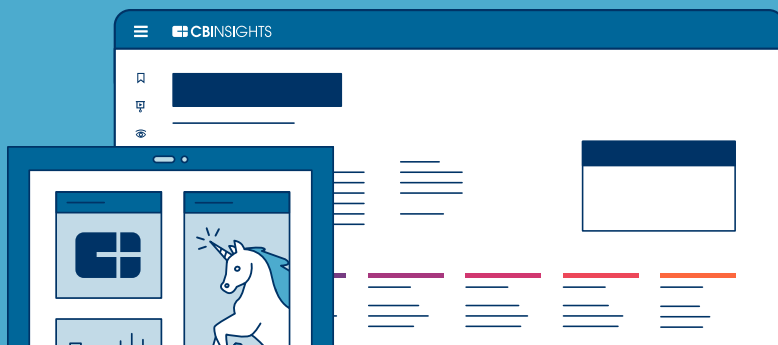# CB INSIGHTS

2020 Tech Trends

2020

CBINSIGHTS

CB Insights is a tech market intelligence platform that analyzes millions of data points on venture capital, startups, patents, partnerships, and news mentions to help you see tomorrow's opportunities, today.

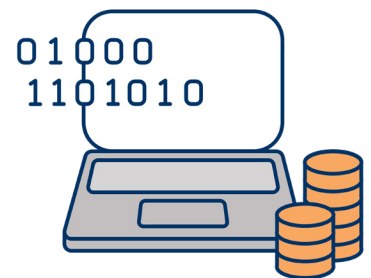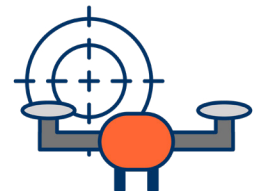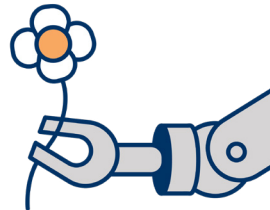CLICK HERE TO LEARN MORE

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Intro

At the close of 2019, one term was far-and-away the most popular search entered into the CB Insights platform: "Artificial intelligence."

Thanks to advances in deep learning, computer vision, generative adversarial networks, and other meaningful technologies, AI has gone from a buzzword to a must-have competence across industries. In 2020, we will see sectors including retail, healthcare, and logistics and manufacturing galvanized by commercially-ready AI applications.

Meanwhile, we're seeing quantum computing, blockchain, and livestreaming applied in new ways, with important results. To take one case, quantum computing is rapidly seeing wider commercialization, and among those doing so are the likes of Amazon and Google. Viewed through the lens of business competition, it's a technology that can no longer be bucketed as "too early to tell."

We believe 2020 — a US presidential election year — will grow more heated in terms of social and political debates around tech. The past year was a pressure-cooker in this sense, and surprisingly or not, this debate hasn't yet hit a natural point of easing up. The debate around the role of tech will continue to rise (hopefully not in shrillness), and reach a natural peak in the lead-up to the US election.
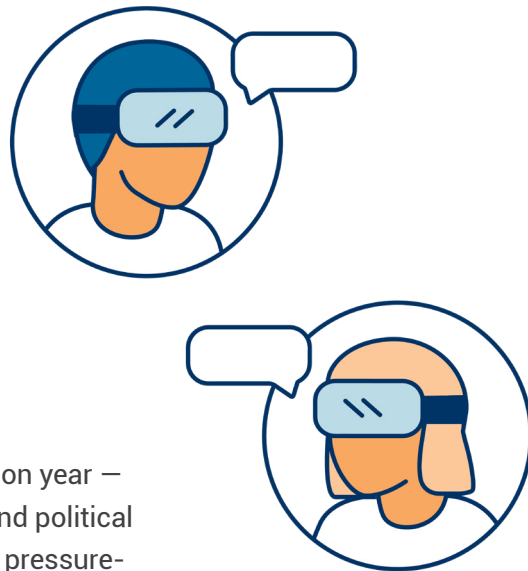
As seen below, the phrase "big tech," which is highly correlated with coverage of this issue, continued to spike in media chatter as the year ended.

News Coverage

News Coverage

● tech backlash OR big tech
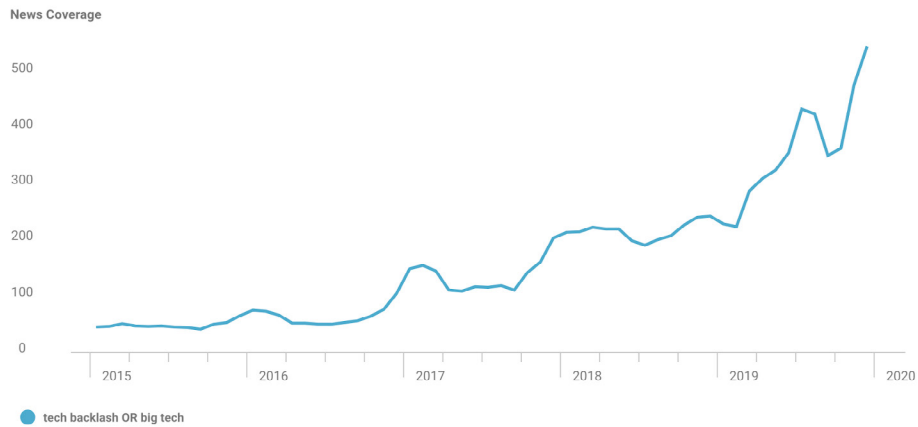
Source: CB Insights

However, by the end of 2020, we expect there will be at least some ability to focus more pragmatically on specific issues that merit particular attention rather than treating technology as a monolith of good or evil. We highlight a few likely such issues in this report, e.g. algorithmic bias. Of course the exact debates will take very different shapes in the US, China, Europe, and beyond.

The trends in this report — while buttressed by data and evidence — are meant to shake our faith in steady trend lines. They point to areas where conditions are ripe for discontinuity and disruption. This report asks us, in effect, to "watch these spaces," and expect to see surprises and opportunities.

In that spirit, here are 14 tech trends that deserve close attention in the first year of the 2020s.

1. We see broader and deeper quantum tech commercialization

Quantum tech is coming of age. Advances in quantum computers and quantum cryptography will begin to stack up as more companies take notice of quantum tech's potential — with both excitement and a bit of apprehension.

Quantum mechanics plays a role in all sorts of everyday tech from smartphones to GPS — but a new breed of technology that harnesses some of the more counterintuitive properties of the quantum realm is beginning to make its way from labs to businesses.

Quantum computers are a prime example. These devices work by stringing together particles that are in a special state where they can represent multiple lines of information at the same time. This allows the computers to calculate different possibilities simultaneously, an ability that could supercharge industries including AI, drug discovery, and logistics.

For example, some AI programs could work much faster if backed by powerful quantum computers. This could open up new applications for AI where computational complexity has hindered applications in areas like genetics or astrophysics.

Quantum computing's potential has attracted an increasing amount of attention in the media, with mentions in November 2019 increasing 64% year-on-year, according to CB Insights' news analysis tool.

News Coverage

News Coverage
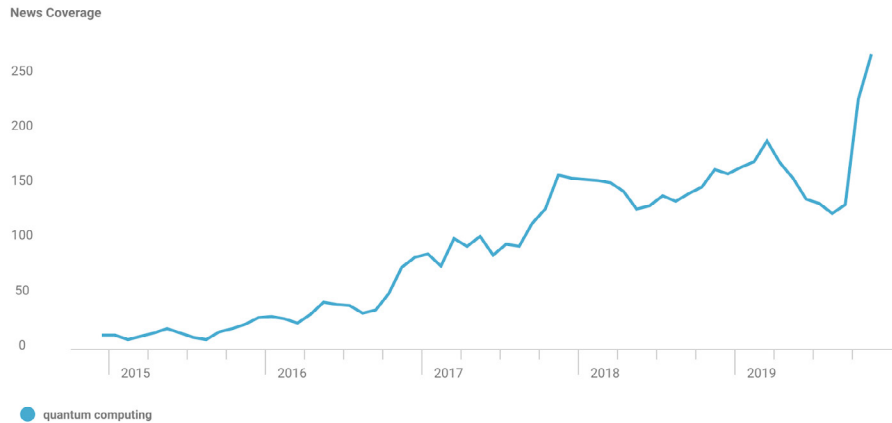
Despite the growing excitement, quantum computers aren't quite ready to be put to useful work. Conventional computers still outperform them at the moment, but big tech companies are beginning to lay the groundwork for a quantum revolution.

In 2019, Microsoft and Amazon both announced that they were hooking up quantum computers to their cloud networks to help enterprise customers test out experimental algorithms.

Meanwhile, research teams from companies like Google and IBM continued to make significant progress.

Google, for example, claimed to have demonstrated "quantum supremacy," a term that refers to using quantum computers to quickly solve a problem that would take conventional computers an ungainly amount of time to tackle. Looking ahead, expect more claims of quantum supremacy to crop up as the underlying hardware becomes increasingly powerful and more researchers focus on building out quantum computing applications.

Startups in the space also gained traction last year. Xanadu, a Canada-based maker of quantum light-based chips, raised $24M in early-stage funding.

Seen below, quantum computing startup IonQ closed $55M in a financing round led by Samsung Catalyst Fund.
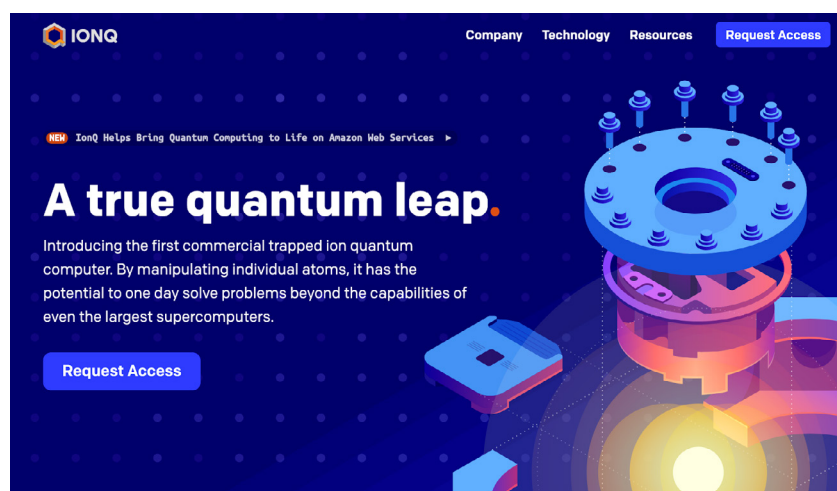
Source: IonQ

In July, quantum computing company Rigetti Computing, one of the most well-funded startups in the space with $119M in total disclosed funding, bought quantum algorithm developer QXBranch. Acquisitions in the space have historically been low, but expect the pace to soon pick up as bigger players look to gain an edge.

As quantum computing advances in the coming years, the tech's promised ability to quickly crack codes could eventually pose a threat to many of the encryption protocols that underpin modern communication. Left unchecked, this could lead to a scenario where private information is much less secure online, threatening e-commerce purchases, the security of stored information, and more. As it happens, another quantum technology could play a role in staving off disaster: quantum cryptography.

Quantum cryptography, also known as quantum key distribution (QKD), involves transmitting an encryption key using particles that have been put into a quantum state that changes when observed. That means it's possible to know if the encryption key has been intercepted at some point on its journey.

Advances in this area are moving fast. In 2019, a research group backed by British telecom giant BT started testing a QKD-backed network touted as being commercial-grade.

Startups like SpeQtral, ArQit (pictured below), and ID Quantique are attracting millions in funding by looking to help customers preemptively prepare their networks for the onset of quantum computers.

