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Experts Say the 'New Normal' in 2025 Will Be More Tech-Driven, With More Big Challenges

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How we did this

This is the 12th "Future of the Internet" canvassing Pew Research Center and Elon University's Imagining the Internet Center have conducted together to get expert views about important digital issues. In this case, the questions focused on the impact of the COVID-19 pandemic of 2020 on the evolution of humans-plus-technology. This is a nonscientific canvassing based on a nonrandom sample; this broad array of opinions about where current trends may lead in the next few years represents only the points of view of the individuals who responded to the queries.

Pew Research Center and Elon's Imagining the Internet Center built a database of experts to canvass from a wide range of fields, choosing to invite people from several sectors, including professionals and policy people based in government bodies, nonprofits and foundations, technology businesses, think tanks and in networks of interested academics and technology innovators. The predictions reported here came in response to a set of questions in an online canvassing conducted between June 30 and July 27, 2020. In all, 915 technology innovators and developers, business and policy leaders, researchers and activists responded to at least one of the questions covered in this report. More on the methodology underlying this canvassing and the participants can be found in the final section.

Experts Say the 'New Normal' in 2025 Will Be More Tech-Driven, With More Big Challenges

A plurality of experts think sweeping societal change will make life worse for most people as greater inequality, rising authoritarianism and rampant misinformation take hold in the wake of the COVID-19 outbreak. Still, a portion believe life will be better in a 'tele-everything' world where workplaces, health care and social activity improve

When pandemics sweep through societies, they upend critical structures, such as health systems and medical treatments, economic life, socioeconomic class structures and race relations, fundamental institutional arrangements, communities and everyday family life. A new canvassing of experts in technology, communications and social change by Pew Research Center and Elon University's Imagining the Internet Center finds that many expect similar impacts to emerge from the COVID-19 outbreak.

Asked to consider what life will be like in 2025 in the wake of the outbreak of the global pandemic and other crises in 2020, some 915 innovators, developers, business and policy leaders, researchers and activists responded. Their broad and nearly universal view is that people's relationship with technology will deepen as larger segments of the population come to rely more on digital connections for work, education, health care, daily commercial transactions and essential social interactions. A number describe this as a "tele-everything" world.

Notable shares of these respondents foresee significant change that will:

- **worsen economic inequality** as those who are highly connected and the tech-savvy pull further ahead of those who have less access to digital tools and less training or aptitude for exploiting them and as technological change eliminates some jobs;
- **enhance the power of big technology firms** as they exploit their market advantages and mechanisms such as artificial intelligence (AI) in ways that seem likely to further erode the privacy and autonomy of their users;
- **multiply the spread of misinformation** as authoritarians and polarized populations wage warring information campaigns with their foes. Many respondents said their deepest worry is over the seemingly unstoppable manipulation of public perception, emotion and action via online disinformation – lies and hate speech deliberately weaponized in order to propagate destructive biases and fears. They worry about significant damage to social stability and cohesion and the reduced likelihood of rational deliberation and evidence-based policymaking.

At the same time, a portion of these experts express hope that changes spawned by the pandemic will make things better for significant portions of the population because of changes that:

- **inaugurate new reforms aimed at racial justice and social equity** as critiques of current economic arrangements – and capitalism itself – gain support and policymaker attention;
- **enhance the quality of life for many families and workers** as more flexible-workplace arrangements become permanent and communities adjust to them;
- **produce technology enhancements** in virtual and augmented reality and AI that allow people to live smarter, safer and more productive lives, enabled in many cases by "smart systems" in such key areas as health care, education and community living.

These six themes were commonly expressed by these experts in their responses to a question that asked them to consider the changes that were set in motion in 2020 by the COVID-19 outbreak and describe what the "new normal" might look like in 2025.

Some **47%** of these respondents said life will be *mostly worse* for most people in 2025 than it was before the pandemic, while **39%** said life will be *mostly better* for most people in 2025 than it was pre-pandemic. Another **14%** said most people's lives in 2025 will not be much different from the way things would have turned out if there had been no pandemic.

Among the **86%** who said the pandemic will bring about some kind of change, most said they expect that the evolution of digital life will continue to feature both positives and negatives. These expert views link in interesting ways with public attitudes. A Pew Research survey in August 2020 found that 51% of U.S. adults said they expected their lives to remain changed in major ways even after the pandemic is over.

This is a nonscientific canvassing based on a nonrandom sample. The results represent only the opinions of the individuals who responded to the queries and are not projectable to any other population.

The bulk of this report covers these experts' written answers explaining their responses. They sounded many broad themes about the ways in which individuals and groups are adjusting in the face of the global crisis, describing the most likely opportunities and challenges emerging as humans accelerate their uses and applications of digital technologies in response. It is important to note that the responses were gathered in the summer of 2020, before the completion of the presidential election in the United States and before COVID-19 vaccines had been approved.

As these experts pondered what was happening in mid-2020 and the likely changes ahead, they used words like “inflection point,” “punctuated equilibrium,” “unthinkable scale,” “exponential process,” “massive disruption” and “unprecedented challenge.” They wrote about changes that could reconfigure fundamental realities such as people’s physical “presence” with others and people’s conceptions of trust and truth.

They wondered, too, if humans can cope effectively with such far-reaching changes, given that they are required to function with “paleolithic emotions, medieval institutions and god-like technology,” in the words of biologist E.O. Wilson.

Among the scores of changes they see is the emergence of: an “Internet of Medical Things” with sensors and devices that allow for new kinds of patient health monitoring; smart millimeter wave machines to diagnose people with disease symptoms; advances in synthetic biology and computational virology that improve drug testing and targeted disease therapies; diagnostic screenings that cover a person’s diet, genes and microbiome; handheld detection devices that citizen swarms use to address environmental problems; and a new class of tele-care workers.

Additionally, these experts forecast the creation of 3-D social media systems that allow for richer human interaction (sometimes via hologram avatars); mediated digital agents (interdigital agents) gradually taking over significantly more repetitive or time-consuming tasks; a “flying Internet of Things” as drones become more prolific in surveillance, exploration and delivery tasks; ubiquitous augmented reality; an expanded gig economy built around work-from-home free agents; urban farming that reaches industrial scale; advances in trusted cryptocurrency that enable greater numbers of peer-to-peer collaborations; locally based, on-demand manufacturing; “local in spirit and local in practice” supply chains; a robust marketplace of education choices that allow students to create personalized schooling menus; “tele-justice” advances that allow courts to handle large numbers of cases remotely; “truth valuation” protocols that diminish the appeal of disinformation; and small, safer nuclear reactors for energy production.

At the more everyday level, these experts also think there will be better speech recognition, facial recognition (including sentiment discernment from facial expressions), real-time language translation, captioning and autocorrect capacity, sensory suits, robust video search, body motion sensors, 3D glasses, multimedia databases and broader network bandwidth that will enable full 3D virtual experiences and developments in AI allowing it to serve more of people’s needs.

These themes and more are outlined in the accompanying tables.

Emerging change: As the global pandemic sweeps in, experts predict an even broader reliance on swiftly-evolving digital life - at its best and worst - by 2025

The pandemic proves that world-upending phenomena can emerge from anywhere. The turn to living and working more intensively within digital communications networks shows the value of these complex systems. The pandemic brings more focus on both the upsides and the downsides of digital life.

- **Tele-everything is embraced**: The broad adoption of "remote" processes – telework, telemedicine, virtual schooling, e-commerce and more – is growing. In 2025, there will be more people working from home, more virtual social and entertainment interactions and fewer forays in public than has been in the case in recent years.
- **Humans' yearning for convenience and safety fuels reliance on digital tools:** The pandemic has rearranged incentives so that consumers will be more willing to seek out smart gadgets, apps and systems. This will speed up adoption of new education and learning platforms, rearrange work patterns and workplaces, change family life and upend living arrangements and community structures.
- **The best and worst of human nature are amplified:** The crisis is enhancing digital interconnectedness that engenders empathy, better awareness of the ills facing humanity and positive public action. On the flip side, some individuals, cities and nation-states will become more insular and competitive as survival mode kicks in. Xenophobia, bigotry and closed communities will also increase.

Source: Non-scientific canvassing of select experts conducted June 30-July 27, 2020.
"Experts Say the 'New Normal" in 2025 Will Be More Tech-Driven, With More Big Challenges"

PEW RESEARCH CENTER and ELON UNIVERSITY'S IMAGINING THE INTERNET CENTER, 2021

Worries: As the global pandemic sweeps in, experts fear growing social and racial inequality, worsening security and privacy and the further spread of misinformation

The advantaged enjoy more advantages; the disadvantaged fall further behind. Concerns particularly focus on the growing power of technology firms. Many suggested solutions have a double-edged quality because they threaten civil liberties. Automation could take many humans out of the work equation. And the spread of lies via social media and other digital platforms is likely to further damage all social, political and economic systems.

- **Inequality and injustice are magnified:** The pandemic and quick pivot to the use of digitally-driven systems will widen racial and other divides and expand the ranks of the unemployed, uninsured and disenfranchised. Power imbalances between the advantaged and disadvantaged are being magnified by digital systems overseen by behemoth firms as they exploit big data and algorithmic decision-making that are often biased. More people will be pushed into a precarious existence that lacks predictability, economic security and wellness.
- **As risk grows, security must also; privacy falls and authoritarianism rises:** The health crisis spawned by the pandemic and broader dependence people have on the internet heighten threats of criminal activity, hacks and other attacks. Optimized security solutions may further reduce individuals' privacy and civil liberties. They are likely to expand mass surveillance, as authoritarian states will use this as an opportunity to silence dissent and abuse citizens' civil rights.
- **Threats to work will intensify from automation, artificial intelligence, robotics and globalization:** In order to survive, businesses are reconfiguring systems and processes to automate as many aspects as possible. While artificial intelligence (AI) and robotics will enhance some lives, they will damage others, as more work is taken over by machines.

Employers may outsource labor to the lowest bidder globally. Employees may be asked to work for far less; they may have to shift to be gig and contract workers, supplying their own equipment, and they may be surveilled at home by employers.

- **Misinformation will be rampant:** Digital propaganda is unstoppable, and the rapidly expanding weaponization of cloud-based technologies divides the public, deteriorates social cohesion and threatens rational deliberation and evidence-based policymaking.

- **People's mental health will be challenged:** Digital life was already high-stress for some people prior to the required social isolation brought on by the pandemic. The shift to tele-everything will be extensive and that will diminish in-person contact and constrict tech users' real-world support systems and their social connections.

Source: Non-scientific canvassing of select experts conducted June 30-July 27, 2020.
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PEW RESEARCH CENTER and ELON UNIVERSITY'S IMAGINING THE INTERNET CENTER, 2021

Hopes: As the global pandemic sweeps in, experts urge that calls for social justice will be heeded and that technology design will focus on human well-being

People have the chance now to reconfigure major systems such as the structure of capitalism, education, health care and workplaces. Advances in technologies such as artificial intelligence, smart cities, data analytics and virtual reality could make all systems safer, more humane and more helpfully productive. Better communication of more-accurate information can dramatically improve emergency responses in crises and alleviate suffering

- **Social justice will get priority:** The reawakening of public movements for social justice and economic equality may create more-responsive government and socio-political systems that are more attuned to diversity, equity and inclusion. This includes a focus on closing digital divides.

- **People's well-being will prevail over profit:** Businesses may start to value serving the greater good above the typical goals of market capitalism. This could produce policies to fund broader safety nets such as universal health care, universal basic income and broadband as a basic utility. A reckoning for tech companies and their leaders might also occur.

- **The quality of life will improve:** The transition to home-based work will reduce urban air pollution, overcrowding and transportation gridlock. It will enhance overall quality of life, create a better environment for family life, allow more accommodations for those with disabilities and inspire other enhancements.

- **AI, VR, AR, ML will yield good:** Artificial intelligence, virtual reality, augmented reality, deep learning, machine learning and natural language processing will make virtual spaces feel much more real, in-person, authentic, and effective.

- **Smarter systems will be created:** Municipal, rural, state and independent services, especially in the healthcare sector, will be modernized to better handle future crises, quickly identifying and responding to emerging threats and sharing information with all citizens in more timely and helpful ways.

Source: Non-scientific canvassing of select experts conducted June 30-July 27, 2020.
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Following is a selection of some of the most comprehensive overarching responses shared by a number of the 915 thought leaders participating in this canvassing.

Marcel Fafchamps, professor of economics and senior fellow at the Center on Democracy, Development and the Rule of Law at Stanford University, commented, "Here are some of the changes I anticipate. Please note that many of them were already in the background and could have occurred anyway, but I suspect less fast and less strongly.

- Economic and social inequality: The economic contrast between the 'confined,' the 'essentials' and the 'unemployed' will perdure. The confined are those who can work from home and be productive. Because employers save money on them, they will continue to prosper. Anyone who cannot work from home will as a result earn comparatively less than without the introduction of work-from-home as a normal way of life. Many workers will be displaced or made redundant by this change, e.g., all those who support work-life (restaurants, transport including car making, maintenance of office buildings, etc.). A gig economy will arise that caters to the same needs for those working from home but, because they will work in a very competitive industry (they will compete with each other for each home-worker-customer) and they will be much harder to organize in unions, strikes, etc., they will earn less. And they will become invisible, like domestic workers or gardeners today.
- The generalization of work-from-home will change where people live – possibly away from city centers, but this need not be the case if people value their social life, as is likely, especially for the young – possibly into small towns instead of big metropolis. This will in turn lead to more social segmentation/parochialism/segregation in terms of residential choice and social circle. Business districts force different people together by need rather than choice. If people can choose who they live with, they will sort on similar attributes, including wealth and all its correlates.
- By reducing the cost of congestion inherent to having a workforce in large office buildings, these changes will enable even larger firms, leading to an even stronger concentration of corporate power into a small number of key actors. The last wave saw the concentration of financial and service industry into a small number of world banks into a small number of geographical centers (e.g., New York, London, Shanghai, Singapore, etc.). We have already seen this with Amazon, Alibaba, Google and the like for their respective industries. We will now see this spread to other work-from-home industries: more agglomeration, but this time happening in the digital world, and not requiring geographical concentration itself.
- Civil liberties were severely curtailed during COVID-19. New tools and technologies were introduced to control people better, including phone apps that identify likely social interactions between people. These tools will be used by totalitarian regimes to control their population better, on the Chinese model. Furthermore, people working from home will be much harder to organize and much easier to target individually by repression. I therefore

anticipate population control to become more efficient and effective, cutting down the productivity gap between autocratic regimes and democracies. As a result, democracy will be on the defensive, its spread will be reversed in many parts of the world, and democracies themselves will infringe more on civil liberties. We are entering a post-democratic era.

- Privacy was always a luxury in the past – only the rich enjoyed it. Then it spread to a large fraction of the population in the West. Now it is receding again, in a way that mirrors the rise in inequality and the inevitable fall in civil liberties. The poor never have privacy. COVID-19 has justified the loss of the last bit of privacy we had left, namely, our health data and who we meet in the park.
- In a not-too-distant future the Soviet Union will be seen as ahead of its time: Its main weakness was the inability to deal with the complexity of matching production and consumer demand. Now this can be achieved via Amazon or Alibaba, and the complex dispatch or matching algorithm that they and Google and Facebook have created. With concentration of corporate power, increase in inequality and weakening of civil liberties, it will be easy to recreate a post-democratic world that fulfills the Soviet promise, without necessarily requiring public ownership in the means of production: It will no longer matter who is formally the owner of capital, as China today demonstrates."

Amy Webb, quantitative futurist and founder of the Future Today Institute, said: "We've entered a new Bioinformation Age, a new period in human history characterized by the shift from privacy and personal choice to new social, government and economic structures that require our data to operate. You can expect to see a Flying Internet of Things: smart drones equipped with object- and face-recognition, audio analytics, motion detection and sense-and-avoid systems that communicate with each other in the air and back down to a command center on the ground. The Flying Internet of Things will be used for surveillance and deliveries of small payloads, such as medicines, medical supplies and other necessities. Drones will transport specimens between buildings on hospital campuses, and they will move prescriptions between drugstores and homes.

"The availability of diagnostic testing will be far more ubiquitous. Drugstores, schools and large company offices will have compact COVID-19 testing machines and technicians. A specimen will be taken, put onto a cartridge and results will be delivered within minutes. Meanwhile, at airports, offices and event spaces, smart millimeter wave machines will be used to algorithmically diagnose people with COVID-19 symptoms. The machines will include a thermal imager and a powerful suite of AI algorithms that in seconds will scan someone's heart rate, respiration rate, blood oxygen level and body temperature. Our new normal will include decentralized, persistent biometric surveillance. Within just a few years, biometric-recognition technology will transition from suspect, to reviled, to acceptable, to essential. Eventually, a massive biometric surveillance apparatus will become the invisible infrastructure enabling our economies to function again. …

"The fate of regulation, as national governments try to reconcile the desire for public safety with a reality in which algorithms are encoded with bias, could take many years to sort out, and the result is likely a patchwork of different protocols and permissions around the world. In the Bioinformation Age, transparency, accountability and data governance are paramount, but few organizations are ready. Everyone alive today is under persistent surveillance from a host of technologies, and what most people don't realize is that tech companies don't need cameras to see you. From Wi-Fi signals to single strands of hair, it is possible to recognize you without submitting to face scans.

"Catastrophe can be a catalyst for positive change. In a race to find a vaccine, important areas of science – synthetic biology, computational virology – are accelerating. This will result in more-efficient drug testing, new approaches to targeted therapies and, someday, a future in which we engineer life itself.

"Many organizations in the public and private sectors had not invested in digital transformation. The virus provided an immediate impetus to change. On the other side of this, organizations should have better workflows, data management, information and cybersecurity, and new efficiencies. The virus could finally be an accelerant to healthcare equity in the U.S. The virus has highlighted the lack of broadband infrastructure in the U.S. and a growing digital divide. One of the coronavirus aftershocks will be a realization that American kids need internet access to perform well in school, and many families don't have it. We could categorize internet access the way we categorize food security and emerge from the pandemic with federal programs to provide internet and device assistance to families in need."

David Brin, physicist, futures thinker and author of "Earth" and "Existence," commented, "Assuming we restore the basic stability of the Western Enlightenment Experiment, and that is a big assumption, then several technological and social trends may come to fruition in the next five to 10 years.

- Advances in cost-effectiveness of sustainable energy supplies will be augmented by better storage systems. This will both reduce reliance on fossil fuels and allow cities and homes to be more autonomous.
- Urban farming methods may move to industrial scale, allowing similar moves toward local autonomy (perhaps requiring a full decade or more to show significant impact). Meat use will decline for several reasons, ensuring some degree of food security, as well.
- Local, small-scale, on-demand manufacturing may start to show effects in 2025. If all of the above take hold, there will be surplus oceanic shipping capacity across the planet. Some of it may be applied to ameliorate (not solve) acute water shortages. Innovative uses of such vessels may range all the way to those depicted in my novel 'Earth.'

- Full-scale diagnostic evaluations of diet, genes and microbiome will result in micro-biotic therapies and treatments. AI appraisals of other diagnostics will both advance detection of problems and become distributed to handheld devices cheaply available to all, even poor clinics.
- Handheld devices will start to carry detection technologies that can appraise across the spectrum, allowing NGOs and even private parties to detect and report environmental problems.
- Socially, this extension of citizen vision will go beyond the current trend of assigning accountability to police and other authorities. Despotisms will be empowered, as predicted in 'Nineteen Eighty-four.' But democracies will also be empowered, as in 'The Transparent Society.'
- I give odds that tsunamis of revelation will crack the shields protecting many elites from disclosure of past and present torts and turpitudes. The Panama Papers and Epstein cases exhibit how fear propels the elites to combine efforts at repression. But only a few more cracks may cause the dike to collapse, revealing networks of blackmail. This is only partly technologically driven and hence is not guaranteed. If it does happen, there will be dangerous spasms by all sorts of elites, desperate to either retain status or evade consequences. But if the fever runs its course, the more transparent world will be cleaner and better run.
- Some of those elites have grown aware of the power of 90 years of Hollywood propaganda for individualism, criticism, diversity, suspicion of authority and appreciation of eccentricity. Counterpropaganda pushing older, more traditional approaches to authority and conformity are already emerging, and they have the advantage of resonating with ancient human fears. Much will depend upon this meme war.

"Of course, much will also depend upon short-term resolution of current crises. If our systems remain undermined and sabotaged by incited civil strife and distrust of expertise, then all bets are off. You will get many answers to this canvassing fretting about the spread of 'surveillance technologies that will empower Big Brother.' These fears are well-grounded, but utterly myopic. First, ubiquitous cameras and facial recognition are only the beginning. Nothing will stop them and any such thought of 'protecting' citizens from being seen by elites is stunningly absurd, as the cameras get smaller, better, faster, cheaper, more mobile and vastly more numerous every month. Moore's Law to the nth degree. Yes, despotisms will benefit from this trend. And hence, the only thing that matters is to prevent despotism altogether.

"In contrast, a free society will be able to apply the very same burgeoning technologies toward accountability. We are seeing them applied to end centuries of abuse by 'bad-apple' police who are thugs, while empowering the truly professional cops to do their jobs better. I do not guarantee light will be used this way, despite today's spectacular example. It is an open question whether we citizens will have the gumption to apply 'sousveillance' upward at all elites. But Gandhi and Martin

Luther King Jr. likewise were saved by crude technologies of light in their days. And history shows that assertive vision by and for the citizenry is the only method that has ever increased freedom and – yes – some degree of privacy.

"I would wager that I am almost alone in saying this in this canvassing. The hand wringers are totally *right* about the problem and the danger presented by surveillance tech! And they are diametrically wrong in the common prescription. Trying to ban technologies and create shadows for citizens to hide within is spectacularly wrongheaded and disastrous. See my book, 'The Transparent Society: Will Technology Make Us Choose Between Privacy and Freedom?'"

Barry Chudakov, founder and principal of Sertain Research, commented, "The 'new normal' for the average person in 2025 will entail adapting to multiple simultaneous accelerations. … COVID-19 will be followed by other pandemics. Atmospheric climate change will accelerate. Wetlands deterioration will accelerate. The number of homeless refugees – due to soil, crop and weather devastation – will accelerate. Information speeds and content compression will accelerate. The invasiveness and accuracy of tracking, search and recognition technologies will accelerate. Our reliance on remote-distance technologies and interfaces will accelerate.

"The consequence of these accelerations is complexity: Problems and issues, programs and technologies, all are becoming more complex. The substrate of the new normal will be ineradicable complexity: Both our problems and our technologies (including how we deploy these technologies) have passed the stage of simple approaches. To quote McKinsey: 'Telemedicine experienced a tenfold growth in subscribers in just 15 days. Similar acceleration patterns can be seen in online education, nearshoring, and remote working, to name but a few areas. All these trends were clear before the crisis and have been amplified by it.'

"This is a fundamental amplification. The way people use and think about technology will progress further on the continuum of actual to virtual. We will become even more screen-dependent. We will see less of the world IRL (in real life) and more through interfaces and screens whose distancing will shield us from deadly viruses but also isolate us. Thus, the new normal with regard to the role of digital technologies in individuals' personal and professional lives will be to usher in, and learn to navigate, the emerging metaverse. … What worries me most about the role of technology and technology companies in individuals' lives in 2025 is the deliberate depreciation of complexity. The diminishment of complexity invites tyranny. It is the tyranny of simple-ism and reductionism papered over by happy talk, lies and distortions designed to distract us from real issues.

"We urgently need clarity and sound thinking. Simplistic clichés and slight-of-hand responses won't solve the complex problems we face such as accelerating climate change, soil and shoreline

erosion, global immigration or morphing pandemics. We must embrace transparency – make the science required to tackle this complexity easily understandable. To be clear: Complexity is not an end in itself; it is a fact of life that must be addressed, like the melting of the Greenland ice sheet. For example, Rana el Kaliouby, CEO of Affectiva, has written and spoken often about the need to embrace the complexity of gender, race, cultural context, accessibility, socioeconomic status and other variables that often are lacking in the environments that design the computer programs and algorithms that mediate our lives. We must humanize AI and make human variability the substrate of bits and qubits.

"A second level of complexity – and the more urgent one – is our engagement with our devices. We use them; we typically are not present with them. We don't notice how they bend our perceptions and behaviors. As complexity accelerates, curiously, our ability to embrace and engage with that complexity diminishes. This is in no small measure due to the ergonomic design of our devices that makes them both indispensable and makes us more likely to adhere in our thinking and action to their compression logic: They compress time, distance, communication, relationships. We have an active and reactive relationship with our tools. Because of this we need a meta layer of awareness that monitors how we change and adapt. Merely adopting tool logic as our own – texting while we drive, ghosting, growing alone together – is hardly a healthy response. Further, our lack of presence with our tools effectively means we are at the mercy of the surveillance capitalism and interruptive logic that pervades their inception. These technologies and the companies that create them daily gain in sophistication; this is a new acceleration.

"Much of this accelerated sophistication is outstanding and useful. But we pick up and use our devices and, as it were, live our lives eyes wide shut. We don't look at what we're using and how we're using it – we practice unconscious tech engagement. Our tools are so ergonomic, so easy to use, so quick to respond that we are seduced by the slick way they reorganize our thinking, our behavior and our lives. But we have reached a tipping point with our tools: They are now more sophisticated than our ability to fully appreciate their effects; those effects are hidden in the tool logic, the actions of the tool. We must become present with our tools; we must gain in meta-awareness, retool our understanding of how we think while tech-immersed versus how we think otherwise.

"Why is this a concern? In prior human history, the power to manipulate reality, facts, behaviors and lives was centered in visible entities with physical representatives: the king, the pope, the organizer, the leader. Institutions from churches to schools to governments were concrete entities with no metalife. If you couldn't talk to the king or the pope every day, you knew where they lived in a castle or the Vatican. While many institutions can fossilize and grow weedy with bureaucratic complexity, newer technologies present the ability to avoid presence. More than absence, this is the ability to hide, to obfuscate, to distort. The more virtual we become, the more I

worry that we abandon the concrete for becoming gadgeteers and, as Neil Postman put it, 'amusing ourselves to death.' The more we disembody, the more virtual our realities become, the more we exhibit antisocial, even psychopathic behaviors. Alone together we lose empathy; we lose compassion; we lose focus. As computing goes quantum, as algorithms and AI mediate more of our interactions, our educational structures have either lagged far behind or have given up altogether trying to prepare young minds for the world they will inherit. The more device dependent we become, the more incumbent it is upon all users to fully understand the tool logic and business model of the tool they pick up and use. Surveillance is a business model; exploitation of data exhaust is a business model; tracking is a business model; observation and analysis is a business model. In whose interest is it for us to embrace that business model? In 'Everybody Lies' Seth Stephens-Davidowitz says, 'Google searches are the most important dataset ever collected on the human psyche.' In other words, the human psyche is an emerging business model."

Brad Templeton, internet pioneer, futurist and activist, a former president of the Electronic Frontier Foundation, said, "It has been suggested that this is the first battle in our last war on disease – that, partly as a result of this, we will come to understand viruses at a fundamental level. And now the budget will be there (due to the obvious benefit) to create the ability to make a vaccine or counter-agent to a virus on demand – just sequence the virus and quickly be able to generate agents that will be known to be safe and effective. It's very likely we'll get much better at diagnostics as well. These are tremendous goods, and one would even say worth the cost of the pandemic, except we were trying to make them before and this just kickstarts them. This could prevent the death of millions, and if you can attribute it to the pandemic, you would have to go into the 'wildly, wildly positive' camp on the pandemic.

"We're learning a great deal about videoconferences and meetings, holding large events online, holding parties online. We still suck at it, but we're learning lots and getting better. The video call was something that was going to be 'the next thing' since the 1950s. The pandemic made that finally happen, and it's probably here to stay. We may even develop means to do pretty significant business travel without the travel, which has benefits in cost, time and pollution. …

"We may learn to do occasional 'dry runs' of all the technologies necessary for hard lockdown – online shopping, delivery, virtual meeting spaces and remote learning and more. We will probably learn that the right approach is to use those technologies to generate a very hard lockdown for a short time, rather than a moderate lockdown for a very long time. Delivery robots (in which I am involved) will gain more appreciation. Public transit will mostly recover but only because it has to; long-overdue changes away from its 20th-century models will be hastened in reaction to that decline, and fear for several years of cramped, packed spaces. This will slightly hasten the eventual replacement of most public transit with robotic group and solo transportation. The world will

probably get a bit cleaner. Ultraviolet disinfection will become common. This may reduce the spread of other infections like flu."

danah boyd, founder and president of the Data & Society Research Institute and principal researcher at Microsoft, wrote, "Inequality will create a huge division between those who are thriving and those who are in dire straits. There will be plenty of high-status people who will come out of the pandemic with wealth, health and their life goals intact. But a large amount of society will be dealing with all sorts of ripple effects. There will be those who got sick and never fully recovered. There will be those who lost their jobs and precarity turned to poverty fast. But there will also be mothers whose careers took a left turn after multiple years of trying to be a stay-at-home parent plus a teacher while working at home. There will be so many people who will be facing tremendous post-traumatic stress disorder as they struggle to make sense of the domestic violence they experienced during the pandemic, the loss of family and friends and the tremendous amount of uncertainty that surrounded every decision. Digital technologies always mirror and magnify the good, bad and ugly. People will continue to use technology to get support and help, but they will also struggle with how technology becomes a place of hostility and information confusion. A cohort of young people will be accustomed to engaging friends through technology, but also struggle with a range of face-to-face encounters as the fears/confusion over illness persist. If we're lucky, schools, conferences, mental health and general health care will be forever reimagined to consider hybrid ways of approaching services. But this is more likely to be something that magnifies inequality rather than actually doing the connective work that could be possible. The biggest unknown in the United States concerns political leadership."

Douglas Rushkoff, media theorist and author, wrote, "2025 may be a whole lot more local in spirit and local in practice. As global supply chains falter and reveal their structural inadequacies, people will come to depend more on locally produced goods. This will also mean fewer ridiculous, meaningless, valueless cubicle jobs, and more time spent actually creating value. I'm thinking simple, real tasks like growing food, building houses, teaching kids, health care and providing energy may dominate what we now think of as 'work.' In other words, instead of developing careers in industries, people will learn how to do things – which could prove truly fulfilling and psychologically stabilizing.

"The climate and economic challenges may be bigger, but our resilience as people could be stronger. It's only three or four years out, so I don't anticipate we'll be through the disillusionment at the failure of global corporate capitalism. As for the role of digital technologies? I don't know if they will be quite as important in their own right. They'll likely be more embedded into other stuff, and less fetishized on their own. The only tech-related change I'm really hoping for is less of it. It's really draining. Even typing this right now I'm using tech to write to you about the future of tech? As for tech making life better? The obvious ones: solar, regenerative energy, less-industrial

agriculture (more low- or light-tech solutions to topsoil depletion, air pollution, watershed destruction). More simple stuff that solves real problems. Less social networks designed to create new problems.

