long-term strategic vision
2. Supporting business functions to define and validate their digital transformation objectives and fostering a cross-functional design community
3. Owning design governance within the organization.

This tripartite approach will help CDOs to deliver something autonomously, build trust and advocacy in the boardroom, and safeguard the reputation of design.

Leading the Exploration of New Strategic Opportunities

Exploring long-term strategic options involves building alternative scenarios setting out different market conditions, human attitudes, behaviors and beliefs. Decades ago, corporate strategy departments carried out this activity, based on heavy quantitative analysis, and

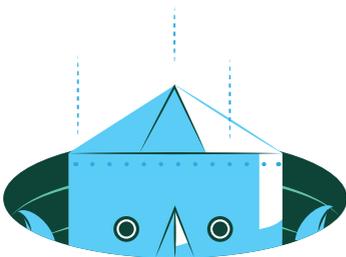
produced a grand plan for the next five or so years. Manuscripts were illuminated, inspiring murals painted etc. Now, the thought of the world avoiding disruption for five months seems far-fetched and quantitative analysts pale at the mention of volatility, uncertainty, complexity and ambiguity. But design methods thrive on uncertainty and ambiguity and have a proven track record of helping companies to draw on research to explore alternative solutions to so-called wicked problems.

In order to clarify why the CDO is best placed to lead this activity, we need to look at how organizations use research to model the future. We can consider research as a continuum. At one end, we focus on the here and now. At this point, marketeers and designers both engage in research to identify how products and services are currently viewed and used in order to make optimizing tactical changes to things such as campaign messaging or user interfaces.

Moving further along the continuum, we enter the realm of Market Research, which, balancing qualitative and quantitative inputs, evaluates how existing niches are evolving, enabling incremental innovation and growing market share in the medium-term.

Still further out, we look at emerging trends in behaviors, attitudes and beliefs; if we're looking to label this, let's call it horizon scanning or "Futurology". Less concrete than traditional market research, Futurology identifies edge cases, and embryonic patterns that may create threats or opportunities for disruptive innovation.

Lastly, at the far end of the continuum we have Speculative Design. This is a predictive rather than an empirical approach, which imagines how new technologies could reshape hypothetical future worlds. Moving through Futurology to Speculative Design, the role of the designer becomes more prominent. We also see the research questions shifting from the tactical - "what can we do" - to the strategic - "who do we



need to be” - reinforcing the view that these approaches are highly suited to shaping the strategic objectives of digital transformation projects.

In the past, organizations have relegated the more abstract forms of research to strategic off-site events, where, positioned as pseudo-academic, blue-sky light relief, they rarely generated value. But things have changed. The rise of Big Tech, the rapid emergence of new technologies, and the advent of open architectures has increased volatility, uncertainty, complexity and ambiguity. In this context, the long-term strategic planning that helps us head to a stationary destination on the horizon appears archaic. In contrast, Speculative Design’s ability to help companies explore a plurality of potential future scenarios seems to be more aligned to the needs of digital transformation programs.

For some, such scenario explorations will continue to be seen merely as light relief. Aside from garnering advocacy from the C-Suite, CDOs can legitimize the approaches based on two, more immediate concrete outcomes. First, considering long-term scenarios surfaces tactics that can be applied to resolve short-term issues. Second, exploring scenarios forces organizations to evaluate the adaptability of their existing tech, operational and organizational models. Both of these outcomes start from considering hypothetical future states but also generate insight that creates short term benefit.

The importance of Governance when Fostering a Culture of Design

If the CDO is going to operate at the strategic level long-term, they must focus on creating a culture of design within their organization. This creates value in multiple ways. Notably, it visibly strengthens design within each of the functional lines of

business, creating a distinct identity for the company’s design diaspora, winning friends in the boardroom, and reinforcing the value of the matrix model over the turf-war.

Acting as a central point for design in the organization also creates a common understanding of where it is relevant to apply design methods, and establishes a common language for design. As well as making design less of a dark art, putting governance in place codifies how and where design should be applied in the organization. Although design community activities predominantly focus at the tactical level, governance ultimately safeguards the legitimacy of design’s participation in strategic discussions.

We have witnessed the rise of and backlash against Design Thinking over the past few years. We have seen organizations invest in Design Thinking and generate value. We have also seen organizations superficially adopt Design Thinking and become rapidly disillusioned. Each approach influences the perceived value of design within the organization. By promoting a culture of design and putting governance in place, the CDO empowers and directs, ensuring that they build a positive brand for design within the organization.

On paper, it is clear that design is well-positioned to help organizations shape better strategic objectives for digital transformation programs. Over a decade ago, Roger Martin identified that generating anything beyond incremental innovation would necessitate grappling with the mystery of the unknown and that the way to do this was by using design methods.¹¹ Transformational projects rely on radical rather than incremental innovation and design drives these types of outcomes. We can substitute “ambiguity and uncertainty” with Martin’s more romantic term, “mystery”, and conclude that design can also have a role in defining effective digital strategies. Things become

more complex as we transition from ideas on paper to engage CDOs in boardroom discussions already progressing at one hundred miles an hour. Understanding how design can become a long-term participant in strategic conversations will be based on how it is positioned relative to existing senior stakeholders; and it is likely that over the next few years we will see companies triumphantly announce the promotion of design to the top table, but which ultimately continue to utilize design as a tactical tool. However, other companies will manage to diplomatically position the CDOs’ role and remit. They will empower designers to explore radical strategic options and they will ensure that becoming a design-led organization builds company-wide competence, rather than misrepresenting and devaluing design. It is these companies that will see design materially and beneficially influence their digital transformation projects.