The ArQit project brings together three powerful technology innovations:
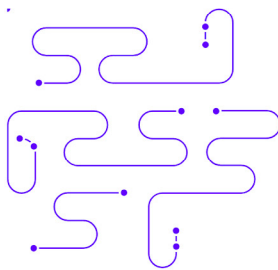
Advances in small satellite technology means that it is now possible to launch and fly robust, fully-stabilised, secure satellite platform constellations in low earth orbit at low cost.
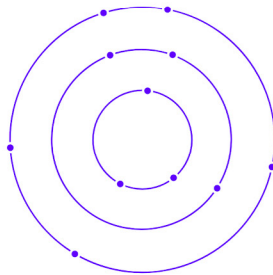
Advances in optical technology means that accurate and powerful instruments can be used in space and on ground to transmit and detect photons to the required level of accuracy.
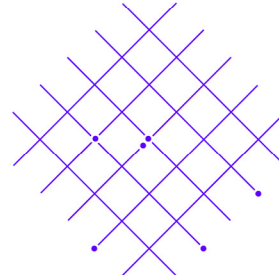
Our innovation in creating quantum enabled security products brings commercial and consumer communications into the quantum realm for the first time.

Source: ArQit

Expect interest in quantum cryptography, and a host of other quantum-computing resistant security methods referred to collectively as "post-quantum cryptography," to spike in 2020. This year, more companies will come to appreciate not just the seemingly boundless potential of quantum computers, but also the looming threat.

2. The next wave of AR/VR tech and 5G will reshape where and how people work

In 2020, the work world will become smaller as immersive virtual tools for collaboration, communication, and productivity gain traction.

Businesses of all sizes are all too familiar with the challenges of expensive commercial real estate costs. Major cities with deep talent pools like New York and London also tend to be among the most expensive to operate in. A drive to reduce this type of expense helps explain the boom in remote work, with 26 million Americans working remotely at least part of the time in 2018, according to the US Bureau of Labor Statistics.

By bringing on more remote workers, companies can cut down on costly office space, access a larger talent pool, and boost retention of employees who may otherwise give up their jobs if they move or need more flexibility.

But the benefits of remote work comes at a cost. Communication can be strained, collaboration hampered, and the opportunity for serendipitous moments of inspiration reduced.

To address these issues, businesses are turning to other tech applications. In 2019, office-messaging app Slack went public in a highly-anticipated direct listing, while video conferencing platform Zoom experienced one of the year's most successful IPOs. But now advances in augmented reality (AR) and virtual reality (VR) are ushering in a new type or virtual office that could bring remote workers directly into a physical space.

Magic Leap, pictured below, is the most hyped and lavishly funded of this new generation of AR/VR startups touting the benefits of VR-based work collaboration.

COPRESENCE

Different cities, same room

Magic Leap 1 makes collaboration across continents as seamless as being in the same room. With realistic copresence, real-time file sharing and multi-user sessions, remote workers can truly bridge the divide. And even reduce their carbon footprint in the process.

Source: Magic Leap

But it's hardly the only one. Startups like Spatial also are building out platforms for office collaboration and communication using AR/VR tech. These products imagine virtual worlds where avatars join meetings and digital objects can be manipulated in real time by participants around the world. Meanwhile, companies like Tandem are offering tools that seek to offer rich collaboration options for distributed teams.

Feeding into the AR/VR trend, big tech companies like Microsoft, Google, and Apple are reportedly building headsets that could catalyze the shift to virtual offices. Last year, Google launched a new edition of its enterprise-focused Glass AR headset and Microsoft released its Hololens 2, also aimed at businesses. Apple was granted a number of patents related to AR/VR tech in 2019, perhaps signaling the advent of its rumored augmented reality glasses, which some expect to launch in 2020.

One of Apple's AR/VR patents, seen below, describes a headset designed to reduce motion sickness when used in vehicles, which would help users work as they commute.
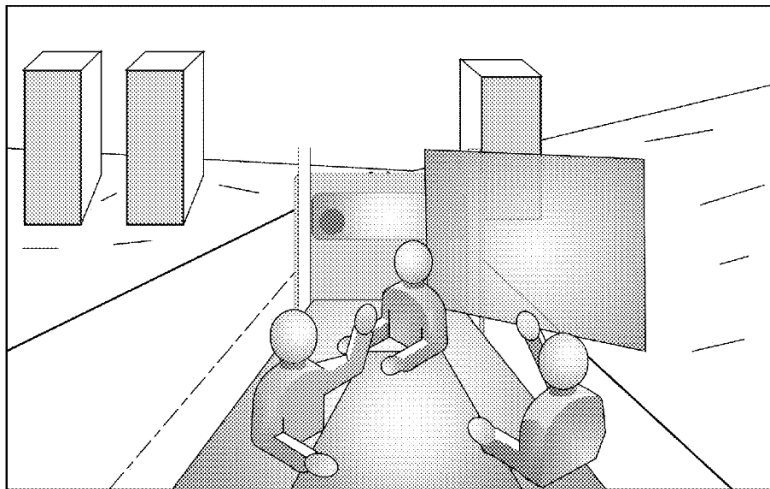
(A)

Source: US Patent and Trademark Office

Beyond making distributed offices more effective, AR/VR could also change how employees in conventional office environments approach work. From a single desk, an employee could use VR to enter into dedicated "rooms" for different projects, complete with interactive dashboards, notes, and relevant apps.

Other tech that will see increased adoption in 2020 could also boost the potential of AR/VR offices, including 5G.

The next-gen wireless connectivity standard should enable faster speeds and more reliable connections in areas where it's implemented. With 5G networks, joining a 3D-virtual meeting from a taxi suddenly becomes feasible from a bandwidth perspective.

The broader deployment of IoT sensors and edge-computing chips could also provide better data to feed into work-related AR/VR experiences, thereby enhancing their functionality. Imagine a "digital workforce" of AI-driven software and robots, which could collaborate with avatars of human workers in these contexts.

For example, an AR overlay might highlight a malfunctioning component in a IoT-equipped factory, and a virtual robot might instruct a human working remotely to operate repair equipment. Or a digital assistant might "join" meetings as an avatar to more personably moderate conversations and jot meeting notes.

Though virtual offices hold promise, the uptake of the tech could be hindered by high upfront costs for hardware, insufficient internet bandwidth, and workers' resistance to adopting new behaviors. But 2020 promises the maturation of several key technologies, and in pockets, we expect virtual offices to begin gaining meaningful traction.

3. Apple doubles down on healthcare products and services

In 2020, tech giants will ramp up their involvement in routine healthcare and chronic-disease management.

Many big tech companies have already started to roll out initiatives and devices focused on healthcare for consumers.

For example, Amazon's Alexa now offers a platform for HIPAA-compliant apps — a US legal standard for dealing with sensitive health information — and the company has developed partnerships with healthcare providers to build Alexa skills for healthcare, including checking the status of prescription delivery and scheduling urgent care appointments. Google Assistant and Apple's HomePod also provide healthcare-related programs.

Amazon has also partnered with JPMorgan and Berkshire Hathaway on a joint venture, Haven.

Haven, which is marketed as a 360-degree wellness service, aims to innovate in the provision of healthcare and insurance for its 1.2M+ combined employees.

IT'S TIME FOR BETTER.

Our mission is to transform health care to create better outcomes and overall experience, as well as lower costs for you and your family.
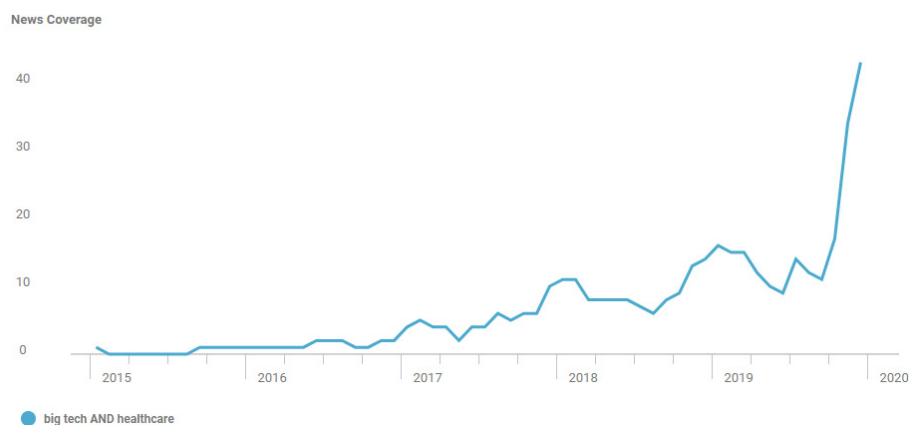
We want you to get the right care, every time so that you can live your best life possible.

Source: Haven

In fact, mentions of "big tech" and "healthcare" have skyrocketed in 2019 as these programs and more roll out.

News Coverage

However, among all the big tech companies, Apple is the most advanced in its efforts to integrate healthcare into its existing consumer devices.

The Apple Watch Series 4 and Series 5 both offer significant health initiatives, including fall detection, an inbuilt ECG, and heart rate monitoring.

The most recent Apple Watch also includes functionality for diabetes management. Last year, Apple said it would sell One Drop glucose monitors, which are designed to integrate with Apple's devices, in its physical stores.

Taken together, Apple's recent moves show that it is rethinking its devices and retail offerings as entries into the healthcare market.

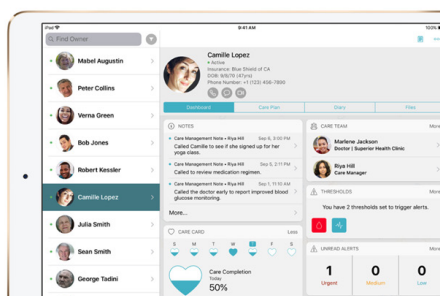## ⊞ Apple integrates healthcare features into its devices

Source: CB Insights, Apple

Apple's AirPod headphones incorporate healthcare features as well, with the "Live Listen" feature that allows the headphones to act like hearing aids, magnifying ambient sounds to help users hear more clearly.

Apple is in the lead, but its aggressive stance is stoking competition. Big tech companies like Google and Microsoft are investing in healthcare companies that seek to further integrate health and tech.

For example, Alphabet — across all its subsidiaries and corporate funds — has invested in over 90 deals to nearly 60 portfolio companies focused on digital health.

Chronic-disease management is a key segment attracting interest, especially from Samsung, which invested in 3 disease-management startups in 2019 alone through its venture arms.

These investments include diabetes-management app Zhangshang Tangyi, Brazil-based seizure app Epistemic, and autism-monitoring startup Alltism. This indicates that the company may be looking to rival Apple in its development of chronic disease management features into its devices.

Apple has heralded its focus on data privacy as another advantage in this area. Its wearables' chips process health and fitness data locally on Apple devices (as opposed to cloud-based or "server-side" processing). But Apple's focus on device-level processing comes with a trade-off, since it can be harder to harness the full power of cloud-based AI applications to refine its algorithms.

2020 will be Apple's year to win or lose the healthcare data and device market, and its competitors will be watching closely.
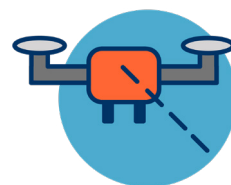
4. 'Slaughterbots,' ransomware, and worms: cyber-risks become real

In late 2017, an ominous video surfaced on YouTube and quickly went viral. "Slaughterbots" depicted a nightmare dystopia in which micro drones — armed with GPS, facial recognition, and wide-lens video cameras — execute targeted assassinations around the world.

The scenario is all the more frightening because it does not require any technology that wasn't already fully developed and mature at the time of the video's publication.

The "Slaughterbots" video showed a micro-drone the size of a large insect zeroing in on an individual human target.

Source: YouTube

The weapon systems built into such drones would not have to be particularly sophisticated to be effective. Further, the low cost of the technology and its simplicity mean governments would not have a natural monopoly on this lethal tech. Almost anyone could develop it: non-state groups, terrorists, criminal cartels, mercenary groups, and so on.
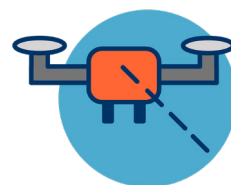
Unlike nuclear weapons, where the doctrine of mutually assured destruction (MAD) makes nuclear war less likely between similarly well-armed adversaries, the deployment of slaughterbots, like the one pictured below, would not be subject to such a constraint.