"My worries? Well, there are now trillions of dollars invested in companies that depend on addiction, isolation and fear to keep growing. That's very dangerous, since these companies will spend their war chests on deliberately causing panic, pain and fear. They know the more upset and reactive we are, the more likely we are to engage with their platforms. So, when the wealthiest industry in the world is doing everything it can to attack our basic sense of well-being, I do get concerned we may not have the resilience as people to oppose these forces. Once they really get a handle on using AI for this purpose, I'm not sure how we get ourselves out of it. Even now, we see people on social media platforms attacking those with whom they should be allied. They cancel people rather than collaborate with them. If AIs determine that turning people against each other is the easiest way for them to deliver desired metrics, then we could be in great trouble."

Esther Dyson, internet pioneer, journalist, entrepreneur and executive founder of Wellville, responded, "Things will be both better and worse. Many people will be dead and many others more will be permanently damaged, physically or mentally or economically. And those people will mostly be the ones who were worse-off in the first place, poor, Black or another minority, disabled or ill, or otherwise challenged. Yet at the same time, the U.S. and even the world at large are much more aware of the disparities and the unfairness of this situation.

"With luck, we will start to think long-term (to the next pandemic?) and realize how much better things could be for all (including rich employers who want educated, happy, productive employees and well-off customers) if we would invest in our greatest asset – human beings. The money one spends keeping pregnant/new mothers healthy, providing child care (and paying care workers' wages that honor their work), educating children, keeping people healthy instead of trying to fix them when it's too late – all that money delivers a huge return on investment. It's just that the rewards don't go directly to those who pay; they go to society as a whole and make the world a better place for both rich and poor (but with more impact on the poor because their condition has so much more room for improvement).

"That's the optimistic view of things. I'm doing everything in my power to make it come true. The short version is that we need to think long-term and invest in everyone's future versus grabbing what we can for our narrowly defined selves. Ah yes, and you were asking about 'digital tech.' We're going to discover that it is getting cheaper to do a lot of things, including many varieties of telemedicine, less travel and jet lag for the rich, upper-class workers, and that we can actually *afford* to invest in human capital cost-effectively. We need to do that and we need to train a large new cadre of tele-care workers to help deal with the residual effects of COVID-19 (including

contact tracing). The human communication skills needed for contact tracing now are the same skills that will also make for better child care, mental health and other care workers.

"One really interesting impact will be on privacy: Any stranger could be infectious, so there will be demands for testing and immunity passports and the like – and a similar demand for secrecy from (usually poor) people terrified of losing their physical-presence-required jobs, their ability to travel, etc., etc. It's akin to issues around concealed weapons, etc., etc. A lot will depend on how immunity/vaccines/and other medical issues play out over the next year.

"There will be a lot less traveling and a lot more appreciation for face-to-face (or mask-to-mask) connections when we do make them. Much more telehealth and a healthier population. More self-aware use of social networks and an understanding of how addictive they can be. The use of all kinds of digital monitors should help people to manage their own health and resilience better (though they can be abused/addictive like everything else). I would love for every third grader in this country to get a continuous glucose monitor along with an age-appropriate scientific curriculum so that they could see for themselves how the food they eat affects their bodies and their mood. Or more cheaply, at least a Mouse House with four mice – two sedentary and two with a running wheel, orthogonally two on a healthy diet and two eating the kind of processed, overly sweetened junk still found in many schools' cafeterias. Maybe PETA would sue, which would just help to make the point of how badly we feed so many children. Meanwhile, the kids could just watch and see the impact of the four combinations of choices. I worry that poor and minority people still will have limited access to all the tech and tools that the rich take for granted. … Disparities in access to tech can aggravate other disparities. I also worry that people will turn to tech rather than to other people for human comfort."

Jamais Cascio, research fellow at the Institute for the Future, predicted, "Three big arenas of technological uncertainty we're likely to see by 2025 emerge from social dynamics well underway now: the prevalence and availability of remote work and the technologies used to enable it; the manifestation of authority and policing, particularly in the balance of surveillance of citizens and surveillance by citizens; and the degree of trust and accountability of social media systems, in terms of both personal privacy and protections against manipulation. All three of these issues could have radically divergent outcomes in a relatively short amount of time, making it very difficult to pin down 2025.

- *Remote work:* The speed and stability of an actual recovery from the pandemic will shape how much we continue to rely upon remote work; there's a very good chance that a significant portion of the pandemic remote workforce will want to continue to work from home, but the longer the forced isolation lasts, the greater the likelihood that people will be desperate to return to human contact at work. Increasing improvements in automation will eliminate some

of the 'essential' delivery jobs. It's possible that these may be semi-automated tasks, where a remote pilot controls the drone or robot used to make deliveries (to handle the unexpected and customer interaction).

- *Policing and surveillance:* The capacities of surveillance technologies are increasing rapidly, but their use against civilian populations and their use as a way to monitor authorities are not necessarily correlated. The degree to which institutions of authority adapt to changing social demands will shape the level to which surveillance could be imposed upon them; conversely, if authorities are able to suppress demands for change, the spread of top-down surveillance will likely accelerate.
- *Social media networks:* Even as Facebook demographics continue to age, Millennials desiring a more stable platform for social (and family) engagement will start to look beyond transient interaction apps. Facebook could remain the default if it manages to act as a bulwark against social manipulation and tighten up its privacy-related behavior, but since that's not a highly likely scenario, we'll probably see the emergence of something else that fills that role for younger adults. This 'something' will allow for both persistent interaction and advanced privacy protection; what that would look like remains to be seen. I'd like to see more systems that allow for improved privacy, accountability and insight.

"Beyond information technology, we could see major improvements in our lives through the acceleration of the shift away from fossil fuels: more electric cars and the corresponding infrastructure, more power-self-sufficient homes and much longer-lived energy storage/batteries. I also hope that the pandemic will trigger a variety of advances in medical and biotech systems, improving the overall quality of health and life for millions (or billions)."

Jim Spohrer, director of cognitive open technologies and the AI developer ecosystem at IBM, noted, "The new normal by 2025 will likely be better. 1) Dealing with pandemics will be improved, vaccine speed of development will be improved, preparedness for next pandemic will be improved. 2) Online education, health and government services will be improved, and more people will have experience with them. 3) Businesses will continue to encourage more online meetings (less travel) and more work from home (less travel). 4) There will be more retail robots, tele-presence robots and robots at home – all with more investment, deployments and success stories. 5) There will be a resurgence in community approaches to local jobs in service of community culture and development."

Fernando Barrio, a lecturer in business law at Queen Mary University of London expert in AI and human rights, wrote, "More than 20 years ago we all had a very optimistic and naive view of the evolution of technology in people's lives, so it was paramount to allow the technology to develop unhindered by regulatory intervention. The result is a vast and resilient network that allows us to do even more things than we envisioned. But it also means a world where wealth is

more concentrated than ever, where science takes second place to charlatans and gossipers that cause serious damage to millions, where the political arena is hijacked by a combination of media and foreign interventions making a mockery of democracy, and the list of not very nice things is quite longer than the nice moments of the Arab Spring and #MeToo movements. And it seems that, yet again, we are planting the seeds for the new normal to be very nice in the surface, while creating a society more unequal, unfair and sharply divided about too many things that need social consensus. In 2025 the new normal will imply a society more sharply divided between those who have access and those who don't. In this context, access is multi-pronged: access to food, access to wealth, access to connectivity and technology, access to power.

"When one thinks about people's relationship with technology, one is thinking of the group of people that have access to it – unfettered access. If we restrict the view to that group, the new normal will be an enhanced form of what we are living today, where the economy, the education, the human relations and the politics are technologically mediated. Before the COVID-19 crisis, there was already a push by certain sectors of the media-IT corporations to normalize the use of certain technologies where the possibility of individuals' control is purely theoretical. That push was supported in part by elite universities, academia, due to funding from those corporations or because the ideological shift had already taken place within them.

"Accordingly, it was possible to see all around the globe members of those groups advocating the change from text to voice, therefore encouraging voice-managed assistants in every room of people's homes, disregarding the immense possibilities of surveillance and absolute control over people's lives that those technologies introduce. Not focusing on the need to have better privacy agreements regardless of the countless examples of violations of agreements that discourage the use of the information for any purpose without individuals' control and consent.

"The COVID-19 crisis showed that the resilience of the vast global network over which different layers of protocols, software and applications run is being used to exalt the upper applications layer because it is the one that made possible the tele-everything that we are experiencing. Thus, in the new normal hyper-intrusive technology is taken for granted. Instead of embedding privacy, security and protection of individual rights in every layer that runs over the network, in the crisis the new normal is that those concepts are modified to allow technologies to intrude in people's lives (as they already do in certain nondemocratic countries). That paradigm shift will also blur the limits between people's personal, professional and public lives. For example, instances of cyber-sacking – in which one loses a job for comments or information posted online – will become more common, having an impact on the quality of the discussions and information put forward by individuals, and even private conversation held in private groups or within hearing of voice-managed assistants at home might be also processed at that effect."

Christine Boese, a consultant and independent scholar, wrote, "Thanks to the horrors of COVID-19, as we sit in our homes and take stock of our personal economic situations, make hard decisions, suddenly what is absolutely essential becomes clear. It is a reset, and – despite the horrors – it was long, long overdue. …

"It is in difficult times when we see the seams and frayed edges of our thin veneer of civilization, the illusions of the fractured U.S. health care system and even the severe limits to much-touted electronic medical records innovations. In times like this, we don't have to look so hard to separate technology hype from reality. We face failing infrastructure across the U.S. Other countries have systems that work, at all levels, while ours falters. Without this horrific stress test, we would not be able to *see,* let alone correct for, these fault lines. That thin veneer of civilization balances precariously on a consumption engine, and American culture is literally consuming itself, even as Rush Limbaugh suggests we need to adapt to this self-consumption 'like the Donner Party did.' As with most absurdities, it comes with its own irony: Like the Roman Empire, we make little ourselves and instead consume the cheaply produced, slavery-inducing trifles created elsewhere, as if it fills some kind of deep emptiness inside. The extremis of the COVID-19 situation glaringly exposes several things that had previously been invisible:

- The actual power of mass media, even as channels multiply and become diffuse. One channel, Fox News, has created an entire class of people who are actively putting themselves at risk of death or lifelong health problems. As someone with relatives who have fallen prey to this external programming, I can attest that *no rhetoric,* no persuasion, no methods currently known to me can penetrate this closed belief set. What we are living in right now makes Leni Riefenstahl look like a mere piker.
- The manipulative panoptic power of interactive social media in the hands of malevolent agents. When I began to do internet research in the 1990s, I speculated that the active and interactive power of user-directed and navigated media would lead to a more aware and awake populace, even if not fully democratized. What I did not anticipate (and I am currently studying now) is the power of dark UX patterns driven by algorithmic assumptions, whether accurate or not, and, very soon, a real Pandora's box of AI-driven machine learning.
- How dangerously hollowed out the U.S. infrastructure is, from endemic underfunding of systems and anything that requires attention to detail below the surface to business-school 'top-line' summaries of a management layer that flies above anything that takes more than five minutes to scan. Newspapers and universities were hollowed out first, the agents that created and fostered critical thinkers. The gutting of public education was the third leg of that stool. Remove anything that might question the status quo, that engages in detailed work (even engineering!) or requires long-term planning. Boeing itself fell prey to something that, from the outside, looks like the Agile-ification of *all* work, which must, despite protestations by the

manifesto's philosophy, degenerate into surface-level patch work and the delivery of marginal improvements called 'features.'

- Lastly, how deeply distorted the cultural fabric of American life has become, when, upon being forced to actually *live* in our homes for extended months on end rather than merely using them as places to sleep and consume things because our primary away-from-home activity was *work,* we discovered how much our homes lacked in all those 'things' we own that actually enrich our lives. As livelihoods were put perilously at risk, many of us came to realize what we were being expected to die for and discovered that that was as hollowed out as everything else, driven by a churn to consume as a red herring to keep us from noticing how thin our lives were becoming, even as we all, as a society at large, have consumed ourselves into larger and larger sizes."

Craig Silliman, an executive vice president for a major global company, wrote, "While COVID-19 has forced us to distance physically, it has brought individuals closer together. Many of us have spent years in countless meetings and meals and on airplanes with colleagues and yet never learned as much about them as we have in the past four months. When we lost our physical proximity, we created emotional bridges that connected us in new and profound ways. It turns out that it took forced distancing to bring out our most complete and authentic humanity. I believe that once we are together again physically, we will not forget what we learned while we were apart, and that will make for richer and deeper relationships for years to come.

"On the technology front, most of the technologies that we are using daily are not new. What has changed is not the capability but our behavior. I have talked to numerous colleagues who have observed that they never again will board a six-hour flight for a two-hour meeting. We previously might have thought that this was highly inefficient but didn't feel we had 'permission' to suggest video conferencing because we weren't sure how a boss/client/customer might react. Because this was a simultaneous discontinuity in work patterns globally, it will have caused us all to change our work habits, particularly involving the use of technology to be more efficient. We will be working in very (positively) different ways in 2025 as a result of COVID-19. We previously have thought about the office as a place where one must go to 'be at work' or to 'do work,' even if the office environment wasn't the most effective location for a particular task. We will increasingly think about a spectrum of locations where work can be done, and a spectrum of technologies that are a platform for work to be done, and start by asking what the task is that we seek to accomplish and then using the appropriate location and technology to best accomplish that task. That will allow us to design office spaces to serve as platforms for what shared, collaborative spaces do best while liberating workers to find the mode and place of working that makes them most effective."

Abigail De Kosnik, associate professor and director of the Center for New Media at the University of California, Berkeley, predicted, "Climate change, invasive corporatized technologies

and increasing economic precarity will all combine to give rise to a far more paranoid society in 2025 than we had at the start of 2020. In some ways, widespread fear and anxiety will have positive results, as people will be more environmentally conscious than ever before and will engage *en masse* in efforts to regulate corporate resource extraction and pollution, and will show a collective willingness to adopt less environmentally harmful lifestyles (for example, I expect a huge upsurge in mass transit use and a corresponding movement to improve the quality of mass transit in cities across the U.S.). However, the paranoia will be justified – there will be fewer opportunities for college graduates who do not have family connections, and climate change will make large regions uninhabitable. This will lead to huge problems in mental health and will negatively impact at least a couple of generations of Americans in terms of their relationships, sense of self and lifetime- happiness quotient.

"I am especially worried about the fact that technology companies are overall having a hugely negative effect on the environment and on humans' ways of thinking about and understanding the world … and they don't seem to care much about spreading misinformation and training hundreds of millions of people all over the world to think *less* critically about information are my biggest concerns. The tech industry will likely continue to produce technologies that either do nothing to improve everyday life or make it significantly worse. What can happen to improve technology is better organization on the part of users and tech workers who object to their companies' negative social impact.

"I have hope that we will see a wave of activism and unionization and the formation of alternate types of organizations (B Corps or P Corps for example) that will yield new technologies whose aim will not be profit but actual problem solving – mobilizing collective intelligence to solve the problems of environmental disaster, massive social inequity and lack of opportunity that we will face in 2025."

Adam Clayton Powell III, senior fellow at the USC Annenberg Center on Communication Leadership and Policy, predicted, "The 2025 'new normal' will be better, often much better, for the affluent and for other global elites. They have now and will continue to have access to and can afford the best technologies to serve them in their personal and professional lives. But 2020 has been such a setback for the hundreds of millions of people, most in Asia and Africa, who have just emerged from poverty and whose progress has now been reversed that it is difficult to imagine these reversals can be entirely cured by 2025. In the U.S. we had record employment – some said 'full' employment – as recently as February of this year. While one can hope that the sudden plunge to Depression-level unemployment can be temporary, there are so many changes – especially in any industry relying on people crowding together (transportation, entertainment) – that the shift to video communication and streaming home entertainment suggests these coping mechanisms for 2020 will not entirely recede.

"Many have said that the virus pandemic has accelerated changes in uses of digital technologies that were already underway. There does not seem to be any reason to believe we will return to 2019. For a start, why would I ever want to commute to an office again? For decades, we have said that the internet brings to our fingertips the riches of the world's libraries. Now people around the world – people who are connected, that is – realize they have the riches of the world's information and entertainment video and experiential technologies at their fingertips. This will not go away. Consider history: The Metropolitan Opera is streaming opera productions every day. It was during the Depression that the Met started transmitting its productions on radio. The Depression ended but the Met's radio broadcasts didn't."

Susan Etlinger, an industry analyst for Altimeter Group, observed, "Technology is ultimately about power – about who frames a problem, what 'solving' it looks like, who benefits, who is overlooked. So, if anything would make post-pandemic life better, it would be a willingness to, as John Lewis has said, 'get in good trouble.' My main concern is that the large technology companies have far too much power to frame what we know and how we live, and that, ultimately, we are all assets to be leveraged for shareholder value. Technology should be a tool – not a weapon, a religion or a government. The biggest issue for technology is essentially a choice: Do we commit to building models that describe and classify people and the world without excluding, discriminating and amplifying inequality?

"In a year in which we mourn the deaths of George Floyd, Tony McDade, Breonna Taylor and too many others and again confront our long history of systemic racism can we finally acknowledge that technology has been deeply complicit? More to the point, can we stop hiding behind the fig leaf that data and technology are a) neutral and b) always the answer? Yes, people are messy, yes this is hard. But we need to stop hiding behind excuses. This isn't to say we should toss our phones and flee to the hills. But we do have to ask the hard questions and make the harder choices about how we solve problems, and whether, in solving one set of problems, we're creating others that are more insidious and longer-lasting.

"Will we, in the interest of public health and safety, increasingly surveil our employees, guests, customers, neighbors? Will we address the inevitable issues of discrimination and exclusion of vulnerable and marginalized populations? Do these technology solutions actually work, and are there other, less invasive ways to keep people safe? Did we leave anyone behind? I hope we can use this moment in our history as an opportunity to reflect on the choices we've made and what, finally, we value. If we say Black Lives Matter, are we willing to speak up in meetings where design decisions have the potential to put Black lives at risk? Are we willing to challenge cultural norms to ensure that we have representation from the people who are most affected by the decisions we make and whose talent we have overlooked? Are we willing to sit down so someone else can speak, and amplify their voices?"

Paul Jones, professor emeritus of information science at the University of North Carolina, Chapel Hill, predicted, "Let's look at changes that were underway and that will likely prevail by 2025:

- *Cashless payments:* No stopping them. COVID-19-era purchasing, whether retail or curbside pickup, is making cashless the norm. In the U.S. this was already apace. In China, cashless is already a done deal. Every phone, every new card, every over-the-phone purchase is cashless and checkless. Goodbye money, coins, etc. Too late for Harriet Tubman to replace Andrew Jackson on the $20 bill, except in the area – much needed – of symbolism in the U.S.
- *Officeless organizations:* They will proliferate. The organization of work within a physical location is, for the most part, done. At home, everyone has their own corner office with a view. Every day is Bring Your Pet to Work Day. Every day is – from the waist down anyway – Casual Friday. The toll paid to commute is fully recognized and rejected. All of this was underway but now the issues are resolved and normalized.
- *Distributed access to education:* This is much more complex that virtual offices or virtual organizations. Despite various rhetorical stances that education is actually job training or something of the sort, countries who provide actual education always take the lead in innovation and tech. That said, we have quickly gotten much better in the U.S. at pushing the limits of our skills to both educate and train, learning what we knew in the physical classroom that, as Marshall McLuhan quipped, 'Anyone who tries to make a distinction between education and entertainment doesn't know the first thing about either.' A straightforward, traditional online lecture has limited educational utility. The reimagining of the classroom for digital life is still underway, but we can expect both the practice and expectations of learning to be changed radically by tech. Mentorship, whether in the classroom, laboratory, or at work, is indispensable. Tools for collaboration will be extended and embraced. Slack, Zoom, GitHub, Google Drive and cousins are already firmly in place and will be improved upon. If tech and policy align correctly, this will make our lives better.
- *Transportation:* Post-COVID-19 we will have seen this shift accelerated, but in which direction? In the near term, public transport (trains, buses, etc.), mass transport (air, cruises, ferries, etc.) and shared ride services including taxis are stagnated. Personal transport is also underused. We are realizing we need not drive, fly or float as much as we have been doing before. We may yearn to travel but not for work. The lack of traditional benefits for ride-share drivers will have to be better addressed – by their own organizing or by government advocacy and regulation. Transportation ownership by people under 35 was already on the decline – except for skateboards. Fewer people will own cars in the U.S. – this will have accelerated by 2025. Business air travel will have also decreased and perhaps become novel.
- *Food:* During COVID-19, people have learned to cook again and to enjoy doing so. We have turned in a few months from a nation of restaurant-goers to a nation of pickup and home cooking. Tech will continue to assist this trend which should continue through 2025. Instapot

is only the first shot fired. Plant-based eating will continue to trend. Americans having gained weight during lockdown are looking in the mirror and thinking of carrots and salads. Our taste for vegetables has returned as quickly as our reluctance to eat as much meat. Thank you, Instagram, for making meal presentation, even of home cooking, into a visual art.

- *Tech itself:* Training in tech has had the attitude that tech is at worst neutral, that people will do with tech what they will (absolving tech from any responsibility), that 'we just create this stuff then people used it or don't.' This concept of socially agnostic engineering was already under challenge but computer science departments in particular are slow at letting go. Father John Culkin said, 'We become what we behold. We shape our tools and then our tools shape us.' This is often incorrectly attributed to Marshal McLuhan. Techno-social scholars have been on the forefront of this concept, looking closely through qualitative and quantitative means at the tech landscape. This has led to overdue attention to diversity issues within tech and to inquiries into social limits as well as tech limits. I expect these inquiries to become much more important than, say, increasing the number of pixels rendered or megaflops produced. We used to teach people how to use tech, now we teach tech how to use people. Not just in information architecture, but in design, the tech business has learned that the lower the barriers to use, the more people will use a product and use it more often and be more engaged. We will see more engagement from sociology, psychology and other disciplines in what we now know as tech. Information science will be more significant than computer science or a disengaged data science."

Jeanne Dietsch, New Hampshire senator and former CEO of MobileRobots Inc., said, "Disruption is always difficult. Until we task AI with the complex logistics needed to optimize the use of resources and the smart automation needed to perform low-skilled jobs, many workers will be overtaxed: teachers, bus drivers, health professionals, mental health professionals, caregivers, administrators, just to name a few. We face a vast amount of work that has been ignored over the past decades full of short-sighted decisions. We have failed to maintain our infrastructure, but more importantly, we have failed to care for the future of the next generation. To turn that work into jobs requires determination and the ability to stand up for our values, stand up against a system that rewards corporations seeking short-term profit over any other goal. Carbon fee and dividend is the first step toward shifting the structure of our economy toward a more egalitarian one, with better values. The use of AI to optimize the logistics of resource use could dramatically improve our nutrition, education, health and even our social interactions. The addition of sensor feedback into automation of all types, from traffic handling to regulatory regimes, could greatly improve the functionality of our systems. What concerns me most is technology's ability to enable people to magnify ignorance and misinformation."

Alexa Raad, co-founder and co-host of the TechSequences podcast and former chief operating officer at Farsight Security, commented, "The pandemic has already highlighted and exacerbated

the gap between the haves and the have-nots, not only in terms of the cost of lives lost but also in terms of economic disparity. The policies of the current administration have accelerated that divide. … The pandemic also put a spotlight on broken systems and processes such as health care that require a significant effort and will to fix. …

"The pandemic highlighted the importance of internet connectivity. Many companies in the tech and service industries will realize that a work-at-home model is efficient and less costly for some or many of their workforce and that they do not need expensive commercial urban real estate. Therefore, more people will work from home, which affects everything from daily routines to the makeup of services offered to the home. However, this is a luxury for only a set of individuals who can work from home and can afford the set up (high-speed access, required space and internet-enabled equipment) to work from home. This of course sets a new and quite complex normal for managing cybersecurity threats. Large-scale industry events will be less prevalent, as will the frequency of corporate travel. All of these will have rippling affects across multiple industries like airlines, hospitality and event/exhibit management. Overall, there will be less economic security. One of the legacies of the pandemic is the realization that although many conveniences of modern life are predicated on the simple assumption that close proximity of people yields economic and social benefits, in an age of accelerating climate change and multiple pandemics (COVID-19 is likely a precursor of others yet to come) that will no longer hold true. Conveniences such as airplane travel, movies, amphitheater, subways, high-rise apartment units, shopping malls, were based on this assumption and as a result densely packed areas were sustained hotspots of infection. … Technologies to identify and manage the spread of infections will be intrusive in terms of privacy (example – contact-tracing apps) unless very thoughtful governance of data privacy is implemented. …

"The new normal will put a greater strain on our health care system. The pandemic highlighted how unprepared we as a nation are, not only in terms of our acceptance of scientific and evidence-based advice, but also in regard to having the means to efficiently and economically deal with a public health crisis. A beneficial tech-related change will be the delivery of some aspects of health care into the home. For example, people will continue to have online consultations with health professionals instead of an inconvenient in-person visit. This is already happening and will be the new normal.

"Internet of Things-based devices will be more plentiful and will serve as a means to monitor everyday health and diagnose and in some cases remotely manage illnesses without the need for intrusive surgery. However, they will also pose a much greater threat in terms of privacy and cybersecurity. More and more private data will be generated, collected and used. Unless there are appropriate safeguards and controls as to how the data is handled, we will see an erosion of our privacy and further loss of control over our choices and decisions as a result. Internet of Things

devices have the potential to greatly improve our well-being, and we will see AI-enabled IoT devices which will, for example, monitor our health, provide biological feedback, anticipate and warm of an impending health crisis, etc. But IoT devices increase the attack surface and vectors for bad actors. We will see rise of new cybersecurity threats. Imagine, for example, a nation-state targeting a public figure by hacking into his/her pacemaker. Given where we are now in terms of lacking a basic level of cyber hygiene for these devices, unless we make significant progress we will fall further and further behind the bad actors.

"A few of my concerns:

- The consolidation of services and power into very few largely unregulated companies worries me a great deal. If this trend continues, we will be beholden to very few companies for the many services our lives rely on. These companies will become 'too big to fail.' In the financial crisis of 2008, the government bailed out financial institutions who were deemed too big to fail, even though the actions of those same institutions were directly and indirectly responsible for the crisis. Many organizations use Amazon's AWS cloud services for their web presence and mission-critical applications. Concentrated dependency has never been a harbinger of benefits.
- I also worry about the lack of proper governance for potential threats posed by AI. And by 'threats' I mean in regard to security (AI can also be used by our adversaries), economic impact (the loss of blue collar jobs without provisions for retraining or alternative employment will only increase the economic gap) loss of privacy, loss of agency, etc. Although the promise of the best of AI is probably likely to come to fruition beyond 2025, we need to be thinking of proper governance and risk mitigation now, and we are behind.
- I worry about the societal cost of social media. Social media platforms have become the breeding ground for disinformation campaigns, conspiracy theories, extremist groups, online bullying, anti-vaxxers and bots that manipulate opinions and sow division and discord. … When journalism and legitimate news media struggle to compete, we lose one of the fundamental bulwarks of democracy – a free press. And then there is the lack of proper guardrails and defined consequences for social media companies' use of our personal data (example – Cambridge Analytica). Lastly, social media effects tap into the brain's reward system and the release of the neurotransmitter dopamine. It is addictive, and its premise is that of addictive entertainment and not critical thinking. When critical thinking is eroded, so is trust in science – and we collectively pay the price."

Maja Vujovic, a consultant for digital and ICT at Compass Communications, predicted, "If entire sectors – education, tourism and hospitality, food production, entertainment and more – continue to experience the deep freeze caused by COVID-19 through 2020 and beyond, the 'new normal' will likely not remain limited to benign disruptions, such as blended learning or continued work from home and the related office space redux. If the pandemic persists for many months or spills

over into another year, the recession will go into free fall. Countries with strong social security systems and/or capital will activate a range of protective measures to prevent public disorder. Countries without such a safety net will be forced to choose between solidarity and oppression.

"If the pandemic persists longer than a year, it will affect the world's economy like a global war; in that case, food rationing and other wartime measures will become inevitable. This will entail identification, allocation, distribution and delivery – all of it enabled by a range of digital tech. Identity control will therefore have to be enforced very strictly, to avoid fraud. Other previously inconceivable disruptions will occur, e.g., primary and secondary education will need to enter into public-private partnerships with commercial providers of automated instruction, learning and testing platforms at scale, able to instruct the majority of students, while teachers from formal schools deal with small numbers of exceptions, such as special-needs students etc.

"Higher education will become a terrain where a small number of entertainment-savvy lecturers attract huge student audiences via tech-enabled remote learning, while professors unskilled in it become dispensable. A 'marketplace' will emerge, where students will be able to pick and choose courses from any university, to create unique, personalized schooling 'menus.' This will create a demand for a certification mechanism at a level above individual universities. Distinguished schools with vast traditions will thus have to reconsider and redefine their missions and their very purpose and a number of them may not prove sustainable. Overwhelmed health systems will become the reserve of emergency and infection treatments. Workplaces will become leaner and nimbler. Specialized teams will work on project-based assignments, often without the need for a large enterprise to sustain them. Taxation and labour laws will need to change, to enable individuals to participate in a more secure, more equitable digitally enabled gig economy."

Jon Lebkowsky, CEO, founder and digital strategist at Polycot Associates, wrote, "My hopes:

- Technical innovations to address and mitigate anthropogenic climate change. Not just clean energies, but also technologies to balance CO2 in the air. Regarding clean energy, innovative battery technologies for energy storage.
- (related) Smarter and lighter transportation technologies, including proliferation of high-speed rail systems and smarter last mile travel, diminishing the number of individual automobiles and the use of fossil fuels.
- Improved space technology and potential colonization of the moon and Mars.
- Innovative methods for managing disease, including ways to combat viruses through genetic modifications and nanotech.
- Development of small, safer nuclear reactors as new sources for energy.
- Ongoing development of new food sources and evolution away from meat consumption as we can derive complete proteins from lab-developed sources.

- And I am most worried about technology-mediated indoctrination through propaganda and 'managed alternate truths.' And I am also concerned about the potential for the increasing and evolving use of AI-driven surveillance technologies."