**TRANSFORMATIONAL
PROJECTS RELY ON
RADICAL RATHER
THAN INCREMENTAL
INNOVATION AND
DESIGN DRIVES THESE
TYPES OF OUTCOMES.**

HEALTH DATA YOU CAN TRUST

*Blockchain Puts the “Structure” into
Healthcare Infrastructure*



#blockchain

#data

#healthcare

#infrastructure

#interoperability

Last year, some of the biggest names in healthcare joined forces

to improve provider data management (PDM). This is at the locus of healthcare delivery in the American multi-payer system, and the linchpin for smooth coordination of the payer network. While maintaining accurate and current provider records might appear to be a straightforward matter, this is not the case. It continues to vex industry insiders. When you consider the industry's progress with cutting-edge AI diagnostic tools, surgical robots, and medical devices, fixing PDM seems long overdue. More pointedly, each year hospitals, doctors, and insurers hemorrhage a staggering \$2.1 billion simply to update provider directories. Not only does this entail byzantine administrative processes to rankle even the most cool-headed person, but the directories are also riddled with mistakes.¹ In the end, patient outcomes suffer. However, in 2019, things might be looking up.

Providers are physicians and other credentialed medical professionals.²

Provider data refers to physicians' specialties and certifications as well as demographic information, such as office addresses, opening hours, and phone numbers. Having on file quality provider data is critical for members (patients), providers, and payers (insurers). It enables sound referral management, connecting health plan members with appropriate providers within the payer network. If incorrect details cut the cord, the member's ability to access care becomes compromised, as is the provider's business functions. PDM also underpins claims adjudication. To confirm a provider's reimbursement request, the payer must establish the care was delivered by an accredited in-network physician, and that the member's health plan covered it.³ Out of sync data causes delays and complications, eroding member confidence in the network to the detriment of the payer.

It is no secret that keeping tabs on data changes is inherently difficult in multi-payer systems. Each payer network (health plan) has its own provider directory. And each provider is affiliated with around 20 health plans.⁴ Physicians are obligated to get in the trenches and manually update their records in multiple networks every time their circumstances change. This is asking for mistakes. On top of that, there's a lack of uniformity in the required provider

information due to variations in formatting across the payers' systems, such as inconsistent data fields. It is a sticking point because this thwarts industry collaboration to promote shared standards and greater interoperability.³

Given their significance to the health system, state and federal bodies mandate that health plans publish their data registries in a machine-readable form and be accountable for its accuracy. Poor record-keeping carries stiff penalties, up to \$25,000 per member beneficiary.⁵ It also risks litigation. Regulations even require some health plans to update their directories on a monthly basis, others quarterly.⁶ This has driven payers to perform regular outreach, structured around calls and emails, to meticulously correct and verify provider details – an administrative headache lamented by all. Yet, for all that, directory accuracy is only deteriorating.⁷

In early 2018, industry heavyweights got together to investigate this and related conundrums. Thereafter, the Synaptic Health Alliance was born, comprising Aetna, Ascension, Humana, MultiPlan, Optum, Quest Diagnostics, and UnitedHealthcare. Billed as a new breed of innovator with a national footprint, the consortium is currently exploring

how blockchain technology could breach common roadblocks, with PDM as the pilot project.

Using blockchain to solve data management coordination in the healthcare system is a trend that will gain momentum this year. Blockchain is a decentralized, distributed ledger database that provides a transparent, immutable, and cryptographically verifiable transaction log. Designed for the digital world, where databases are the common infrastructure upon which whole systems are built: blockchains are the “shared ‘plumbing’ through which many data types can be stored, referenced, and transferred.”³ For the consortium, blockchain was “the trigger that brought us together,” says Mike Jacobs, Senior Distinguished Engineer, Optum, but “the collaboration to solve widespread healthcare problems is our real goal. We envision the possibility of effecting change at scale – helping to make the health system work better for everyone.”⁸

Concerns in the heady early years about blockchain’s teething problems had given way to greater confidence in its technical capabilities, in the wake of significant experimentations and development work across a variety of industries. By 2017, healthcare practitioners had formed the view that its architecture was uniquely good at synchronizing, in real-time, data residing in multiple silos from multiple stakeholders. Having trialed other solutions and failed,⁹ blockchain promised to unify provider information into a “single source of truth” from the distributed network of health plans. This would improve data accuracy, access to care, and streamline administration. It provided a foolproof way, with its append-only structure, to verify which records came from which entity, as well as the ability to trace back to the original records.

For its pilot program, Synaptic Health Alliance is capitalizing on recent technological developments. It uses a multi-

enterprise permissioned blockchain based on Ethereum called Quorum. This solution has matured for use in scalable applications in production environments. It leverages the increasing computing capabilities and convenience of the cloud, enabling it to store nodes in separate data centers.¹⁰ In addition, the Alliance has formulated best-practice cybersecurity controls “to protect even sensitive healthcare information using infrastructure-as-code (IAC), a new approach that completely automates the configuration to circumvent errors that can occur when human intervention is required.”¹¹

Launched in April 2018, the Alliance has spent the better part of the year integrating its various systems and databases with the new PDM blockchain architecture. This well-chosen project uses less sensitive provider data, ducking the regulatory gaze. It demonstrates an immediate benefit in cost reductions and enhanced efficiencies. Furthermore, its foundational framework is intended to serve other medical data use cases, facilitating cross-enterprise data sharing in healthcare.