Source: YouTube

Targeted assassinations are already common. The killing of Iranian military leader Qasem Soleimani earlier this year by a US drone is the most recent example of the tactic, as well as a demonstration of its potential geopolitical repercussions. Already, Iran is promising retribution.
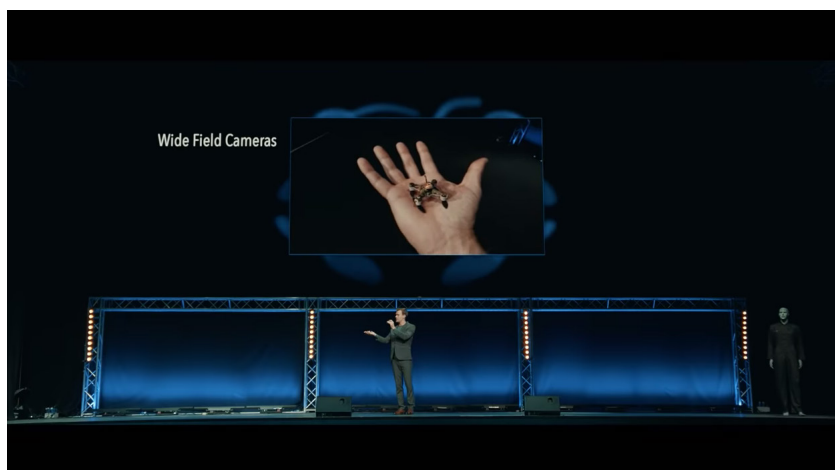
In theory, the slaughterbots scenario would make these events and the tit-for-tat escalation more frequent and pervasive.

The creator of the video intended to stoke public discussion and societal action to guard against this threat. Others are also looking to raise awareness. For example, Stuart Russell, a computer science professor who has written a standard textbook on AI, recently discussed the slaughertbot scenario at length on the After One tech podcast hosted by author Rob Reid.
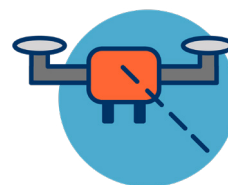
More broadly, there's a clear sense in the defense and government establishments that the public and private sectors aren't prepared for new tech-centric security threats with physical real-world targets.

The slaughterbots video offers a particularly vivid scenario, but it's hardly the only one.

For example, cyber attacks on agencies and governments responsible for vital services have become more common. Attacks on the UK's National Health Service, the City of Atlanta, and a suspected attack on the London Stock Exchange, are just a few recent examples.

2020 will be a year in which the public, businesses, and governments realize security threats to people and physical assets have increasingly become ubiquitous, continuous, and software-based.

Thanks to technology, lethality and the capacity to inflict economic damage have been democratized. Many software-based weapons — bots, drones, worms, ransomware — are seeing a high degree of proliferation. Ransomware in particular is rampant, and is feared to be becoming more widespread.

Unlike spam or attacks on data and information, which can take some time to reveal their damaging consequences, ransomware exacts an immediate and palpable real-world toll.

First, ransomware attackers freeze computer systems vital enough to inflict real-world pain if they are not working, and then they extract cash payments from victims to free them up again. Similar tactics would be used even if the motive is geopolitical as opposed to purely criminal.
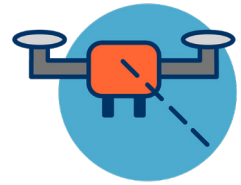
In 2019, McAfee said there would be 'stronger malware as a service families' as malicious hackers would partner up, consolidating the ecosystem.

Businesses and governments must prepare for a world in which information and data security is only part of the concern. A broader lens is needed — one which takes into account risks to human life and physical systems.

Advances in cybersecurity could help combat these threats. Broadly, the space remains a hot area, especially after a flurry of billion-dollar cybersecurity M&A deals and IPOs by former fledgling startups. There have been over a dozen of these exits since 2017, as seen below, creating big windfalls for early investors.

BILLION-DOLLAR CYBERSECURITY EXITS

VALUATION OF ACQUIRED COMPANY   ● IPO   ● M&A
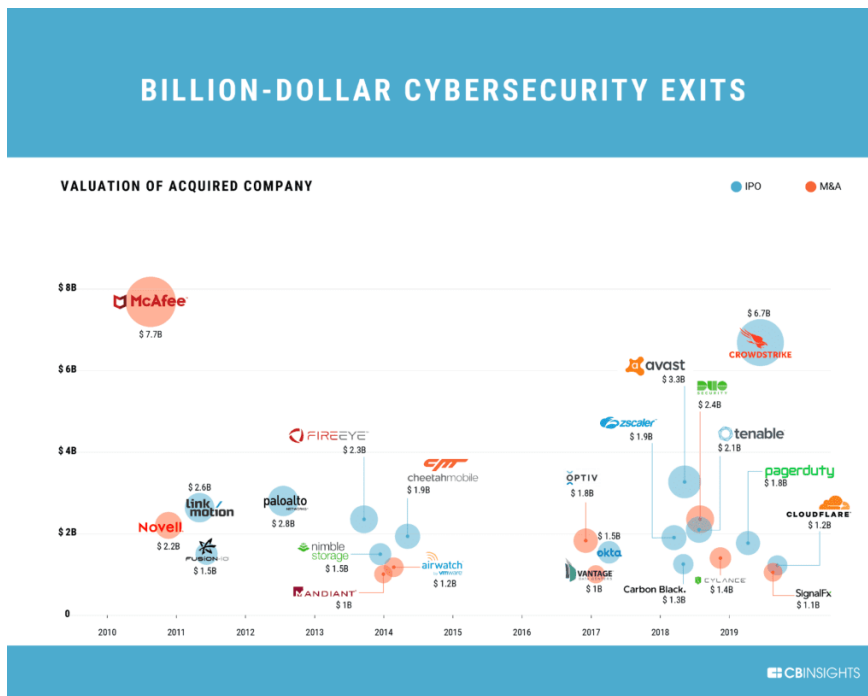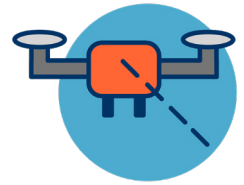
But the term is something of a misnomer. Information-security breaches themselves often involve a combination of factors — including human error and/or exploitation of a security gap in a physical system — which enable a database or network to be hacked.

Today, we are always under attack. In an era of continuous threats, it's impossible to be completely bullet-proof, the new paradigm must be about thwarting the worst threats. Security should be thought of as an umbrella that can protect a company or government agency against the worst of the elements, even if feet get wet in the biggest storms.

The optimistic view is that in 2020 scenarios like slaughterbots or ransomware pandemics will galvanize the public and private sectors into effective action that guarantees some modicum of safety. The pessimistic view is that only a tragedy or a dramatic failure of defenses will provoke the necessary wake-up call.
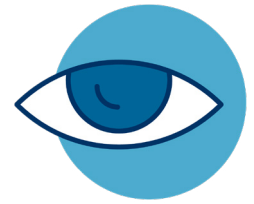
5. AI bias becomes a top regulatory concern

AI is often treated as a means to overcome human error. But an algorithm is only as good as the data it's trained on.

Gaps and biases in training data can cause AI to go very wrong — even for some of the largest tech giants with the most advanced AI capabilities.

Amazon's AI-powered recruiting tool reportedly penalized resumes that included the word "women's." Google's algorithm for detecting hate speech on social media was found to disproportionately flag black users' tweets before it was corrected. And recently, Apple's new credit card has come under fire for allegedly giving higher credit limits to men than women, sparking an investigation by New York state regulators.

Controversies around bias in AI algorithms have attracted a lot of attention, generating increasing chatter about the problem of bias in AI (as shown by CB Insights' News Mentions Analysis tool, below).

News Coverage

News Coverage

(algorithm AND bias) OR (AI AND bias) OR (artificial intelligence AND bias)
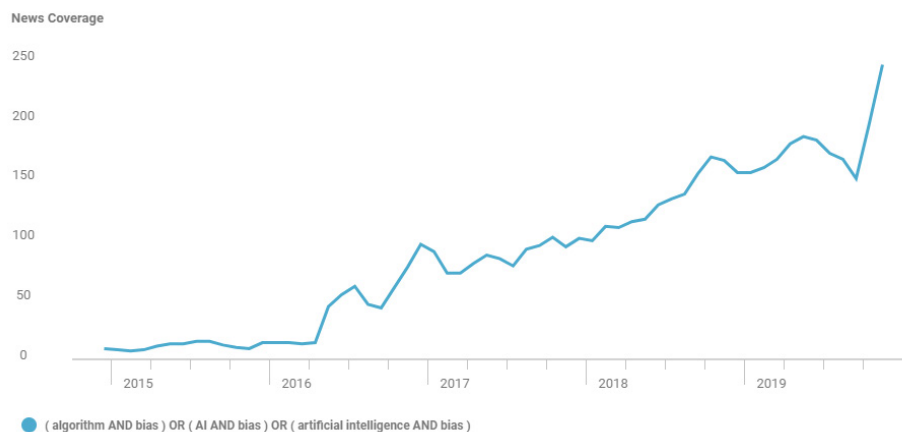
Source: CB Insights
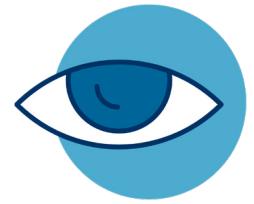
As focus on AI bias has risen, tech companies have increasingly released public AI guidelines.

Google shared its "AI Principles" shortly after pulling out of the controversial Project Maven US military contract; Microsoft's AI principles champion AI solutions "that reflect ethical principles" like fairness, inclusiveness, and privacy; and IBM named AI bias control as one of its 2018 "5 in 5" (5 innovations that will change our lives within 5 years), citing the importance of "teaching our machines about our common values."

However, this self-regulation may not be enough.

In 2020, there's a high risk of a shift from loose self-regulation to governmental regulation of bias in AI and machine learning.

There's early momentum for these kinds of moves from 2019, which could set the stage for a broader regulatory framework. If this happens, or a particular case rises in the court systems, we may even see a ruling by the US Supreme Court or a high-level European Court on companies' responsibilities to test, identify, and correct algorithmic bias.

In 2019, government involvement in AI regulation in the US largely centered on banning government use of facial recognition technology, which has been shown in some federal studies to possess race and gender bias.

In May, San Francisco became the first major US city to ban using facial recognition technology use by the city government. Cities such as Oakland, CA, Berkley, CA, and Somerville, MA have instituted similar bans. In mid-2020, Portland plans to propose one of the strictest bans on facial recognition tech, extending to private businesses.
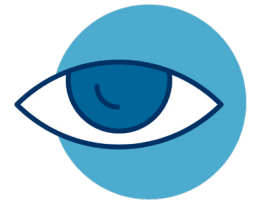
AI bias regulation has also attracted attention on a federal level.

In April, Senators Wyden and Booker introduced the "Algorithmic Accountability Act of 2019," which would authorize the FTC to create regulations around AI bias, requiring qualifying companies to identify and repair discriminatory algorithms.

In Europe, there has been less government focus on AI bias. But it certainly hasn't been completely absent. The General Data Protection Regulation (GDPR), mandated in 2018, put some early restrictions on certain types of automated decision-making based on personal data (like algorithms used in credit/insurance risk assessments).

In 2020, expect AI bias regulation to ramp up at all levels of government, and for tech companies to potentially get a head start on compliance by implementing bias policies before any legislation is passed.

One strategy companies may pursue is simply more rigorous internal AI development guidelines, which incorporate specific guardrails against bias.

Over the past couple years, IBM has said it introduced efforts like an independent bias rating system to determine the fairness of AI systems, as seen below in a snippet from CB Insights' earning transcript analysis tool.