Mary Chayko, author of "Superconnected," said, "In the absence of a national commitment and strategy to assist marginalized populations in attaining online access, skills and literacy, social inequalities will persist and deepen in the 'new normal.' This will exacerbate all current societal problems: racial and gender discrimination, poverty, health crises and complications, educational and work-related inequities, privacy and surveillance. Digital technologies can be employed to help to improve these conditions, but unless their benefits can be realized by all, social justice and equality will remain elusive. Digital technology, and the means to use and understand it, must be considered a primary social good. Technologies that will assist people in living productive, healthy lives – like online learning, working and telemedicine tools – should be freely and widely available, along with necessary and relevant information and support. I am most worried that the scope of tech companies' impact on our lives will become so deep, sophisticated and far-reaching that we will fail to see and resist it or grow weary of doing so."

Jeff Jarvis, director of the Tow-Knight Center and professor of journalism innovation at City University of New York, commented, "Yes, there may be unintended positive consequences, including greater awareness of racial inequities in society; less travel and thus less environmental damage; greater ability to work at home and remotely and be closer to family. But we cannot gloss over the still-unknown health repercussions that millions of needlessly infected people will have to deal with; the severe economic impact on so many sectors of a service economy permanently affecting the employment of people in lower-paid jobs; the likely permanent economic damage to universities and colleges as institutions; the lost educational time for children during the pandemic; and mental stress on everyone. As much we may now suffer Zoom fatigue, I believe that in the long run, having become accustomed to seeing people in online calls, we will find they provide richer interaction. At work we will still be addicted to having too many damned meetings but if we can waste less time traveling or commuting to them, all the better. Social media enabled us to connect with people anywhere in glancing ways; video conferencing in many forms – virtual conferences, happy hours and so on – will let us connect in more direct and meaningful ways. I would like to think that we would see the value in gathering and sharing health data at a level that would allow us to spot and treat problems early in their spread in the future, but I fear a growing moral panic around data may prevent that."

Jillian York, director of international freedom of expression for the Electronic Frontier Foundation, wrote, "I expect that, when it comes to technology, our 'new normal' will be an even greater dependency on privately owned infrastructure and platforms, making us more beholden to Silicon Valley than before. I worry that the amount of time that we're now spending at home has

led us to this greater reliance on it, and that companies are not adapting along with us. When it comes to platforms, specifically, one of my biggest concerns is the impact they have on our speech and our well-being or dignity. On the one hand, hate speech is rampant and companies are responding piecemeal. On the other hand, at a time when many of us need platforms for our livelihoods, companies are cracking down prudishly on nudity, sexuality and the human body. The impact that this has on sex workers, burlesque performers and others whose work touches on these themes must not be ignored; by banning content around these topics without their consultation, we've essentially created an untouchable class of workers.

"I worry about the unaccountability of Silicon Valley and the ways in which corporate policymakers practice 'both-sidesism' in order to craft policies that benefit the lowest common denominator without upsetting too many others. I worry about the fact that so many people are willing to hand over the governance of their speech to unaccountable actors. I worry about the potential for technology companies to keep our own history from us – already we've seen images from U.S. protests taken down (often for violating rules on 'graphic violence' – even when it's the Feds committing the violence – or in some cases, bans on nudity), echoing what Syrians have been pointing out for years about the erasure of videos, many of which contain documentation of war crimes, emerging from their country. I worry about the continued capture of data for no purpose other than to sell us more stuff we don't need."

Morgan G. Ames, associate director of the University of California, Berkeley's Center for Science, Technology & Society, responded, "While I am heartened by the #BlackLivesMatter protest movement in the United States as well as protest movements in Hong Kong and elsewhere around the world, I look to previous disasters and broader trends as a probable guide to what will be coming. And what I see are too many opportunities for the powerful to retrench and expand their power. Ubiquitous surveillance, increasingly fascist policing tactics, the expansion of hate groups that amplify the worst state ideologies, and the widening chasm between the ultra-rich and everyone else are all global structural trends that will be incredibly difficult, and incredibly disruptive, to reverse. As much as I would like to hold out hope that the disruptions caused by the novel coronavirus can be turned toward social justice, the evidence so far that this is the case is really not good."

Vint Cerf, Internet Hall of Fame member and vice president at Google, observed, "We may see more flexibility in work-from-home provisions. Travel may be less necessary thanks to video conferencing. I have maintained significant international interactions despite time zone challenges for the past three months. I further expect:

- Cloud computing and cloud commuting!

- We will see an Internet of Medical Things (sensors mostly), as remote doctor house calls escalate. There is an interesting tension involved in digitally linking a lot of one's online life: calendar, messaging, travel, geo-tracking/location – all this information can be usefully correlated to make life easier but, if exposed, also erodes (destroys?) privacy. The more we rely on online resources, the more tempting it is to interlink information to take automatic and useful actions.
- Reminders and notifications, etc. For example, I am on email a lot of my time, and getting an email saying a FedEx package has arrived is actually very helpful. Of course, if there are too many 'messaging' applications all running at once they 'self-pollute' as in getting an email because you have a LinkedIn message (Aaaaargh!).
- I am optimistic about the use of information technology to automate chores and to facilitate cooperative work. Shared access to Google Docs has been a remarkably enabling capability – shared spreadsheets for tracking group activity for example. Still, there is the exposure of personal information, lax security leading to serious compromises, poor user attention to security. Reliance on autonomous software leading to unexpected failures and consequences."

Christina J. Colclough, an expert on the future of work and the politics of technology and ethics in AI, observed, "Unless our governments step into another gear, we will:

- Become super-surveilled at the expense of our fundamental rights and human rights.
- Work will become more and more individualised and precarious as companies first cut costs by making working from home the norm and then by hiring contract workers rather than permanent employees.
- Mental health will suffer as loneliness, financial struggles and competitive forces pressure individuals.
- Innovation will decline as social capital declines due to the above.
- Workers who need to go to work (physically) will be segmented from the 'others.' I am tech optimist under the condition that it is regulated and governed.

"I would like the following to be regulated:

- Improved workers' data rights. These are either weak in current regulation, or nonexistent.
- Collective data rights. All data regulations (bar some discussions currently held within Indian Parliament) are concerned with an individual's rights. We need to think of communities, of workers, of citizens, of businesses and of the relationship between state, market and civil society and ask: How can we benefit from digital tech so it benefits people and planet?
- We must break up Big Tech. Its power is unfathomable and comes even at the expense of democracy and governments' scope to regulate.

- Public procurement must include a demand that all data generated and produced is shared between public and private actors.
- We must globally enforce the principle of data minimisation and, preferably, data emphermality.
- We need to talk redistribution again and close tax havens. Probably tax revenue and not profit.
- We need vastly improved rights over data inferences.

"Among my worries are these:

- That we lose the right to be human, in as such that who you are, what you want, your dreams, desires and aspirations become subordinate to algorithms and algorithmically defined choices on your behalf.
- That we are monitored and surveilled at home, in the public space and at work without the means and power to resist.
- That democracy will suffer, as the public sector is fundamentally dependent on data from tech companies and all that that entails of desired versions of 'reality.'"

Alan D. Mutter, a consultant and former Silicon Valley CEO, wrote, "We are not going to code our way out of the moral and political mess we are in. Technology will help if the right people do the right things. It will do epic damage if they don't. The social media were hijacked by thugs and trolls to do incalculable damage. Their efforts were at once ignored and abetted by Facebook CEO Mark Zuckerberg and his ilk to amp up page views to boost ad revenues. Social media had great promise to level the intellectual playing field by giving everyone the power to give or get whatever information they wanted. Instead, the social media have become treacherous cesspools of mis- and mal-information. Artificial intelligence can do wondrous things so long as it is properly trained and deployed. That is its notable fail. For instance, AI often fails to accurately recognize the faces of people of color. When AI is used to recommend sentences for criminals, it tends to discriminate against people of color. The failures of social media and AI are not technology problems. They are problems of human design and execution. Technology is only as good as the people who devise and control it. I am less interested in potential technology advances; I am worried about whether new developments will be wisely and safely deployed."

Kathleen M. Carley, director of the Center for Computational Analysis of Social and Organizational Systems at Carnegie Mellon University, commented, "More people will be able to work remotely, allowing companies access to greater pools of talent, and a possible leveling of pay across cities. There will be an increased understanding of viruses and how to create vaccines and improved technology to support health care. There will be regulation of and self-imposed constraints on social media platforms.

"There will also be: increased public understanding of the limits of, and problems with, machine learning; police-hiring reform; an international response to disinformation; improved technologies for group meetings online; new agile business models for technologies that mainly employ the web; improved health standards in schools and public places; improved sick leave policies; a decrease in business travel, possibly leading to a better carbon footprint; less middle management. There will be a small increase in automation, but more effort on designing and building even more automation for the home and small businesses that will become more ubiquitous and some type of certification for AI to show that it meets some ethical standards. There will be certification for online tools to show that they meet some privacy standard.

- Expect to see: increased access to the internet; more stores that operate only for pickup and returns; more mail-in voting, and experiments with online voting; increased provision of medical advice and appointments online; increased online services for legal issues.
- There will be: more jobs requiring more computer skills, or skills with online web tools; improved search routines; new parental control panels for online-group-meeting technologies; new toys that support interaction through the internet for very young children and grad school 'children'; an increase in self-paced online master's programs for those working remotely.
- There are some things that are likely to reduce the quality of life: a decrease in the variety of items carried by grocery stores and, indeed, all stores; a decrease in gourmet food items, specialty tools, and high-end fashion or a major increase in their cost; favorite restaurants will have closed; food prices will increase.
- There will be an emergence of an overwhelming number of stories, movies, songs dealing with the pandemic.
- In many countries, there will be fewer women in the workforce, and fewer women in schools.
- There will be an initial increase in income disparity, which should eventually be reduced through an increase in service jobs and greater access to the internet.
- Scams, fraud and price gouging will rise due to new internet services, delivery services and online shopping services.

"Other things – it is not clear if they will be good or bad, but are possible:

- There will be a new baby boom entering preschool and kindergarten in 2025.
- Expect to see mandatory health screening in organizations.
- I hope we will increase the national debate and create a shared perception about what level of regulation is acceptable on what type of technology.
- That there will be recognition that disinformation is like pornography and it has to be treated similarly in legal terms. There will be improved transparency through online access, etc., of health processes, legal and government processes and assorted other processes.

- There will be certification programs for privacy-preserving software and for ethical software and there will be international treaties relating to information on social media.
- There will be more funding for research on robotics for home use, and a consequent transition to market, improved technologies for measuring and removing particulates from the air, improvements in our understanding of how viruses and bacteria impact the human body, and so increased speed in generating and testing vaccines. If the cost of computing does not go down, it will slow down the development of the Internet of Things, however, we should expect to see more smart technology in the home and workplace."

Sam S. Adams, a 24-year veteran of IBM now working as a senior research scientist in artificial intelligence for RTI International, wrote, "The confluence of the global pandemic and the U.S. presidential election cycle is likely to accelerate a large number of large-scale changes in multiple domains and industries. Given the caveats of no multiple concurrent pandemics and no revolution-scale social unrest, these changes will likely accelerate a number of positive transitions that will improve life in general.

- *Telework and resulting de-urbanization:* The forced telework situation due to the pandemic has opened many eyes to new possibilities. Living in the city to avoid nasty commutes gives way to moving to the country and buying land vs. a high-priced apartment. If commuting patterns change drastically, then lots of other dominoes fall, including pollution and its impacts.
- *Telehealth is here to stay:* No way customer management systems will return to requiring in-person visits for practitioners to get paid. This will accelerate other forms of telehealth, expand the physician assistant and nurse practitioner ranks, and allow doctors and specialists to telework as well, resulting [in] more optimal use of medical resources without reducing quality of care. I expect quality of care by 2025 to actually improve because of this transition.
- *Tele-justice:* The U.S. court system has been all but shut down during the pandemic. Some jails have released large numbers of lesser offenders to prevent pandemic blooms. This pandemic straw will break the judicial backlog's back, and a number of new approaches will take root. I predict this will also force legal reforms in how trials are conducted, which may even cause major changes in the legal profession.
- *Tele-education:* Forced virtual schooling (where most parents are also forced into part-time homeschooling as well) forces state public school systems to create virtual curricula, which is then available to non-local, non-physical attending students, including traditional homeschoolers. Competition for quality and the digital nature of the content transforms the education system into a hybrid physical-virtual system, where access and quality of content and instructors is better distributed. The MOOC revolution in college and professional training will accelerate into the primary/secondary grade levels, and commercial education content

providers will grow dramatically as parents of even public school children are able to augment their kids' education with high-quality commercial sources, cafeteria-style at low costs.
- *Communication networks:* In 2025, 5G deployment is widespread, driven by a national mandate to eliminate internet have-nots. Broadband access becomes a human right-level issue."

J. Scott Marcus, an economist, political scientist and engineer who works as a telecommunications consultant, predicted, "The impact of the pandemic is large, but the world will eventually recover (assuming that the virus does not mutate to a still-more-dangerous form). This was the case in 1919 and there is no reason to expect anything different here. Changes such as remote work, teleconferencing, telemedicine and remote learning are mostly positive. The changes that have emerged were technically feasible for years but held up by institutional rigidities.

"Things will not go back to where they were – not entirely, anyway. As a whole, I think most people will be worse off, not solely because of the pandemic, but at least as much due to intensifying trade wars, a decline in international cooperation and more. The impact of climate change will still not be catastrophic, but it will continue to grow. I hope for the acceleration of trends toward remote work for jobs in the upper-income quartile or two. The greatly increased use of teleconferencing, with a corresponding decline in travel; tourism will take a long time to return to previous levels, if ever. Increased reliance on telemedicine. A major retooling of the education and training systems was needed anyway, not only to shift to remote learning (which is not simply the same as current practice done from afar), but also to lifelong learning.

"My worries are information bubbles, fake news and their negative impact on traditional (more reliable) news media and public broadcasting. I worry about the growing dominance of a small number of platforms. My worry for AI and big data is challenges with explainability."

Glenn Edens, professor at Thunderbird School of Global Management, Arizona State University, previously a vice president at PARC, observed, "There is a good chance by 2025 society will have forgotten all about the current crisis. A key question is, how soon do we find a viable vaccine and how long does it take to put that into production, and when does it become part of the annual flu-season vaccine? If for some reason a vaccine and treatment continue to be elusive, then all bets are off for recovery by 2025.

"The economic fallout from the current crisis will likely take a decade to 'fix' – we should be prepared for five to seven years of lower growth prospects, higher taxes, continued failures of firms and an uneven recovery. It is reasonable to expect that some industries will find it harder to return to 'pre-COVID-19' status quo. Some will not recover – for example, e-commerce, on-demand delivery and working from home are not retreating. Many firms are realizing they don't

need huge commercial real estate or physical infrastructure – I'd predict a significant restructuring of commercial real estate. The displacement of brick-and-mortar retail by e-commerce, which has been steady and slow, has been kicked into high gear – how will the convenience of e-commerce versus the experience of physical retail unfold? My bet is that many brands and chains will not survive and the very nature of a 'shopping mall' will have to change dramatically – these facilities will survive, as will site-specific retail experiences. Consumption = convenience, so I'd suggest e-commerce is likely to jump to account for 50% or more of all retail sales and it will continue to grow.

"The conflict of the individual versus the good for the commons has been vividly brought to the forefront, and so far the results are not looking so good for the commons. While working from home (or remotely under different scenarios) is not perfect or anywhere near as good as it could be, it is here to stay. Many firms are discovering it is very cost-effective. The jury is still out on the true impact of productivity gains or losses due to working from home. Many of the firms I've talked to are seriously thinking about incorporating working from home as a long-term part of their human resources and commercial real estate strategy. This will continue to provide funding for more innovations in the communications technology sector – we are already seeing improved security and some small advances in user interface and user-experience improvements (we may finally get real spatialized audio).

"There is a dark side of these tools, which is not well understood yet – many managers I've spoken to are intrigued with (giddy about?) the increased tools for monitoring employees, their work output, productivity, work styles and intricate details of their behavior – this will be exploited and may lead to unintended consequences. At the same time, it is interesting that the 'internet' didn't collapse – it held up pretty well, and it is pretty clear that investing in high-speed internet access is going to continue to set geographic areas apart economically. We seem to also be getting more serious about security. Longer-term it is clear, of course, that society will continue to increase its dependence on digitally intermediated systems for every facet of life: health care, education, shopping, groceries, entertainment, transportation, work and finance – that trend is unstoppable. At the same time, we are a social species and we crave social interaction – risks will not sway us. :)"

Gregory Shannon, chief scientist at the CERT division of Carnegie Mellon University's Software Engineering Institute observed, "I see willingness to trust and flexibility in trust as a key element of the 'new normal.' Previous trust modes/models/habits/norms will evolve, and those most successful in the new normal will have adapted/optimized their approaches on trust. Those who don't adapt/evolve their approach to trust will be hampered, inefficient and even isolated in the new normal.

"The new normal will continue and accelerate the move towards digital spaces, which, without in-person interaction, are abstract and hard for many to grasp. I find it interesting that many modern efficiencies are based on getting many people physically close together. Transportation, sports events, restaurants, education, work teams, hospitals, city parks, gyms, places of worship, Fifth Avenue, etc. Who and where do we each trust to get close to others? Can we get 'close' in a meaningful way via technology? It's not clear to me how.

"Will we see an exodus from cities as density becomes more of a bug than a feature? How will we meet new people? Will it be much more localized, like to our neighborhood? I expect a real increase in social isolation, especially for those older, or less tech savvy, or with few resources to connect virtually. I expect smart virtual avatars/agents will make and manage connections. They can suggest/negotiate introductions to new colleagues with relevant yet diverse perspectives. The agents could also warn/caution when new colleagues seem insincere, untrustworthy or even artificial.

"I expect we'll see much better virtual collaboration technologies. From wikis and such to continuous virtual conferencing. I worry about the availability of accessible, stable and secure bandwidth. The current 'best effort' residential connectivity plans are failing. There are too many dropped calls, glitchy video, audio drops (every other word) and a lack of scalability for group discussions. Privacy is also certainly an issue. If these are not addressed well it will increase social isolation."

Chris Arkenberg, research manager at Deloitte's Center for Technology, Media and Telecommunications, predicted, "While a five-year horizon will see some classes of society claiming benefits from the COVID-19 discontinuity such as more remote-working arrangements, fewer commutes, better habits in many high-traffic institutions, etc., many will still be under the economic downturn. Many jobs are simply disappearing under the twin engines of small-business destruction and enterprise-scale automation. More job providers are already seeking the security of automation to hedge against the next crisis. Eventually COVID-19 will also likely accelerate the deconstructing of an aging capitalism that fails to allocate resources to teachers, workers, 'essential services' and many other economic sectors that have been undervalued while favoring rent-seekers and financial vaporware that adds no real value to society. This will take 10 years at least.

"At the same time, global political leaders who recently rode a far-right, nationalistic wave of anti-immigration will see more election cycles by 2025. With such strong economic challenges, it is unclear if nationalism will retain its influence or if there will be a mandate for a more technocratic and educated leadership. One might hope for the latter, given the [Trump] administration's failure to manage COVID-19. In short, a five-year horizon will likely still feel

disrupted and degraded for most, while a 10-year horizon may see some of the sea changes underway that were only amplified by COVID-19 start to yield meaningful results.

"The reality is that global, national and state institutions are being reconceived under the impact of globalization, the internet, global warming and, now, global pandemic. There will be a rocky transition to the next stable state."

Kenneth Cukier, senior editor at The Economist and co-author of "Big Data," said, "I see this for 2025: Economic crises, less global trade and constant international political conflict. Companies substituting technology (machines and algorithms) for human labor. A rise in populist or 'infotainment' governments means serious, long-term problems aren't addressed by the state, and well-meaning civil institutions can't have the impact they'd like.

"The educated, wealthy, moderates (aka 'elites') retreat even further from mainstream society, believing the situation unfixable and to avoid being a target of attack. Worthy social-justice issues like racism get hijacked by extremists, creating a 'cultural revolution' of intolerance that crimps free expression and ideas.

"New technologies will greatly improve the quality of life, such as AI in health care. We will be able to scale up productivity to new heights by applying software and data to all areas of economic activity. Tech will also be on the front lines of responding to climate change. But tech will continue to foment huge problems like misinformation and social platforms that drive people apart. It will create new problems, such as dominating the business landscape by dint of size and scale that offline players can't compete against. And in tech will be the vital ingredient of a new class of weaponry without safeguards to control it well."

Stephen Downes, senior research officer for digital technologies with the National Research Council of Canada, commented, "The net result of the pandemic will be an increased recognition of the role of governance and civil society, seen in an increased interest in social and economic support, including, for example, the need for public health care and for income support. It will also be seen in greater social and civic responsibility, including new controls on policing and greater access to services for minorities and underserved populations. And it will be seen in a wider recognition of social responsibility, for example a return to more progressive taxation, especially corporate taxation, as a response to income inequality.

"The most significant change could be summarized with the slogan 'protocol, not platform,' as Mike Masnick argued last year. The idea is that instead of depending on a specific social media application to connect with friends and colleagues, people could use the application of their choice and use a common messaging standard. This makes it more difficult for platforms to shape

discourse using algorithms and to monetize discourse using tracking and advertising. The current structure of dialogue and media privileges extreme and provocative content, which tends to polarize society and to make it more difficult to come to consensus on social issues. Discourse that is more cooperative and creative enables constructive responses to be adopted society-wide to pressing issues of the day, including but not limited to equity, environment, prejudice and policing. With common communications protocols, *solutions* to pressing issues will begin to emerge. Common protocols also enable greater security, through such mechanisms of zero-knowledge proofs, for example. This allows better insight into the effectiveness of social programs and enables governments and critics to evaluate innovation on more than merely financial or economic criteria.

"Our experience during the pandemic showed clearly how even modest improvements in interoperable communications can have a significant effect. Before the pandemic, there was no incentive to support widely accessible cross-platform video conferencing. Then we had Zoom, a simple tool everyone could use, and suddenly we could work from home, learn remotely or host conferences online. Having learned how convenient and efficient so many online services have become, we will be much less likely to commute to work, attend residence-based campuses or fly to conferences. This makes the world of work, learning and commerce much more accessible to large populations who previously did not have the resources to participate, and greatly increases our efficiency and productivity.

"My concern about the near future is that our technology choices will force us into mutually exclusive and competing factions. These factions may be defined politically or may be defined by class or race, by economic status or by power and control. Technological dystopia occurs when one faction uses technology against the other, perhaps by means of surveillance and spying, perhaps by means of manipulation and misinformation or ever by means of hacking and disruption. When technology divides us, it also disempowers us, as everything about us becomes subservient to the conflict. Our agency, our identity, our activities – all these become the means and mechanisms for one faction to fight the other. This is a worry about technological public spaces becoming private spaces: There's no application we can use or no online space we can go that isn't owned by some entity and designed to further the objectives of that entity, with the social goods of individual freedom and social cohesion taking a back seat to those objectives. It's the sort of world where we no longer own things, but can merely lease them, subject to the terms, conditions and digital rights management of the technology company. It's a world in which there is no space for creativity or free expression outside the constraints of end-user licensing agreements, and no public space for discussion, decision and action where the needs of society can prevail over private and corporate interests. By 2025 we will have a clear idea whether we are slipping into technological dystopia. The more difficult we find it to interact on an equal basis with people from other countries, other cultures, other political beliefs or even other platforms or social networks,

the less likely we are to be able to find common solutions to global problems. The more prevalent surveillance and control through technological means becomes, the less likely a less-powerful people can redress the excesses of the more powerful. These, eventually, will manifest in physical symptoms of dystopia: shortages, outages, civil unrest, open conflict."

A lawyer and former law school dean who specializes in technology issues predicted, "There will be greater awareness of need for broadscale safety nets for employees – workforce employment protections (such as those implemented by EU). There will be greater societal demands for public health and safety protections supported by governments. There will be a widespread demand for more effective leadership of government institutions. Just contrast how the leadership overseeing the COVID pandemic problems in New Zealand, much of Europe, Taiwan and South Korea with the anemic, chaotic leadership in the U.S. People will demand more and better leadership traits in their elected leaders. My hopes are for better social media 'ethics' by movements to constrain and reduce hate speech, overt hatred online and manifest dishonesty on social and political issues. A greater societal awareness of need to rely on truth-telling online, especially the major influential sources (Facebook, Twitter, etc.) while recognizing that some things are opinions and should be respected as long as not false, defamatory, hateful, likely to inspire hatred, etc. There will be a movement from the essential lawlessness of the internet to a demand for a more civil and civic discourse approach. I worry over the tech companies' lack of respect for the importance of civic discourse on their platforms. Much of the social media space is essentially the Wild West: no laws, no rules, hate speech is permitted if it supports advertising revenues, etc. Those companies' employees are revolting within the context of their employment, and they are demanding that the corporate leadership grow a spine and step up against the voices of discord, hatred, anarchy, etc."

Amali De Silva-Mitchell, a futurist and consultant participating in multistakeholder internet-governance processes, said, "Technology will ease the work-life balance; increase productivity; help reduce carbon emissions; allow for savings on infrastructure expenditures such as roads, although there should be more spending on internet infrastructure and actions to enable universal access. Life may seem to speed up, and new technologies that were supposed to still be in development for a decade will become available sooner. In-person social life with a human touch will be restricted and perhaps even mistrusted. The packed pub or tea house will only be open to those who can provide proof of vaccination.

"Evidence-based identification to show 'purity of health' and even health histories will be required everywhere. Face coverings will be commonplace, and each person may be embedded with an ID chip that can be tracked on the street. Outward appearances may appear to be the same as today, but the underlying monitoring of each person will be much greater. People will trade privacy for a semblance of the old normal. People will become more aware of their actions and

feelings and be knowledgeable about repercussions. It is possible that brain waves will be used to monitor the emotional space of the public so as to predict behavior of crowds. We may see new forms of safeguards or barriers in projections via holograms which will also be common at business meetings.

"AI will be everywhere, but there will be issues with the quality. The individual's self-identity could decline, and the need to conform to a norm increase, as being out of step will create the need to sort out the exceptions. People will become more managed, spontaneous behavior will be discouraged, although creativity at work will be encouraged. Humans will be replaced in many settings by robots, forcing them to compete; economic security may become something of the past unless the state provides universal benefits. People will guard their minds as if they are a gold mine as that will be the ticket to their individual sustainability.

"Medical technologies may assist humans to live a full life, from telemedicine 24/7, to new medications from AI developments, to new monitoring devices and delivery devices, prosthetics, etc. Items such as clothing, footwear, nutrition, household goods, vehicles, etc., could be designed with technology to optimize output as well as service and be produced or delivered at reduced cost. Waste minimization, safekeeping, comfort, specification and adaptation will be key. Minimizing expenditures will be key for the average working person, hence technologies that assist with that goal to produce the product or service at little cost the consumer will do well, hence the trend to AI-driven technologies for production, etc. Wearable technologies will be important, as people keep all their possessions close to them for safekeeping, hence there will be more and more micro products and perhaps the use of holograms to assist with screen display. Voice and sound technology will assist the elderly and disabled in a very beneficial manner, as will text-to-speech and speech-to-text. These applications will be developed further to assist with everyday work productivity. The need to remember things will be something of the past.

"People are giving up a lot of privacy to receive the benefits of technology. Data risk management in an ethical manner is critical. Standards will lag behind new technical developments. The even greater risk will be the lack of transparency around emerging technologies, and thus the lack of feedback from the public to mitigate the risks of these new developments until an event occurs. A few companies will have data concentrated in their hands and any mismanagement, including poor ethical standards, could have serious outcomes."

Greg Sherwin, vice president for engineering and information technology at Singularity University, responded, "The new normal will include a greater awareness of systemic dependencies and the need for social goods. Linear thinking and highly individualistic, reductionist approaches to society and the planet will shift towards communitarianism. The myth of social atomism is being broken and more will observe the harm of that model on individual

belonging and health as well as social and planetary cohesion and survival. That being said, privacy will continue to slide away as a mythical value. Algorithms will continue to rule our lives but will be questioned as to their validity, bias and rules for human appeal. We will also have quickly discovered before 2021 that we over-indexed for how we thought the pandemic would change our view towards health in our surroundings. Instead of the overarching narratives about how offices and architecture will never be the same, we will have found common ground with the human experiences of 1919 – where everyone quickly returned to their normal social habits."

Mike Godwin, former general counsel for the Wikimedia Foundation, wrote, "The 'new normal' has the potential to be more humane for workers in many ways. First, it seems clear that we are learning rapidly the extent to which 'knowledge workers' can work effectively from home, provided that they have the right informational infrastructure that supports such remote work. Cutting down on the need to commute, making schedules flexible and increasing the ability for employees to be caregivers and parents while working will be helpful.

"Second, there is a growing consensus that providing income security is the right approach to coping with abrupt economic downturns that can be caused by pandemics, by climate change, and by social unrest associated with both pandemics and unrest – including increased migration, which will be a major disruptor in this century. The greatest single improvement I hope for is increased access to reliable broadband internet for the purposes of remote work, as well as the more efficient coordination of aid and resources in response to weather crises or public-health crises. The digital devices at the endpoints of the broadband infrastructure (personal computers and phones, primarily, but more and more devices with other functions) already will have a great deal of local processing power, but the key point on the critical path will be the prioritization of broadband access that's inexpensive, robust, capacious and widely available in small towns and rural areas. Enabling competition and appropriate government subsidies and other support will likely play a central role in keeping prices down and keeping capacity rising. I worry that processing power and widespread data sharing will make it increasingly easy for individual privacy to be eroded, not least through technologies like facial recognition but also through traffic analysis and aggregation of individual transactional patterns. The amount of processing power this kind of monitoring and tracking of individuals will require is already here."

David Krieger, director of the Institute for Communication and Leadership, based in Switzerland, commented, "The growing need for a viable vision of a global future will (hopefully) shift political discourse away from traditional ideologies toward new horizons. Even if the impact of medical science on politics may be short-lived and ambiguous, the impact of digital technologies on society is enormous and will continue. Both in the private and the public sectors, in education, health care, research and other areas, organizations of all kinds have realized that home office,

virtual delivery of services and products, virtual collaborative work, new work and decentralization function very well and reduce costs as well as solve pressing environmental problems.

"Many digital immigrants have been quickly and even forcibly 'naturalized' into the digital world, and traditional top-down, command-and-control management has received perhaps a death blow. There is a clear need to reduce bureaucracy and cut red tape, not only in health care but in all areas of society. The virus has disabled not only many people, but also many traditional convictions about social and economic order, about the way things have to be done.