With this in motion, 2019 promises to be the year of large-scale blockchain solutions emerging in the healthcare sector.

**WHEN YOU CONSIDER
THE HEALTH INDUSTRY'S
PROGRESS WITH
CUTTING-EDGE AI
DIAGNOSTIC TOOLS,
SURGICAL ROBOTS,
AND MEDICAL DEVICES,
FIXING PDM SEEMS
LONG OVERDUE.**

Health Data You Can Trust

A GLOBAL EXCHANGE FOR PATIENT DATA

BurstIQ is a leading provider of enterprise-level blockchain solutions for the healthcare industry. Its platform, which is compliant with the Health Insurance Portability and Accountability Act (HIPAA), securely manages the storage, sharing and licensing of colossal volumes of patient data.¹² Importantly, the information kept on the platform will always be up-to-date, which could prove helpful in pinpointing over-prescriptions of drugs, such as opioids.¹² The company's clients can leverage the platform to innovate data-driven products and services, in addition to setting-up marketplaces for personalized health and wellness products, insurance products, healthcare services, and so on.¹³



Health Data You Can Trust

PATIENT IDENTITIES ON THE BLOCKCHAIN



Blockchain software firm, Medicalchain, safeguards the consistency and integrity of electronic medical records whilst establishing a single point of truth.¹⁶ By having a record of origin, and maintaining a clean and accurate database, doctors, hospitals and laboratories can request patient information knowing it is protected and secure.

Last year, the firm released the telemedicine platform, MyClinic.com, which enables patients and doctors to communicate via video link-up. Patients can pay for the consultation with MedTokens.¹⁶