International Business Machines Corporation (IBM) Q3 2018
Results - Earnings Call Transcript

2018-10-16   **IBM**

This includes the management of **bias**, security and provenance of models and data which are the issues clients are facing with scaling **AI** in the enterprise.....read more of the excerpt   Mentioned (**algorithm** A ...: 2 times

We announced **bias** detection services and introduced new Watson services on the IBM Cloud Private platform as clients seek the benefits of **AI** and the cloud behind their firewall.....read more of the excerpt

Source: CB Insights, Mentions of AI bias on IBM earnings calls, Q3 2018

Companies may also look outward to adapt to new AI bias regulation, partnering with specialized startups to develop better algorithms and stay compliant with new regulations (as we saw with GDPR and California's new data privacy law which went into effect 1/1/20).

One focus could be partnerships with companies that provide "synthetic data." These companies supplement potentially skewed "real data" with specially generated synthetic data to overcome biases and gaps in the initial dataset.

One startup, AI.Reverie, has specialized in this area and aims to "offer diverse images and scenarios to help algorithms generalize well and reduce bias" and was featured on our 2019 AI 100 list.

Whether they try to manage AI bias in-house or through outside partnerships, tech companies will certainly need to adapt their AI strategies to stay competitive and compliant. We expect public and government concern over AI bias to grow in the short term.

6. Radical biohacking: Biohackers push medical devices and regulators to the brink

The term "biohacking," or "DIY biology," covers a wide range of activities outside of traditional medicine that can include anything from intermittent fasting to implantable computer chips to injections of CRISPR-edited DNA. The goal is essentially to manipulate the body to push its limits and boost performance.

Biohacking has captivated Silicon Valley, but its popularity is spreading far beyond tech billionaires. It is becoming a more global, mainstream, and commercialized trend.

Biohacking tactics can be risky, since they are too often pursued without appropriate medical supervision. And much of what is talked-about and marketed is bunk. But biohacking culture is still worth watching for the latest nutrition or ingredient trend on the cusp of mainstream acceptance, as well as signals for what future self-care and wellness regimes might look like.

Some biohacking efforts are attempts to cure illness. In the US, developing and approving a new drug can take up to a decade. For people with serious health conditions — who may not expect to have that much time — biohacking can seem like a means of taking their health back into their own hands.

Bringing a drug to market is a drawn-out process
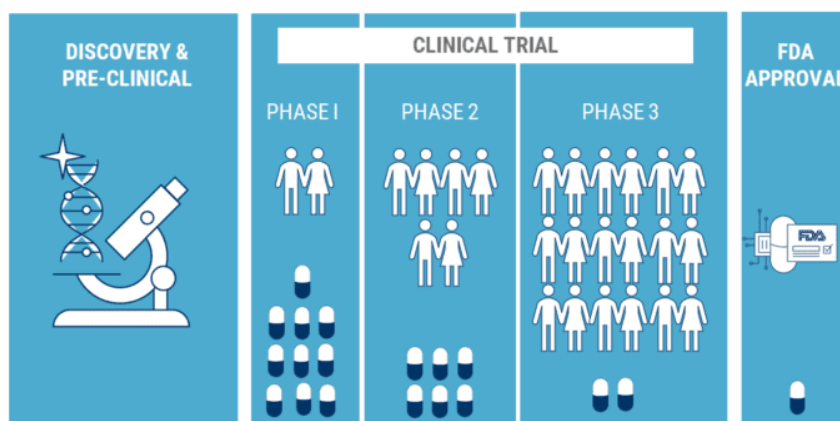
Source: CB Insights

But for many, biohacking is about extending life expectancy. For example, Dave Asprey, biohacker and founder of venture-backed supplements startup Bulletproof, is on a mission to live to age 180.

He reportedly has his own stem cells injected into every joint in his body every 6 months, takes 100 supplements each day, bathes in infrared light, and spends time in a hyperbaric oxygen chamber.

Biohackers find ways around regulations by various ruses. Some hack medical devices used for continuous glucose monitoring in diabetics. Others order prescription drugs online from unlicensed drug mills, while some create "stacks" of non-regulated supplements or over-the-counter drugs for energy, muscle growth, fat loss, sleep, memory, or concentration.

Nootropics is the name given to supplements used to boost mental performance, and one venture-backed company, HVMN, has focused its business on this class of supplement.
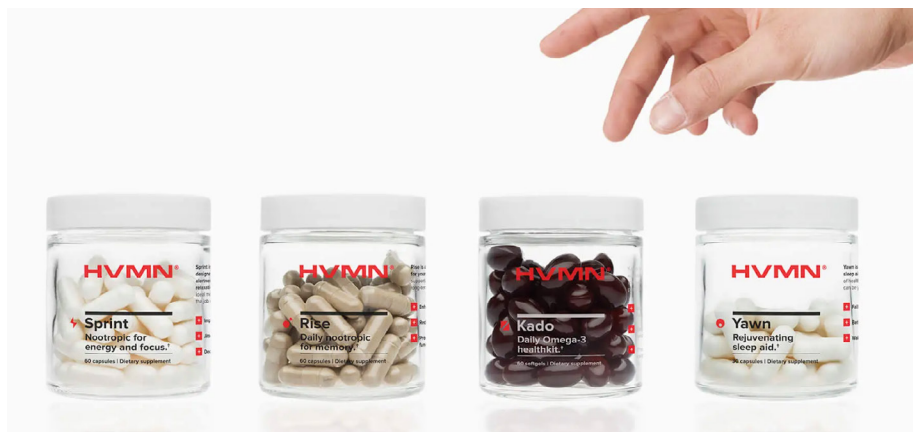
Source: HVMN

Other increasingly-hyped nootropics are microdoses of psilocybin mushrooms or LSD, CBD oil, and MDMA.

Fasting, intermittent fasting, or radical dieting of different forms is another popular method of biohacking. A recent wave of research has shown that reducing caloric intake can dramatically increase lifespans in rodents and nematode worms. Some studies have also indicated that caloric restrictions may help delay or prevent age-related diseases, including cancer, from manifesting. Twitter founder and CEO Jack Dorsey has said that his biohacking regimen includes eating only one meal on weekdays and not eating at all on weekends.

Part of biohacking is breaking down bodily functions, such as sleep patterns, into quantifiable metrics. This can be done with activity monitoring wearables like the Oura Ring, or, in more extreme cases, implantable computer chips.

A niche group of biohackers known as "grinders" have chips imbedded in their hands to track glucose levels and other stats. The chips can also act as key fobs.

Interest in longevity research continues to climb

News mentions of "senolytic," "senescence", or "age-related disease" from Sept 2013 – Aug 2018

News Coverage

● senolytic OR senescence OR age-related disease
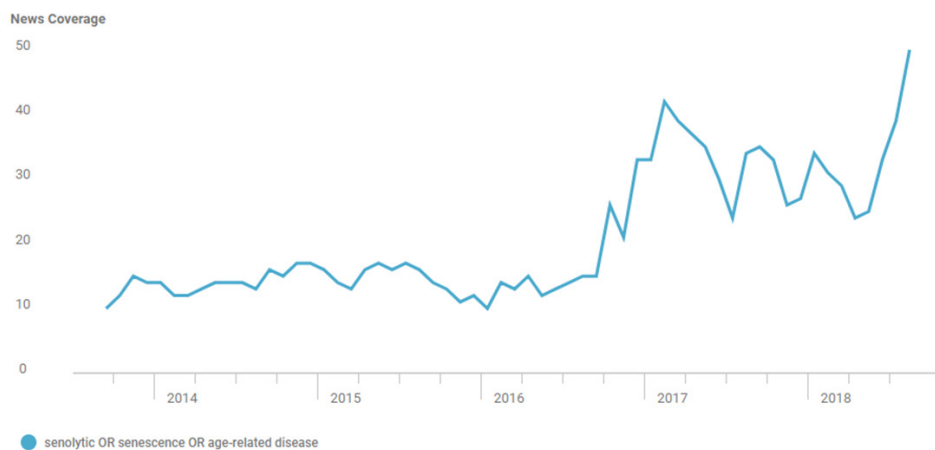
Source: cbinsights.com

CBINSIGHTS

Despite biohackers' enthusiasm, most of the methods have questionable scientific validity, and some can be harmful to users' health. For example, in February 2019, the US Food and Drug Administration issued a statement warning consumers to avoid "young blood" transfusions — the practice of pumping plasma from a young person into the veins of an older person. The treatment, which can cost as much as $8,000 per session, has intrigued wealthy biohackers for its alleged ability to prevent Alzheimer's, Parkinson's, heart disease, and multiple sclerosis.

Fecal transplants are another form of experimental biohacking that can be harmful. In 2019, two people contracted severe infections from fecal transplants that contained drug-resistant bacteria. This occurred in the monitored environment of a clinical trial, meaning DIY biohackers could likely face even more severe consequences if they attempted to administer treatments themselves — and they have.

As patients with chronic conditions continue to lose patience with the time-intensive clinical trial process, and as Silicon Valley billionaires continue to tout the benefits of experimental procedures, biohacking will likely become more mainstream. In 2020 and beyond, look for the practices to present a more intense challenge to medical device makers and regulators.
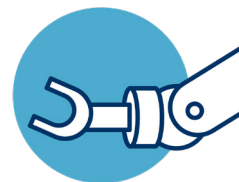
7. Robots' commercial impact grows with advances in grip, soft robotics, and locomotion

Historically, the robotics sector has been plagued by dexterity issues.

The space has seen some improvement, especially with the rise of "cobots" (safe robots that collaborate alongside humans). But robotic gripping and mechanical capabilities are still limited. In short, robots are unable to modulate grip easily for delicate manual tasks.

Locomotion is also still a challenge for robots. Despite widely-circulated videos featuring robots running through forests or climbing rocky cliffs, the reality is that robot systems continue to fail at basic movement-related challenges. Even the most trivial physical variation in their environment can throw them off. Robots' locomotion challenges led the Wall Street Journal headline to quip a couple of years ago, "How to survive a robot apocalypse? Just close the door."

In 2020, look for innovation in AI-assisted grip technology and locomotion as well as in "soft robotics" to create nimble and gentle robots relevant to a variety of industries, including healthcare, food service, consumer electronics, and environmental monitoring.

The locomotion issue saw some serious advances this year. For example, a team of scientists used a dog-sized quadrupedal robot (pictured below) to demonstrate that robotic locomotion could be dramatically improved with tactics borrowed from AI research.
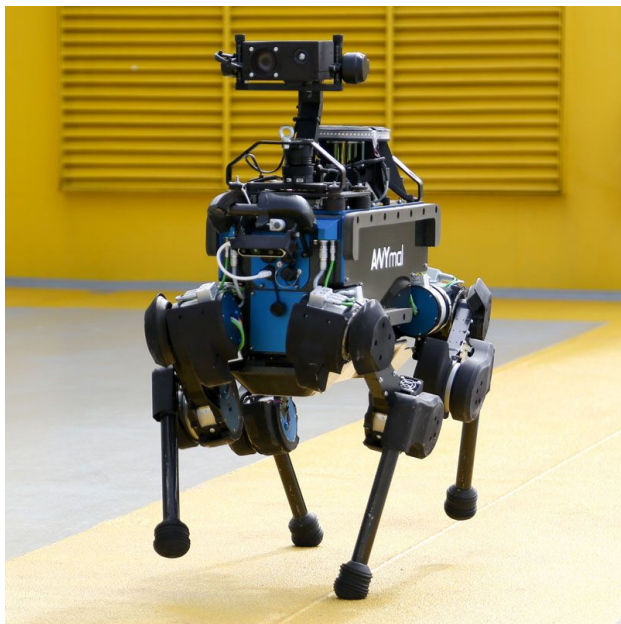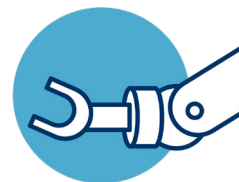
Source: Péter Fankhauser/ANYbotics AG

The team collected a large volume of data and fed it into a neural network, which is an AI system that roughly imitates neural brain architecture and activity. In this case, the software directed the robot's hydraulic limbs. The result was a robot dog that was able to run significantly faster and recover quickly from falls.