"A further impact of the pandemic will probably lead to increasing demands for transparency and open information. Already many accuse China of dangerous censorship and secrecy with regard to information about the outbreak. Scientists have joined in a worldwide exchange of data and research. Publishers have torn down paywalls. Open access to information of all kinds is considered a priority. Intellectual property claims are becoming suspect. In addition to this, governments are deploying tracking apps, and citizens are accepting more disclosure of so-called 'personal information.'

"In the trade-off between liberty and security/health, security seems to have better cards. This becomes even more apparent when we consider that the shift of more governmental and business activities into the cyber realm will bring greater dangers of cyber criminality and cyber warfare, which in turn demand much greater investments in cybersecurity, or indeed, entirely new concepts of security and accompanying social and organizational changes. Taken together, it appears that in the wake of the pandemic, we are moving faster towards the data-driven global network society than ever before.

"Some have predicted that the pandemic will end the 'techlash,' since what we need to survive is more information and not less about everyone and everything. This information must be analyzed and used as quickly as possible, which spurs on investments in AI and big data analytics. Calls for privacy, for regulation of tech giants and for moratoriums on the deployment of tracking, surveillance and AI are becoming weaker and losing support throughout the world. Perhaps traditional notions of civil liberties need to be revised and updated for a world in which connectivity, flow, transparency and participation are the major values."

The sections of this report that follow organize hundreds of additional expert quotes under the headings that follow the common themes listed in the tables at the beginning of this report. For more on how this canvassing was conducted, including full question wording, see "About this canvassing" at the end of this report.

1. Emerging change

A large share of expert respondents in this canvassing expect a number of already evident trends to extend through 2025. They said the greatest needs include more refined and responsive global governance of the complex systems on which people depend, as telemedicine, telework, tele-learning and tele-life spread. These dependences will increase demands for expansion of secure digital communications systems and will inspire education systems focused on digital literacy.

As they were responding to this canvassing, many of these experts noted the broad response in the United States and elsewhere demanding the elimination of social inequities in the aftermath of the the killing of George Floyd by a police officer in Minneapolis. They said this incident and others sparked global cries for greater diversity, equality and inclusion that will be a potent force in the coming years. At the same time, some respondents said the near future will also bring more crime and threats to civil liberties, arguing that times of crisis bring out the best and the worst in people.

Larry Irving, Internet Hall of Fame member and former head of the National Telecommunications & Information Administration, predicted, "There will be considerable change. The new normal will include using technology more extensively for most facets of American life, but particularly for education/remote learning; medical diagnostics; news, information and entertainment; and for business and commercial activities. It simply isn't realistic to believe that now that folks have found out they can travel less, commute for fewer hours, study or review educational materials on their own time and obtain a medical opinion or diagnosis without sitting for endless hours in a doctor's office waiting room that they will return willingly to the old normal.

"To meet these new demands on the internet we will see more copious and ubiquitous networks, as consumers won't tolerate less. You also will see much more continuous monitoring of health metrics, particularly if the suspicions that vaccines for the virus will need to be updated on yearly or half yearly basis hold true. The measured life will become much more real if failure to measure could lead to death. I hope that greater access to copious broadband will allow for a revolution in education as people figure out new pedagogical models to help personalize learning, to allow people to learn at their pace and to allow collaboration by connected students and teachers and professors. Remote learning has great potential benefit for training, retraining and upskilling workers. I believe that medical diagnoses will be more accurate and more timely. I worry deeply about: security, privacy, AI being used to make assumptions, the proliferation of wrong or misleading information, exploitation of the naivete of young audiences. These are serious problems that we haven't had the will to address."

James Morris, professor of computer science at Carnegie Mellon University, wrote, "We'll be leaning on technology, including artificial intelligence, at an accelerating rate. This acceleration has been going on since the invention of agriculture or the breakdown of the bicameral mind, but it is an exponential process which looks like an explosion to us – whether beneficiaries or victims. The better/worse question comes down to who is in control, humankind as a democracy, a super-race as a totalitarian system, or (strangely, improbably, but hopefully) the technology itself."

Michael R. Nelson, research associate at CSC Leading Edge Forum, observed, "In the first four months of the crisis, in most countries, we have seen four years' worth of digitization. We have had the technology for telework, online learning, e-commerce and much more – but now *everyone* wants to use it, so the inertia and regulations that were barriers are disappearing. And internet policy could move in a better direction as governments realize connecting the unconnected is critical if everyone is going to prosper in the post-COVID-19 economy. Likewise, there will be more public pressure to ensure privacy online. If you spend hours each day in your 'Zoom room,' you want as much privacy as you have in your own living room."

Henning Schulzrinne, Internet Hall of Fame member and former chief technology officer for the Federal Communications Commission, said, "The epidemic has accelerated the awareness of technologies that were previously only known to early adopters. In particular, remote-interaction technologies, whether video conferencing or various virtual reality applications, seem likely to be more commonly used by many employees outside the technology sector. This might allow at least partial work-from-home for many back-office jobs, whether customer-service or business-process jobs. These tools will also likely persist as add-ons to family life, allowing families to stay connected when travel is difficult due to age or lack of financial resources. Better collaboration technologies could improve traditional education and human interaction by making them more accessible even to people who cannot travel or cannot attend a regular classroom."

Tele-everything is embraced

These experts broadly affirm that the adoption of "remote" processes – telework, telemedicine, virtual schooling, e-commerce and more – is growing. They argue that in 2025, there will be more people working from home, reconfigured work spaces, more virtual social and entertainment interactions and fewer forays in public than in 2020. They said they see a new societal focus on the power and performance of technology companies and their leaders. Additionally, they noted that the pandemic proves that anything that happens anywhere can influence life everywhere. The turn to living and working more intensively within digital communications networks shows the value of these complex systems on which billions of people depend and brings more focus on both the upsides and downsides of digital life.

Gary A. Bolles, chair for the future of work at Singularity University, observed, "This transition period is 'The Great Reset.' It has been suggested for some time that people need to leverage digital technologies more in their personal and professional lives. The pandemic response has accelerated a range of uses of certain technologies."

Terri Horton, futures strategist and founder and CEO of FuturePath, wrote, "The COVID-19 pandemic has forever changed how we will work, live and play. In particular, COVID-19 exponentially accelerated digital transformation as organizations moved swiftly to harness the power of artificial intelligence platforms and systems across the enterprise. In turn, investment and implementation of AI systems and automation to support operational continuity, pivot to remote work, improve processes, reinvent business models and capitalize on emerging revenue streams accelerated the unfolding of the future of work by five to seven years. Now, as we move through what McKinsey & Company refers to as the 'unfreezing period,' many organizations have realized that they were able to shift, pivot and reimagine operational efficiency and agility rather well and were far more resilient than they had imagined. To that end, the new normal is about fully actualizing the enterprise by operationalizing new knowledge and insights, leveraging more AI aimed at growth and heavily investing in people strategy, reskilling and humanizing work, particularly as we move through the decade where Millennials, Generation Z and Gen Alpha will dominate the workforce."

Cliff Lynch, director at the Coalition for Networked Information and adjunct professor at the University of California, Berkeley, said, "Our world is forever changed. The new normal is not a full return to the old normal, though to the extent that we've had to put some basic human needs, behaviors and impulses on hold we'll hopefully find a way to re-accommodate them in the new normal. There are some changes that are clear in the new normal: Working from home has been widely accepted (along with rather ambiguous and expansive working hours), and that isn't going to be fully reversed, though there will be certainly some role for offices and bringing people together to work together. And there are issues with work-life balance that are simmering. The implications around workspace and getting people together aren't just about offices, but about performance spaces of various kinds: college campuses, schools, shopping malls, bars and restaurants, social spaces, etc. This will have huge implications for the future of cities, mass transit, infrastructure, and all the economics, demographics and other things that follow from this. There are massive implications for employers in regard to the workforce available and the jobs available to many people who don't live in urban centers (keep broadband inconsistencies in mind). We'll see more robots and automation; they don't get COVID-19, they don't unionize, they don't demand pay raises, among other desirable characteristics. Meat-packing companies are already investing more in these technologies – this will only grow. The tougher things to predict are the second- and third-order effects from these obvious fundamental shifts. The really hard things to predict are how fundamental human behavior changes as we come through this, not just

patterns of commerce. I'm trying to figure out how the public might view science and medicine by the end of this. Or how higher education will be perceived. It feels like trust in government is pretty bankrupt, certainly at the federal level. The pandemic experience accelerates the move from physical content carriers (like traditional print books or newspapers) to electronic ones. Due to the stay-at-home orders we have largely lost access to our physical collections (in libraries, museums, etc.) for the duration of the pandemic, and there's lots of concern about books and the like as disease vectors. This is probably a behavior change that stays. … One can hope that institutions like higher education, the arts and the like will pull through. … A lot of things from the old world won't come back, at least anytime soon."

Michael G. Dyer, a professor emeritus of computer science at UCLA expert in natural language processing, predicted, "The major change due to COVID-19 five years from now will have been the acceleration of the already ongoing trend of many transactions moving from physical to virtual, of those transactions that can move. The process of virtualizing business will have been accelerated by the COVID-19 experience. More people will order products online and have them delivered than going to stores to shop. More food will be delivered to the home. Those involved in areas of virtualization will be better off. A larger percentage of the educational experience will be virtual. Many educational institutions (the smaller ones) will have gone bankrupt, but new ones will rise up because students want largely a social educational experience, not one just through a screen. Consider music, already 99.9% of all music is experienced virtually; less than 0.1% of music is experienced by physically listening to physical musicians physically performing in real time. Is the world worse or better because of this fact? Music has been virtual for so long (with the advent of records, then CDs, then thumb drives, then downloading, then streaming) that no one is even old enough to bemoan the transition of music to 'virtuality.' Traditions on their way out already will be accelerated, such as viewing films in movie theaters."

Ethan Zuckerman, director of MIT's Center for Civic Media and associate professor at the MIT Media Lab, commented, "Recent research suggests that it is unrealistic to expect a 'polio-type' vaccine for COVID-19 – take it once and enjoy long-term immunity, instead, we can expect a flu vaccine path forward, which means multiple shots per year and partial immunity. As a result, the transformations we are experiencing in the U.S. are just at their beginning. Any aspect of human life that depends on high-density co-presence is going to change. That likely means prolonged unemployment for people in entertainment, the restaurant business, tourism, hospitality and dozens of other areas. While there may be some upsides for people in white-collar, fully virtualizable industries, on the whole the transition is going to be difficult, draining and economically catastrophic."

William L. Schrader an internet pioneer, mentor, adviser and consultant best known as founder and CEO of PSINet, predicted, "Governments and corporations will still work from home

in 2025. Home offices will be a planned and built-out quiet room for the working parents, and children will respect it during the day. Learners from elementary through continuing education will suffer greatly in the next five years. Higher learning must calculate what to do with their campus when their only income for 72 months is from online services. Do they maintain the ivy? … The internet is the only solution to our future. Increasing simplicity of use for computing power is needed to allow the disenfranchised to avail themselves of all that is available. The parts and pieces that feed that internet are what matter. How they use renewable energy *must* be addressed. I'd like FTH (fiber to the home, *everyone's* home). I expect global warming to worsen materially due to the fascist regimes such as in the U.S., Brazil, Russia and China. This means we need low-cost, high-productivity solar – with battery systems for any home that wants it. Including the data centers that will control 100% of our education, commerce, control of our borders and all other communications for the foreseeable future."

Marc Brenman, managing member at IDARE, a transformational training and leadership development consultancy based in Washington, D.C., wrote, "The pandemic will not be the only influence on life in 2025. There will be more virtual mobility (telecommuting, telemedicine, online shopping, etc.) and our electronic devices will have more bells and whistles. There will be even less privacy. … Artificial intelligence may help make medical diagnoses and selections of treatments better, faster, more accurately. Cars will continue to become safer due to high-tech devices. Privacy will decrease. Hacking, worms, trojans, phishing, etc., will increase. In other words, our devices will 'bite' us."

Randy Marchany, an information technology security officer at Virginia Tech who has worked with the White House Partnership for Critical Infrastructure Security, commented, "The pandemic has demonstrated the need for 'universal' high-speed internet access. Work from home will continue, and school from home may become more prevalent as school staffs' health concerns can't be addressed. Internet access has been shown to be a vital component in a post-pandemic world. It's become a utility like power, water, etc., and will need to be regulated as such."

Michael Zimmer, director of data science and associate professor in the department of computer science at Marquette University, responded, "The 'new normal' will have both positive and negative aspects, and these will be unevenly distributed, thus in my assessment things will be generally worse off. Those with jobs and home situations that allow for flexible and remote work and learning might benefit. There will be fewer miles driven on highways, a re-centering of life around the home and micro-local neighborhoods, and technology can help motivate these changes through improvements in video conferencing, remote learning, distributed play and entertainment, etc. But for a larger and more vulnerable segment of society, these same changes will point to their fragile place in the economy. Reductions in public transit schedules might put pressure on their mobility; reduced in-person schooling might put pressure on their ability to

ensure their kids are taught and fed adequately, plus make it harder to leave the home to work in jobs that can't be performed remotely. Continued enhancements to digital learning platforms, reading and writing, creative game-playing and coding might emerge as institutions and platforms try to innovate given the 'new normal.' A key worry is the potential expanded role of technology in monitoring and regulating our work and personal lives. Workplace-surveillance technologies are already entering the home as employers seek to monitor and ensure their staff is maintaining sufficient productivity and attentiveness to their work duties. This will only increase in the years to come, combining video monitoring, wearables, and other smart devices that 'report' on your attentiveness and activities while working at home."

Miguel Alcaine, head of the International Telecommunication Union area office in Central America, said, "The status of digital transformation before COVID-19 was directly proportional to a country's resilience. The digital world has shown us preexisting human conditions on steroids. Unconnected people living in urban areas have been the most affected. Vulnerable groups have been the most affected, as is always the case during catastrophes. In contrast, the better-connected a country is or a people are, the better their resilience. One thing that has changed for the time being as the pandemic evolves is the general awareness is that digital transformation is a must. Even those in politics realize that now. We need to work to take advantage of this window of opportunity, which might close after the emergency abates."

Jon Stine, executive director of the Open Voice Network, wrote, "The new normal will be an accelerated arrival of trends that were forming pre-pandemic. Examples: The digital divide between rich and non-rich; digital grocery shopping; the failure of retail real estate in first-ring suburbs; remote- and from-home-working; streaming, on-demand, and cord-cutting entertainment. From a technology perspective, we will see the accelerated arrival of video-heavy internet traffic (what was forecast for 2027, even 2025 will be here in 2021) and voice assistance."

Jonathan Taplin, author of "Move Fast and Break Things: How Google, Facebook and Amazon Cornered Culture and Undermined Democracy," observed, "The pandemic's economic damage is, even now, not well understood. Business travel will be sharply curtailed as Zoom meetings are an acceptable substitute. The airline business will shrink. The retail business will wither, and malls will close, as e-commerce will be an acceptable substitute. Commercial office space will go unused, because many companies will find it more productive to let their employees work from home. All of this may bring some benefits to air quality and even white-collar quality of life, but it will not make up for the continued unemployment and increasing economic inequality. I worry that everything I wrote in my book 'Move Fast and Break Things' comes to pass. The tech giants get bigger and more powerful; surveillance capitalism becomes pervasive and our media culture and politics become more Balkanized."

Edson Prestes, a professor of computer science at Federal University of Rio Grande do Sul, Brazil, commented, "COVID-19 showed us how dependent we are on technology. Access to the internet as a human right is an urgent subject that should be included in the agendas of all governments as a priority. Although I understand and, in fact, most of us have understood the benefit of technology to restructure the way we do business, access public and private services and get information, some governments do not provide adequate infrastructure for all of their citizens. As they see it, easy access to information and to doing business gives people the power to tear down governments and/or big corporations. Unfortunately, this is a reality in countries that do not put their citizens in the center of their political debates. If nothing is done, we will witness an amplification of existing inequalities and an increase in poverty. I believe that countries with adequate digital services infrastructure and access to the internet will reshape their lives with technology. Across the globe, anyone, independent of gender, abilities or race, can do business, make money, create new jobs and have a comfortable life. It is not difficult to picture a world where digital infrastructure is available and everyone has digital skills. Telemedicine has proved to be a key technology for diagnosing patients with COVID-19 and is crucial to all aspects of health. My mother lives along the Amazon. She receives medical advice via mobile platform. The use of digital tools allows governments to make agile decisions. Restaurants and supermarkets are now rethinking their business models and delivering food and services. Even gyms are helping some people to get in shape via internet."

Mirielle Hildebrandt, expert in cultural anthropology and the law and editor of "Law, Human Agency and Autonomic Computing," predicted, "The architecture of 'office space' will probably evolve towards:

1. a space to meet up for an appointment,
2. to have a meeting,
3. to withdraw, or to
4. have access to high-quality video conferencing.

"This will have consequences for the distance between office or workspace and home, with a shift away from urbanisation. People may prefer to move to what used to be called 'the countryside,' to have a more quiet life in less densely populated areas – while being able to connect with work/family/friends via myriad applications, both to get work done and to develop and maintain connections within their private sphere. I think that there will be simultaneously: 1) a much greater appreciation and awareness of the nondigital (real-time, embodied proximity, gardening and small-time farming, walking and biking, home cooking, enjoying the stillness that is largely absent in urban hubs) and 2) a much greater appreciation and awareness of the connectivity and productivity offered by various applications, with less attention to false promises and more attention to issues of security, privacy, nondiscrimination, freedom of information, but also much

more attention to applications that are generative of new products and services without being focused on extraction. Let's hope that there is 1) a strong, democratic government that takes care of basic goods (economic security and access to good-quality education and health care), while otherwise sustaining a level playing field for businesses, and 2) a fairly-instituted marketplace that thrives on creative (not destructive) invention and a new understanding of the idea of 'added value.'"

Philip M. Neches, lead mentor at Enterprise Roundtable Accelerator and longtime trustee at California Institute of Technology, commented, "The impact will vary greatly. Some people, particularly those in tech-heavy fields, will be better off, earning more, working from home, commuting less. Some fields will be permanently scarred. Business travel will not recover to pre-pandemic levels. Leisure travel will not fully recover. Hotels, airlines, rental car agencies, travel agencies, etc., will remain depressed. Many jobs in these industries will be permanently lost. Many restaurants and retail establishments will be permanently closed, with resulting loss of jobs. Demand for oil and gasoline will not recover to pre-pandemic levels. Nor will sales and service of automobiles. Construction and infrastructure will grow, some by new demand, some by government stimulus to rebuild old infrastructure. Demand for commercial real estate will remain depressed, particularly for Class A office space. Residential real estate demand in the suburbs and exurbs will be strong, at the expense of core cities. Many businesses will change to mostly work-from-home, cutting down on commuting and giving workers up to two hours per day more time for family and other pursuits. Schools will continue to offer more than half of all instruction remotely. All-remote college-prep and university programs will start to emerge at price points more favorable to the bottom 90%. The debate between whether we want a service society or a surveillance society will be in full swing. Also, serious debate about breaking up the Big Four (Amazon, Facebook, Google, Microsoft) will ramp up."

R. "Ray" Wang, principal analyst, founder and CEO of Silicon Valley-based Constellation Research, predicted, "In general, the view on technology will go from negative to even. The trade-off between privacy and health, privacy and security, privacy and convenience remain to be determined. We saw an ideological shift on how much privacy we were willing to give up to government control for the promise of better health via contact-tracing app adoption as well as location data being used in aggregate to track spread. The public will probably become more vigilant on how privacy data is being used for public good. Given social distancing, potential labor disputes and lawsuits for safety for return to work, fear of density, we can expect more work to be automated. Machine learning, automation and artificial intelligence adoption will increase as we find ways to reduce human contact and mitigate risk. Autonomous vehicle adoption will increase as workers fear mass transit, an exodus from the cities to the suburbs and exurbs picks up pace due to COVID-19. New networks of delivery and development around regional hubs will emerge. The big fear is that too much concentration of power in one individual's hands will be possible, as

the power of tech increases the ability for one individual to scale. We will see that with the power of automation, bots and AI. We need to ensure that checks and balances are in place."

Gus Hosein, executive director of Privacy International, based in the UK, said, "People's sense of space will become interesting. Will they want restaurants, cinemas and outdoor spaces more because of being locked in; or will they have enjoyed not having to travel for events as much? That will determine the tech that shapes markets for some time to come. I'm not sure that people will rush to queue again or to be in shops and other establishments, but when they do it will be more worthwhile. I also think that there's a limit to logistics and efficiencies for every person everywhere to be able to receive deliveries and personalisation."

Laurie L. Putnam, an educator and communications consultant, commented, "We need to stop looking for a 'new normal,' as though life will find stasis after COVID-19 is tamed. Eventually, yes, the virus will become manageable, but life will remain in flux. This pandemic is demonstrating that we must learn to adapt or we will not survive. Think of it as a trial run for the crisis of climate change. What we need to look at now are the hard truths the virus is exposing: that some of our social structures and technologies can work and others are failing. Some of our digital tools are supporting our society and others are breaking it down. Tech tools can be repaired and social structures can be rebuilt, but we have to do that work collectively, and it will take time. I hope we take a hard look at what we can do better and differently, because the problems COVID-19 has exposed will not vanish with a vaccine. Our technology, and our relationship to it, will have to evolve.

"I hope we will retain the best (and fix the worst) tech tools for flexible learning and work and find positive ways to remix our physical and digital experiences of life. I hope we will realize that maybe we don't need to consume as much, and our technologies can be more sustainable than disposable. I hope we will face, head on, the effects of digital misinformation and surveillance, and take serious steps to protect ourselves. I hope more of us will understand that tech businesses driven by financial returns need to be held accountable for harms their products inflict. And I hope more of those leading and funding the tech businesses will process how their impact on society goes beyond the bottom line. These are hopes we can make real if we care to. At some point, technology leaders and the political leaders who fail to regulate them (because, the money) will face a reckoning. In the meantime, serious damage is being done to our individual well-being and to the health of our society, and it's going to take a long time to repair that damage."

Humans' yearning for convenience and safety fuels reliance on digital tools

The experts canvassed here note that the pandemic has rearranged incentives so that consumers will be more willing in the coming years to seek out smart gadgets, apps and systems. They expect this will speed up adoption of new education and learning platforms, rearrange work patterns and workplaces, change family life and upend living arrangements and community structures. Here are a number of the expert responses speaking to these issues:

Carol Woody, technical manager for the Cyber Security Engineering (CSE) team at Carnegie Mellon University's Software Engineering Institute, predicted, "By 2025 there is much less fear of technology by the typical citizen. With the sudden shift, people in church, school, office, family, friends are all using more technology and recognizing its limitations as well as its value. There is a growing recognition that the tools can be improved, and that using them is not magic, but requires some investment of time. Privacy has been slipping away slowly for a long time, and this is not widely recognized as a bad thing. Too many artificial constructs have been put in place to respond to privacy efforts like the Health Insurance Portability and Accountability Act (HIPAA) that are seen to only hinder information sharing and create added paperwork and delay for every step. Adoption of new technology for its own sake seems to be weakening. Buying the next version does not seem to be an automatic need. Autonomous vehicles can create a public transportation system that is door-to-door and not limited by bus routes and the cost of drivers. This will help with an elderly population who should not drive and are not mobile enough to walk blocks to a bus stop. Smaller vehicles that support social distancing limitations are feasible. More effective online meeting environments that are widely known and supported will make connecting remotely easier. More people will move to where they want to be instead of having to move to where the job is based. I am also looking forward to better 'out-of-the-box' solutions for phones, cameras, connections and other Internet of Things products that support better security of solutions to reduce the risk of compromise."

Beth Noveck, director, NYU Governance Lab and its MacArthur Research Network on Opening Governance, observed, "Much will depend on governance and leadership, especially who is elected in November 2020, but the hope is that the shift to more online work, online education, online services and online life will lead to significant innovation. This could create the opportunity for dramatic and expanded upskilling and the preparation of more workers for a new future of work. It could create the opportunity to personalize and customize education for students and deliver better learning. The shift to more work online and less travel could have a significant impact on climate change and carbon emission reductions. But all of these positive possibilities depend entirely on political leadership and a willingness to invest in innovation. The need for more socially distant ways of learning, working and playing could create the impetus for positive change

if the public and private sector choose to make the right investments in this future. With adequate access to broadband, new technology, the right regulatory environment and concerted investment and innovation, the new normal could mean more-personalized and intensive education for more students and better learning outcomes.

"Imagine every kid being able to have a tutor – both human and AI – available to her at all times. It could mean better access to telehealth and tele-mental health services, where people can get cheaper and better access to care from home. It could mean a future where more workers are trained for jobs that can be done at a distance, which will create opportunities for good work, a living wage and safer working conditions. But with a shift to life online, we will have to make new plans for and redesign our urban infrastructure. We will have to rethink the design of public transit and public buildings. We will have to come up with new ways to create civic engagement and civic cohesion. And we will have to ensure that people have access to the tools and the skills they need to take advantage of these opportunities. There's so much promise and far too little political will to realize it."

Barry Chudakov, founder and principal of Sertain Research, said, "My hopes for tech-related changes that might make life better in the coming years are focused on reimagining education. With massive funding for reeducating and bringing innovation to the educational process, we can change the world for good in untold ways. As XPRIZE Chairman, Peter Diamandis, describes it, reimagined education means rapid reskilling on a continuum of constant education. The notion of high school and four years of general (college or university) as preparation for the new world is hopelessly outdated. In a tech-enabled world, learning is a lifelong endeavor and we need to structure our lives and education accordingly. Embracing interconnectedness, we can use the dynamics of technology, and the data that drives technology advancement, as a paradigm to reimagine education.

"To do so, it is useful to recall that our educational paradigms were built on the alphabetic order of linearity, one-at-a-timeness, patriarchy and holy books. Without abandoning that order, we must reimagine education as an ongoing interactivity with the real world, so our perception of the real world is clear, accurate, undistorted by cultural, religious or political misrepresentations. As our engagement with the real world becomes increasingly data-driven, and as our datasets become impracticably large, education reimagined must include universal data and computational literacy. This is more or less standard operating procedure in China, which has made it a national initiative to bring 5G to everyone in China by 2025.

"We need a broad swath of our population – not a slim class of techno-overlords – who understand the potential and biases of algorithms, machine learning, quantum computing, artificial intelligence, the Internet of Things and qubits. At the same time, we must reimagine

education to include a foundation of tool awareness and meta realization. Now that our tools are more powerful and pervasive than ever, we must build curriculum focusing on the basics of their logics and the ability of tools to influence (and distort) our perceptions. This is as fundamental to education as weightlessness training is to become an astronaut. Our tools and technologies are now more sophisticated, and their influence in our lives is now too pervasive to adopt a use-it-and-ignore-it approach. Ignoring the effects of our tools on our minds and behaviors ensures we will become their slaves, not their masters."

Frank Kaufmann, president of the Twelve Gates Foundation, said, "The great many (far greater on balance) positive tech-related developments that arose include, to briefly name only a few:

- International cooperation in science and medicine sharing and in general information sharing.
- The rise in the understanding of humans as human, and not as Balkanized by gender, race, nationality, class, age. Tech cooperation is 'division-divisive' blind, seeking to protect and promote health and life and such. This is a great gift from the pandemic.
- Superfluous and unnecessary time away from family love was unavoidably diminished during the lockdown.
- The extreme wastefulness of bogus 'business travel,' 'late nights in the office' and all other fake, artificial and disingenuous excuses to not tend to family relations conscientiously and sincerely was undermined by the lockdown.
- Commutes – the two-, three-, five-hour chunks of life lost daily – were recognized as wastes of life and wastes of natural resources.
- The lockdown allowed Earth's environment to recover. We learned about normal, human, daily impact on Earth's environment from the lockdown and the tech substitutes we quickly put in place to sustain our productivity.
- The flexibility of tech to quickly compensate for those important, needed and desired parts of life were rapidly discovered and developed: banking, telemedicine, dance lessons, time with friends and colleagues.
- The limitations of physical geography were dismantled as people discovered a 'wider circle of friends,' a more available chance to 'renew old friendships' and the chance to bring in or attend professional speakers; all arose rapidly during the COVID-19 lockdown.

"This is a quick, superficial and undeveloped list. But millions quickly discovered massive promise to rewrite life in the world in positive and enduring ways. I can only imagine the vast explosion of tech discoveries, new uses and advances to increase exponentially and expand on this very trend which has triggered a new, more friendly human-tech interface and integration. Prior to COVID-19, people were intuitive about the personal use of tech for convenience and efficiency. But because what the lockdown primarily undermined was our softer humanness related to creative dreams, and love and friendship, the benefits of tech entered into a new relationship with us; how

tech supports our 'humanness' (we like to dance, we like to sing), not just our convenience and efficiency (how do I get the best seat on the plane, how do I know when an Amazon price has dropped). Humans, being natural entrepreneurs and profit-seekers, should see an infinite horizon to develop a hitherto untapped universe of tech-human relations and integration. A new universe was born through this."

Perry Hewitt, an executive with Ithaka, an organization advancing global higher education through innovative use of digital technology, commented, "My greatest hope would be that technology will enable high-quality, engaging and affordable online learning at scale. For higher education in particular, I hope we can use technology effectively to deliver, measure and credential learning in a way that is meaningful for individuals, beneficial to communities and recognized by employers. Few would dispute that the current model is broken from a cost perspective, or that the benefit of one-time, on-campus learning is an effective approach for a 21st-century workforce. We now have enough examples of universities like Georgia Tech to know we can deliver value at a lower cost; how can we extend this to greater and lesser public universities before access to education, like health care, is in the hands of employers?"

Alex Halavais, associate professor of critical data studies, Arizona State University, predicted, "Our memory of the pandemic will be short, but the impact on our institutions will be long. The pandemic was a catalyst for changes that had long been in play and it has sent unbalanced institutions toppling. Nowhere is that more clear than in education. Schools and universities find themselves reeling, and it seems they have difficulty looking more than a few weeks into the future. In terms of school, it has made parents rethink the role of school and think seriously in a way that they have not before about the value of schooling. Is it a place for learning fixed curricula? Is it a place for learning to socialize in certain ways? Is it a way to care for children while the parents work? It is, of course, all of these things and more, but the sudden cancellation of school for many parents has led them to think about what functions it plays in their lives and what alternatives there may be. It has also, by necessity, made them confront the reality of online school. For parents who have the privilege to now work from home, they have entered into a new set of expectations around parenting while working. Just as work-from-home has gained more acceptance (and, indeed, as many employers and workers find that they can be at least as effective working from home and that this reduces many of the traditional expenses of employers), they are thrust into an environment in which they must also be teachers and caretakers throughout the day. These new stresses, nonetheless, have opened up opportunities for those who offer online learning experiences for young students. The shift has been rapid, and while there will certainly be a swing back toward in-person teaching and activities, many will come away from the current changes with more robust online offerings that will continue through to 2025. Indeed, as the children of more well-off and professional parents are more likely to stay away from school as it reopens in 2020, I think we will see a refocusing of financial resources toward online learning at

that level. This will come through at the university level as well. A number of universities were already well-situated to transition to online and 'flexible' learning. The latter will be the legacy of the pandemic for universities and further accelerate the concentration of the industry in the U.S. By 2025, a much larger number of students will attend universities in more flexible ways, taking the majority of their courses online. Much of this was a move that was already underway. As a people in a larger number of professional roles are expected to work from home or at a distance, online education will better prepare them for that role."