Health Data You Can Trust

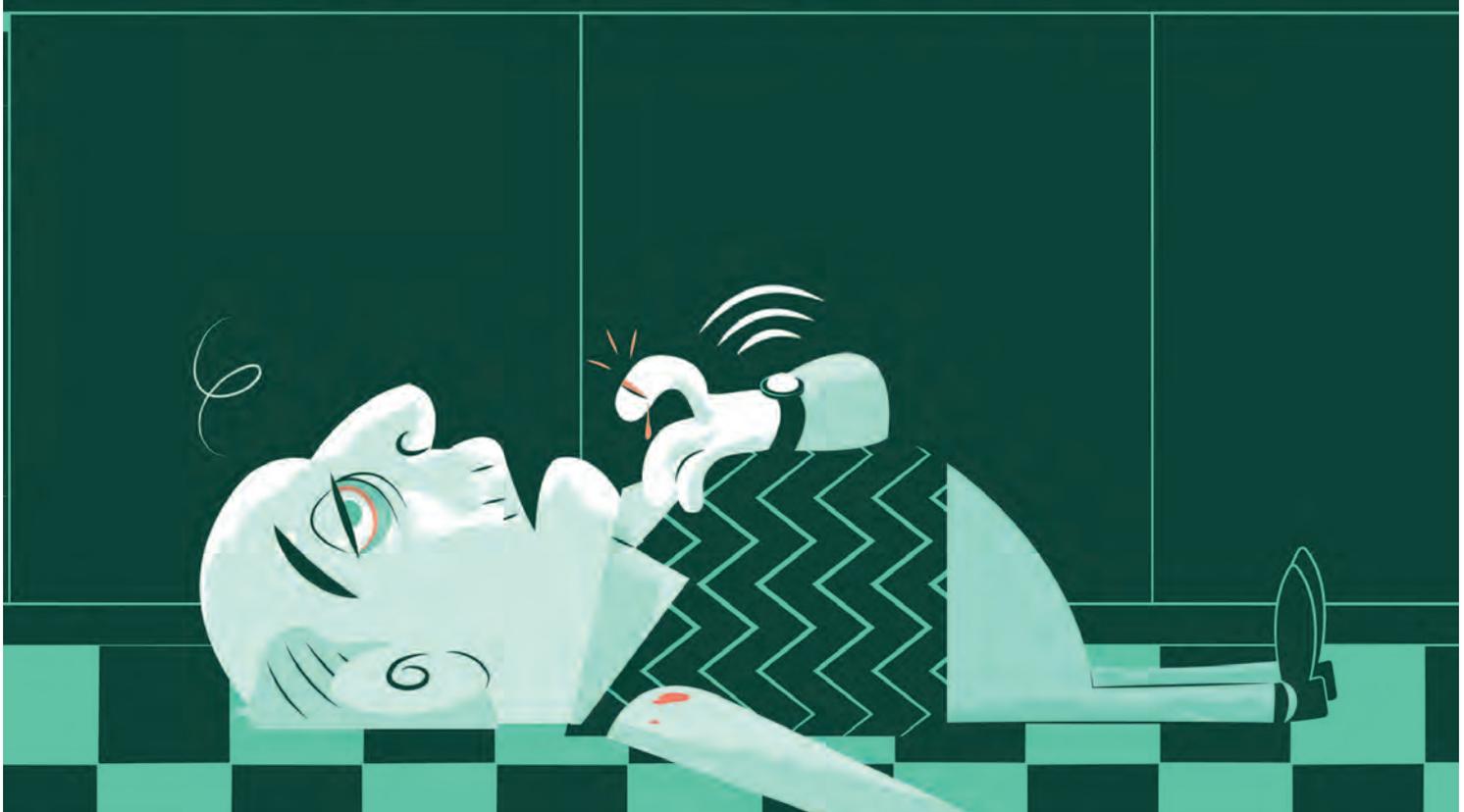
ENCRYPTING PHYSICAL PATIENT RECORDS



Factom is a blockchain company that helps businesses secure the integrity of their data. This is particularly important for complex industries where having a transparent, immutable data trail that can be scaled is vital to their operations. Indeed, Factom's open-source data layer protocol, which is built on Bitcoin, permits individuals and businesses to create applications.¹⁴ For the healthcare industry, it has created products to help it safely store digital records that only hospitals and healthcare administrators are privy to.¹⁵ In addition, Factom can equip physical papers with special security chips that contain private information about a patient, made accessible only to authorized persons.¹⁵

OMNISCIENT HEALTHCARE

*Connected Health
Ecosystems are
Breaking Down Silos*



#AI

#analytics

#data

#healthcare

#interoperability

#personalization

#wearables

Think of the Fitbit or Apple Watch wearer

and the image that flashes up is of a tech-savvy, kombucha-sipping sporty type, checking her biometrics throughout the day, and surging up that last flight of stairs to reach her target daily step count. But that picture has been expanding, with new market segments coming on stream. The leader of the pack, Apple, has placed bets on its smartwatch to spearhead its healthcare program.¹ It is dedicating big money and some of its best engineering talent to transform the Apple Watch from a fitness tracker to a far more encompassing tool for medical diagnostics, health, and well-being. The wearable's evolution is part of the broader "connected health" trend gripping healthcare, which digitally links patients and providers ever closer together. Smart devices are becoming a significant force in a healthcare industry worth a lucrative \$3 trillion.² But the missing piece for 'smart health' to advance is a more

joined-up system between tech giants, healthcare providers, research institutes, and patients. As they integrate further, they can harness the cloud and artificial intelligence to extract critical insights from big data, enabling personalized care for patients in real-time. Eric Topol, Director of the Scripps Translational Research Institute, says: "It's not the data. It's the analytics. Up until three-to-five years ago, all that data was just sitting there. Now it is being analyzed and interpreted. It's the most radical change happening in healthcare."³

Connected health uses technology to deliver healthcare services electronically, including programs such as telehealth, remote patient monitoring, and chronic disease and lifestyle management. In 2019, it will increase in prominence, propelled by a chain reaction of multiple drivers.

First, landmark industry collaborations have taken place over the past year. For example, traditional rivals Google, Amazon, IBM, Microsoft, Salesforce, and Oracle committed to building a set of

common, open standards to make it easier to exchange medical data between different hospitals.⁴ They pledged to remove "barriers for the adoption of technologies for healthcare interoperability, particularly those that are enabled through the cloud and AI. We share the common quest to unlock the potential in healthcare data, to deliver better outcomes at lower costs."⁵

Second, public sector programs are gathering apace. As an example, the Federal Communications Commission in the US has cleared \$100 million in funding for telehealth and telemedicine platforms for underserved populations.⁶ Policymakers are under intense pressure to find new blueprints to deal with the growing pent-up demand for healthcare services in the face of profound doctor shortages and overburdened hospital networks. Telehealth platforms represent one such release valve. Patients in remote areas now have a digital conduit to access health services that have long been denied to them.

Third, the race to bring to market

**THE MISSING PIECE FOR
"SMART HEALTH" TO
ADVANCE IS A MORE
JOINED-UP SYSTEM
BETWEEN TECH GIANTS,
HEALTHCARE PROVIDERS,
RESEARCH INSTITUTES,
AND PATIENTS.**



innovative consumer products is heating up at the firm level. The Apple Watch Series 4 was unveiled in September 2018, marketed as “an intelligent guardian of your health.” Approved by the Food and Drug Administration, Apple’s new watch offers fall detection and additional heart monitoring capabilities: low heart rate alert, heart rhythm detection, and personal electrocardiogram monitor.⁷ This has thrust the wearable into new market segments as a medical grade device, enabling the targeting of retirees as well as those suffering from chronic illnesses. When you consider that 90 percent of the United States’ annual healthcare expenditure is for people with chronic and mental health conditions,⁸ the impact of such technologies for both patients and the healthcare system at large will likely be considerable.

If wearables are for active people, “invisibles” are for the sedentary. MIT researchers have invented a non-invasive wireless device, which transmits low-frequency radio signals that reflect off people’s bodies. In this way, “invisibles” monitor their

posture and movement, even when the device is in the adjoining room. Utilizing Machine Learning (ML) techniques, the reflected signals are then analyzed to extract physiological information, which healthcare professionals can act upon.⁹ One use case concerns the diagnosis of sleep-related disorders. The device can accurately map a patient’s different sleep stages without the use of instrumentation (forget visiting a sleep lab and settling in for the night with countless electrodes taped to your head).

Another application is for chronic disease management. For example, using data collected over two months, MIT Professor Dina Katabi showed the invisible was able to accurately correlate motor fluctuations in a patient with a Parkinsonian gait with the onset and offset of medication. She said, “Not only do you start understanding the life of the patient, but you start understanding the impact of the medication.”¹⁰ Two recent developments have made this wireless device possible. Advances in radiotechnology have led to

the detection of very weak radio frequency signals; and ML models have progressed such that they can now make sense of complex analog data.