Perhaps most importantly, they argued this data-intensive training regimen was replicable without great expense, opening the door to a new generation of more nimble robots.

Another area of advancement is in new materials. Because they are made from soft, elastic materials and their design is often inspired by nature, so-called soft robots are uniquely suited for tasks that conventional robots can't accomplish. In healthcare, this can include surgery and rehabilitation.
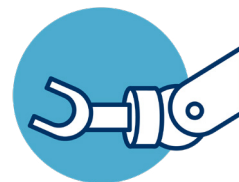
Soft robotics could prove to be especially useful in minimally invasive surgery (MIS), which is performed by surgical instruments being inserted through small incisions in the body. The purpose of MIS is to complete a surgical procedure quickly and safely, with minimal damage to the surrounding tissue. In current robotic MIS procedures, surgeons use a rigid robotic device to maneuver surgical instruments. While they do enhance stability and precision, these devices can't access all targeted areas of the body because of their rigidity and size. This is where soft robots can help.

Because of their pliable materials, soft robots are well-suited to navigate small areas inside the human body without risking tissue damage. Their added flexibility may also reduce post-op pain for patients. However, while soft robotics technology has promising implications for MIS, it still faces a set of challenges, including "low force exertion, poor controllability, and a lack of sensing capabilities," according to a study published by *Frontiers*. We expect to see companies in the space addressing these issues.

Soft robotic devices are also assisting with physical therapy and rehabilitation. For example, there are a number of neurological disorders that have debilitating effects on hand motor functionality, which soft robotics could help restore.

The Journal of NeuroEngineering and Rehabilitation reports that several groups are designing rehabilitative soft robotics devices, but few have progressed far enough, yet, to prove their clinical effectiveness.

One recent patent filed describes a "soft robotic haptic interface with variable stiffness" to help patients restore sensorimotor function in their hands after sustaining damage from illness or traumatic injury.
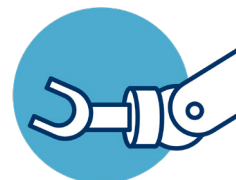
The gripper from a recent patent filing, seen below, is meant to assist in hand rehabilitation.
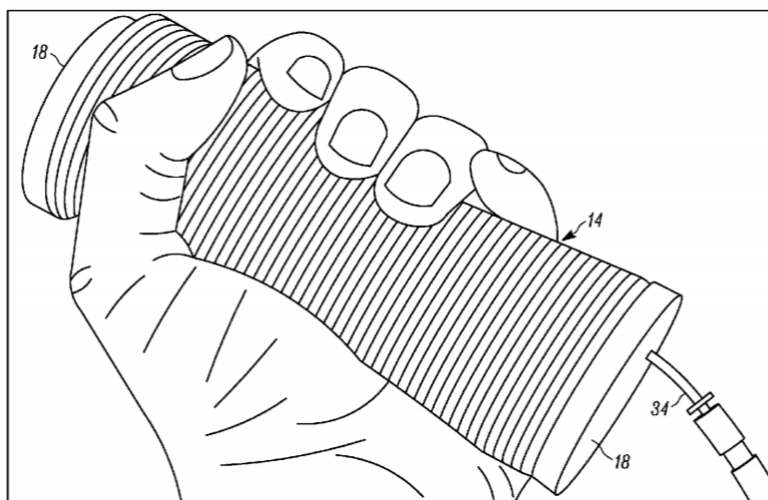
Source: US patent filing

Outside of healthcare, soft robots and new grip technology are finding use cases in the food industry. Massachusetts-based startup Soft Robotics has developed a robotic gripper that is FDA-approved to handle food, and is currently used for food packaging.

Because the gripper, directed by algorithms, uses flexible materials and fluid or air pressure rather than mechanics, the risk of crushing objects with too much force is significantly reduced.
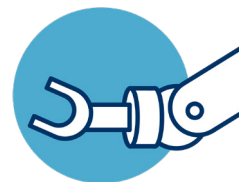
Soft Robotics' gripper, below, has been shown to be nimble enough to handle delicate tasks such as meat processing.

Source: Soft Robotics

Soft robots could also be used to monitor hazardous environments. Researchers from Bristol's Faculty of Engineering have developed a small, "stretchable skin-like" robot called ElectroSkin that moves by contracting artificial muscles and using electrical charges to grip a surface. ElectroSkin's design was inspired by the way snails and slugs move. Science Daily calls it "a new fundamental building block for a range of soft next-generation robots." For example, ElectroSkin could eventually crawl into environments that are dangerous or difficult to reach, such as collapsed buildings, to assess damage.

8. There will be a new wave of Saudi Arabian & Russian investment in tech & software

Saudi Arabia and Russia may not be the first two countries you think of when discussing tech investment. However, these countries' tech investment landscapes have still seen notable deals and growth. And despite geopolitical fault lines, they will continue to be a factor.

The reason is simple: They command a wall of money. Saudi Arabia's Public Investment Fund (PIF) in particular has made notable investments in tech startups, including a massive $3.5B investment in Uber in 2016. The PIF has also indirectly invested in tech innovation through its $90B investment in SoftBank's Vision Funds (across 2 payments of $45B since 2016). The fund, in turn, has backed tech startups including Slack, Kabbage, Paytm, 10x Genomics, GM Cruise, and many more.

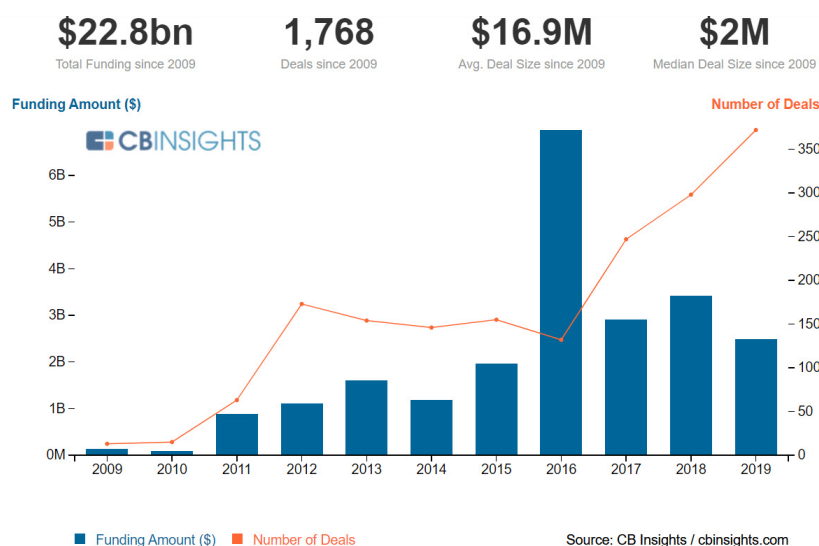## "We are the creators of SoftBank Vision Fund. We have 45 percent … Without the PIF, there will be no SoftBank Vision Fund."

— SAUDI ARABIA'S CROWN PRINCE MOHAMMED BIN SALMAN

Meanwhile, the Russian Direct Investment Fund has made tech investments ranging from ride-hailing apps (Yandex) to augmented reality (WayRay) to Richard Branson's hyperloop transportation initiative (Virgin Hyperloop One).

Beyond state investment funds, Saudi Arabia- and Russia-based investors backed a record number of tech deals in 2019, participating in 370+ deals worth nearly $2.5B, as seen below.

$22.8bn	1,768	$16.9M	$2M
Total Funding since 2009	Deals since 2009	Avg. Deal Size since 2009	Median Deal Size since 2009

Source: CB Insights / cbinsights.com

Source: CB Insights. Note: the funding spike in 2016 is largely due to PIF's $3.5B investment in Uber that year.

Not to mention, the existence of accelerator programs and other support for early-stage innovation within Russia and Saudi point to a real effort at home-grown innovation, which may benefit from excess capital as well.

In Russia, the Skolkovo Foundation is responsible for the Russian Skolkovo Innovation Center, a center for developing science and tech innovations. It is a prolific accelerator of early companies, with at least 40 deals to startups in recent years.

While the Foundation itself has not participated in new disclosed VC deals since 2017, in 2018 it launched Skolkovo Ventures, a corporate venture firm focused on IT, industrial technology, and biotech in Russia. Another top investor in fledgling startups in Russia is Sberbank.

The number of support organizations in Saudi Arabia (including incubators, accerlators, and co-working spaces) has tripled over the last few years as the government's "Vision 2030" mandate increases focus on supporting SME and startup entrepreneurship.

And finally, the IPO of Saudi Aramco in December 2019, the largest in history, has injected even more liquidity into the complex of state enterprises and state-run investment vehicles in Saudi Arabia. And they will simply need to invest that money, with overseas tech investments a likely beneficiary. If US investors don't take it (and they may not), this cash will find its way to tech investments in China, Southeast Asia, Africa, Europe, and beyond.

In 2020, expect Saudi Arabia- and Russia-based investors to continue ramping up their tech investment activity.

9. Longevity, health, & wellness rise as an unstoppable cross-industry $8T+ mega-market

As innovations in science, tech, and medicine increase lifespans, the number of Americans aged 65+ is expected to nearly double from 2018 to 2060. In fact, the number of older (65+) people in the US is projected to outnumber children for the first time in history in 2030, according to the US Census Bureau.

The growing size of the aging population is creating an increased demand for tech that aims to improve seniors' health and wellness.

In 2020, expect to see a boom in investment in companies focused on helping people live longer — and better — as they age.

The opportunity is huge once it's seen in its true scope.

Wellness, which includes categories such as nutrition and dieting, fitness, spas, etc. is in and of itself a $3.7T global market, as seen below.

Market Size Estimates and Related Markets

Markets	Analyst Consensus	CAGR	Related Markets
> Wellness	$3.70T		Nutraceuticals, Wellness Program, Workplace Wellness, Weigh...
> Wellness Tourism	$863.08B	-5.88%	Wellness Travel, Medical Travel and Medical Tourism
> Wellness Travel	$818.60B	10.57%	Wellness Tourism

Source: CB Insights' Market Sizing Tool

But increasingly the lines between healthcare and wellness are blurred. Prevention care takes place in hospital visits but also in self-care and healthy lifestyle routines. Both feed into the other.

And that means the $5.04T global healthcare market, seen below in comparison to adjacent markets, and the wellness market together are credibly thought of as an $8T-plus opportunity.

Market Size Estimates and Related Markets

Markets	Analyst Consensus	CAGR	Related Markets
› Healthcare	$5.04T		Life Sciences, Medical Devices, Pharmaceuticals, Digital Healt...
› Elder Care	$1.50T		Private Healthcare, Home Care and Community Care
› Personal Care	$790.00B		Baby Products, Cosmetics, Organic Products, Personal Care Pr...
› Pharmaceuticals	$728.94B	-36.89%	Biological Drugs, Biopharmaceuticals, Biosimilars, Drug, Life S...

Source: CB Insights

Anti-aging therapeutics are certainly part of this picture.

An increasing number of companies are working on anti-aging remedies that aim to increase longevity.

Google's anti-aging spinout Calico Life Sciences is one of the most prominent companies in the space. The company focuses both on researching the biology behind lifespan and developing therapeutics that target aging and age-related diseases, like neurodegeneration and cancer.

Another example is Samumed, a regenerative medicine company, which focuses on age-related areas like tissue health and degenerative joint disease. The company raised $438M in VC funding in 2018, bringing its current valuation to $12B.

A common health issue faced by aging patients is the need for new organs — and a host of new startups are helping to improve organ health or make transplantation a more accessible option.

A host of new startups banking on anti-aging therapies include companies like Lygenesis, which is working to prevent organ failure via organ regrowth, as seen below.

Stopping organ failure via organ regrowth

Lygenesis could help patients afflicted with **kidney disease**, or liver failure from **diabetes**.