Amy Zalman, global futurist and founder and CEO of Prescient, responded, "For those who have access to digital technologies in the first place – the global middle class – such technologies seem poised to be more pervasively part of the daily weave than at present. Daily work routines, forms of entertainment and peer connection and security will be augmented by the same technologies as at present, but more intensively. As a global collective, our current focus on data analytics of all sorts to help us navigate the present crisis will make its way into the way many more people experience the world, even if they were not analytics focused previously. For example, I may be accustomed to checking the weather and the stock market now, but might add to my day five to 10 other near-term trend lines to try to understand and help me navigate whether I should see people, go to a particular location, buy tickets to an event, start worrying about my employment status, enroll my child in college, etc."

Aram Sinnreich, a professor of communication studies at American University who specializes in law and technology, commented, "As harmful as it has been to our health and our economy, I think COVID-19 has the potential to inspire significant change for the better in America and throughout the world at large. It exposes the limitations of authoritarian political regimes. It reveals the human toll of disinformation and science denialism. It has illuminated the limited utility of strong intellectual property controls, such as the patents preventing scientists from developing effective therapies. It has shown us how effectively cities can function without automobile traffic. It has revealed to us how delicate and costly our global supply chains are. It has shown us how essential online community is and how important it is that we close gaps in accessibility and expertise. It has revealed how bias may be engineered into digital communications platforms. It has shown how useful economic safety nets – both existing ones, such as Medicare, and prospective ones, like health care for all and universal basic income – are in maintaining the peace and stability of a large, complex society. I believe we have an opportunity to rethink our social, technological, economic and political values in light of these revelations, and that our responses to these crises may contribute to making the world more equitable, and to raising the quality of life for all humans. I hope for more accessible and egalitarian online communications. More distributed and efficient global supply chains. Open-source solutions for medical research. Accountability for online disinformation. More focus on engineering privacy

into digital platforms. Less tech-solutionism and more holistic approaches to understanding sociotechnical challenges."

Narelle Clark, a longtime network technology administrator and leader based in Australia, said, "I hope that we can develop privacy-respecting apps that can support a populace that is weatherworn and damaged by the pandemic. One major need is apps that assist in supporting mental health that have a basis in science and assist in procuring goods and services without disclosing rafts of private data without consent and for no good purpose. Telehealth uptake will continue and be delivered in increasingly reliable ways with vastly better diagnostic tools via image-recognition and access to AI and bigger data sets for machine learning. Hopefully this will be done in privacy-protecting ways. The pandemic has also driven open sourcing of vital medical technology so that local people can repair and replace worn parts of critical items such as ventilators – I hope this opening up of access continues. The closed-supply-chain approach where the supplier controls vital medical equipment from origin to end of life has worked against the skilling up of local biomedical engineers, and it has driven up prices of vital equipment when things could have been simpler and easier to support locally with local know-how and locally sourced parts. Opening up of educational resources in order to stimulate the economy may improve access to knowledge and information. Perhaps we will see an increase in trust of scientific institutions and actual science because pandemics expose the need for fact-based approaches."

Soraya Chemaly, an advocate and activist with The Representation Project working to change attitudes about gender norms, predicted, "There will be technology related to better health outcomes, built with a greater awareness of how biases infuse standards, diagnoses, remedies and solutions, could make life better. Also, given the pandemic's effects on all kinds of travel, tech that creates new and different forms of community-building and travel both might evolve in ways it might not have for years. Technology that enables more widespread political engagement and counters some of the more primitive forms of voter suppression. Reproductive health care technologies, biotech, might also benefit from the necessary restraints on medically unnecessary, paternalistic and oppressive in-person consultations for women. Additionally, I don't see how American colleges and universities can sustain their economic models without long-term adaptations that incorporate better remote learning."

Donald A. Hicks, a professor of public policy and political economy at the University of Dallas whose research specialty is technological innovation, observed, "Ever more opportunities to participate in an economy are being revealed by the current quarantine requirements. Organizations' 'footprints' are likely to be permanently reconfigured to allow some portion of their employees to eliminate the time and cost of commuting from their budgets and still develop a career using new technologies. This will reduce the barriers to participation for young parents, the disabled, the elderly, etc. With a broader and more diverse set of skills available, one can expect

new varieties of entrepreneurship and new ties between larger organizations and heretofore 'fringe' talents left unattached to organizations previously. From these expanded human capital resources, expect new goods and services, new business models and new definitions of 'career.' And, especially, a new openness to alternative ways to connect to an economy. This will require a new breed of leadership, new models for continuing education, etc.

"Digital technologies, not unlike all previous technologies that have changed the world, will succeed as they become more invisible, part of the leitmotif of an evolving society/civilization. Think of electricity, wireless connectivity, etc. Without anyone noticing it except in the rearview mirror, the intangible share of U.S. investment (value-added) overtook the tangible share by the early 1990s, a quarter-century ago! (See page 40 of Haskel, Jonathan, Westlake and Stians' 'Capitalism Without Capital,' Princeton University Press.) The resulting recombinant innovations have expanded exponentially ever since and can be expected to continue to do so. There are always trade-offs associated with technical advances. Some people, places and activities will be left behind on any such journey. However, in all previous technology transitions, the net benefits have made the changes worthwhile. There have always been increases in health, wealth and welfare, although some of these changes are not appreciated until well after the fact. Political economist Joseph Schumpeter's work is a good guide here.

"Expect significant opposition to changes that are unfolding from the American Medical Association, media and political jurisdictions from local to federal, as new technologies redistribute power and resources. The real worry is what can happen to individual liberty when new technology is in the hands of ruthless regimes such as those in Russia, China, Iran, North Korea, etc. – or even malign groups in Western nations like our own. Digital technologies in and of themselves are neutral forces; their potential negative impacts become apparent when put to malign use. Over the long term, however, new technologies will inevitably erode the power of even the most tyrannical regime as their capabilities are undercut and/or eliminated."

Holmes Wilson, co-director of Fight for the Future, said, "My biggest hope is that a developer revolt and antitrust campaign against Apple will begin to end the period of intense centralized control that the iPhone and App Store ushered in. When you trace it back, most of the problems we're seeing with persistent monopoly power in the tech space really accelerated in the late 2000s with the rise of the iPhone. Mobile devices made computing vastly more accessible, but they also vastly increased the barriers to entry, introducing new gatekeepers, less organic discovery, higher-stakes winner-take-all dynamics, a much more constrained space for digital creation and a tendency towards pure consumption or highly mediated creation. I'm fairly sure that if you remove the underlying bottleneck of the app store and make mobile app development and distribution work more like desktop apps or the open web, this will start to erode. I also hope advances coming from the cryptocurrency space make it more possible to build complex modern

applications on peer-to-peer networks, and that just as computing moved from the web to mobile, computing will move from centralized clouds to peer-to-peer networks built with free and open source software.

"My final hope is that the trend line from Occupy Wall Street and the Arab Spring to #BlackLivesMatter to #MeToo to the Hong Kong protests to #DefundThePolice continues and the internet continues to create ever more miraculous social movements that achieve shocking new milestones in how they're able to change debate and rewrite rules of public discourse. … The days of mandatory commuting for three or more hours, five days a week just to be in an office are behind us. Office presence will start to be more optional, partial, negotiated and used sparingly in the moments where it matters most, even after we all have been vaccinated. Supermarkets have always been a disaster for human health and well-being. I expect that many people who have transitioned to grocery delivery services, community-supported agriculture groups and outdoor farmers markets will only sparingly return to supermarkets, and the groceries delivered will increasingly come more directly from suppliers. For high-end and environmentally conscious consumers, in season at least, food will increasingly come directly from farmers. This will take some time, but COVID-19 accelerated it."

Meryl Alper, a professor of communication studies at Northeastern University expert in children and families' uses of technology, wrote, "My hopes center on new forms of care and mutual aid that technology has the potential to enable. I hope that a greater percentage of people telecommuting to work leads to more value placed on child care, elder care and personal care attendants. This includes higher pay within the profession and opportunities for professional advancement, particularly as these workers are more likely to be women of color. I also hope that non-disabled people develop a greater appreciation for and prioritize the skills and talents of disabled people, and in doing so, extend the opportunity to telecommute from home to this population beyond a period in which it is deemed necessary for the non-disabled. Post-coronavirus, more people will be living with the chronic health conditions that it increasingly appears come with surviving the virus. It is my hope that broader disability solidarity forms online and offline in response, a solidarity that is critical of all the ways in which technological 'innovation' has also generated disabling conditions, especially for those already marginalized by their race, ethnicity, sexuality, gender and country of origin."

Melissa R. Michelson, a professor of political science at Menlo College, commented, "People will be more able to access health care and other services without needing to find transportation. There will be more events online, such as dance performances, musical performances, etc. There will be more access to events that used to be expensive and require tickets and travel to broader swaths of Americans."

Michael Muller, a researcher for a top global technology company whose work is focused on human aspects of data science and ethics and values, said, "The privileged among us are developing new skills in working virtually or remotely. These skills with technologies of virtuality will allow us to live where we want, rather than being constrained by proximity to workplaces. I hope that conferences and other gatherings will continue to allow remote participation. If we can reduce travel and lodging costs for conferences, then we can include people from poorer countries and poorer institutions. We need the benefits of their ideas! And they need the opportunities of full participation."

Stowe Boyd, a consulting futurist expert in technological evolution and the future of work, wrote, "We frame the discussion about 'working from home' in the wrong way. It's not that we're 'working from home,' which many of us did relatively regularly before the plague. It's that we are not working at the office, at all. Unlike some, I don't think that the new norm will be zero time in the office, it will be minimum office. Research has shown that the people who are most productive and engaged are those who spend 60% to 80% working out of office. That translates to 20% to 40% in the office. So, 'remote' – *isn't*, it isn't remote, I mean, psychologically or emotionally. Management has wised up and seen that what was formerly considered impossible, isn't. Connecting the dots, businesses are likely to consider downtown office space a costly indulgence rather than a necessary requirement, so they will decrease that cash outlay as an obsolete cultural belief. This will translate to increased use of communication and community-cation technologies: most obviously video conferencing, but work technologies across the board will be more widely adopted and provide a basis for deep analytics and AI underlying the post-normal workspace (no longer a 'workplace'). These techniques will see more of the work of managers being taken up by the machinery of what can best be considered business-operating systems. There was a time when a customer on one cell network could not text message someone on a competitor network. That was overturned by legal requirements from governmental bodies. Today, if I am a user of Slack and you are a user of Microsoft Teams, we can't share a chat room. This is an artificial barrier to cross-company collaboration, and I hope that the (minimal) technological barriers to fixing this will be overcome, perhaps by government intervention."

Howard Rheingold, an internet pioneer expert in exposing the social and political implications of modern communication media, said, "Several changes that have been forced by the pandemic could lead to positive trends:

- Face-to-face conferences where thousands of people fly hundreds and thousands of miles to gather together will disappear or be severely reduced, with online conferences often substituted – thus reducing a significant amount of carbon pollution.

- From my own experience, working from home can be more productive, but total absence from the office can be counterproductive. However, if one in four office workers worked from home one day out of four, traffic and carbon pollution reduction would be significant.
- In the absence of federal leadership and a cacophony of state and municipal leaderships during the COVID-19 pandemic, mutual aid – often facilitated online – is thriving. Perhaps that will continue.
- With more and more people socializing online, perhaps it is an opportunity to build out a 'green space' of social networks and online communities outside the paralyzing and toxic enclosure of Facebook.
- Teaching online is not a matter of delivering your normal curriculum via videoconference but instead is a powerful pedagogy when it is done right. Universities without endowments are in trouble, and unfortunately, many will go under if they can't get tuition-paying students back on campus soon. I taught blended courses at Berkeley and Stanford for 10 years: three hours of face-to-face each week combined with six to nine hours online during the week between classes. I hope to see more online socializing outside of Facebook. More telecommuting. Fewer face-to-face conferences. Better preparation for, and awareness of, potential pandemics. More peer learning online. I am concerned about facial recognition, universal CCTV surveillance, hacking of essential services and uses of AI in warfare and law enforcement."

Marjory S. Blumenthal, director of the science, technology and policy program at RAND Corporation, observed, "The pandemic has shifted the balance in favor of tech-mediated interactions – more online shopping, more delivery, more telework, more telehealth, more uses of video in socializing (and work), more online learning (including about how to troubleshoot when things go wrong). … Although today's apps relating to contact-tracing leave room for improvement, in five years there should be more meaningful tech support for coping with infectious disease in a privacy-preserving way. And five years should be enough time to redress the uneven access to the broadband capacity that is needed to achieve the benefits listed above, as well as to develop bandwidth-conserving approaches. Finally, other kinds of technologies (involving physical equipment and facilities) should be more available to provide safety to people whose jobs require physical presence in a shared space, as well as at least some reengineering of how those jobs get done. I expect progress to facilitate more – and more extensive – use of technology by people with differing abilities (both cognitive and physical). Today's jokes about the three most often-heard words being 'you're on mute' demonstrate that everyone has moments of needing to adapt to technology, and more thought about design that anticipates or at least adapts to different behaviors would be good – such design is certainly possible. There are also opportunities to use tech to help people who feel disempowered have a voice, beginning with people in positions on the lower economic rungs who may hesitate to speak up about workplace concerns or to help those knocked off their anticipated paths by the pandemic to find another path. Perhaps today's crisis will also help to achieve more of the long-touted potential of open data and open systems

(especially if some of the pandemic-motivated systems and ventures endure). From today's vantage point, the addictive qualities of technology may have been exacerbated by extended stay-at-home routines, something that may endure even with less physical distancing. Meanwhile, the challenges of proliferating modes of deception (deepfakes, bots, fake news and so on) call for new mindsets that will take time and likely greater public awareness to set in. Tech companies have choices to make; we can already see some responsiveness to policymaker and public-interest advocate concerns."

Andy Opel, professor of communications at Florida State University, said, "The virus has revealed the deep inequalities in our economic system. This embodied learning at a global scale is going to prompt a rearrangement of economic rewards, recognizing and rewarding what is widely seen as 'essential' and putting limits on speculation and the financialization of life that has played such a powerful role in the widening inequality of our time. The power of virtual collaboration is being felt in meaningful ways, but, at the same time, there is a deep longing for physical presence and intimacy that cannot be replaced. I don't think the changes in the role of digital technologies will be as profound as the recognition of the power of personal interaction, the shared experience of an audience, or the breaking of bread with family, friends and colleagues. Technology has the potential to make our lives more efficient, reducing energy consumption and fostering a connection to how our daily decisions impact the natural systems that sustain life. The electrification of transportation is one example of the move toward a low-carbon economy where digital technology will reward efficiency."

Benjamin Shestakofsky, assistant professor of sociology at the University of Pennsylvania, commented, "The COVID-19 crisis has already spurred new organizing efforts among essential workers in sectors including logistics, food service and education. The impact of social movements supporting workers' demands for improved compensation, working conditions and recognition in the workplace is likely to extend far beyond it. The lasting impact of the crisis on our use of digital technologies is likely to depend on the duration of the pandemic itself. The longer it lasts, the more governments, businesses and individuals will generate and maintain new, digitally mediated routines (e.g., increased telework, increased use of tracking technologies in the workplace). The most vulnerable workers are most likely to see their privacy, well-being and economic security threatened by digital technologies. 'Low-tech' changes may be just as important as 'high-tech' improvements. For example, states can protect voters from COVID-19 while simultaneously bolstering democratic participation in the long term by switching from in-person voting to vote-by-mail systems. By 2025, the increased appetite for regulating tech giants could result in an industry that is more accountable to principles of democratic discourse (e.g., Facebook) and workers' rights (e.g., Amazon)."

Ebenezer Baldwin Bowles, an advocate/activist, predicted, "Digital technology will dominate all aspects of life, further detaching humans from one another. There will not be a 'new normal,' but rather a continuously changing abnormal as humans and institutions draw further and further apart in a radically fragmented society. Eyeball-to-eyeball professional and personal contact will be intentionally set aside in deference to digital video communication. Diminishing resources will lead to a national mood of scarcity, giving rise to aggressive competition between individuals and groups. Economic security will become a dream for the great majority of the citizenry. Tech-related changes in medicine will lead to a continual state of breakthrough developments for the betterment of humankind, but fewer and fewer citizens will be able to afford the new diagnostic and treatment regimens. Positive developments in broadband accessibility will be the Trojan Horse of the era, transforming the digital realm into a force of control by corporate and governmental entities. By inviting technology into their homes, working class and middle-class individuals will be totally relieved of their privacy. What, me worry? It makes little sense to worry about the inevitable. Five years from now, more and more homes will become beholden to technology and the technicians who operate it. Big data will be drilled down into almost every aspect of daily life. Video interfaces between home and governmental/corporate interests will be all-pervasive. There is no escape from Big Brother, once ago a fiction and now a reality."

Charlie Kaufman, a security architect with Dell EMC, said, "Once COVID-19 stops being a direct major influence on society – which is probably at least two years away, but probably fewer than five – it will have accelerated changes that would have happened eventually anyway. The biggest of these is that more of our lives will take place in cyberspace, with more people telecommuting from home using conferencing tools for meetings. This will be a huge benefit for the environment, reducing both carbon emissions from commuting and the need for the duplicate indoor space we consume having both an office and a home. This will benefit the people who thrive in such an environment and hurt the people who don't. Also important is the continuing trend of physical stores disappearing, as people favor ordering things on the web and having them delivered. In social interactions, being tall, big and loud will no longer give people the ability to dominate an interaction. On the other hand, being aggressive and rude will probably still win out. For people who live alone, it could be a very lonely existence, and there will likely be an increase in mental health problems. Technology will obsolete more of society's worst jobs, which could be good news for some people but may be bad news for the people currently occupying those jobs. The richer society that results could enable them to do more rewarding jobs, or it could leave them in a permanent underclass. The increase in telecommuting will be a boon to the economy and the environment."

Vincent Alcazar, a retired U.S. military strategist experienced in global intelligence, wrote, "COVID-19 is the catalyst for displacement, dislocation and more marginalization. The human toll itself will affect two to three following generations. It is those generations whose following effects

will be what we might best see and measure to understand impact. However, that will all successfully evade measurement because what will lie hidden are all of the events and opportunities that did *not* accrue in people's lives."

Andre Popov, a principal software engineer for a large technology company, predicted, "Remote/off-site work will become more acceptable to businesses. Generally, this will probably lead to more atomization of society, weaker interpersonal interactions. Internet infrastructure companies and large datacenter operators are the winners. Transportation, entertainment, hospitality, etc., are the obvious losers, although, e.g., the entertainment industry can transform to meet the new reality. In a way, this is a trimming-down of nonessential businesses. It makes for more efficiency, but also detracts. We are probably living the 'new normal' right now: Microbial life mutates rapidly, and we will surely see COVID-20 and so on. There is a growing accumulation of power and resources within the corporations that own the internet infrastructure. Content delivery networks, cloud companies and telecom companies are the world's computer and data storage. An individual has zero privacy from these corporations. And that's the case now, even before the wide spread of Internet of Things devices."

Sean Mead, senior director of strategy and analytics at Interbrand, said, "The average person will have less income, worse access to credit and greater job insecurity. There will be massive economic dislocation as continuing aftershocks from the large number of small-business failures and the collapse of financial markets affect people for years. People will offload more of their administrative activities and communications with others to digital assistants. Legislatures will be confronted with the need for clearer laws around the responsibilities for, use of, and problems caused by digital agents. We'll see the start of the fracturing of the internet into geographically bordered networks and into separations between secure networks that require positive identification and less-trustworthy networks. Many parts of the digital economy benefit so strongly from network effects that the market leaders become natural monopolies. This is particularly true with distribution platforms for communications, the monopolization of which are particularly pernicious. Because of widespread phone installations and voluntary grants of phone permissions, the Googles and Facebooks of the world can build intelligence tools like association networks and location history tracking that would be the envy of NSA and GCHQ planners from the near past. There are few real controls on how this information is utilized."

Gerry Ellis, an accessibility and usability consultant, commented, "Employers will try to set the balance at a point where people spend most time at home as this can save the organization money. This will suit some employees fine – e.g., those who live far away from their office – so they do not have a long daily commute, and those with adequate physical space in which to work who do not have children or other caring responsibilities at home. However, for many it will not suit. They may not have a large living space and thus nowhere from which to work. Their Wi-Fi connection

may be poor. They may have children at home who interrupt them as they work. They may not wish to interrupt others in the home. They may miss the personal collegiality of working in an office. They may miss the technical support or support of others when an issue arises, particularly if they are new to the organization. Some may find it difficult to learn and adopt to the particular ways of working of the organization if they are not physically working close to their peers, again particularly for new employees. There are also costs to staying at home rather than going to an office such as those for extra food, heating, lighting and insurance costs. Insurance is a particular issue of concern; if an employee does not inform their insurer that they are working from home, is their insurance valid should they – for instance – have a fall during normal working hours? If they do inform the insurer, will their insurance costs rise as their home is being used as an office? Working from home for people with disabilities has its own particular issues. Reasonable accommodations that may be available in the office may not be available at home, e.g., adapted furniture and specialized technical support. I would expect that there will be conflict in the next number of years between employers who wish to make savings and the unions representing employees who may not wish to be at home full time because of the issues raised above. The final point I would make is that line managers may find it much more difficult to build good teamwork, brainstorm and assess employee performance if regular physical meetings do not occur."

The best and worst of human nature are amplified

These experts see evidence that both sides of human nature are being amplified by the pandemic. The crisis is enhancing digital interconnectedness that engenders empathy, better awareness of the ills facing humanity and positive public action. On the flip side, they said they expect that some individuals, cities and nation-states will become more insular and competitive as survival mode kicks in. Some say xenophobia, bigotry and closed communities will also increase and these changes will cascade through all aspects of society – including international relations, the composition of social and economic safety nets for vulnerable citizens and basic human relations.

Steven Miller, professor emeritus of information systems at Singapore Management University, observed, "The worst of it: The source of income was either stopped or substantially reduced for a lot of industries, organisations and individuals. It will take several years for these entities to recover or they may never fully recover. A number of them – small, medium and large – will cease to exist. This will be painful economically and in other emotional and behavioural ways for the people involved. There is no denying there will be a thread of impact along this 'worse-off' line. The better things to emerge arise from the fact that COVID led people to change things they never thought they could change, at least not in such a short time period. COVID has led people to try things, to reimagine things and to do things. Specialists in evolutionary biology and related aspects of geology and climate history refer to this as 'punctuated equilibrium.' COVID will have that type of effect on how we live in the broad sense of things, including all levels of analysis from

individuals to groups, to organisations, to institutions, to societies. We know the terrible things about COVID – the large number of deaths, the huge amount of suffering, the many examples of dislocation. There will be endless examples of the harsh realities and byproducts.

"Exactly because it has been such an extreme situation it will catalyze new ways of thinking and doing, new approaches, new things, and all of these changes will persist beyond the period of medical threat, and will undoubtedly change the way we live, both directly and indirectly. For more than a decade to come or a decade after the medical threat eventually subsides – however long that may take – we will see the equivalent of a 'Cambrian explosion' of innovation catalyzed by COVID. These changes and innovations will go well beyond things directly related to dealing with the medical threats and contagion now or in other pandemics to follow. They will open up countless new possibilities for the way we work, live, learn and play. We will have the Dickensian 'worst of times' and 'best of times.' Both forces will propagate across various societies simultaneously. Those looking to be optimistic as well as those looking to be pessimistic will find ample examples and supporting evidence for their point of view. While COVID is extraordinary in some senses relative to contemporary history in recent decades, it is not so different than situations the world has encountered throughout the arc of history in a set of forces [that] simultaneously propel change. Somehow, the human species adapts, as it always seems to do, and things keep on keeping on, though in different ways."

John Harlow, smart cities research specialist at the Engagement Lab @ Emerson College, explained how complicated things are in 2020, "We are stacking crises here: state violence, climate change, opioid epidemic, COVID-19 pandemic, historic unemployment and the disastrous Trump presidency's effects on geopolitics. I'm sure you could name more. The 'new normal' in 2025 seems most likely to be constant change to absorb historically unusual threats, zoonotic pandemics, extreme weather, food insecurity, housing insecurity, unstable political systems, etc. I think the world will be less stable because of these drivers. … There are so many paths from here to 2025. Could we all be on Signal, Protonmail and Mastodon, or literally raising a generation of teens addicted to a Chinese Communist Party intelligence agency spy platform? The internet could cease to exist as we know it due to trolls, the concentration of everything into walled gardens or infrastructure challenges. Could we all be deep into solving climate change problems? 2025 feels like 2020, constant change and uncertainty. …

"The ongoing Black Lives Matter protests against a half millennium of white-supremacist state violence and extrajudicial killings have amassed support and momentum for change beyond anything I can remember from my lifetime. The premise of abolition invites us to imagine a world without police and policing, and there is building to be done to replace those retributive oppressive structures with care-based, harm-reducing alternatives."

Ethan Zuckerman, director of MIT's Center for Civic Media and associate professor at the MIT Media Lab, commented, "We have the chance to build a different type of internet around video co-presence and sustained online interaction. The systems we're using now to create public spaces online are either extensions of social networks built around surveillance capitalism, or they're simple extensions of two-way video chat. We have the opportunity to design and build spaces that have a variety of uses, support different behaviors and norms and operate on academic, civic and other logics, rather than a market logic. As we learn to teach, meet, brainstorm, hang out and govern in these new spaces, we may start designing a digital future that's radically different from the one we're starting to fight against."

Bill Dutton, professor of media and information policy at Michigan State University and former director of the Oxford Internet Institute, pointed out that people must be connected to participate but many are not. "The pandemic has underscored the centrality of the internet and related digital media to everyday life and work, so that efforts to paint digital media as harmful will face increased scrutiny, along with the policies and regulations that a harm model is fostering, such as censorship of online content. There may also be more acknowledgment of and awareness of the importance of grappling with the digital divides locally and globally. Efforts to recover revenues and institute more governmental regulation of digital media will undermine innovation and the promises of an open, global internet."

Ian O'Byrne, assistant professor of education at the College of Charleston, said, "I worry that humans will move away from physical interactions and spend more time socializing via digital tools and spaces. The algorithms and echo chambers will continue to distance social groups as the machines consider how best to keep us satiated and always clicking in. Attention is the new economy, and when people are enraged they're more entrenched in these platforms. Social distancing could lead to community distancing, as neighbors may feel that they have even less in common with their peers as they only see what they want to see online. It may seem as if we all live in different media, information and social spaces that rarely, if ever intersect."

Maggie Jackson, former Boston Globe columnist and author of "Distracted: Reclaiming Our Focus in a World of Lost Attention," wrote, "I am deeply concerned that the move to an even greater reliance on virtual relationships during the pandemic will inspire people to increasingly accept the diminished standards of togetherness that technology offers. The definition of a Dark Age in part is a 'forgetting' – and it's possible that at least some sectors of society will be increasingly tempted to leave behind the discomfiting hard work of trying to understand one another fully. Relating fully takes lifelong practice, and humans even in the best of times often fail to do so well; an over-reliance on technology socially may leave us less and less able to work past difference and deliberately pursue complexity in relations."

Rebecca Theobald, assistant research professor at the University of Colorado, Colorado Springs, observed, "The way societies are responding to the challenges faced by the pandemic reflects their willingness to invest in the future. This is demonstrated by the sacrifices or inconveniences the people living in a country agree to undertake; the amount of resources designated for children, young people and the disadvantaged; and the ability of the community to discuss differences in a rational manner, starting by agreement about basic frameworks of the state, whether that is democracy, theocracy or autocracy. In 2025, the 'new normal' will be most affected by the changes brought about by rising seas, warming temperatures, changing habitats, increasing vulnerability to disease and multiple other issues documented by scientists across the world. The communities that will be most successful – countries, provinces, cities or towns – are those that are able to examine the facts of a situation, whether it be details of insufficient wealth due to systemic discrimination based on a characteristic the dominant group finds abhorrent or irritating or the evidence of how common food sources are no longer producing the nutrition necessary for a society to subsist and alter their activities so that all people in their community benefit."

Miguel Alcaine, head of the International Telecommunication Union area office in Central America, said, "The status of digital transformation before COVID-19 was directly proportional to a country's resilience. The digital world has shown us preexisting human conditions on steroids. Unconnected people living in urban areas have been the most affected. Vulnerable groups have been the most affected, as is always the case during catastrophes. In contrast, the better-connected a country is or a people are, the better their resilience. One thing that has changed for the time being as the pandemic evolves is the general awareness is that digital transformation is a must. Even those in politics realize that now. We need to work to take advantage of this window of opportunity, which might close after the emergency abates."

William L. Schrader, an internet pioneer, mentor, advisor and consultant best known as founder and CEO of PSINet, wrote, "Look at the drivers of mankind first: safety, health, wealth. For those without safety and health, while wealth can help them gain safety and health, they cannot possibly achieve wealth without the first two. Thus, fear becomes the primary driver for most of mankind – 99.5%? As for drivers of business which includes technology, the concepts of global warming and global supply chains to optimize both costs and time to market will wane due to pressure from nationalist governments like [the] U.S., UK, Brazil, China and so many others. Most countries will attempt to move to pure domestic production, or at most, regional production and supply chains. *That* drives the reciprocal for the consumption side; people will buy domestically or regionally prior to buying the best. That goes for auto, telephones, computers, home gadgets of all kinds and even planes (but I doubt any firm, including airlines, will buy planes very soon). Economic security is gone, *especially* in America, due to Trump. Yes, personal and professional lives are altered permanently, routines will be all new, fear and anger will drive most

people globally. The rich will get richer and the poor will riot and be killed by law enforcement and the military will stand by and wait. *If* the military engages, then the rules of engagement will change."