Connected health innovations are taking shape now, and they are addressing an ever-expanding range of healthcare problems. Of particular significance is their extension into areas that until now were deemed infeasible to support, such as health services in sparsely populated regions. These developments augment traditional protocols around treatment and disease management in addition to placing greater emphasis on preventative care. In a nutshell, there’s a distinct difference between yesterday’s environment where you visited your doctor for a medical complaint, to tomorrow’s connected health environment of continuous, real-time care. Step by step, big data analytics is merging with personalized healthcare, which will deliver vastly improved, cost-effective medical service.

Omniscient Healthcare

GENOMIC PROFILING FOR WELLNESS

Imagine having your very own personalized diet and lifestyle plan, offering behavioral nudges and helpful nutritional recommendations to keep you on the straight and narrow. Then imagine the service turbo-charged with DNA testing, AI, and a fine-tuned understanding of your dietary habits.¹¹ The world's largest food company, Nestle, has done just that with its Nestle Wellness Ambassador. Launched in Japan, 100,000 users can upload

photos of their meals to the popular Line Messaging app, while an at-home DNA kit and blood test reviews their susceptibility to certain diseases.¹² Nestle then offers advice coupled with specially formulated vitamin supplements. With this, Nestle has the opportunity to capture a goldmine of data on customers' wellness and diet issues, which will be useful as it moves deeper into the health and wellness market.



Omniscient Healthcare

DIY ANEMIA DIAGNOSIS

Anemia, a common blood disorder, is usually diagnosed from a blood test. Now, US researchers from Emory University have created an algorithm embedded in a new smartphone app that can detect anemia merely from “reading” a photo of an individual’s fingernail.¹³ From this photo taken on a phone, the algorithm evaluates the concentration of haemoglobin from the color of the fingernail bed. The app “converts fingernail colors into quick readings of blood haemoglobin levels.”¹³ It turns out that fingernail color is a good indicator of overall haemoglobin levels because nails do not contain melanin that would conceal the color.



Omniscient Healthcare

WEARABLES AGAINST DEPRESSION



Wearables may make a difference with people struggling with mental health issues. Korean startup YBrain has developed MINDD STIMM, a wearable headband that is a “wireless, non-invasive neuromodulation system for depression treatment.”¹⁴ The headband transmits weak electronic currents to the frontal lobe of your brain.¹⁵ Known as transcranial direct current stimulation, the process is designed to stimulate the frontal lobe as decreased activity is linked to depression.¹⁶

LEFT-FIELD TRENDS

Way-out Trends Making Their Way-into Our Lives

Wondering what is happening at the bleeding edge of innovation? Clamoring for a dose of inspiration, for a key-hole look at some of the most thought-provoking trends around? As hardline innovation fanatics, we were restless to find out too. Scouring trend pieces, consultancy papers, and analyst reports, we zeroed-in on seven disruptive trends. Go ahead and dive right in but be aware: they may just capsize your established thinking or undergird a whole new line of mental mischief.



**THE DIGITAL
ECONOMY IS
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DNA EVERYTHING

Lower Cost of DNA Testing Pushes a New Wave of Personalization

Hyper-personalization is a longstanding trend and with the demand for products and services that are specifically designed for individual customers staying strong, in 2019 personalization will evolve to become DNA based.

Technical advances have lowered the cost and complexity of DNA testing and analysis supported by advanced AI.¹ Moreover, consumers are now able to collect DNA samples themselves with easy-to-use test-at-home kits. The most prominent early adopters lie within the beauty, healthcare (including companies investigating genealogy), and fitness industries. These

businesses have started capitalizing on this trend by offering skincare, dietary services, and fitness advice that is uniquely personalized to the customer's DNA. Linking DNA data to other information available through sources, such as health tracking apps and wearables, builds a detailed picture of a customer's health.

For the healthcare sector, this is more than just a passing trend. As we see the lines between professional and lifestyle oriented healthcare continuing to blur, the rise of test-at-home kits is making holistic healthcare more approachable and accessible. Personalized healthcare

solutions such as personalized medicine have considerable potential in the market given that "an estimated 90% of drugs are effective in only 30-50% of the population, which means that more than a third of all money spent on drugs has been ineffective." According to Professor Andres Metspalu, Director of the Estonian Genome Center at the University of Tartu, "taking into account the individual's molecular characteristics complemented by environmental and lifestyle factors, will allow [us] to develop more precise and improved disease prevention and treatment programs compared to conventional methods."²



DNA Everything

ALLEL SKINCARE

Allel is a Swiss luxury skincare brand that tailors consumers' anti-aging skincare regimes to their DNA. DNA is collected with a self-test kit and then analyzed by looking at 16 DNA markers, which are broken down into five key driver categories for skin aging. Based on this information and a lifestyle evaluation done face-to-face, the customer is assigned products from the Allel range that respond to their personal skin needs.³

#AI

#data

#DNA

#healthcare

#personalization

DNA Everything

ESTONIA NATIONAL BIOBANK

The Estonian Genome Center at the University of Tartu has launched a program to collect DNA from its citizens to provide personalized health advice and medicine. Gene donors voluntarily participate in the scheme and, beside their DNA, are asked to provide information including personal data (place of birth, places of living, nationality, etc.), genealogical data (family history of medical conditions

spanning generations), educational and occupational history, and lifestyle data (physical activity, dietary habits - Food Frequency Questionnaire, smoking, alcohol consumption, women's health, quality of life). The Center produces close to 100 publications every year.⁴ The goal is to contribute to the advancement of preventative healthcare.