LYGENESIS

Organ regeneration using a patient's own lymph nodes
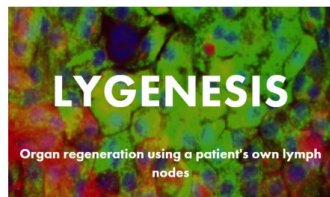
Lygenesis hopes to **enter human trials in 2020**

	Discovery	Small animal	Large animals	Clinical trials
Liver	✓	✓	✓	Human trials 2020
Kidney	✓	✓		
Thymus	✓	✓		
Pancreas	✓	✓		

CBINSIGHTS #FutureHealth

Source: CB Insights' The Future Of Aging: How Tech Is Transforming Each Phase Of Human Life.

Meanwhile, companies like Organovo and Cellink are exploring ways to use 3D printing to "print" healthy organs for transplant.

That said, healthcare is only a narrow lens when compared to the ambitions of the wellness industry.

Through the lens of wellness, improving the quality of life for the aging population doesn't only mean taking care of their physical health — it also means looking after social wellness, financial health, and general wellbeing.

Here are some areas where technology is improving seniors' wellness beyond traditional healthcare.

- **Connected homes:** Smart appliances can help delivery telehealth and wellness services, from voice assistants that can give reminders to take medication to smart home sensors that can detect if someone has fallen, or is in need of medical assistance.

- **Autonomous vehicles:** Autonomous vehicles could help increase mobility for the elderly, allowing them to remain socially engaged and active without needing to drive.

- **Financial services:** A number of fintech startups are offering services designed specifically for seniors and retirees.

- **Consumer packaged goods:** Food and beverages, as well as personal care goods, focused on "functional" benefits such as increased strength, energy, injury-resistance, or immune support.

- **Supplements:** In recent years, a proliferation of supplements and additives with promised health benefits have attracted the attention of name-brand investors and prominent life-sciences researchers. Basis, one such supplements company focused on longevity-promoting tablets, has been receiving plenty of media buzz.

- **Social & emotional wellness:** Isolation and depression are key wellness concerns for seniors that tech is trying to address.

But to take less well-known areas in which software can make a difference, consider the market for senior services and retirement. California-based Golden allows caregivers to view and manage financial, healthcare, and legal decisions for seniors, while Blueprint Income offers guaranteed lifetime annuities to retirees.

Meanwhile, Silvernest is an online home-sharing platform that helps pair aging homeowners with qualified roommates, while Papa's "grandkids on demand" platform connects college and nursing students with older adults who need transportation, household assistance, or basic companionship. For a different type of companionship, Ageless Innovation's Joy For All brand designs lifelike robotic pets for older adults.

Rendever, a startup out of MIT, is aiming to build a virtual reality platform to improve seniors' quality of life, allowing older adults to revisit familiar locations or "travel" to new places.

Of course, seniors are only one demographic that will contribute to make wellness a massive market. Wellness is increasingly viewed as a lifelong concern, especially by millennials and Gen Z consumers. It encompasses not only the healthcare market, but the nutrition, fitness, and cosmetics/beauty markets, as well as many other industries.

Editor's note: For more on this topic, check out our brief, The Future Of Aging? The New Drugs & Tech Working To Extend Life & Wellness.
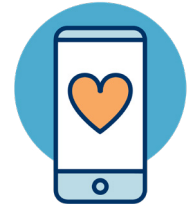
10. Empathy becomes a must-have in tech product design and development

Using empathy in product design means leveraging data about users' thoughts, emotions, and needs to create a user experience attuned to providing value and understanding. "People ignore design that ignores people," as illustrator and author Frank Chimero says.

We expect empathic design to continue gaining steam in 2020 as political and social pressure push tech companies to account for humanistic concerns. Theoretically, the demand for empathic products and features will only increase as more interactions — in retail, clerical, office environments, and more — become automated and mediated by machines.

Empathic design has steadily gained media attention over the last 5 years, as the analysis below shows.

News Coverage
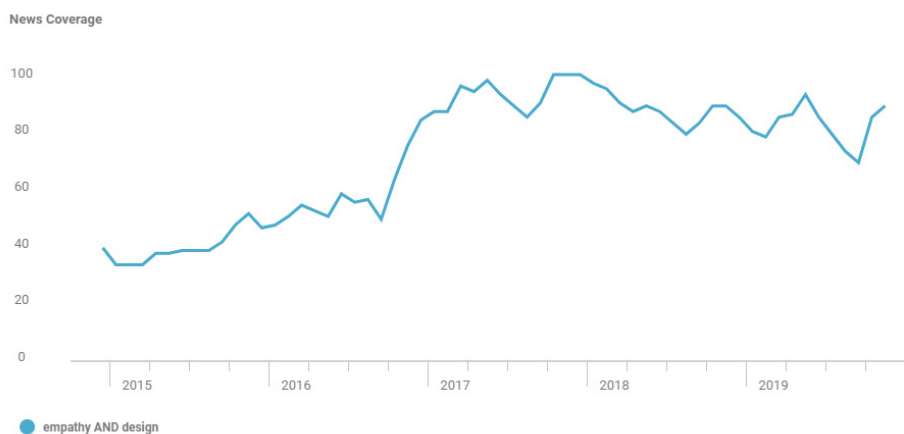
Source: CB Insights

There are multiple variations of the empathic design process, but Dorothy Leonard and Jeffrey F. Rayport's Harvard Business Review article "Spark Innovation Through Empathic Design" lists the main steps as: observe, capture data, reflect & analyze, brainstorm for solutions, and develop prototypes.

One example of empathetic design in use is when Nissan's design team reconsidered the fabrics used for car interiors after analyzing driver behavior. The team was "startled to see how many people were eating in trucks — not just drinks, but whole spaghetti dinners." This process helped to make the company's car interiors more intuitive for users.

While the potential for insights is high, the process can be very simple.

1 OBSERVE 2 CAPTURE 3 ANALYZE 4 BRAINSTORM 5 PROTOTYPE 6 TEST
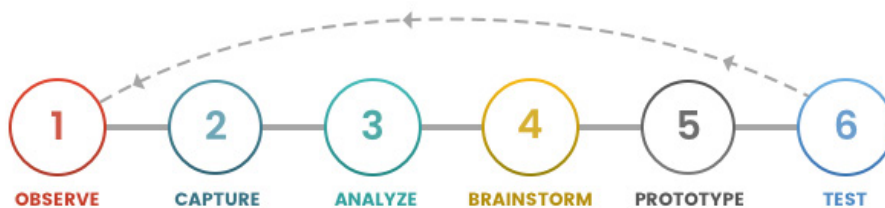
Source: QBurst

This method aims to involve users directly in the design process — rather than just designing for users — to ensure that the end product meets their needs. As product designers learn more about their users, they may reveal needs that haven't been previously met or identified, thereby creating more opportunities for innovation and disruption. This is particularly the case in industries where there's a credibility gap, or a lack of consumer faith in companies' good intentions.

For example, health insurance startup Oscar was launched with the explicit goal of addressing the need for more simplicity and transparency by frustrated and suspicious health insurance customers. While it has had hiccups, it has been consistent in attempting to make health insurance more user-friendly by simplifying enrollment, offering personalized plans, and using straightforward language on doctor bills.

Its ads, as seen below, were recognizable for their approachable and youthful-feeling motifs.
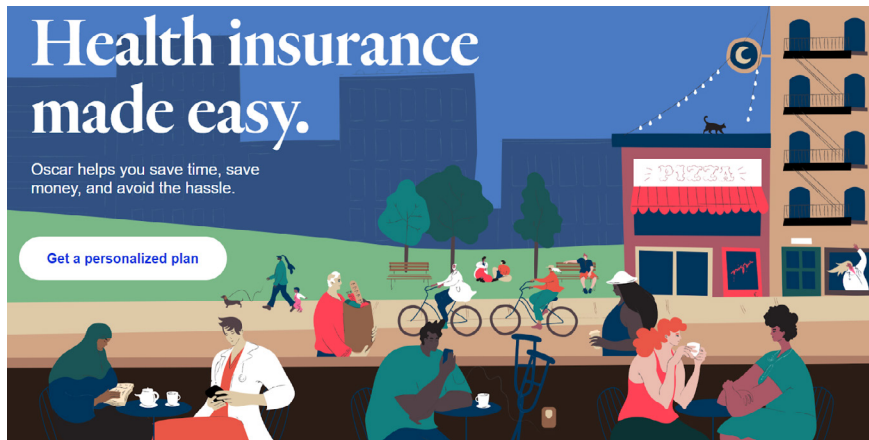
Source: Oscar Health

Empathic design is also becoming more evident in the auto industry, where we're seeing a constellation of in-vehicle human-centric features become standard. These include unlocking and starting the car with biometric-based authentication, in-vehicle voice assistants that enable hands-free navigation control, as well as computer vision-based monitoring to protect against drowsy or distracted driving.

Taken in isolation, each feature may seem trivial or simply added convenience. However, these features can seriously improve the lives of certain demographics, namely more senior drivers, which disproportionately suffer in avoidable car mishaps ranging from inconveniences — like locking keys in the car — to fatal accidents.

For a view into the future, consider one nascent mobility startup called Mpathy.ai. It is in stealth mode, but is said to be developing a virtual ride attendant for use in shared autonomous vehicles. These AV fleets, though far from wide-scale adoption, are likely to shuttle people around in the future, and will need to guarantee pleasant experiences for riders. Basically, this technology from Mpathy.ai aims to "humanize" what may turn out to be an alienating experience of being zipped around in a robot car.

In 2020 and beyond, look for companies across virtually all industries to embrace empathic design, with a view on an increasingly automated future.
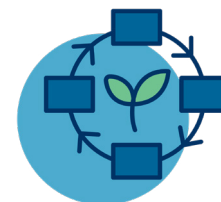
# 11. Big businesses embrace sustainable 'cradle-to-cradle' supply chains and the tech enabling them

As consumers increasingly demand more sustainable products, companies from sectors as varied as consumer electronics, retail, and healthcare are leveraging tech to redesign their supply chains. They aim to reduce waste, boost profit margins, and offer more transparency.

Cradle-to-cradle supply chains are designed to encompass the entire lifecycle of a product — from input materials, to manufacturing processes, to distribution, to promoting reuse and recycling. Typically, the intent is to better manage waste and efficiency. Profits might be boosted through better use of resources and more effective monetizing of byproducts. But there's also a halo effect when a brand or product can boost its sustainability credentials.

As seen below, cradle-to-cradle supply chains aim to take account of a product's entire lifecycle.
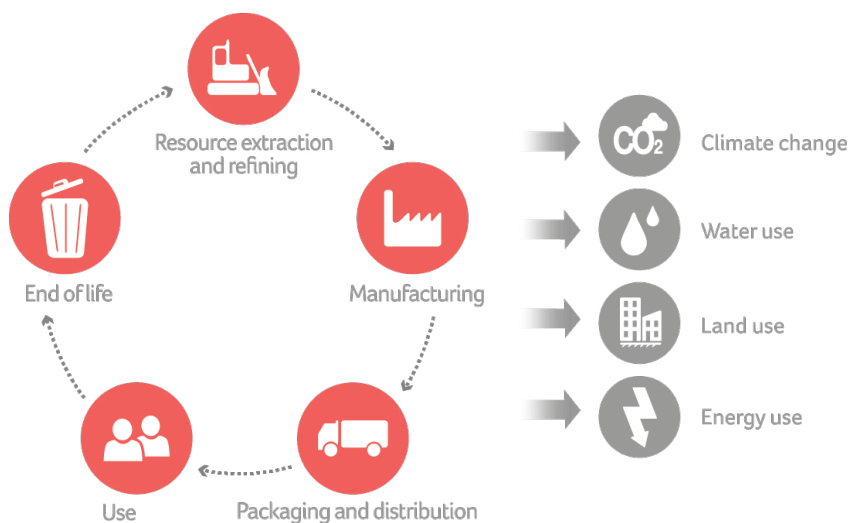
Source: Ecoinvent
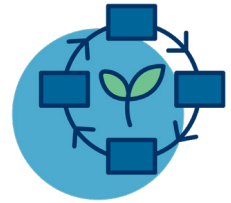
Though cradle-to-cradle supply chains can be challenging to implement effectively, recent advances are beginning to make it easier.