Jim Witte, director of the Center for Social Science Research at George Mason University, predicted, "Many people will be somewhat worse off in 2025 as a result of the pandemic. Disruption is never easy – particularly when it is rapid. Lives will be upended in the transition to a 'new normal.' Jobs have been lost and many will never come back. I do believe the economy will recover – at least in the developed world, but many will be left behind. Many older Americans will face an uncertain retirement, particularly as the cost of living rises with inflation driven by higher levels of government spending and the economic costs of the pandemic. Just like other businesses, many colleges and universities will not survive. Those that do survive will be transformed – businesses and providers of higher education. In this disruption, where physical distancing will still be a part of the new normal, digital technologies will play a critical role. These technologies have already transformed the way we live and work, but the 'demands of the day' (a la Max Weber) will dramatically accelerate this transformation. Some will thrive, some will cope and some will be left behind.

"The very real health risks associated with COVID-19 are likely to lead [the] developed world to become more insular, and the bits of prosperity that trickled down to the developing world will become leaner. Not a pretty picture. To mitigate the negative consequences will require strong leadership on the international stage with the willingness and authority to speak out for 'positive-sum solutions' in contrast to zero-sum thinking. This kind of leadership – from the U.S. but also in collaboration with others in the developed and developing world – will be essential to manage this disruption while averting disaster."

Bill Woodcock, executive director at Packet Clearing House, commented, "While there are a number of unexpected beneficial outcomes of the COVID-19 pandemic, they're being learned at great cost in human life and well-being, not to mention economic cost. We've learned that we can make immense gains in global inclusivity in newly virtualized events that previously required expensive, time-consuming and carbon-heavy air travel, and in allowing people to work from home rather than make daily commutes. The meetings at which important decisions are made should remain virtual. They should remain equally accessible to those from developing countries. They should remain open, and not return to their previously behind-closed-doors ways. We've learned that being more careful about our hygiene benefits us with respect to many diseases, not just the one of most pressing immediate concern. But these lessons could easily be lost, and the 600,000 lives that have been lost to learn them will have been wasted if we don't take them to heart. At the same time, the inequality of distribution of wealth, which I consider our second-greatest problem after the destruction of the environment, has been severely exacerbated by

COVID-19. The rich use 'disaster capitalism' to ensure that they profit regardless of the situation, while the poor are most heavily impacted by both the disease and its economic effects. I worry that the intersection of the surveillance economy, omnipresent data-brokering, AI and the pragmatic psychology of getting-people-to-do-things-they-ought-not is really coming to a head. The worries of skeptics of even five years ago now seem quaint. The machinations of evil capitalists of 15 years ago now seem benign, in a Nixon-goes-to-China sort of way. Although there are quite a few people within the industry who recognize this, too many of them are happy to profit from it and not enough are bringing the danger to the attention of the public, regulators or policymakers. Unless these practices are curbed, we're headed for a really dystopian nightmare."

Patrick Larvie, global lead for the workplace user experience team at one of the world's largest technology companies, observed, "We are seeing a breakdown in international cooperation (e.g., weakness in the European Union, the U.S. pulling out temporarily from the World Health Organization), and this will make cross-border coordination of epidemiological surveillance much more difficult. While the world will be connected, people will be less mobile than before. I fear that this will lead to increasing restrictions on travel and a rollback of international trade. Cross-border distrust and suspicion may lead to increasing nationalism. Technology will be leveraged as part of a surveillance strategy. Communication will likely be less free and far more subject to search and seizure, whether that means the devices or the medium."

Michael Froomkin, professor of law at University of Miami Law School, expert in legal and policy issues relating to new technologies, said, "Even in the best case, the economic consequences of the pandemic will take a long time to heal. Meanwhile, subsidies are going more to the wealthy than neediest. They'll need to be paid for eventually, and probably not by the wealthiest. Changes in terms of work also won't work to the workers' advantage. Efforts will be made to offload as many costs as possible onto the worker (e.g., home office when applicable). I do expect one good thing: This will accelerate the push for full national health coverage in the U.S. The digital divide will be more serious as we move more and more services and public and private life online."

Michael Marien, director of Global Foresight Books, futurist and compiler of the annual list of the best futures books of the year, wrote, "The 'new normal' will certainly include more emphasis on health security and may include more emphasis on the UN's Sustainable Development Goals. On the other hand, there may be more authoritarian regimes based on empty slogans such as 'Make America Great Again' and 'America First.' In contrast, there may be more emphasis on the slogan proposed in a column by Thomas Friedman: 'Respect science (RS), respect nature (RN), respect each other (REA).' It is highly uncertain as to which set of slogans will prevail, where and for how long. … Good public policy is needed far more than new technology – policy based on RS, RN and REA. The most important tech-related change could well be creating a global technology

assessment organization such as the IPCC, modeled on the U.S. Congress' Office of Technology Assessment, which did excellent work in the 1990s."

Bryan Alexander, a higher education futures consultant and senior scholar at Georgetown University, responded, "The new normal will mean changes to personal and social lives: greater suspicion of other people and reduced social engagement. … Technology use will be strongly split by national borders, political ideology and views of technology."

Leslie Daigle, a longtime leader in the organizations building the internet and making it secure, said, "2025 will feature a mixed bag of changes due to the COVID-19 pandemic. The reason it's going to be overall worse for the average person is mostly because of economic impact. I am also concerned that necessary geographic isolation is going to breed more isolationism and xenophobia. While people are anxious to get back to their vacationing habits around the globe, and businesses desperately need to be able to have people travel for work purposes, at the same time people are twitching when they see out-of-state license plates or hear nonlocal accents. On the plus side, we've already seen a reduction of seasonal flu impacts (all that hand-washing paid off!) and we can certainly hope that people's habits have changed for the better, and that medical research is going to achieve not only a vaccine and/or better treatments for COVID-19, but also better knowledge about how this and other viruses work."

Melissa R. Michelson, a professor of political science at Menlo College, wrote, "Digital technology is being used to help connect people who otherwise might be isolated. Many older people are being taught by younger friends and family members to use Zoom and other video tools to visit with one another. Their comfort levels with these technologies are increasing."

Meredith Whittaker, a research professor and co-director of NYU's AI Now research institute, commented, "A primary lesson from the failed U.S. response to COVID-19 is that the ruling class will not act on a crisis if they can protect themselves from said crisis (by quarantining, by divesting risk onto primarily BIPOC [Black, Indigenous and people of color] essential workers), and if addressing the crisis would perturb the functioning of capitalism. In this sense, COVID-19 provides an ominous warning about what will happen if we don't adopt significant structural changes soon, in the face of the looming climate crisis. Climate chaos is already harming people who have suffered from colonialism and structural racism, while those most responsible for climate change – wealthier people in the global north – are more easily able to protect themselves. We are facing a fundamental choice: Do we move to manifest revolutionary change at a global scale, or do we stand by as people who are already vulnerable are made expendable in the name of profit and White supremacy?"

Glenn Edens, professor at Thunderbird School of Global Management, Arizona State University, previously a vice president at PARC, wrote, "Technology can increase the resiliency of individuals as well as firms, societies, geographic regions and nations – we might find a better balance between globalization versus populism."

Sean D. Young, executive director at the Institute for Prediction Technology in the University of California–Los Angeles Center for Digital Behavior, responded, "People are being forced to find creative ways to use technologies. The positive side of this is that tech for good will rapidly advance."

Judith Schoßböck, research fellow at Danube University, Krems, said, "I have hopes in the area of urban planning, smart cities and in general a more energy-efficient way of living together. I also hope that better digital literacy will lead to better options of networking and more personalized ways of living together, particularly for certain groups of society like the elderly."

Joshua Hatch, a journalist who covers technology issues, commented, "I hope that there's a recognition that high-speed internet isn't just a luxury; it's a necessity for connecting people and providing access to tools and information. I'm not terribly optimistic that leaders will take the steps necessary to provide it, though. Ultimately, there's an imbalance between technology companies and the public at large. The public can't have expertise in the issues around technology, so at some point they throw up their hands and give in. A lack of trust in government, and a government that can be bought off, means the public's guardian won't be there to protect them. So, ultimately, the public is going to have a difficult time fighting off unscrupulous technology companies – a problem we already see."

Steve Jones, professor of communication at the University of Illinois at Chicago and editor of New Media and Society, responded, "I hope for a greater understanding among the general population of the complicated and prominent role that social media plays in knowledge and action. I've long believed and argued that in many ways there is less difference between the online and offline worlds than we seem to admit, and I'd like to see greater acknowledgment of the blurring of that boundary. Will that make life better? Well … not in a techno-utopian sense, I suppose, but it might make us better users of technology, particularly social media, and it might make for more sensible policy discussions, too."

John Laudun, professor of culture analytics, wrote, "Yes, things will be worse, but that was already our path. I worry less about any given technology and more about who is wielding it and how. … Thanks to the reversed consumer model on which media production and consumption is based, where users are the product sold to advertisers, and to the pinched wallets of most Americans (thanks to depressed wages), I don't see most of us escaping the information bubbles of

our own making in which so many of us now live. Fairness has been overwhelmed by a sense that the only thing that matters is competition. I do not see this trend declining. The result is that the current path we are on, where inequality increases, will only continue."

Andrea Romaoli Garcia, an international tax lawyer active in multistakeholder activities of the International Telecommunication Union and Internet Society, observed, "COVID-19 brings changes that will be different depending on each country and culture. In Europe and Asia, people will embrace social detachment easily even after everyone has been vaccinated. This stems from historical learning from previous pandemics. In the Americas and Africa, social life will not be affected, and after vaccination, people will continue to touch each other as they do today. Despite this, prejudice between races grows and the 'new normal' imposes more barriers to migration, economics and education. The gaps in different cultures reacting to pandemic coronavirus will justify more bureaucracy and barriers. … In the socioeconomic field, the 'new normal' brings grave retrocession, inequality and racial prejudice. This is a very negative post-pandemic effect that puts global security at risk. We will see more countries closing borders and more cultures being banned. The 'new normal' is instigating new laws and procedures for exclusion under COVID-19's false justification. The question that the 'new normal' poses is: 'How much more can society peacefully carry out?' I would suggest new discussions and measures on international cooperation to recover rights. The people involved in this effort should not only include the young, rich or White people. Remember, we all share the same planet and we are all affected by events that occur within any single country."

Rosalie Day, a policy leader and consultancy owner specializing in system approaches to data ethics, compliance and trust, predicted, "Individual isolation is going to become ever more of a problem. Meeting people who don't share your hobbies or religion will be exacerbated even more than the filter bubble of values and political ideology. People meet people by engaging – for example, on public transit – and they mutually benefit (see the work of Dr. Nicholas Eppley). People will become more sedentary, and obesity will grow from not having to commute and not having to leave your chair. You can ask Alexa to do your shopping and to change your music selection. Further, general nutrition will suffer, because as exposure decreases – becomes less diverse – the individuals and communities eating junk food will know nothing else."

The director of a major strategic project, recipient of the U.S. National Intelligence Exceptional Achievement Medal, responded, "Back in 2013, and again in 2016, a proposal informed by the anthrax events of 2001, West Nile virus in 2002, severe acute respiratory syndrome (SARS) and an outbreak of monkeypox in the United States in 2003 was shared with the Defense Advanced Research Projects Agency (DARPA). The proposal at the time was something seen as a safeguard against a 'low-probability, high-consequence' event – a natural or human-caused pandemic. The solution was a series of proposals centered around the concept of

building an 'immune system for the planet' that could detect a novel pathogen in the air, water or soil of the Earth and rapidly sequence its DNA or RNA. … At a minimum, such an immune system for the planet would overcome the limits of waiting for nation-states themselves to alert the international community of outbreaks within their borders. A second reason also was associated with this proposal, namely: exponential changes in technology and create pressures for representative democracies, republics and other forms of deliberative governments to keep up – both at home and abroad. In an era in which precision medicine will be possible, so too will be precision poison, tailored and at a distance. As proposed both in 2013 and again in 2016, this will become a national security issue if we don't figure out how to better use technology to do the work of deliberative governance at the necessary speed needed to keep up with threats associated with pandemics. The world needs a collective effort to gather and share data to steer society and nations back to full operations, and to provide early indicators and warnings of future pandemics. Current methods for accessing data owned by public and private institutions and private citizens today are not able to guide COVID-19 recovery. The new data-access frameworks in this initiative could succeed while strengthening societal welfare, prosperity and peace around the world."

David Krieger, director of the Institute for Communication and Leadership, based in Switzerland, commented, "One of the results of the pandemic is that it is finally obvious to everyone that we are global. Not only did global connectivity and flows of people spread the virus throughout the world in a matter of weeks, but subsequent shortages of protective materials and medical equipment showed international dependencies. The nationalist reaction of closing borders and blocking flows of people and materials represents a 'lockdown' mentality aimed to disrupt connectivity and stop the flow of the virus, but at the cost of disrupting the economic, social and political foundations of the globally networked society. Politically, anti-globalist factions see themselves justified, whereas those who see the nation-state and its populist supporters as outdated point to the need to strengthen international organizations, such as the World Health Organization and the United Nations.

"Following these two possible trajectories into the economic realm, some expect a reorganization of supply chains and production favoring national independence under the regime of stronger centralized control and regulation even to the point of nationalizing some industries, while others look to decentralized and networked organizations that alone are capable of dealing with the complexity of the situation. The left is calling for a universal basic income and increased government support for those who have lost jobs and income, while the right is calling for deregulation to spur innovation and the quick development and deployment of new business models and new products and services.

"More interesting than the rehearsal of well-known political mythologies is the role of science and technology in the post-pandemic world. Some see the growing dependence of politics on

science as a trend toward technocracy, whereas others see how science is unable to deal with pressing moral and social concerns the pandemic raises. On the one hand, society must be guided by scientific evidence and not political ideology, while on the other hand, scientists cannot tell us what values and visions for the future society should follow. Is it right to 'sacrifice' lives to 'preserve' economic prosperity? How much money is a human life worth? When is life no longer 'worth' living? Calls for economic sacrifices in the name of generational solidarity no longer go unquestioned. And these are questions that cannot be answered by science."

2. Worries about life in 2025

Whether they expressed optimistic or pessimistic views about the "new normal" in 2025, these respondents also weighed in with their worries for the near future of humans and digital technologies. Their views embraced several overarching themes that can be summed up in one: *The advantaged enjoy more advantages; the disadvantaged fall further behind*.

Much of their concern focuses on the growing power held by the technology companies that control information flows into people's lives and their potential to compromise individuals' privacy and autonomy. Most respondents to this canvassing who discussed the problems arising in the digital age due to the business models of Big Tech said it is highly unlikely that there will be a successful movement soon to change market capitalism and the competitive imperative to make profit-making the primary priority. Solutions to this problem have a double-edged quality because opportunity and challenge are equally present. Some argued that the spread of lies via social media and other digital platforms will damage social, political and economic systems. They acknowledged that some of the likely remedies may interfere with civil liberties. They maintain that the seemingly unstoppable flow of lies, disinformation and misinformation online is divisive, dangerous and destructive.

Many warned that health-monitoring, work-surveillance and security solutions that may be applied will expand mass oversight, threaten human rights and lead more regions of the world to become more authoritarian. Some pointed out a variety of downsides to telework, and said they worry over the accelerating automation of more business systems and processes causing the number of available jobs for humans to shrink. Additionally, they worry about people's mental health at a time of so much isolation.

They wonder who will take action to bring about the positive change necessary to tackle all of these obvious issues.

This section opens with a number of broad statements from respondents about these concerns, followed by sets of assertions sorted under themed headings.

Soraya Chemaly, an advocate and activist with The Representation Project working to change attitudes about gender norms, said, "Technology will become even more pervasive in our lives, every aspect of them. This will enable work, alternatives to school and improved health care, but will come at a high cost – increased surveillance, loss of privacy, greater risks – to both individuals and political systems. The confluence of degrading economic conditions, civil unrest, uncertain long-term pandemic outcomes strike me as more likely to lead to technology-related harms and abuses than not, particularly as products rush to market with even less rigor applied to threat

modeling, risk assessment, etc. The panopticon worries me. The immense and largely unregulated power of technology companies operating with little or no transparency, accountability or oversight as proto-transnational governments worries me. The alignment of these companies with authoritarian and antidemocratic forces everywhere worries me."

Jay Owens, research director at pulsarplatform.com and author of HautePop, wrote, "Compared to, say, November 2020, the 'new normal' in 2025 is net worse for the average person, based on economic, health and well-being factors:

- There is a significant likelihood of facing a long period of unemployment in 2020-21 if they work in a COVID-affected sector, with knock-on effects of increased debt, reduced savings, reduced salary progression.
- Women with children have faced significant pressure to exit the workforce or go part-time in order to cover the child care gap caused by a) school closures and b) their male partners not taking 50/50 responsibility for their offspring. This results in lifelong financial impacts plus a sense of frustration.
- There is a significant likelihood of ongoing disability following a coronavirus infection, given what's emerging about the medium- and long-term lung damage and chronic post-viral fatigue.
- In the UK, Brexit produces a further economic crunch for sectors that might have got through coronavirus reasonably well (e.g., manufacturing, food supply, logistics).
- People will have significantly fewer friends, as relationships dwindle given the lack of regular in-person contact. I expect a somewhat neo-traditionalist intense focus on the couple and the nuclear family which will be rather stifling.

"I worry about technology companies' monopolisation – a lot of activity concentrated in four or five megacorporations. See the negative impact of Amazon on the wider retail sector. There is too much reliance focused in these companies' platforms, with screen-centricity for everything: social life, entertainment, work, the arts. There is an overemphasis in society on what tech can do well (convenience) and not what it can't (the level of quality of the interaction or experience)."

A journalist and industry analyst expert in AI ethics observed, "The focus during my long career in Silicon Valley and Sand Hill Road has been the art of the possible (innovation) and fast economic returns. This is not a sustainable model moving forward. Hence, my second full-time job, which is AI ethics (someone has to fight the good fight, even if it is idealistic at this point). We're being forced to conform to the digitization of everything, which is separating people from each other, enslaving them, facilitating mass manipulation and oppression. Technology is becoming far too intrusive, and we are allowing it to happen. We have already become a surveillance state. Going completely digital is exciting and also dangerous, in my opinion, because

it makes people and organizations more vulnerable to attacks. While there have always been divisions in society, people are now being manipulated into them artificially, which only adds to what happens organically. I, for one, am deeply active in AI ethics, however, 'we' operate too slowly as groups and there is so much money and power at stake that bad actors will have an advantage for the foreseeable future. Humanity is self-destructing. Only we can save ourselves. The 'new normal' is a society that's more divided than it has ever been in history. Already we're recording every breath, every step, every heartbeat. Every thought is next. Digital tools amplify everything that we do, but we don't stop to think about what we're doing in the bigger picture, and it's going to be harder to do the right things for society at large when the mindset is individualism. There will not be one 'new normal,' but several. Most people on the planet will be disadvantaged, though not to the same degree by automation, economic structures. And downright control mechanisms that favor the few at the expense of the many."

Cliff Lynch, director at the Coalition for Networked Information and adjunct professor at the University of California, Berkeley, took a look at one worst-possible scenario, writing, "Herd immunity (and diagnostics, vaccines and treatments) might fail, or at least fall drastically short. We cannot rule this out. I don't think we will even know if this is a possibility for a couple of years. This is a scenario that is not getting much attention because it's so awful. In this world, we find vaccines don't work well, or not for more than a month or two, and we find individuals can be repeatedly reinfected, perhaps with each bout worse than the last. There really isn't a new normal to reach, only a continually unfolding disaster where I don't understand the exit mechanism to any kind of genuine sustainable new normal other than perhaps through eventual biomedical breakthroughs.

"Life in this continued nightmare is a constant trade-off between near-total social isolation and threat of death or disability. Day-to-day life in the face of this varies greatly, structured around paranoid protective measures for some, driven by duty and courage for others, fatalism and stoicism (and perhaps denial) for still others, and a steady drumbeat of human tragedy in the background for all. Technology is actually really important here. It can help people to function in this kind of environment and stay alive, but it can't fix the mental or social damage.

"One thing I would expect in this scenario is the enthusiastic adoption of invasive tracking and monitoring technologies coupled to totalitarian political measures to try to control infections on a continuing basis, likely with only very limited success. This probably goes hand-in-hand with a lot of other bad political developments. At least for a while, I would expect some parts of society will continue to operate and perhaps prosper (or at least make lots of money) operating from isolation, remotely, defensively and with critical dependence on technology. This is somewhat similar to what is happening today with the relatively well-off and fortunate who can work from home and minimize social interactions, but much more so. I would expect to see an ongoing breakdown of

society and the economy over time, and perhaps ultimately violence, revolution, martial law, economic depression, breakdown in food supplies and other supply chains and the like, all adding to the misery. And don't overlook a major war as a possibility in this scenario either, either because a ruler needs to distract the population or because some nation judges an opponent as vulnerable. This future is a very bad place. I hope we don't go there.

An anonymous respondent commented, "We are headed into the perfect storm of diminished democratic processes, increased medical vulnerabilities, increased wealth and power disparity and the confounding effects of climate change. The five-year period will encompass significant changes for the worse for the vast majority of people in the world. Those who currently control wealth will use every means at their disposal to maintain their position, and that will include the use of AI and private security (effectively private armies). It will be difficult to determine the difference between public assets such as police and military and assets of control at the behest of what will effectively become a new 'ruling class.' The vast majority of humanity will exist as wage-slaves and have little resilience in the face of dramatic environmental change. A consequence of climate change and humans' desperate attempts to maintain a semblance of quality of life will be the development of further niche/novel viruses. Not factored into this are the use of chemical, biological or nuclear weapons by rogue states. I'm hoping that such events will not occur in the next five years because they would usher in a cataclysmic demise of much of humanity. Thanks for asking."

Frank Kaufmann, president of the Twelve Gates Foundation, said, "I have no special worries any more than when they invented an ax to chop wood. Tech allows human badness to gain strength and power, to be more harmful and destructive and to cause more suffering and pain with each new tech development. At the very same time, the very same tech could be used to amplify our ability to do kind acts and to do good. The same tech China uses to record which stuffed animal my two-year-old daughter currently is playing with could as easily be used by compassionate geniuses to save her life in a moment when she otherwise wouldn't have stood a chance. My worries are just the perennial ones. Tech gives bad people power to be worse. It gives good people power to be better. I worry that there exists a world of tech geniuses who don't know right from wrong and good from bad. And there is a world of tech users who'll sell their soul for a giggling emoji."

Wendy M. Grossman, a UK-based science writer, author of "net.wars" and founder of the magazine The Skeptic, observed, "The upcoming economic catastrophe as government support runs out and rents come due means damage to millions of households who may recover by 2025 but whose children will be permanently changed. My parents and many of my friends' parents lived through the 1930s Depression. It permanently changed how they thought about work, money and safety nets, often making them more frugal, less interested in consumerism for its own sake and more concerned to ensure that others could survive in difficult times. … I don't think most

people will remain enthusiastic about full-time working from home, and I don't think it will serve most businesses as much as they think right now. We are currently coasting on social relationships that we've built over years of personal interaction. Everyone I know is tired of Zoom meetings. Side channels – an important part of any meeting – are missing in action; random meetings that produce new ideas don't happen; and newcomers find it very hard to establish themselves as part of the group. My prediction is that the people who are now eyeing living in remote locations because they don't have to commute any more will, in a few years, find the constant flying back for meetings annoying and expensive, and will be thinking of moving closer to work again, especially as climate change will force air travel to become more expensive and/or difficult."

A director for a major global project studying emerging social, political and economic systems at a U.S. technological university said, "I worry that too much technology will be developed by computer scientists and engineers who have little understanding of human social behavior and this will cause inadvertent harm. An example of this is the biased machine-learning models that are used for profiling. I worry that large companies will drown out innovation from academia and small businesses and that large companies will begin to control funding and direct policies and thus determine which small businesses and universities survive. I worry that sets of companies will band together against other sets to make their technologies interoperable only within that set whereas common standards and complete interoperability of all technologies is needed to make the Internet of Things achieve its ultimate capability. I am concerned that policymakers who don't understand the strengths and limits of technology will begin making premature policies."

Inequality and injustice are magnified

A notable share of these experts predict that the pandemic and quick pivot to the use of digitally driven systems will widen divides and expand the ranks of the unemployed, uninsured and disenfranchised. The power imbalances between the advantaged and disadvantaged are being magnified by digital systems overseen by behemoth firms as they exploit big data and algorithmic decision-making that themselves are biased. They predict that more people will be pushed into a precarious existence that lacks predictability, economic security and wellness.

danah boyd, founder and president of the Data & Society Research Institute and principal researcher at Microsoft, observed, "The tech sector has built the new Gilded Age. Inequality has been a problem in our society for a long time, but the relationship between the tech sector and late-stage capitalism is insidious and getting worse. It's also affecting other sectors. For example, most of philanthropy is dependent on the logics of the tech sector. Tech sector wealth is creating new philanthropists, and endowments are heavily dependent on growth coming from the tech sector. Unsurprisingly, philanthropy has adopted many of the same logics as tech, from tech

solutionism to the fetishization of 'move fast and break things.' This weakens civil society, which is crucial for holding tech, politics and capitalism accountable. This systems-level issue will have all sorts of ramifications for individuals, but I think that the costs will be significant. Our polis will be less informed and less financially stable. Technology will also continue to amplify neoliberal logics that put individuals in a very precarious place. Nowhere will this be clearer than in the realm of health care. We have so much technology in the health space, so much knowledge, and yet our supply chains are broken and inequality in access to health care is at an all-time high."

Henning Schulzrinne, Internet Hall of Fame member and former chief technology officer for the Federal Communications Commission, said, "Countries like the U.S. that utterly failed in their response will find that many young people will have had extended disruptions to their educational progress, from K-12 to higher education. Many entry-level job opportunities will have vanished simply because of retrenchment in service-oriented industries as disposable income decreases. This will strongly depend on the availability of a vaccine, highly effective non-pharmaceutical interventions such as air filtration and UV-C lights, more effective treatment protocols. If neither exists in 2025, many sectors such as restaurants and live entertainment will disappear except in countries that manage to suppress the virus in their population to levels that make indoor gatherings plausible. Many of the new touchless technologies, e.g., in hospitality, will also decrease the need for entry-level, customer-facing jobs and will likely be made permanent."

Susan Crawford, a professor at Harvard Law School and former special assistant in the Obama White House for science, technology and innovation policy, commented, "I am worried that the caste system in America will be increasingly entrenched and amplified by technological asymmetries – as access to health services, jobs and opportunities of all kinds becomes more and more targeted to people who have the money to access the platforms that provide them."

John Harlow, smart cities research specialist at the Engagement Lab @ Emerson College, wrote, "The most vulnerable people (poor, disabled, racial and ethnic minorities, LGBTQIA+, women, children, religious minorities, geographically vulnerable) will likely suffer between now and 2025."

Micah Altman, a social and information scientist at MIT, observed, "The pandemic holds a mirror to society, revealing the existing faults in our digital infrastructure and the grave inequities in the distribution of resources and opportunities to make use of them. For example, the difficulties encountered by public primary and secondary schools in attempting an abrupt transition to distance learning due to underinvestment in education, not (generally) poor technology choices by school administrators. None of these problems will be fixed by 2025, and few areas will see substantial progress (with the possible exception of partially reversing some of the worst policies of the [Trump] administration)."

Benjamin Kuipers, a professor of computer science and engineering at the University of Michigan known for research in qualitative simulation, warned, "If technology companies focus on maximizing profits – which has been 'religious' economic dogma since the 1960s – rather than on demonstrating their trustworthiness to individuals, they can drive the economy down the path to dystopia and they will not even get the profits they seek. The Prisoner's Dilemma is not just a toy thought experiment. Only trust in each other provides a good overall solution. Trying to maximize individual reward leads to an outcome where everybody's reward is poor."

Simeon Yates, a professor of digital culture at the University of Liverpool and the research lead for the UK government's Digital Culture team, wrote, "Many recent technologies have exacerbated, enhanced or extended the effects of long-standing social, economic, cultural and political issues, but they have not fundamentally changed them. Inequality is still excessive in nearly all nations. The benefits of 'working from home' accrue to a small proportion of the population. Shifts to new forms of remote access to services (e.g., health) end up excluding those most in need. The drive by governments towards greater use of data and algorithms in response to acute planning need will only likely lead to further automation of inequality. In general, the predictions as ever focus on the technology and what it can do, and not on the underlying social forces and structures and general human behaviour. A key point is a lack of accountability of technology companies and their sheer arrogance at not addressing the identifiable harms caused by their products. As operators of limited-choice platform economies they have both a moral and an ethical duty to address these issues, to become more transparent and frankly more open and democratic in how they are run. They need to show citizens and consumers greater respect. Rather than cosying up to these platforms, governments should be protecting their citizens from the worst excesses of these companies."

J. Nathan Matias, an assistant professor at Cornell University expert in digital governance and behavior change in groups and networks, said, "The pandemic will continue to widen economic and social divides around the world. People whose work requires them to be present in physical locations will lose more economically. The pandemic will also normalize levels of surveillance and social control that previously seemed unimaginable, especially for individualistic Western societies that have traditionally valued individual civil liberties. The impacts of that surveillance disproportionately affecting the least powerful in society. Because online education tends to privilege students who have access to technology and private spaces, the pandemic will have a lasting impact on diversity in the technology industry. On one hand, tech firms will continue to have a more remote workforce, which will distribute the industry's wealth more geographically widely. On the other hand, that workforce might become even less diverse than it was before the pandemic due to disparate impacts among the most vulnerable."

David Barnhizer, professor of law emeritus and author of "The Artificial Intelligence Contagion: Can Democracy Withstand the Imminent Transformation of Work, Wealth and the Social Order?" responded, "When the U.S. economy was 'globalized' over the past 30 years and became intensely interconnected and interdependent, anything that significantly affects one or more of the major economic powers (U.S., UK, EU and China) has heavy impacts on all of them. Exactly what they are, how deeply they will penetrate, whether we have the wisdom, tools and strength to respond positively to the pandemic is not obvious. What has occurred in the past five months relative to the virus unfortunately fits in much too closely with predictions of contagion, about a U.S. torn apart by wealth inequality, racial and other critical tensions around competing views of social justice, the difficulty of coping with an incredibly large and rapidly increasing national debt and annual budget that even before the pandemic stimulus was growing more than $1 trillion per year, aging population demographics that Pope Francis has referred to as the 'Age Curse,' along with health care issues and underfunded pension concerns facing the federal, state and local governments (as well as corporate pension and health plans)."

Kevin T. Leicht, professor and head of the department of sociology at the University of Illinois, Urbana-Champaign, commented, "Rosy predictions of the future don't have a good track record. In the end, every technology has five different features: 1) what the inventor believes the technology will do, 2) what the buyer of the technology thinks the technology will do, 3) what interested observers think the technology will do, 4) what the new, front-line users of the technology think it will do, and then 5) what the technology actually does, which is rarely if ever a neat summary of 1 through 4. … Technology and technology companies have (inadvertently in most cases) aided in the creation of a rolling cultural and economic disaster. The lethal brew involves the connection of technological innovation with governments that have been asleep at the switch for almost 40 years. We have almost no antitrust enforcement. No IRS auditing. Extensive financial deregulation. Almost unbelievable economic concentration in leading sectors.