Habit Food⁷

DNA Everything

HABIT NUTRITION

Habit, an Oakland based start-up, uses DNA and blood testing to create personalized nutrition plans with specific health and wellness goals for its customers. The company compares more than 70 data points and partners with FitBit to further enrich the picture it has built of its customers with insights on their activity levels. Customers who have already taken an AncestryDNA or 23andMe test will

not have to re-do the DNA test and can simply transfer their results to save money. Users access reports, detailed dietary recommendations, and tools that help with building healthy eating habits via the Habit app.⁵ In 2016, the Campbell Soup company invested \$32 million (£25 million) in the start-up.⁶

GENZ TRAVELERS

Editorial End-to-End Travel Experiences

In 2019, GenZ is set to outnumber millennials,¹ and the travel industry is preparing for a new generation of travelers.

Received wisdom says that travel agencies and package holidays are a thing of the past, as online booking platforms empower people to book hotels and transportation separately and create trips that are personalized to them. In 2019, however, we will see the package holiday reinvented as a value-driven, editorial-style adventure.

As digital natives, GenZers' travel style has been shaped by social media, which is their first (and main) point of contact when it comes to planning a trip.

Looking for experiences that are not only instagrammable - read enviable - but authentic, GenZers seek out value-based groups that focus on creating meaningful travel experiences. Old fashioned travel clubs have been revived as communities of like-minded people that move beyond going on a holiday, but turn travel into a lifestyle. Responding to people's increasingly nomadic lifestyles, these communities connect to their member's worklife and residences, providing a holistic, end-to-end experience that is deeply embedded into their lives.

Travel brands that want to stay relevant in 2019 need to adopt a broader perspective

on the relationship between travel and everyday life, and understand that their offering does not sit in isolation but is embedded within a wider ecosystem of experiences. Mapping out end-to-end journeys and understanding how to open up offerings through tools like APIs will be key to crafting experiences that are personalized to the traveler's values and interests. Providing inspiration and complementary services will be just as important as the travel experience itself. Furthermore, AI-powered travel platforms will get to know their users to curate their experience in more relevant ways.

GenZ Travelers

TOPDECK TRAVEL

Founded in 1973, Topdeck started out as a bus tour operator but successfully reinvented itself for the 21st century by combining affordability with Instagram appeal. This made Topdeck one of the few survivors of this category. Specializing in providing trips for 18 to 39 year olds, Topdeck provides curated travel experiences throughout Europe, North America, Africa, Egypt, the Middle East, Australia, New Zealand, and Asia. In line with the interests and values of their target audience, the 330 different tours available are experience-heavy and designed around "bucket list items." Accompanying blog posts share the best photo opportunities by destination.²



#AI

#API

#customer experience

#genZ

#social media

#travel & hospitality

GenZ Travelers

TRIPADVISOR 2.0

In order to appeal to younger, social media native travelers, TripAdvisor has rethought its platform. The website now features an inspirational content feed based on the user's travel interests and allows users to follow travel influencers, publisher brands, and friends. The move, which aligns the experience closer with social media networks, can help TripAdvisor better compete with the likes of Instagram and Pinterest in the battle for attention from the GenZ audience.



GenZ Travelers

VALUE-BASED COMMUNITIES



Onda is a platform that consolidates more than 100 members' clubs worldwide in one membership. The platform aims to create meaningful experiences while providing travelers with a sense of community. Onda blurs the lines between living and traveling and only accepts new patrons through a referral system based on "their purpose-driven spirit." In line with this emphasis on connection and conscientiousness, the brand not only provides its members with access to exclusive hotels and clubs, but offers events such as curated dinners, sustainability lectures, yoga classes, and group gallery visits.³

“More than half (63 percent) of British school children now say that they would be happy if social media had never been invented.”

- Fjord, 2019⁵

JOMO

The Joy of Missing Out

Hyperconnectivity and the habit of perpetually sharing and consuming experiences online gave birth to the 21st century phenomenon of FOMO - fear of missing out. The concept has become so important to our society that FOMO has been added to the Oxford English Dictionary. It is defined as “[a]nxiety that an exciting or interesting event may currently be happening elsewhere, often aroused by posts seen on social media.”

While the term is often used tongue-in-cheek, FOMO above all characterizes the pressure - especially experienced by millennials and GenZers - to be constantly connected and to present a “perfect” life. Research has shown that depression and rising suicide rates among teenagers are linked to smartphones and social media;¹ and researchers at Stanford University have coined the phrase duck syndrome,

“referring to the way a duck appears to glide effortlessly across a pond, while below the surface its feet work frantically, invisibly struggling to stay afloat.”²

In light of this, a new term, JOMO - the joy of missing out - will be a pivotal concept for technology behaviors in 2019. We will see more and more people seeking to disconnect and unsubscribe, to escape cognitive overload, digital clutter, and distractions.

For technology providers, there is an emerging need to realign their solutions with what’s in the best interest of humans and society. JOMO is about finding balance. Currently, as the Center of Humane Technology puts it, smartphones are slot machines in our pockets. Technology has been designed to be addictive, but now businesses face the risk of burning

out their customers and losing them. It is preferable to help users dose product usage and develop a healthy relationship with technology to keep them as customers for years to come.