As tech like AI, blockchain, and rental platforms become more widespread, companies across industries are seeing feasible opportunities to embrace the cradle-to-cradle ethos.

One application of tech in cradle-to-cradle supply chains is to help improve logistics and inventory management.

Apparel companies are among the most motivated to adopt this type of tech, as the fashion industry is one of the most wasteful in the world. "Fast fashion" in particular has come under fire recently because of its constant manufacturing, shipping, and showcasing of cheap, throwaway, seasonal fashion. However, the entire space has much room for improvement.

To that end, sports apparel giant Nike bought AI-based inventory management company Celect last August. Supply chain and inventory management startups like Relex and Cosy are also targeting the retail and fashion spaces. If products can be made available in a way that better gels with demand, i.e. without overproducing, then retailers can boost sales while reducing emissions and saving money on unnecessary distribution costs and waste. The supply chain then becomes leaner and easier to manage.

Companies are also looking to use tech to make delivery cheaper and more sustainable, cutting down on supply chain inefficiencies. An example here is New York-based Fabric, a micro-fulfillment startup that raised a $110M mega-round in October, which is aiming to use AI to help get items to consumers more efficiently.
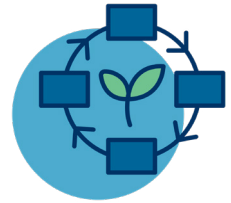
UK-based Starship, which raised $40M last August, is taking a different approach to sustainable last-mile delivery by offering self-driving robots that could help retailers and the food industry cut down on transportation emissions.
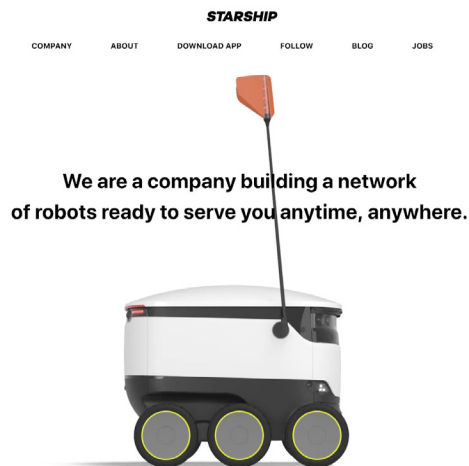

Autonomous delivery robots could help cut down on distribution emissions. Source: Starship

Reuse is another central theme in cradle-to-cradle supply chains. In the fashion world, rental platforms are gaining traction and market themselves partly on avoiding the waste associated with fast fashion. US-based clothes rental startup Rent the Runway became a unicorn in 2019 after raising $125M at a $1B valuation, while its rival Le Tote bought Lord & Taylor for $100M in August.

Aside from saving costs and increasing sustainability, the cradle-to-cradle trend will also help more companies offer greater supply chain transparency as they look to gain a competitive edge with social impact-minded millennial consumers.

Blockchain-based decentralized ledgers could make it easier to track products across complex logistic journeys and international borders.
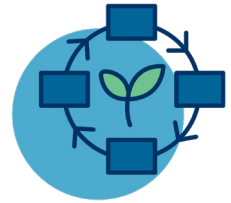
IBM's blockchain-based cargo tracking service TradeLens gained traction last year as more shippers signed up for the service. Meanwhile, food giant Nestle announced a blockchain-based food tracker in July that aims to allow consumers to track individual items all the way back to their farm of origin.

This type of approach could help companies and consumers verify that sustainable practices are being used, and perhaps one day, how individual components or ingredients end up being recycled or reused.

The tech could also make it easier for governmental bodies to implement recollection or recycling in a more targeted way, such as extended producer responsibility (EPR) schemes, under which companies are given a duty for the disposal or recollection of products after use.

IBM's TradeLends, shown below, is a private-sector version of a tech that could track and enforce a cradle-to-cradle supply chain.

Source: TradeLens
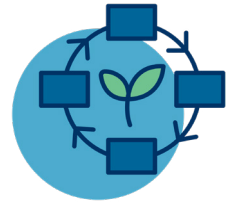
In 2020, look for more companies to offer tech-enabled transparent supply chains while touting improved sustainability and social impact outcomes. From a policy perspective, governments newly equipped with data-rich lifecycle metrics may soon begin experimenting with economic incentives to encourage outcomes like recollection and recycling.

Consumer demand for new products will always carry some environmental cost, but the rise of cradle-to-cradle supply chains could help reduce the negative repercussions while also providing a way to make companies more competitive.

12. Livestreaming takes off as a new shopping trend

Online shopping has been a "thing" for at least 20 years. And yet, as an experience, it hasn't changed as much as one might expect or hope. The conventions of the process remain the same: the product page, the product picture, the shopping cart, and the checkout. One-click shopping is the exception that proves the rule — it certainly removed friction from the purchasing process. But product-browsing and research goes are essentially still in 1999.

Despite the hype around AR and VR enhancing shopping, livestreaming promises to advance much more quickly. The idea, which is being championed by a handful of startups and early corporate adopters, involves humans actually interacting with products, paired with online shoppers over live video. There are many variations, but in its simplest form, livestream shopping is about making authentic, detail-rich, and relatable live video available to shoppers as they browse.

There are various levels of interactivity. Viewers might be able to message the livestreamer and chat with one another. These are well-established behaviors in the world of live-streamed video games, where fans post comments and chat with each other as a popular gamer plays on live video. For many young shoppers, this behavior will feel familiar if not intuitive.

Livestreaming goes beyond providing basic information about an item and helps users experience the product's look and feel before purchasing. Livestreams could be particularly valuable in categories like makeup, jewelry, apparel, as well as for bigger purchases such as furniture, electronics, and sporting goods. In these categories, details of function and form are difficult to discern online, even with the aid of AR or product videos.

More broadly, livestreaming promises to enliven the experience of online shopping, allow for a freer flow of information, and perhaps save retailers billions in dollars — if it can reduce returns, customer service queries, and abandoned shopping carts.

Livestreaming shopping apps could also broaden the pool of shoppers for some brands and retailers.

One company ShopShops, seen below, livestreams shoppers in luxury stores in the US and Europe to buyers in China.
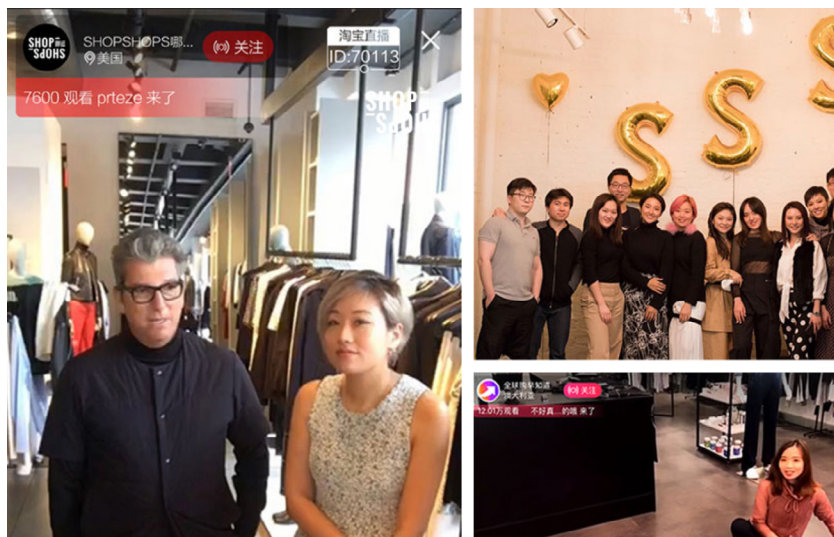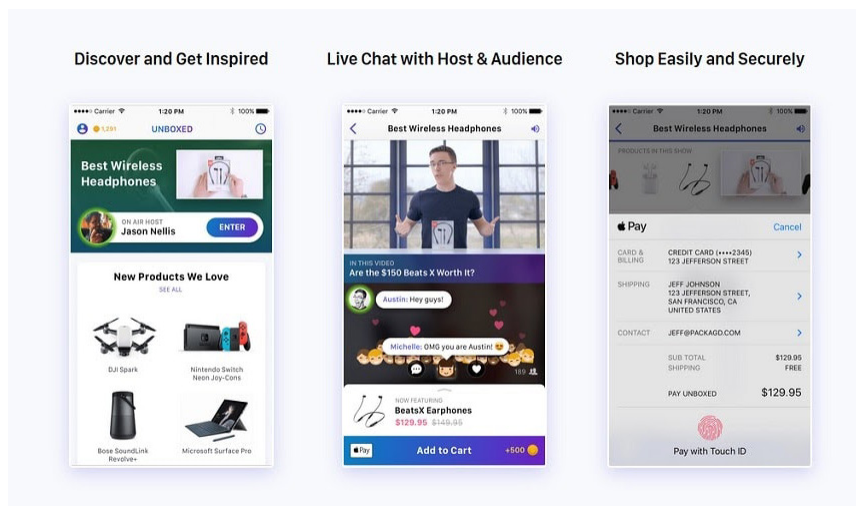

Source: ShopShops

Dote is a service that often features livestreams targeted at Gen Z shoppers. Amazon's new Amazon Live platform is another experiment in this direction, though it hasn't yet shown massive uptake.

Last year, Facebook acquired Packagd, a startup focused on "unboxing" and demonstration livestreams, as seen below.

Source: Packagd

Livestreaming is more promising than AR for the simple reason that it is an already established behavior. Gamer culture revolves around millions of amateurs — or celebrity streamers — broadcasting their game play. The process would be the same for product influencers focused on fashion, DIY, or gadgets. Instagram and other social platforms would be a natural hub for these shopping livestreams, but retailers and brands might recruit or sponsor their own livestreamers and host the videos on their own e-commerce sites.

There are many exciting opportunities for facilitating livestreams combined with e-commerce. The retailers and brands that find the correct formula and are able to harness this trend will benefit greatly.

13. Unicorn-to-unicorn M&A: Uber and Airbnb merge? Spotify acquires Snap?

In tech, we have a handful of super heavyweights, with mind-bending valuations, including Microsoft's $1.2T market cap at the time of writing. Arguably this class of super-heavyweights is limited to 8 companies globally: Microsoft, Amazon, Google, Apple, Facebook, and the 3 Chinese tech giants, Baidu, Tencent, and Alibaba.

On the other side of the barbell, there's a group of companies that is significantly smaller. In 2020, we'll see M&A on a peer-to-peer level among these (relatively-speaking) smaller players.

Many of these companies are recent "unicorns," venture capital-backed companies that reached $1B or higher valuations in the private markets, before going public. Others are longer-running publicly-traded companies that have not grown to the same scale as the big 8.
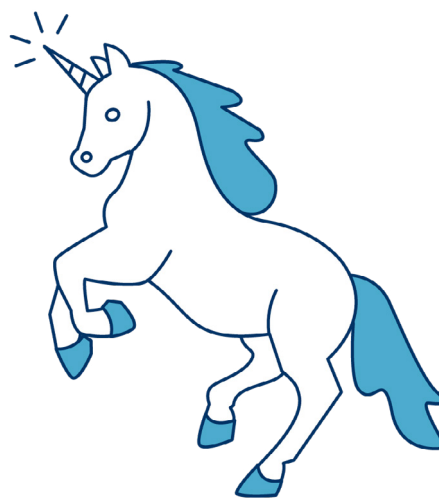
These types of deals are likely to get quickly green-lighted by US and European regulators, who will smile on any combinations that provide stronger counterweights to the big eight companies.

And that's especially if these deals happen across categories rather than within them. An Uber and Lyft combination, for example, would be a tougher pill for regulators to swallow, since it would arguably create a ride-sharing duopoly.