"Because of this, almost none of the rosy projections of what technology and technology companies would do, as described in the 1980s and early 1990s, have come to pass. Technology has not rendered the world 'placeless' – it has created unprecedented concentrations of economic power in winner-take-all, global cities. Technology has not reduced educational inequalities because educational inequalities are created by families rather than schools and technology increases those family-based inequalities. Technology and tech companies haven't reduced our dependence on carbon-based fuels (at least not yet). And technologies have to take some of the blame for destroying the labor markets of the middle class. Do most of our students in colleges really want to be 'entrepreneurs' or are we peddling that route because we've destroyed credible career trajectories through work? It is true that technology did not create the cultural and economic disaster we're experiencing. But the ability of technology companies to exploit cultural and economic weakness to benefit themselves has far outpaced any outcome that could be viewed

as a public good that has reduced inequalities. In the absence of drastic, non-technological intervention, these problems will only get worse rather than better."

Mirielle Hildebrandt, expert in cultural anthropology and the law and editor of "Law, Human Agency and Autonomic Computing," said, "I worry over society's baseless trust in crappy digital decision-systems, with few options to opt out and even fewer options to contest decisions outside of prefab boxes with preformatted complaints. There has been major investment in so-called 'AI' systems without any evidence for the claims their advocates put forward, and they are running amok and causing widespread frustration, fear and cynicism in those who employ them and in those subject to them. I worry over the further increase of inequality and the ridiculous amount of economic power held by Big Tech, Big Pharma, Big Law, Big Finance, all sustained and enabled by a mistaken enchantment with 'digital,' 'AI,' 'algorithms' or 'big data.' I am concerned about the further disruption of the public sphere, resulting in dangerous populism and cynicism."

Richard Lachmann, professor of political sociology at the State University of New York, Albany, predicted, "Most people will be poorer, and they will have more-precarious jobs. The relatively privileged will work at least part time at home, reducing their social interactions, with serious consequences for their mental health. Important institutions will have been bankrupted in the aftermath of the pandemic. America will have fewer theaters, restaurants, coffee houses, concerts and universities. The U.S. will be much more isolated in the aftermath of COVID-19. Even if Trump is not reelected, other countries will have learned that America both is incapable of keeping its population healthy and is vulnerable to electing unreliable and bizarre leaders. We can expect other countries will take steps to reduce their reliance on and interaction with the U.S. Foreign students who sustain American universities' science and engineering programs will go elsewhere. That will lead American high-tech corporations to relocate more and more of their research and development to other countries that will be attracting the best students and that will be able to keep the best graduates. The shift to work-at-home will lead to social isolation and a dispersal of the population into exurbs that use more energy and destroy nature. Tech companies will increase their surveillance abilities. People will spend more time online, reducing their social interactions and making them ever more vulnerable to manipulation by advertisers and extremist politicians and groups. The most ominous development could be a permanent shift to online education. New York Gov. [Andrew] Cuomo's plan to enlist Bill Gates to reimagine schools is a warning signal. Gates' record of 'reforms' that disempower teachers makes it likely he will propose, and Cuomo will try to implement, rote learning rather than the sort of education that happens when students and teachers interact in unscripted ways."

Wendell Wallach, ethicist and scholar at Yale University's Interdisciplinary Center for Bioethics, observed, "Digital technologies exacerbate inequalities not only in the U.S., but throughout the world. Addressing the downside, the economic impact of the pandemic and of

structural inequality will require major reforms in the political economies of larger countries. The COVID-19 crisis is further centralizing power among the digital elite and among those best able to take advantage of high stock valuations for those companies that are thriving during the pandemic. There will definitely be an expansion of applications that improve the quality of life for a large portion of users and even ameliorate the downside of digital application. However, without serious reforms I expect that the overall trade-offs will be a net loss for the average citizen, and particularly for underserved communities. This may, of course, be masked by highly publicized applications that generally improve some aspects of life for specific communities. My worry is too much concentrated power! While a few powerful companies are seriously interested in ethical considerations, most continue to be primarily focused on their image. The deterioration of privacy is likely to continue as it serves the bottom line. More importantly, surveillance technologies in both democratic and more authoritarian countries will place a damper upon, if not actually suppress, free expression."

Rebecca Theobald, assistant research professor at the University of Colorado–Colorado Springs, wrote, "If income inequality, both at the national and global level, persists, then there will be a dystopian existence, with only a few people benefiting from the technological improvements created by clever minds, locked away in their gated communities and hopping from wormhole to wormhole ignoring the majority of people. If there is to be an 'average person' in 2025, then people will need to figure out how to maintain their connections to families, geographies, cultures and ideologies without squashing others in the process. We need people to speak truth to power, and to have the power to listen. And we need people to cooperate. From the vantage point of 2020, in 2025, people will likely be more entrenched in smaller and smaller tribes, talking only to each other and less inclined to give up what they feel they have earned. People in developed regions will have more flexibility in work and will be continually monitored. Health care will change because people's health and genetic history will become available, and we will grapple with questions about who should or should not receive treatment. We will still not be willing to pay people who do what has been deemed 'essential work' during the pandemic a living wage.

"Without a change in philosophy, particularly in the United States of America, geospatial technology will be used to manage and manipulate people rather than to make their lives better. I hope by 2025 efficient pooling of information about ways to improve people's lives – whether it be about health, economic or social issues – can be readily transferred from community to community. Economic inequality will decrease because everyone will be able to access how much money people make, how much they pay in taxes, and how they contribute to their community through contributions to philanthropic causes or political campaigns. Public transportation will become more efficient with more information about which bus/train/metro/trolley is arriving when and where, with more participants and public funds, fewer individual vehicles and less pollution. People who make public statements or declaim something on social media about

scientific or historical issues not based in fact will be immediately quashed with data. If those in power – governments and corporations – contain technology advances and manage them to their advantage, everyone will suffer over time."

Paul Henman, professor of social sciences at the University of Queensland, predicted, "There may be some flow on discussions about taxation and revenue reform, but the essential power imbalances between rich and poor, disadvantaged and advantaged – both within and between countries – will continue to be a strong force that will draw the above changes back to pre-COVID-19 realities and fissures, albeit with a post-COVID-19 hue. In short, COVID-19 has not fundamentally challenged these social structural realities. I worry that the use of tracing and public health surveillance technologies and the associated supporting legislation necessary to respond to the pandemic will continue to be deployed once the pandemic justification has receded. These will be used by actors who will seek to reinforce control and reinforce preexisting social categorisations of dis/advantaged."

Sarita Schoenebeck, an associate professor at the School of Information at the University of Michigan, said, "The pandemic has made visible country-level variances in child care policies, worker rights, health care policies and economic issues. … I'm hopeful that by 2025 technology activists have been able to impact technology design and law in areas like facial recognition and privacy. I'm hopeful that similar advocacy will encourage technology that meets the needs of people with disabilities, reduces harm towards minoritized groups and prioritizes democratic principles. I'm worried about the unfettered role that technology companies have in people's lives. Some of it produces good, but it also produces so much harm for people and societies, including harassment, disinformation and inequity, and those harms seem to be gaining steam rather than losing it."

Jim Witte, director of the Center for Social Science Research at George Mason University, observed, "There is the possibility that this transformation could lead to greater equality, democratization, and a further 'flattening' of the world, as described by Tom Friedman in his 2005 book 'The World is Flat.' But, as I have argued elsewhere (shameless plug, 'The Internet and Social Inequalities,' 2010) technology embedded in a capitalist economy and society is far more likely to reproduce inequality and stratification than to reduce it. The pain will be felt acutely in the developing world, where progress has been made in meeting basic needs, but the blow to the global economy will make this difficult to sustain."

An expert in in the history of U.S. foreign relations and the international human rights movement wrote, "I worry that without taking steps to shore up our education, health care, the environment and safety net or taking action to prevent mass evictions, the closure of small businesses, hunger, unemployment, poverty, etc., the gaps between the wealthiest and the

rest of us will grow to intolerable levels. Furthermore, without action to end systemic racism, state violence and mass incarceration against Black and other marginalized Americans, we will rightly continue to have protests. Without making strides toward providing child care and maternity leave, to creating stronger protections and more security for contingent workers, all of the technology in the world will not solve our problems. Already, we are seeing the negative effects of the existing income gap damaging our society through the rise of violent right-wing nationalism, anti-immigration sentiments and rising isolationism. I fear we will just see increasing unrest. Republicans will likely continue to trot out their tired canards about the threats of socialism, but no party has done more to make socialism appealing to the masses than selfish conservative policies that have redistributed wealth upwards to the wealthiest, while the rest of the country is left with stagnant wages, poor health care, a degraded environment and few protections from rapacious corporate greed."

June Anne English-Lueck, professor of anthropology at San Jose State University and a distinguished fellow at the Institute for the Future, said, "Global economic disruption has exposed and exacerbated economic inequalities. The experience of work differs dramatically for those who can protect themselves and get access to preventative care and treatment and those who do not have access. Mobile devices linked with place-based surveillance are ubiquitous as contact tracking continues. The focus should be on the issues of division based on class, race and the many flavors of gender, the clash with the immediate public health needs, which will be exhaustingly present in 2025, and the ever-more-pressing woes of climate change."

Brian Harvey, emeritus professor of computer science at the University of California, Berkeley, predicted, "The virus will accelerate the growing divide between the rich and the poor – in this case talking not only about the very rich, but about intellectual workers like me, who may discover that they can avoid the traffic jams going to work. Meanwhile the poor have jobs that can't be done from home, those of them who still have jobs at all. A possible benefit would be if the United States developed a social conscience and instituted the kind of safety net that civilized countries have. I am assuming that eventually there will be a vaccine and/or an effective cure to this virus, but the writing is on the wall: There will be more such viruses, and the poor will suffer disproportionately."

Michael Muller, a researcher for a top global technology company whose work is focused on human aspects of data science and ethics and values, wrote, "If we have a non-vaccine new normal, poorer people will continue to do the most COVID-19-hazardous work, while wealthier people continue (as we do now) to work remotely. This situation is unjust. If it became perpetuated, then this aspect of injustice would also be perpetuated. Our lives are already riven and sickened with injustice. I hope we can find ways to reduce injustice. So far, COVID-19 is mostly making it worse."

Michael Marien, director of Global Foresight Books, futurist and compiler of the annual list of the best futures books of the year, said, "Life will be better for some in 2025, but worse for most people within and among nations. COVID-19 is clearly worsening inequality worldwide, and the worst impacts of the pandemic are yet to appear due to underreporting in 'developing' countries, many of which will be 'undeveloping.' COVID-19 is 'the great equalizer' in that anyone can catch it and suffer, but 'the great unequalizer' because it will impact the poor in crowded slums and the informal economy who have little or no access to health care and, for many in the near future, food."

Alice E. Marwick, assistant professor of communication at the University of North Carolina, Chapel Hill, and adviser for the Media Manipulation project at the Data & Society Research Institute, predicted, "Five years from now I expect that working from home will be normalized for most white-collar industries. The pandemic has shown us that people can be productive without an office environment, and many people who believed they had to live in very expensive metro areas to work in their desired field will opt to live in lower cost-of-living areas while still being active participants in their workplace. However, I do not envision system-wide reforms for some of the systemic inequities that the pandemic made highly visible. The three-tiered employment system of the unemployed/furloughed, the 'essential workers' who primarily work in low-wage, low-prestige jobs that require in-person engagement, and professional/white collar workers shows no signs of abating. The immense difference in the U.S. between people who have caregiving responsibilities at home and those who do not will not change without systemic investment in child care, elder care and disability benefits. The difference between parents who can afford to hire nannies, teachers or tutors for their children and those who cannot will manifest in greater educational inequality along lines of race, class and income level.

"Even if we assume that COVID-19 is no longer a threat in 2025, those inequities will remain unless there is a nationwide change in funding priorities and an end to partisan gridlock in Congress. Many of the economic effects of COVID will continue to be felt five years from now, from urban centers that never fully regained their economic vibrancy to long-term salary depression on people who were laid off or entering the workforce during the pandemic. In addition, without national-level, comprehensive privacy reform, the use of social technologies by the criminal justice system, the police and the government will continue and will further entrench unevenly distributed levels of privacy. Expansion of surveillant efforts of the state and criminal justice system will further marginalize the poor, people of color and political activists. The use of algorithms to distribute social benefits punishes the poor, especially the elderly or those without access to the internet."

Alice Xiang, a researcher at The Partnership for AI whose work is focused on fairness, transparency and accountability, wrote, "We have already seen that COVID has affected people

very differently along existing socioeconomic and demographic lines. I think the 'new normal' will reflect further-entrenched inequalities. The demand for those with technology-related skills will likely increase as more of people's lives are conducted virtually. While in-person service jobs have provided significant employment for lower skilled workers, those industries will likely still suffer in 2025."

Amy Sample Ward, CEO of NTEN: The Nonprofit Technology Network, said, "Most of the systems that surrounded our lives before the pandemic – for education, health, work and beyond – were overly reliant on offline interaction and not made from values or processes that enabled effective shifts to more virtual environments. As we've seen with the way many of these systems have been forced to find new ways to operate during the pandemic, systemic oppressions, issues of accessibility and competing systems of capitalism have prevented many communities from being able to stay safe, access services or continue working. Building 'back' from here will be a very long road and one that will, unfortunately, continue to burden most those already most impacted by these systems. Until there is real investment in ensuring that everyone has reliable access at home, reliable and appropriate devices (not only a smartphone) and the skills to use the internet for their needs, any tech-related changes that may be developed will continue to serve mostly those with more privilege and access to resources. The very real needs facing our communities during this pandemic present challenges ripe for technical innovation and solutions, however those facing the most needs today are also those most likely without service and devices. We need to have our collective interest in change include bringing everyone online. The role of private equity should worry everyone, as well as the continued monopolization of technology, especially AI tools entering homes."

Jon Stine, executive director of the Open Voice Network, responded, "I worry that, from policy and investment perspectives, the national digital divide will be of little interest to those in power. And that many of our leading technology firms take little or no responsibility in addressing the fact-free narratives that increasingly shape societal attitudes and political decisions."

Craig Spiezle, managing director and trust strategist for Agelight and chair emeritus for the Online Trust Alliance, said, "We are facing a perfect storm: levels of civil unrest, extremes in political discourse and lack of faith in our government. I fear it will be long road to recovery not only from the economic damage but the impact to trust and integrity, not to mention the unknown long-term impact from social isolation. … The new normal will arise with a transformation of many jobs and of the overall economy. While we have high hopes for technology, COVID has taken the divide between digital inclusiveness and digital inequality to a new level due to the need for home schooling, remote work and telemedicine. While affordable, fast and reliable connectivity is paramount, the issues are not limited to access. Key digital obstacles include but are not limited to basic online literacy, language capabilities, understanding of relevancy and access to technical

support. Combined with increasing privacy deficits and risks of fraud, these issues are impacting several segments of society more than others. Pew released research in June 2020 showing 65% of adults [ages 30 to 49] say the internet has been essential to them during COVID, compared with 31% of those 65 and older. This is not surprising as older cohorts in general have not embraced a digital lifestyle and do not understand what they are missing."

Perry Hewitt, an executive with Ithaka, responded, "2025 is too soon for us to expect that the economic impact of the COVID-19 pandemic, and the fissures in inequality and health care disparities it exposed, will have receded. 2020-2023 will feature massive disruption to educational attainment and employment that will affect everyone, with a particular blow dealt to teens and young adults. For white-collar workers, the forced mass adoption of collaboration tools will provide some more efficient and better ways to work. With the outlier remote worker reimagined as the norm, entrenched assumptions about 'facetime' and acceptance of astronomical rents and outlandish commutes will diminish and improve work life through technology. And here's hoping that by then we view video as a tool to use in a particular context, and not a blanket replacement for in-person connection. At the same time, three years of unemployment will redirect power into the hands to the corporations wielding those tools. Productivity and connection tools are uncomfortably close to remote-worker monitoring, which is also on the rise. Technology exists today that could enforce social distancing in meatpacking plants, and yet laws enable these health and safety measures to be circumvented. Tech skepticism will (and should!) exist at all levels of socioeconomic status, but I worry the working poor and the poor will experience technology only as a negative force leveled against them by employers."

Gus Hosein, executive director of Privacy International, based in the UK, observed, "We will still be in recovery in 2025, but will potentially be building a better world – recovering in regard to economic, psychological and physical health. We probably will have another rise of populism and anti-poor and anti-foreigner sentiment unless a National Health Service-like attitude prevails for a new morality around people being humans who are deserving of humane treatment without regard and despite differences in status and origin and ethnicity and identity."

Luis Germán Rodríguez, a professor and expert on the sociotechnical impacts of innovation in education at the Universidad Central de Venezuela, wrote, "The 'new normal' will involve forced behavioral changes that are not internalized for the majority of the population. This pandemic is unprecedented for a humanity that has achieved, thanks to its technological development, degrees of mobility that are a threat to strategies necessary for containing and controlling the virus. The precarious state of information literacy in all the strata of society is a danger. Rather than creating tools in a way that allows users to solve problems as they wish, technology designers force users to think within the logic of the tools. People are becoming more reliant on digital technology, thus they need to understand how it is created, understand the motives of the technological giants that

make it. People in organizations, governments, private companies of all sizes and civil society are lagging behind in understanding the role of technology in the 'new normal' and they need help mastering digital literacy. A digital emergency should be declared, similar to that decreed in the face of climate change, in order to take measures that guarantee the individual liberties of each person, including those of information and expression. … The best thing that technology can bring to the years to come is to add transparency and auditability to its operation. Stop being a 'black box' for citizens. Rescue and preserve the individual freedom of each one and stop encapsulating people as a user-product. Technological resources, mainly those based on artificial intelligence, must guarantee the interpretability of the results they yield. This applies to developments promoted by technology companies as well as to those promoted by governments. The digital environment is consolidating as a bubble that limits the possibilities of individual development and conditions communications between humans."

Valentine Goddard, the founder and executive director of the AI Impact Alliance, which aims to facilitate an ethical and responsible implementation of AI for all humanity, said, "When confinement measures were imposed, most of us were forced to rely on digital tools for communication. Our dependence on digital tools is now higher than ever. Those who are equipped with digital capacity are pulling through, but those who aren't are losing access to basic needs and rights such as access to work, education and health care. Recent research shows that the digital divide is growing, and that will have an impact on our capacity to achieve the United Nations' 17 Sustainable Development Goals (SDGs). COVID-19 is highlighting the unequal distribution of resources and power in the digital economy.

"As the digital transformation is accelerated by COVID-19, the preexisting ethical, social, legal, political and economic implications of AI and big data are more critical than ever. Yet, [in] society's haste to prioritize economic recovery, AI's ethical requirements risk being overlooked. Given the current distribution of capacity and resources in AI and AI ethics, given the underrepresentation of women in AI, gender equality will take a huge step backwards. For the average woman, that would mean adapting to digital tools designed and deployed by men in all spheres of their lives (employment, economic security, well-being, civic participation). If we focus on access to work, for example, new research shows that due to COVID-19, the participation of women in the workforce has been set back 30 years already. Previous research has shown that women's jobs were more likely to be automated, and therefore replaced.

"Prospects for 2025 in those circumstances should be of high concern and a top priority for governments around the world. Meanwhile, in Big Tech – a sector that employs roughly under 15% of women in AI – profits are skyrocketing. Technology companies play an increasingly important role in everyone's lives, including our civic capacity to engage with democratic institutions. The digital divide, left unaddressed, will silence the voices of digitally illiterate

citizens as well as those of entire communities who don't even have access to internet. As governments are digitizing services to citizens, their reliance on private technology companies is proportionally increasing, giving them more and more power. Not to underplay their expertise and capacity to contribute positively to society, but these are privately owned and managed for-profit organizations that suffer from a critical lack of women and diversity. There is currently no legal obligation to socialize the benefits of the data they collect. Furthermore, from startups to mid-sized businesses in AI, AI expertise is either underfunded or nonexistent. Given the current landscape of uneven access to AI, the lack of large-scale efforts to help citizens understand the implications of AI and data governance, the diversity and gender crisis in AI technology companies, the nonexistence of social impact assessment frameworks, the absence of an obligation to use AI and data to achieve SDGs, I am concerned about the increasing role of technology companies in the lives of citizens in 2025."

Gary A. Bolles, chair for the future of work at Singularity University, responded, "My worry is over the increasing power of the winner-take-all tech companies and the lack of viable competition; a venture-fueled, extractive approach to innovation that guarantees the incumbents will win, as they buy startups designed specifically to be purchased. There is a lack of collective commitment to default processes that work primarily to the benefit of humans, such as a fundamental right to data ownership and privacy. The continued dependence by many governments on legacy processes and old technology that keep them from nimble response to citizen needs is a negative. There is a lack of widespread commitment to ethics and inclusion, leading to the continuing dehumanization of technology."

Ronnie Lowenstein, a pioneer in interactive technologies, commented, "My concerns revolve around: 1) Economic distress worldwide. 2) Continued and escalating social unrest. 3) Political strife threatening democratic institutions. 4) Inadequate models of schooling. While technologies hold promise, as tools of transformation, exponential speed of change minimizes the potential benefits. It takes vision and political will to harness technologies for benefit. The lack of coordinating mechanisms among people within and across nations are negatively impacting response to [the] pandemic. We need global dialogues to create 'regenerative' collaborations institutions harnessing the collective intelligence. Emerging cyber-civilization could improve lives only *if* leaders apply systems thinking and foresight management in the design of policies that ensure the traditionally marginalized communities are supported with technology access, technology education and training and economic opportunities for wealth creation and sustainable, meaningful career paths. My worries are related to: 1) Ethics and privacy rights. 2) Growing impact of misinformation and inability to actually discern reality in technology doctored videos, or the truth in media. 3) The lack of critical thinking/media literacy skills in populations. Since 2009 the UN, UNESCO and U.S. Department of State recognized that without media literacy skills, our democratic institutions are threatened."

Elwyn Davies, mathematician, internet architect and consultant, observed, "Unless there is a sea change in government attitudes, it is looking increasingly likely that many of the cultural aspects of pre-COVID life will not be supported through the economic turmoil that has ensued. The creative and cultural industries are currently at the back of the queue for support. This will make the world a greyer place, and mental health will suffer. The current focus on getting the old-style, so-called 'productive industries' restarted just means sending the wage slaves back to work to ensure the that the rich keep their fortunes intact and continue to enjoy a nice life. Lower down the scale, life will be more constrained, with many jobs keeping us locked up in our homes and personal contact minimised. On the technical side, the internet will be ever more critical to how life functions. I fear also that governments will not take the opportunity to embrace a greener regeneration. Here in the UK our so-called government urges us to 'build, build, build,' but to build houses to last century's standards rather than with heavy duty insulation, low-carbon heating and with solar generation on every roof. Sorry to be so pessimistic but we seem to have been cursed with a mostly short-sighted and venal collection of leaders at this juncture."

Ryan Sweeney, director of analytics for Ignite Social Media, said, "I'm worried most about the furthering of the class divide in a country which is already sitting on a powder keg of inequality. One of the biggest changes will be in terms of working from home. Looking specifically at companies and people who can afford to work from home, the value of doing so will be redefined. The 'office' has been evolving away from tradition, as working from home becomes more commonplace. … Pessimistically, in the 'new normal' for people who are unable to afford to work from home and have been financially harmed by the pandemic we will likely see further isolation. If it becomes commonplace for social interaction and financial transactions to happen online, those who are unable to afford high-speed internet (or even the internet in general) will continue to be left behind, furthering the class gap. Generally, I hope this pandemic and the issues it has raised within our society will lead to positive innovation as opposed to further class segregation. Hopefully as we acknowledge where technology leaves people and businesses behind we will leverage technology to solve for those predicted negative outcomes."

Tommy Johnson, a technology developer/administrator, observed, "The internet has been more and more dominated by proprietary systems. Email is probably the last protocol in use which one can use without having to agree to terms of service with some pointless third party. Even the web has been usurped by requiring that one have a signed key from a gatekeeper like Let's Encrypt. Let's Encrypt may give you a key now, but the keys they distribute are intentionally short-lived and can disappear at any time. They are as much a gatekeeper as Verisign. People could have used SIP clients instead of Zoom, FaceTime, Google Hangouts and Microsoft Teams. But they aren't. And the final result is that participating in society while also managing to avoid the pointless rent seekers is impossible. The pandemic has changed the set of winning rent seekers, but not the fact

that the public square is now under an end-user licensing agreement. Absent some unimaginable event, I cannot imagine the rent seekers being reined in."

Vince LaPiana, an information security analyst at Carnegie Mellon University's Software Engineering Institute, wrote, "If we consider only the subset of people in North America, Western Europe and the economically developed countries around the world, working people who use and depend on technology may be better off, as the abrupt change to more remote working will provide this group greater flexibility in where they work, greater mobility and greater freedom of choice. It will also accelerate overseas work in places like India and China, where labor costs are significantly lower even for educated technology workers. I fear we will see a greater economic division and a worsening situation for workers outside of the technology arena, such as people in service industries. People whose service jobs align well with technology workers' needs may do well, but others will not. This economic bifurcation, if it occurs, would be socially unhealthy and disruptive for everyone, including the technology workers who, on the face of it, would be better off – but won't be, if they're living in societies with less economic equality."

Kate Klonick, a law professor at St. John's University whose research is focused on law and technology, said, "The new normal in 2025 might be better in some ways, but will mostly be worse. While working at home can be incredibly beneficial to some people, the loss of 'hallway effects' gained from business travel, daily commutes and work environments will be significant. While I believe most of the risk of COVID spread will be mitigated by 2025 so that people can generally return to 'normal' will be an ever-present fear of reemergence. I am most pessimistic about the pandemic's impact on education, from K-12 to college to professional schools, and on small businesses. I believe the models those systems function under will be the longest for recovery (close contact, indoors) and thus the most economically damaged and least likely to recover. I worry people will become out of practice with in-person interactions. I worry that rushing to certain types of technology to stop the spread of COVID, like contact tracing, will have terrible long-term effects on privacy with little benefit."

Arnaud Gahimbare, network administrator at the East African Court of Justice, commented, "The way technology is bringing services closer to individuals with minimal physical effort will increase the rate of noncommunicable diseases due to lifestyle such as obesity and related diseases. Also, technology will kill some careers, and those who will not be able to adapt to new ways of working will lose their jobs. The average person in my part of the world is mostly uneducated, a farmer, living in a rural area without electricity and water. So, for the average person in my part of the world, the new normal in 2025 will be worse. Not much will have changed in the way s/he lives. The rest of the world will be operating within a digital economy that will negatively affect the average person in my part of the world since trading will be done and

decisions made with him/her not being involved and yet the consequences will follow on him/her. I hope technology will make the world smaller and services affordable and much more reachable."

Alan S. Inouye, director of the Office for Information Technology Policy at the American Library Association, responded, "In 2025, the question will be, 'What is the proper proportion of in-office workers vs. remote workers?' For many of these workers, increased flexibility will be obtained, with the possibility of hybrid models. A major revolution in the office/organization paradigm will be taking place. Those whose work is not so place-dependent, based on their human capital and expertise, and can be done via technology may well be winners. Others not. The others include most of the service workers who do the physical work to make the economy go, such as restaurant workers, brick and mortar retailers, agricultural and meatpacking workers, janitorial workers and many others. Their work is primarily tied to a place, and place may well still be compromised in 2025."

Faisal Nasr, an advocate, research scientist, futurist and professor, wrote, "If national policies fail to address the use of digital technology in all walks of life, especially ensuring access to all layers of society, then other responsible organizations – public, private, CSOs, universities and others – have to do their part in ensuring productive and fair digital technology utilization free of abuse in labor markets and mindful of people's work and meaningful contributions. … As a professional economist since 1975 in academia and international development, I have found that the excessive emphasis on the profit motive is very dangerous, is contaminating the world and is negatively influencing democratic governance and the real role of the public sector as the conscience of society to ensure fair and inclusive economic growth and development. The private sector is very important for economic growth, but private sector institutions have to see themselves in a very different light than the past: one with a social responsibility to share the gains which stem from society, to ensure future balance and stability."

The director of an artificial intelligence research institute said, "Networked technological systems – those that we refer to when we talk about 'tech' – are tools of centralized control. The technical systems that are clustered under the banner of 'AI' require massive infrastructure, huge stores of data and elite training to produce and maintain. In the Western context such resources are only available to a handful of large tech corporations, who effectively form a monopoly. As these technologies are further threaded through sensitive domains, from COVID-19 contact tracing, to determining which students get into which schools, to deciding who goes to jail and who gets bail, to determining who gets a loan and much, much else, we are increasingly ceding control to these sensitive decisions to obscure and unaccountable companies. Because such systems are almost always developed and sold by private companies, they are hidden behind corporate secrecy, and not open to scrutiny by researchers or the public. And, when they are deployed in specific domains, frequently they are procured and implemented in secret, without

robust democratic debate, or the people on whom they're used even knowing that their lives and opportunities are being shaped by 'tech.' There is nothing magical, or even necessarily competent, about these technologies. What they are particularly good at is centralizing power and helping obscure regimes of social control that accrue more power to those who already have it, while further disempowering those who don't."

Ben Grosser, associate professor of new media at the University of Illinois, Urbana-Champaign, predicted, "Governments and corporate employers will use this moment to dramatically expand computational surveillance, particularly into the home environment. Employee activity will be increasingly tracked, measured and analyzed through quantification, and this encroachment will have a significant negative effect on individual agency, happiness and safety. The divides between those who have adequate technological resources and those who don't will widen. I hope there is a renewed interest in building, deploying and adopting decentralized noncorporate infrastructure for tasks that are now provided by companies like Facebook. However, it's already an inarguable disaster that a single corporation such as Facebook holds so much personal data about nearly 3 billion humans on the planet. Such platform dominance and the perils it presents will only expand."