This supports health and wellness trends that observe a shift towards mental wellbeing and mindfulness. Apps that promote self-care by helping to monitor screen time, relax, and meditate have been on the rise, as have physical spaces and installations that are designed to provide a break from the digital world.³

In the long-run, this trend may mean significant cost savings for healthcare providers, employers, and governments as it is currently predicted that the increase in mental health issues could cost the global economy up to \$16 trillion for the period between 2010 and 2030.⁴

JOMO

REDUCING SCREEN TIME

- #digital detox
- #genZ
- #healthcare
- #social media
- #wellbeing



Apple and Google have released applications and features that are designed to help limit screen time by providing weekly reports and alerting users about increases in screen time. Apple phones additionally feature a downtime function: only selected apps are available during a set time period. iPhone users can also set daily time limits for the use of certain app groups (social networking, education, entertainment, etc.).



JOMO

WELLBEING CAFES

Wellbeing cafes are a rising trend in Korea. Places like “Shim Story” in Seoul call themselves “public convenience lounges” and offer people a space to sit down, relax, or sleep - a quality that bustling cafe’s cannot offer.⁶

RATING THE WORLD

The Rise of the Universal Review Culture

The idea of rating products, services, and people is nothing new: it dates back to the 1900s when merchants kept files on customers to assess their potential to pay their tab. It was formalized in 1958 when FISCO first introduced Credit Scoring. Today, the concept is deeply embedded into our everyday lives: from checking the rating of a restaurant on TripAdvisor while traveling, to leaving a five-star rating for a friendly Uber driver. It has become a behavioral pattern that we are accustomed to and rely on through everyday interactions.

Is it only natural then to expand this concept and create a network of scores that serve as an indicator for trustworthiness across more than just one interaction? In 2019, organizations will explore expanding existing rating systems and experiment with new rating models, in order to respond to a growing need for reliable verification in the digital economy. In fact, China has done just that by introducing its Social Credit system.

For China's system, Sesame Credit (owned by Ant Financial, formerly known as Alipay) has developed an algorithm that considers five key factors: credit history,

fulfilment capacity (does the citizen fulfil their contractual obligations?), personal information (such as mobile phone number and address), behavior and preferences (this includes shopping habits), and interpersonal relationships (this includes friendships as well as online behavior and messaging). The system is designed to draw conclusions on the citizen's character according to Li Yingyun, Sesame's Technology Director: "Someone who frequently buys diapers would be considered as probably a parent, who on balance is more likely to have a sense of responsibility."¹ Beyond people's character traits, the service utilizes a wider ecosystem of services to nudge people into changing behaviors that are deemed undesirable by the government.

People with high scores may receive monetary trust benefits such as instant loans, but scores also have social effects. For example, profiles of people with higher scores rank more prominently on the Chinese online dating app Baihe.

The underlying concept of a social credit system conjures up images of the dystopian Black Mirror (a British science fiction television series) episode "Nosedive" in

which every action of a person is rated in an Uber-esque fashion and those with low scores are prohibited from taking part in society. Yet as we move into a society where most of our interactions with strangers are digital, we are in need of a method of measuring trustworthiness. We are lacking a universal system that allows us to make informed decisions when making transactions online. Beyond this, the end of traditional credit scoring looms; millennials and GenZers are known not to have a conventional credit history anymore, as their spending attitudes significantly differ from previous generations. For instance, they are unlikely to own a credit card or apply for a loan with a bank.²

Alternative methods of assessing financial and behavioral trustworthiness will become a necessity. In 2019, we will see businesses explore different scoring and rating models to tackle this issue. While China's social credit model is grounded in a communist tradition that is rather extreme and unsuitable for European and American markets, there will be learnings to be taken from their bold moves.

#AI

#behavior

#china

#data

#finance

Rating the World

PRODIGY FINANCE

Prodigy Finance is a London based loans company for students who wish to study abroad. It assess students on their future earning potential rather than only considering their credit history. The business supports students who have been accepted into specific programs at a defined list of schools and universities.³



FEMTECH

Female-Focused Products Changing the Tech Landscape

The HealthTech industry is undergoing a transformation by women, for women, and it is called FemTech. This should come as no surprise, as women make up 50 percent of the total population.¹ The resulting trend is now going through a boom phase.

This trend is an accumulation of bubbling activity in a couple of areas. Firstly, the rise of women's issues in the media over the past year, including the #metoo and #timesup movements, have increased awareness of women's health. The technology market has been influenced by these conversations, making it easier for investors to broach previously taboo topics. They can now say "I have three FemTech companies in my portfolio" as opposed to "I have a company for women incontinence products," which can be hard for a male investor to say. Secondly, the number of women playing an active role in care delivery is also growing, including those who are primary

caregivers. Healthcare professionals and providers have recognized this increase, especially as women are the primary decision-makers regarding healthcare in the home: 80 percent of the household healthcare spending is done by women.¹

Between 2015 and 2018 FemTech ideas received more than \$11 billion in funding. And it doesn't look like it will slow down anytime soon: by 2025, it is predicted to be worth \$50 billion.¹

Femtech used to be associated with period tracking apps, but it now covers a broad spectrum of both products and services. This market is no longer niche. With an increased number of conversations around women's health, and the attention from companies that traditionally deal with broader health issues, this trend is only set to continue.