Here's a non-exhaustive list of some candidates for this flavor of M&A and their market cap at the time of writing (note: Airbnb's is a private-market valuation):

- Uber, $55B

- Airbnb, $35B

- eBay, $29B

- Spotify, $27B

- Twitter, $24B

- Snap, $22B

- Lyft, $13B

- Pinterest, $11B

- Dropbox, $7.8B

- Box, $2.5B

Arguably, they are *incentivized* to combine in some form, or they'll face seeking an acquirer or a route to IPO at the same time as all of these unicorns. Arguably, the bigger the unicorn, the better the chance of standing out and commanding a larger price, either in M&A or IPO.

In fact, there were nearly 400 unicorns in the private markets as of August 2019, as shown below. (There are 430+ as of January 2020.)

GLOBAL UNICORN CLUB: 393 PRIVATE COMPANIES VALUED AT $1B+
as of 8/27/2019
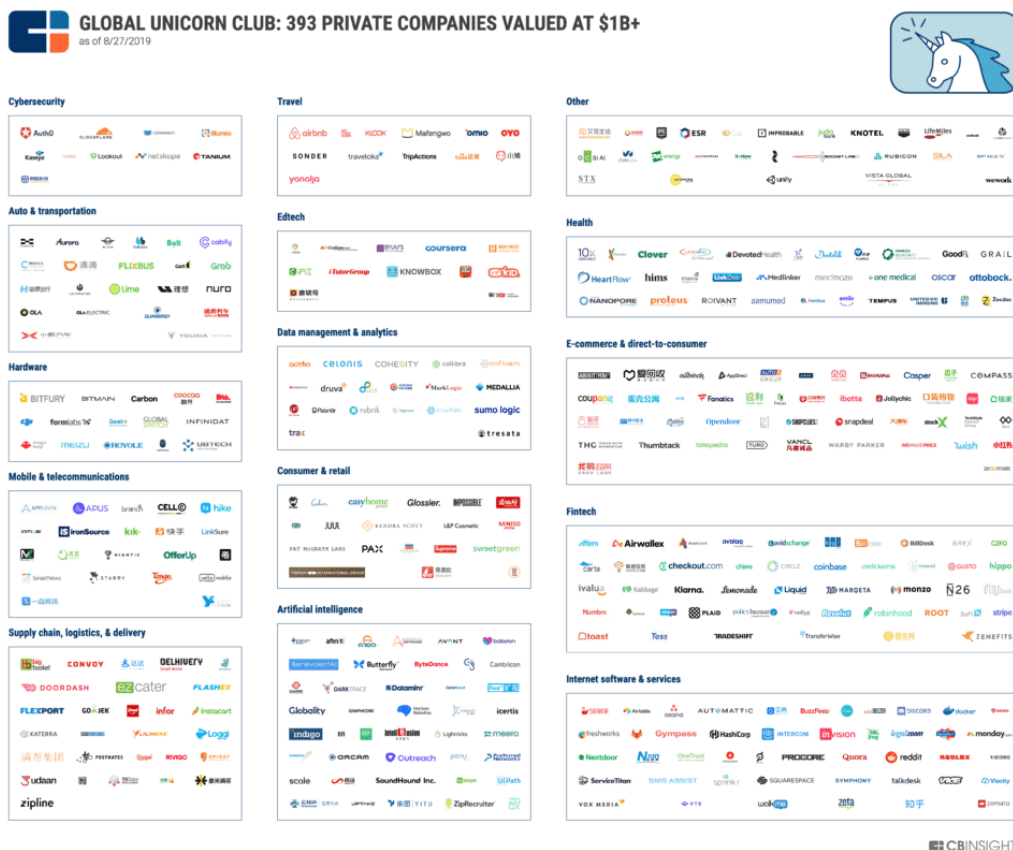
Source: CB Insights

In this spirit, here are a few possible major tie-ups in this vein, with a focus on the already-exited or largest unicorns, and the rationale behind them:

An Uber and Airbnb tie-up would be less odd than might first appear.

Airbnb and Uber serve complementary markets — urban transport and lodging — with natural cross-selling potential ("take an Uber to your Airbnb from the airport and to 'experiences'," is just the first and most obvious example of one). Both Airbnb and Uber are two-sided marketplaces dealing in real-world goods and services, which bodes well for integration.

Their user bases, while doubtlessly overlapping, would enhance the merged companies' "trust graph" or aggregate ratings data on drivers, hosts, guests, and riders.

Trust is core to both Uber and Airbnb's value proposition as marketplaces, which is why even internally a richer "trust graph" would be immensely valuable.

Likewise, a combination of Snapchat and Spotify would see complementary use cases, business model harmonies, and data synergies.

With Snapchat, Spotify would gain access to the video and photo habits of a youthful user base, a valuable "taste graph." Already Spotify has been notable for using AI to create a music-recommendation engine better than those of its larger competitors.

Not to mention, Spotify would gain some of Southern California-based Snapchat's media, licensing, and advertising know-how and relationships. And it would do so as China-based Tik-Tok emerges as a music and video rival, and as Apple, Google, and Amazon push deeper into music and entertainment.

Even Netflix, a company that has a track record of surprising Wall Street, remains relatively "sub-scale" at a ~$146B market cap. And so an alternative scenario to the above is Netflix joining forces with Spotify.

Turning to the business-to-business space, you might see an Atlassian and Slack combination. These companies will need to either bulk up or eventually fall into the maws of the big tech companies or a business-software incumbent with cash in hand, e.g. a Salesforce.

Already, as seen below, Atlassian shuttered its well-liked and mature work-chat product Hipchat and partnered to distribute Slack instead, presumably as a way to close ranks against Microsoft.

Source: Atlassian

Atlassian also bought project- and task-management app Trello, which given the $425M price tag of that deal was itself on the way to unicorn status, but apparently decided it also didn't want to attack Microsoft on its own.

Of course, some of the smaller players and ex-unicorns might be acquired outright by the giants, as LinkedIn was by Microsoft. But regulators, already making noise about antitrust actions, are unlikely to be friendly to "big tech" acquisitions. Instead, 2020 will be the year of small- and medium-sized fish gulping one another up in a bid for any incremental scale advantage they can digest.
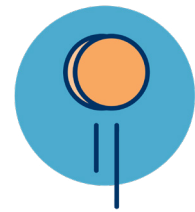
14. Crypto reversal: Central bankers embrace the 'enemy' and roll out their own digital currencies

In a way, this trend is the antithesis of what enthusiasts hoped would happen as cryptocurrencies proliferated in the world.

They wanted currency to throw off the "shackles" of central control and government meddling.

They touted bitcoin's decentralized structure and its deliberate scarcity as its two most valuable features.

In their utopia, where a currency like bitcoin is the coin of the realm, central bankers would no longer be able to "print money" at will, inflating currency to pay off government debt.

But in fact, what we're seeing is a growing interest among monetary authorities in experimenting with digital currencies.

Central banks — including China and France's — are using many features of cryptocurrency to develop their own software-based monetary instruments, and these would remain firmly under central bankers' control.

Why does this matter? Because currencies such as the US dollar, or the Euro, or China's Renminbi are threatened in the long term by technologies like bitcoin, or Facebook's Libra. The threat is hardly imminent, but the risk is palpable enough that regulators in many countries have sought to clamp down on Libra *and* bitcoin.
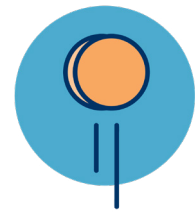
Meanwhile, as another tactic, as seen in the headlines below, central banks have begun to experiment with digital currencies in their own right.

y! Yahoo Finance

China's digital currency 'progressing smoothly', officials say

At the end of October last year, Chinese President Xi Jinping made a speech on blockchain technology, saying it is "vital" for the future ...

11 hours ago

F Forbes

China's Planned Bitcoin-Killer Sparks Major Concerns

Bitcoin and cryptocurrency have this year successfully provoked central bankers and governments to take digital currencies seriously—though ...

1 week ago

B Bloomberg

Say Goodbye to Banking as We Know It

Source: Google News

China is reportedly launching its Digital Currency And Electronic Payment (known as "DC/EP") system soon. The Chinese authorities haven't released many details about it but apparently they've been working on it since 2014. The goal is to digitize (and track more easily) some portion of cash in circulation. The Chinese are considered closest to launching something like this at scale.

But France, Turkey, and the Bahamas have also said that they will start piloting central bank digital currency in 2020. Many other nations are researching the idea (including US), but more for conceptual purposes at this point.
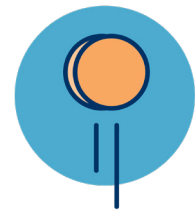
Other than tracking cash and managing circulating currency with more accuracy, monetary authorities hope that digital currency will allow them to more effectively police against money laundering, drug trafficking, as well as counterfeit cash. Perhaps more controversially, digital currency is seen as a solution to the relative anonymity offered by cash. With it, central governments can keep better tabs on whatever is done with money, not just illicit activity. For example, they may be better able to monitor and tax informal economies as well as consumer habits.

They also see a possibility of managing currency more nimbly, which may help in the response to positive and economic shocks, like a spike in oil prices or a bumper export crop.

Experts say deployment of digital currencies can be done alongside existing paper and electronic systems, so it is not an all-or-nothing proposition. This means that there is likely little downside in launching pilots of the sort France and China have announced.

While too early to map out the consequences, the development of central bank-backed digital currencies might ease regulatory and compliance costs for banks and other financial players. In theory, they could also accelerate interoperability, speed-of-settlement, and data-sharing between financial institutions. This would offer further encouragement to already-promising trends such as Banking-as-a-Service and open banking APIs.

The crypto community might scoff at these Central Bank-led efforts, but it would be foolish to rule out governments' capacity to absorb some of cryptocurrency's innovations while maintaining the power of the mint.

Methodology

Every year, CB Insights analysts parse data for forward-looking signals that inform the company's 3 cornerstone turn-of-year reports: Tech IPO Pipeline, Game Changers, and Tech Trends.

For Tech Trends, the supporting data includes:

- Anonymized and aggregate client searches on the CB Insights platform. Most heavily weighted are terms seeing much higher search volume in recent time periods compared to a longer-tail time period.

- Patent activity

- Investment activity by "smart money" VCs

- Media and executive chatter tracked by the CB Insights Earnings Transcript and News Mentions search tools

Finally, in a complementary qualitative process, research analysts, managers, and editors are surveyed for their picks of top trends that may not be showing signals in the data either because they lay outside of the data lens we employ, or because they are able to support these trends with other qualitative evidence.

These nominated trends are then examined by the Intelligence Unit's leadership. Any "weak" trends — due to unpersuasive evidence or because of a lack of value — are discarded. Stronger trends are researched for supporting evidence and included if they are substantiated. The final list is pressure-tested, vetted once more, and officially finalized.

Past trends

1. The hyper-personalization of everything

2. The smart home targets the senior citizen market

3. Malls are out — Retail moments are in

4. Maps become a layer for all kinds of real-world data

5. Last-mile delivery gets automated

6. Tech comes for your sleep

7. Data becomes a hot-button geopolitical issue

8. Smart buildings maximize comfort, wellness, and efficiency

9. Buses and logistics providers go green

10. China sets the bar for social network innovation

11. Electric vehicle makers expand into lifestyle products and services

12. Tech apprenticeships grow in popularity

13. Digital swag makes big money

14. The new healthcare clinic is your home

2018

1. Cars become a subscription good

2. The global race for AI chip dominance heats up

3. The rise of massive simultaneous online social communities (msocs)

4. The great cash windfall of 2018 will give large tech companies even more power

5. Cross-border M&A and partnerships draw scrutiny

6. People take cybersecurity into their own hands

7. Pay-per second cloud computing

8. The future of fitness is no gym at all

9. Swallow a smart pill for better diagnostics and treatment

10. Personalize the pooch

11. Under pressure, physical retail invades new spaces

12. Holograms become a format for augmented reality

13. 3D printing moves from novelty to essential industrial tool

14. Technology improves elder care

15. Big tech as real estate and property developer

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The CB Insights platform has the underlying data included in this report

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