#customer empowerment

#education

#feminism

#healthcare

#wellbeing



FemTech

DOLLA DOLLA WORLD

Created by Irregular Labs, Dolla Dolla World is a financial literacy and professional development brand built by and made for the next generation of women.² Currently fundraising on Kickstarter, they aim to run “101 foundation classes” on subjects such as budgeting, student loans and entrepreneurship.

FemTech

ELVIE PELVIC TRAINER

The NHS partnered with Elvie in 2018 to offer their pelvic trainer on prescription to patients with stress urinary incontinence. The biofeedback within the device can improve both compliance and success rates by 10 percent as well as reduce surgery rates by 50 percent. This could potentially save the NHS £424 per patient.³



Elvie Trainer With App.⁴

THINKABLES

ThinkTech to Replace VoiceTech

For those who remember the Roald Dahl book “Matilda,” you will recall her psychokinetic powers that allowed her to move objects and hover them in the air using her eyes. Thinkables will bring us one step closer to this childhood dream. They are a subsection of wearables that are able to generate an interface between the brain and technology, allowing the user to control designated devices using only their mind. This technology offers us continuous, cognitive, real-time analytics of measured biometric and biological data at the point of

sensing.¹ While many of the first adoption uses are focused on gameplay, there is also the potential for this technology to have other applications. Many of these products are still in a developmental phase (for example, voice assistants becoming less embarrassing), but their applications have the potential to be stupendous.

We have all witnessed the astonishing rise of wearables. Now, it is time for another ‘able’ to take center stage further blurring the line between human and machine.²



Alterego Wearable.⁷

Thinkables

MIT ALTER EGO

MIT have created a non-invasive wearable called AlterEgo that allows humans to communicate in natural language with other machines.³ Humans are able to do so without speaking or making any movements, but simply by articulating words internally. The system captures the peripheral neural signals that are produced when the internal speech articulators are volitionally and neurologically activated.³

#AI

#analytics

#data

#gaming

#wearables

Thinkables

MIND POWERED GAMING

4DForce is working on making a headset that can convert a user's brainwaves into a signal that computers can understand. This product will help to stimulate and promote concentration and coordination, allowing users to lead a healthier lifestyle.⁴ There are clear applications for this budding technology in the fields of gaming, wellness and entertainment.

Thinkables

BRAIN POWERED VR

Neurable, a Boston-based company, recently created a VR-game controlled by a thinkable interface. The company is now letting people try a demo version of its dystopian sci-fi game Awakening, which is still in development.⁵ Players must wear an electrode-laden headband that connects to an HTC Vive virtual reality headset.⁶ This headband picks up brain waves and let players control the game. Neurable plans to finish the game in 2019 and hopes that it, and the related hardware, will be picked up by VR arcade companies.



RECLAIMING YOUR DATA

Data Minimalism vs Data Monetization

Over the past year, customers' awareness and data concerns about data security have risen considerably. This has been driven by the Facebook scandal involving Cambridge Analytica, and a rising awareness of the monetary value of personal data, have coincided with initiatives like Europe's General Data Protection Regulation (GDPR).

This has given rise to two converging trends: reclaiming data ownership and data minimalism. Consumers are demanding more control over the data that companies

hold about them, including increased transparency around how data will be monetized and increased autonomy, enabling users to completely opt out, adopting so called data monetization

Regulations have led to greater transparency and subsequently less trust. However, this new landscape will create opportunities for the development of new tools and customer models that offer customers incentives to give consent to share and use their personal information.

#behavior

#customer empowerment

#data

#regulation

#transparency

Reclaiming Your Data

A MARKET FOR YOUR DATA

BehaviourExchange, a tech startup has created a digital platform that lets people turn their data into money, and in turn provides businesses with hyperqualified target customers. This extreme version of permission based marketing lets B2C businesses reach their target customers. This is shifting the balance between online users, i.e., data owners, and tech companies.



Reclaiming Your Data

DATA AS A CURRENCY

A cafe chain in Japan called Shiru is trialing a concept that applies a different view on data. University students can exchange data about themselves, such as their name and age, their graduation year and interests, for money off their purchases. In doing so, these students open themselves up to receiving information from corporations who pay the cafe to reach its customers “through logos, apps, digital advertisements on screens in stores, and on mobile devices, signs, surveys, and even baristas.”¹

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With thanks to:
Mark Barnes
Britain's Fourth Greatest Illustrator

About Virtusa xLabs

xLabs is the digital innovation hub within Virtusa, set up to help organizations accelerate their tech innovation and digital transformation and leverage disruptive technologies to deliver the best value for them. xLabs combines design thinking and digital engineering to reduce time and costs associated with identifying, evaluating and exploiting new technologies to create competitive advantage for its clients. The hub provides a cloud-based environment with a built-in Open API layer and microservices sandbox, modular AI components, blockchain capabilities and a banking model data set enabling organizations to run quick experiments and turn ideas into MVPs.

About Virtusa

Virtusa Corporation (NASDAQ GS: VRTU) is a global provider of Digital Business Transformation, Digital Engineering, and Information Technology (IT) outsourcing services that accelerate our clients' journey to their Digital Future. Virtusa serves Global 2000 companies in Banking, Financial Services, Insurance, Healthcare, Telecommunications, Media, Entertainment, Travel, Manufacturing, and Technology industries.





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