Brian Harvey, emeritus professor of computer science at the University of California, Berkeley, wrote, "My friends in the computer world tend to believe that the solution to bad technology is good technology. But when it comes to the social implications of technology, I have the old-fashioned view that it's human decisions, not technological imperatives, that usually matter. Shoshana Zuboff gives the example of Google quietly abandoning the 'don't be evil' slogan when they figured out that they could make more money collecting dossiers on everyone than on search itself. It would help, for example, if rising unemployment (already underway before COVID-19 but much worse now) finally led to a worldwide guaranteed basic income – an adequate one, despite the word 'basic' in its name. Everyone is already worried about the fact that four people rule the world, answerable to no one. Well, I guess Apple isn't quite just one person, so three people and one small group. The problem is, as usual, worst in the U.S., where technology bubbles have given rise to a 'post-truth' politics that is truly frightening. But, just as in the case of fast food, the rest of the world has been eager to import the very worst things our society produces (instead of toilet paper, the only thing we do better than the rest of the world). The computerization of elections is another terrifying development."

Michael G. Dyer, a professor emeritus of computer science at UCLA expert in natural language processing, said, "I worry that, as the world becomes more virtual, companies could end up owning and controlling all our virtual 'possessions.' If you buy a physical book you can give it to someone else; not so with a virtual book. You will use someone else's software to create your virtual 'building' in which your employees meet and interact. What happens if you, for any reason,

annoy the company that maintains and licenses to you that business environment? We already are seeing the incredible power that Amazon, Facebook and Google have over the businesses and people who use their software. At some point such companies will have to be broken up unless proper laws can be crafted that rein in that power. …

"The acceleration of the already ongoing trends of robotics and virtual interactions will continue to make life worse for the poorly educated and better for the highly educated. Some form of universal basic income (UBI) will need to be implemented, hopefully coupled with the requirement that those who receive it must at the same time be acquiring educational credits. Over time, more and more people will be educated via online targeted courses with targeted certifications. Only the wealthiest will be able to afford a traditional education in which they physically gather on campuses to learn philosophy, history, science, mathematics, etc."

Annette Markham, a leading expert in digital ethics, identity in sociotechnical contexts and futures of technology, responded, "Predictive analytics and the invasion of digital tech into our personal and work lives will certainly continue. In 2025 we can expect blanket surveillance and deeply personal data collection. But this will not be without strong voices continuing to hold corporate and governmental entities accountable. We can expect that additional tragic events and unjust outcomes of predictive policing and data breaches will have helped create stronger public pushback against invasive technologies."

John Sniadowski, systems architect, predicted, "The gap between people able to work from home and those forced to go to work because their job needs physical input will widen."

As risk grows, security must also; privacy falls and authoritarianism rises

A significant number of these expert respondents argued that the health crisis spawned by the pandemic and the accompanying broader dependence people have on the internet heighten threats of criminal activity, hacks and other attacks. Some noted that optimized security solutions are likely to further reduce individuals' privacy and civil liberties. They said the mass surveillance that seemed necessary to fight the pandemic is likely to expand the opportunity for authoritarian states to silence dissent and abuse citizens' civil rights.

Michael R. Nelson, research associate at CSC Leading Edge Forum, said, "The need for better medical information (to track COVID-19 patients, for instance) may make us figure out how to properly handle digital health information – and lead us to get better, more rational privacy policies for ALL types of data. … Governments are going to have to decide how to reconcile contradictory policy goals. One possible solution would be end-to-end encryption (and cloud

services that let me encrypt my data using keys only I control). Another solution is 'data trust' or 'data unions' that store data about me and let me know who is accessing it and why. There is a lot of innovation yet to come – *if* governments don't insist that there is *one* solution for every problem, when allowing different approaches for different communities with different needs makes a lot more sense. I am excited about the 'Cloud of Things' – what happens when each of us have 50-100 networked devices helping us live easier, safer, more organized lives. But that requires networks that are reliable, ubiquitous, flexible and affordable – and *interoperable*. (That means a lot more than just the 5G solutions that some companies are pushing.)

"I'm also excited about the promise of big data and machine learning – *if* we can overcome the fear of the future and techlash that are leading to dystopian visions of a future where the Tech Titans control everyone and everything. I worry that governments are writing rules to regulate the Tech Titans and not realizing that those rules will *kill* the opportunities for new entrants to provide new services and compete with the established players. This is particular true in regard to copyright, privacy, the 'right to be forgotten' and hate speech. I'm also concerned that authoritarian countries will develop and export technologies for tracking their citizens – and lead to a backlash to some of the most exciting potential applications of the Cloud of Things."

Giacomo Mazzone, head of institutional relations for the European Broadcasting Union and Eurovision, commented, "The COVID-19 crisis will accelerate changes that normally would have occurred in two decades; they now very likely will happen within the next five years. If Europe will not be able to counter and resist the pressure of the internet giants and reestablish ethical and human rights-based principles in the digital world, nobody else will do it for us. Especially not China, Russia or other totalitarian states that see in this change an opportunity to replace the old-fashioned Stasi's service with more efficient and less costly apps, like Clearview. It also will be important to understand the 2020 elections in the U.S. Those with wealth will pay to protect (as much as they can) their privacy and their valuable information. The new poor will simply give their identity in exchange to access to basic services that appear to be available for free."

Jonathan Kolber, a member of the TechCast Global panel of forecasters and author of a book about the threats of automation, wrote, "I am concerned that universal surveillance will become the norm due to drastic reductions in the cost, size and mobility of sensors, and antennas, as well as the AIs that will monitor and sift through surveillance data. I expect an Orwellian model, albeit in somewhat softer form, to proliferate in China and nations under its growing influence, as well as in democracies that cannot effectively adjust to the triple pressures from a Depression, accelerating automation and environmental crises. Universal surveillance can actually become a tool for both public safety *and* protection of individual rights, but it will require a radical rethinking of societal design, including how that surveillance is implemented."

Alf Rehn, professor of innovation, design and management at the University of Southern Denmark, responded, "The new normal is likely to be one of insecurity – social, economic and existential. A sense of unease regarding the next crisis is likely to become a default state for many, with the attendant shortening of planning horizons. There is a risk that people will become less prone to take risks such as getting a new education or starting a new business, as the focus shifts very much to the immediate future. People will still believe in innovation and new technology, yet there is a distinct risk that there will be far less investment and support for the same, as fear drives organizations and societies to take less long-term risk and focus more on a few key areas (such as health care). The new normal might superficially look quite a lot like the old normal, just less forward-looking and risk-taking. … The short-term benefits may be dwarfed by the long-term risks of focusing too much on things that can go to market in a 12-to-24-month span, and not enough on the research and development that might not create an impact until 10 years down the line. We need to be careful that we're not selling out the future when dealing with today. There are of course many things one could worry about – privacy, data security, the fragility of systems and so on – but the thing that worries me the most is that companies may cut down on the kind of long-term research and development that we will need in not just 2025, but in decades to come. If countries, too, abandon basic research, we may be setting up an innovation time bomb that will be felt beyond 2030 when the needed advances simply haven't emerged."

Susan Etlinger, an industry analyst for Altimeter Group, predicted, "We will never completely return to the period of relative innocence (or willful ignorance) we enjoyed before January 2020. That world is gone, and we'll need to be vigilant both from a personal and public health perspective from now on. Humans being what we are, we should expect lapses, flares and inevitable restrictions as part of our 'new normal.' As we're rapidly learning, there is no 'one and done' when it comes to novel viruses. Since the beginning of 2020, we've seen organizations accelerate their digital transformation efforts and the move to cloud computing. A few years ago this was considered innovation; now it's survival."

Seth Finkelstein, programmer, consultant and Electronic Frontier Foundation Pioneer Award winner, observed, "The potential misuse of surveillance and tracking is mind-boggling. We have many communications highly centralized in a few large corporations, location data tracked by a similar handful of large corporations and are moving towards having delivery of the necessities of life increasing under the control of some large corporations. This is all a totalitarian's fantasy toolbox. It's possible that contact-tracing infrastructure implemented to minimize spreading the virus of COVID-19 could be repurposed against spreading the virus of subversion. While this is not a new dilemma – a standing army that can defeat a foreign enemy can also potentially be used against a domestic political rival – I worry there's not comparable effort to effectively deal with the risks."

Morgan G. Ames, associate director of the University of California, Berkeley's Center for Science, Technology & Society, wrote, "Surveillance technologies and the erosion of privacy and civil liberties are already well underway and could be significantly worse all around the world by 2025. There is little incentive for technology companies, especially less high-profile but more specialized ones, to avoid close cooperation with fascist regimes around the world. While there has been a lot of focus on the role of Microsoft, Google, Apple and especially Amazon and Facebook in this already, there are many others who have avoided scrutiny in this area. I fear that there is little to stop this expansion."

William L. Schrader, an internet pioneer, mentor, adviser and consultant best known as founder and CEO of PSINet, predicted, "Privacy will be lost forever. The internet does not sleep and does not forget. People who control these firms have inordinate power now and into the future. They are quite capable of being shallow and selling out to the U.S. government, or any government. So, they will. The poor people and those who are cognitively limited will always be at a disadvantage. However, they won't be the primary targets for the theft and abuse by governments. Technology will be a mixed blessing in the future. Reread 'Nineteen Eighty-four.'"

Anthony Clayton, an expert in policy analysis, futures studies and scenario and strategic planning based at the University of the West Indies, said, "There will be an increased emphasis on cybersecurity, as an explosion of fraud, misinformation and fake news came with the virus. The FBI, for example, reported that COVID-19-related scams had approximately doubled the total volume of cyberfraud in the U.S. Scammers took advantage of the chaos and offered fake advice on COVID-19 to induce recipients to click on their links, which allowed them to download malware and capture personal and financial information. I worry about the extraordinary concentration of power in the hands of a tiny group of technology firms, one or two of which have shown an insouciant attitude to the various harms they were allowing, such as the use of their platforms by criminal, terrorist and extremist groups."

Jean Seaton, director of the Orwell Foundation and professor of media history at the University of Westminster, responded, "The shape of all the issues has to be struggled for by determinate political actors. Surveying the world, they don't look a promising bunch. However, there may be a new will. Similarly, the shape and use of technology will be changed by collective decisions to use it in ways that are in the collective good. Right now, the model of viral advertising is triumphant (see TikTok). It is a dreadful way to run polities, let alone international collaborations. We haven't even begun really to have the discussions about 'privacy' that we need to have. Plus, on top of another economic shock, many of the jobs that poor people all over the world do may disappear. I wouldn't want to be a dissident in 2025. The big companies cannot and are not fit to make a new political space. Meanwhile new, messy authoritarian states and old hyper-authoritarian states will use the technology without any limitation to produce compliance, satisfaction and order."

Doug Schepers, a longtime expert in web technologies and founder of Fizz Studio, wrote, "My worries are the steady erosion of privacy in the form of surveillance capitalism; the growing concentration of wealth in fewer and fewer hands, especially executives of tech companies; the decrease in empathy for others due to physical distancing and remote working and living; increasing influencing of elections via digital tools like social media deepfakes and sockpuppets."

Barry Chudakov, founder and principal of Sertain Research, commented, "It goes without saying that as we move more of our lives online, and self-presentation becomes more virtual than actual, security of identity and sensitive information will become a paramount concern. We will develop better protocols to handle these issues, but we will give up privacy to do so. Privacy will be like a luxury yacht: available only to the wealthy."

Garth Graham, a longtime leader of Telecommunities Canada, said, "The structure of international institutions that balanced global issues since World War II is disintegrating, in part because trust has largely disappeared within the connective benefits of information and communications technologies that enable globalizing structures. In 2025, what people could trust would be technologies that support self-organizing local response to local problems. In other words, a fractal organization of response to global problems, one that is distributed rather than centralizing. However, there's no sign that awareness of a need for heightened sensitivity to local conditions and ecologies can face the challenge of all the calls for a revitalization of existing sources of power."

Andrea Romaoli Garcia, an international tax lawyer active in multistakeholder activities of the International Telecommunication Union and Internet Society, wrote, "New technologies are being adopted indiscriminately, without any respect for ethics or human rights. … We should not accept that tracking people and scanning their faces or looking inside their bodies should be the new normal. We should remember that when technology brought socioeconomic acceleration to the 21st century it also introduced new and lethal means and weapons of war. AI is advancing human health; it is also allowing drones to choose young men as military targets. For this reason, the 'new normal' reinforces our need to respect human rights and accept only ethical technology. The violation that was deemed necessary in the COVID-19 crisis should not be accepted as the definitive measure. After the COVID-19 pandemic, health protocols deserve special attention. Experienced professionals must join young professionals to build safe algorithms to assure health protocols.

"After the COVID-19 pandemic, countries with dictatorships or weak democracy have suffered from organized crime and retrocession of human rights. Corruptors plunder the public trust. Freedom of Expression is threatened as new laws are being established in some places to allow censorship. The COVID-19 pandemic has been used as an excuse to withdraw individual rights

and guarantees permanently. Individual freedoms and guarantees have been violated. These are fourth-dimensional fundamental rights that, from the Fourth Industrial Revolution onwards, open the need for a sixth dimension of human rights to guarantee human security and to establish equitable justice that is reinforced by access to technologies.

"These are forgotten themes when leaders of technology companies discuss their profit plans. Just as it is illegal to trade parts of the human body, the same rule should be applied to individuals' data and their individual freedoms. If this continues to be overlooked, technology will not be beneficial to the future of humanity because individuals will be unable to experience its awards. … Personal information is being used and multiplied infinitely. This must be tackled now for a better life in 2025 and to prevent a long economic recession. The roles of technology and technology companies in individuals' lives in 2025 are crucial to preventing the rich turning richest and the poor turning poorest."

A distinguished professor emeritus of engineering observed, "Everything that is networked is insecure. Companies are failing on security and fraud prevention. Enhanced services require access to data, but I want to have control over the ways my data are used. How can I achieve that? Technology tends to constrain my behavior by guiding it toward well-understood channels. Tech companies need to detect this effect and respond in agile ways. How can we scale personalization and flexibility? Rigidity leads to catastrophic failures (not to mention loss of customers)."

Gary A. Bolles, chair for the future of work at Singularity University, responded, "Privacy will be under much deeper strain, as governments and high-tech giants continually iterate their ability to gather data with relative impunity. … There is a lack of collective commitment to default processes that work primarily to the benefit of humans, such as a fundamental right to data ownership and privacy."

Narelle Clark, a longtime network technology administrator and leader based in Australia, said, "I am concerned that we will see even more unreliable, insecure digital technology emerge and it will increase the risks to an already vulnerable population. People accept what is 'free' but cannot see the trade-offs they are making. The shift to 'apps' on handsets and personal computers has rendered the technology largely opaque, even to experienced and technology literate users. This means an increase in software vulnerabilities. The massive take-up of 'contactless' payment and other interactions due to the pandemic means that even people who were resistant to tracking, identity and technology-enabled theft will become more vulnerable. We will see increases in the unreliability of infrastructure due to cyberwarfare from the unstable geopolitical scene. More online theft will take place due to more desperate people – because of the economic circumstances. We will see increased human rights abuses by increasingly authoritarian and

intrusive governments who will abuse the pervasiveness of technology into people's homes and lives. People may be ready to adopt contact-tracing apps during a pandemic, but these will be coupled with data mining by both governments and technology companies to increase their power and economic value. With the increase in telehealth and closed supply chains, medical technology will increasingly harvest data from unknowing populations and use it for private profit, not necessarily public good."

Fernando Barrio, a lecturer in business law at Queen Mary University of London expert in AI and human rights, commented, "In a system that takes as a given that technological development is good and that the main purpose of corporations and individuals is to maximize profits, the future is bound to be one where technology is designed and used to trample individual rights. Already privacy is almost fictional, and the right to express ideas is being manipulated. This is twisting the political processes in democracies. See examples like the last U.S. election, the Brexit referendum and many other elections in supposedly democratic countries. The combination of lack of regulation, oligopolistic IT ownership and populist governments, from the right, center and left, results in technology having an overall negative role in society's development and in individuals' lives. The rise of an Orwellian society is already a fact in certain countries, and others that are allegedly democratic are sleepwalking towards them because naive individuals are happy that they can find a recipe by simply asking a device that hears everything one says inside ones' home. Another issue, with larger impact on societal levels, is the deployment of so-called artificial intelligence to decision-making processes that affect individuals' lives, from social security decisions to criminal system ones, with an expected exponential rise of biased decisions, which would have been naturalized beforehand by the media and academia. We already see and hear the calls to not regulate AI so 'it can be fully developed.'"

The head of research at a major U.S. wireless communications trade association predicted, "Powerful institutions will use technology to control the freedom and ability of people to determine their lives, while allowing for more thorough-going surveillance and 'social ranking' to preserve power, at the cost of social and economic advance, and even long-term stability. Technology companies will be neutral players in this; simply advancing technological capabilities, by perceiving their roles as limited, apolitical entities, simply pursuing a course of technological development. Individual technologists, leaders and employees may have – and express – qualms about the potential misuse of some technological capabilities, but this will not prevent their development and deployment, although it may cause some companies to forgo involvement. Individuals and populations will remain vulnerable to the security applications of technologies for surveillance and control. Both hostile state actors and nonstate organizations (and individuals) may also use improved technological capabilities to perform terroristic attacks and hacks aimed at disrupting society and harming lives (such as the viral attacks on power companies in Eastern Europe)."

Dan McGarry, an independent journalist based in Vanuatu, wrote, "The original dream of a federated and centerless internet has more or less died. It is now well within the grasp of most nation-states to exert sufficient control over the data passing within their borders that they can consider it a sovereign sphere. The arguments in favour of leveraging this capability to fight the pandemic are in equal parts compelling and frightening. We are, alas, at a point where the machine is running at such a rate of speed that our only options are to continue accelerating or risk the whole thing breaking apart. Technology is the prime enabler of this situation. Despite the risks, however, the majority of political power brokers in the world seem content to send a succession of shocks through the system that not only threaten its smooth operation, they threaten its ability to work. We are entering a phase of global society, therefore, in which the new normal requires we deal with higher stakes than at any point since World War II. I fear collapse. It would be exceedingly hard to achieve, but some days it seems we're hell-bent on achieving it nonetheless. Better communication brings more prosperity. This a demonstrable and well-understood fact. If we don't screw the rest of it up, we will become more prosperous globally than we have ever been."

Garth Graham, a longtime leader of Telecommunities Canada, said, "Breaking up the Big Five [Amazon, Apple, Facebook, Google, Microsoft] is not just a consumer issue, it's a human rights issue. While there is some growing awareness that the data tracks expressing the extension of the person into the online world are and should be owned by the person they describe, I don't believe that enough public consciousness of the need to express that right in law exists to provoke political action."

Tracey P. Lauriault, a professor expert in critical media studies and big data based at Carleton University, Ottawa, Canada, commented, "I foresee increased surveillance/dataveillance that will be rationalized under public good, public duty and public health. I foresee greater ICT solutions that will track, sort, leash, fence people more and more. The technologies may start as a public-health tool, but they will leapfrog into other areas such as in workplace, at play, during travel, in the smart home, the smart housing estate, the smart city, the digital twin and other national and international interconnected smart technologies or large social and technological systems. The rationale for the increased levels of 'observation,' 'surveillance,' 'monitoring' via registration; biometrics including facial, fingerprint, DNA and gait, UIDs, etc., will go ungoverned, as there is currently a lack of accountable, informed, technical and legal actors involved in any form of data and technological governance.

"It is for the moment laissez-faire of the companies to 'self-assess' with impact assessments and no inspection, and most decision-making is at the limited level of privacy protection and cybersecurity, which may protect an individual from harm, but the social and group privacy and implications of these technologies to control, be biased, exclude or include into the 'wrong' group are not assessed as the conversation is about innovation and efficiency.

"We have not learned to be technological citizens in our technological societies, we have not considered large social and technological systems, assemblages and ecosystems and infrastructure, and as the platform of politics and deliberation, which limits our ability to do technological citizenship. Even suggesting these ideas in some circles is to be considered as anti-progress, old school, traditionalist, impeding progress and the like. There is also no opt-out, as opting out causes suspicion; 'you must have something to hide' mentalities. There is also very little use of these technologies to liberate, but they are to control, and there is little scrutiny as to who gets control, and what social and technical biases will be encoded into these new technologies. The technologies will, of course, be reflecting the concerns of politicians, economists, existing legal frameworks and of course the companies that will profit from these.

"There will be very little deliberation that will be open and transparent in communication to the public; there will be little oversight, let alone any holding people accountable should things go wrong. Interoperability and standards are our friends, but in this case, when the ecosystem of data, software, apps, code, sensors, readers, devices, platforms, massive data storage, data brokers and geodemographers, chip manufacturers, the states, the private sector and some large alliances, interoperability becomes a foe, as there will be no workaround. Anonymity will be replaced by autonomous systems; agency by automation; heterogeneity by rule sets to sort."

Irina Raicu, a member of the Partnership on AI's working group on Fair, Transparent and Accountable AI, said, "As earlier Pew Internet studies have shown, Americans have been increasingly worried about their privacy and feeling powerless to protect their data – especially online. While most of us have been grateful for the key role that the internet has played during this time of pandemic, we have also felt forced to make some choices purely as an emergency response – choices we might not have made otherwise – about what data to share with which entities. Given the push toward contact-tracing apps, various tech tools that offer to protect people as they return to work and other surveillance technologies being deployed in the name of health or national security, and given the vast numbers of people who are losing their jobs who might therefore feel compelled to accept privacy-invasive conditions on their employment, I believe that, out of fear and a sense of lack of choice, Americans will feel even more powerless to protect their privacy.

"At the same time, state privacy laws that were passed pre-pandemic, such as the CCPA in California, might offer some protection against unfettered data collection and use. There are also efforts to pass some privacy-related federal laws, but the clashing agendas of various stakeholders might prevent their passing. We increasingly rely on technology to keep us safe, keep us connected, keep us employed. The lines between data collected by private companies and data collected or used by governments was already blurry; it is getting even more so now that data-sharing is seen as one way to combat the pandemic and its related challenges. Given ongoing justified concerns about data that is purportedly collected for one purpose but then used for

others, it is hard to know what the role of technology and technology companies will ultimately be. 'Tech for good' might be repurposed in ways that no one anticipated."

Olivier MJ Crépin-Leblond, entrepreneur and longtime participant in the activities of ICANN and IGF, responded, "This is a significant time for change: Whilst populations are focused on survival (in the economic sense) in light of COVID-19, some significant geopolitical moves are happening: 1) Tightening of the internet's control – touted as needed for cybersecurity. 2) Erosion of privacy – touted as a process needed to track COVID-19 cases. 3) Political advancement on a global context – mainly by China – as a strategic move forward. None of these processes is good for the public nor for democracy as a whole. In 2025, the new normal is a world that has moved from 'relative freedom' to 'managed freedom.'"

Cliff Lynch, director at the Coalition for Networked Information and adjunct professor at the University of California, Berkeley, commented, "What has changed here is that there's a new nexus between tracking and surveilling of people (and self-surveilling) and the perceived public interest in doing this to help enable things like contract tracing (and, perhaps, quarantines). The more panicked the public gets during the pandemic, the more leadership may choose to normalize and enforce the adoption of these tools which will also enable lots of extra data collection by technology companies and government. It feels like the boundaries between corporations and government are getting very porous again, in much the same way as it happened after 9/11. Both collect huge amounts of data on everyone, and it's being passed back and forth freely with little transparency or oversight of the process. It is summer of 2020, and I am watching the not-much-discussed nexus of citizen reporting via cellphone, security video, facial recognition, cellphone tracing and the identification and potential prosecution of protesters and looters in the recent unrest.

"The federal government has come a long way in its ability to track and surveil since the days when it tried to identify and watch protesters against the Vietnam War. During the pandemic an assortment of technologies have gained ground that I can only describe as disgusting. They should probably be banned or intensively regulated; organizations that adopt them need to do some very serious soul-searching about what they're doing. Two poster children: remote-examination proctoring systems in education and systems that allow employers to monitor and track employees working at home. There are doubtless numerous others.

"One other thing I wonder about: I think many people are exhausted and frustrated at the tech vendors' heady pace of planned obsolescence, of gratuitous and unnecessary disruption and change for change's sake. They are inflicting this on their consumers. It's costly, not just in terms of the expense of replacing products that are still working well, but even more so in terms of time and disruption. In today's world, people are *depending* on products to work reliably, and to

continue to work. It's harder to get support and help. There's going to be a lot less money for useless upgrades, and people have much less time to waste on this. Is there going to be a recalibration on this in the vendor community, and are consumers going to vote with their dollars in support of this recalibration?"

Perry Hewitt, an executive with Ithaka, wrote, "As a society, we (including myself!) have made the decision to trade privacy for convenience. As technology becomes more ubiquitous and systems potentially interoperable (what are my Whole Foods app and my Withings scale telling Blue Cross Blue Shield about my health status?), this trade-off is increasingly dangerous. The ability to monitor and surveil as corporations and governments is largely unchecked, in part because of the lack of tech savvy of lawmakers involved in public policy."

Melissa R. Michelson, a professor of political science at Menlo College, observed, "The more of our lives that is online, the more possibilities there are for data-gathering about our private lives, and of course the more vulnerable we are to hacking, to identity theft and to fraud. Large social media companies do not have good track records on these issues; if we are conducting more of our lives online, then there are more possibilities for misuse of our personal data and of negative impacts on individuals."

Charles M. Ess, a professor of media studies at the University of Oslo expert in information and computing ethics, said, "There is an ongoing shift towards what Habermas identified decades ago as 'the colonization of the lifeworld' by the market logic of capitalism, both directly and indirectly (i.e., as more and more people seem incapable of thinking about values and relationships in anything other than market terms of competition and profit). Both governments and the tech giants will continue to push for intruding technologies in the name of greater efficiency, including surveillance tracking of the virus and its inevitable successors, as well as marketing claims of greater fitness, well-being, etc. Profit through data collection is a powerful engine and one difficult to resist much less regulate . …

"The forces in favor of greed, individual 'success' (whatever the cost to others), and corporate profit/socialism are very strong and now very deeply embedded in the political institutions and mindset of very large numbers of people. So long as the latter prevail, well-being – which I understand in classic virtue ethics terms as the consequence of cultivating a number of capacities and habits ('virtues') that foster communication, deep relationships, long-term commitments to both self and others, and the pursuit of a sense of contentment (eudaimonia) that goes beyond the simple pleasures of conspicuous consumption – will be out of reach for most people. … Life will be much more about the struggle for economic survival – survival that will be more precarious and hence push more and more people to accept invasion and control. As a few commentators have argued, surveillance capitalism is closely analogous to medieval societies. Worst case: A few will be

the very grand and wealthy lords and ladies (e.g., 'the billionaire kings' such as Jeff Bezos, as but one example of tens of thousands) and hundreds of millions will be the equivalent of unwilling serfs and peasants, thoroughly trapped in highly sophisticated technological systems and economic/legal arrangements favoring the well to do – systems of all but unbreakable control and repression."

The director of a business consultancy predicted, "Expect the hacking world to become many times more dangerous, and that may be the biggest worry of all. We won't be able to tell if it is a single hacker who brings down the power grid or launches a rocket or if it was some government actor. The political dialogue around whatever happens is no longer trustworthy. When there is no trust in tech – we will find ways to destroy it. The tech companies will increasingly be blamed for their failings. All are based on manipulation of large-scale exchanges. Some are more open than others to outside abuse. All have a concentration of information that can be leveraged. All either are regulated or have a regulated compact that protects their position. All communications have a 'charge,' whether monetary or included in the information. Government is far, far behind. The systems are all broken or managed by outside contractors and thus, again, set up in the interest of generating profit and power for a few rather than for the betterment of all."

Susan Ariel Aaronson, a research professor of international affairs expert in digital governance and human rights, responded, "People will be more dependent on technology, but trust it less. I hope that someone will develop 'privacy as a service' and 'security as a service.' Moreover, a national data-protection law may be a fantasy. There are other ways to encourage companies to protect privacy, including mandating that they are transparent about how they do it, how much they spend and how they have failed."

John Harlow, smart cities research specialist at the Engagement Lab @ Emerson College, said, "Contact tracing will likely see an explosion of international activity. Some innovations will be useful beyond COVID and may help fight other diseases. Some will be dark and become permanent surveillance architecture. … I worry about the amount of data generated about an individual and how it can coalesce into a cross-referenced profile across sources, i.e., simplicity of tying government data to mobile phone data to hacked purchase data to society-scale, real-time gait and facial (and other) recognition across widespread public-surveillance video feeds."

Simeon Yates, a professor of digital culture at the University of Liverpool and the research lead for the UK government's Digital Culture team, wrote, "Tech is not something that has singular impacts, good or ill. Where it will help is in managing COVID-19 – though it might come at the cost of privacy (see the failed UK virus app)."

Marcin Cieślak, a futurist based in Europe, said, "My worries are more surveillance technologies. I am afraid we will take the silent acceptance of the surveillance technology to the next level."

Steve Jones, professor of communication at the University of Illinois at Chicago and editor of New Media and Society, commented, "The obvious worries include surveillance, privacy and data rights. Nothing really new here. I suspect we'll have the same worries then as we do now, with the possible addition of concerns regarding skin electronics and vehicle security."

Michael G. Dyer, a professor emeritus of computer science at UCLA expert in natural language processing, responded, "The trend toward loss of privacy will continue because without laws to force that all communication and resulting data be highly encrypted, more and more of everyone's life will become less and less private. This is a 'natural' consequence of virtuality. Without legalized encryption, consider a tiny portion of a virtual day: I attend any type of virtual meeting: Everything I saw and heard at that meeting can be captured and stored digitally, for some authority (or hacker) to later analyze at leisure. If I wore a virtual suit, then authorities would be able to know also everything I have felt during those virtual interactions."

Paul Epping, chairman and co-founder of XponentialEQ and keynote speaker on exponential change, wrote, "Cybercrime will jeopardize vital systems in our societies, including electricity, water and communication. Sensors will flood the world, measuring whatever you can think of, including our bodies. It is not clear who will own the data, nor what the analyses might be and what the results of that will do to us. We will face big control issues that will lead to political instability. The growing dependency on digital technology will create a paradise for hackers, so cybersecurity will be one of the top priorities, costing society trillions. It can eventually evolve into a 'symmetrical escalation war' between AI and ML and less control by humans because we can't oversee the entire spectrum anymore."

Wendy M. Grossman, a UK-based science writer, author of "net.wars" and founder of the magazine The Skeptic, said, "I'm hoping less for actual tech changes than for changes in *our response* to technology changes. I'd like to see us be more thoughtful both as individuals and as a society about the technology we adopt and how we let it permeate our lives. Surveillance capitalism is possible partly because companies take advantage of us, but partly because of weak regulation and a social and educational failure to push back against it. The early promise of the internet was a decentralized system in which millions of small businesses flourished. Increasingly, we have built a highly centralized system that supports mass surveillance. This is the structure we are transferring into the physical world via the Internet of Things, smart cities, connected cars, algorithmic decision-making and robots. Often, adoption of these technologies is proceeding against what most people would want. I'm thinking of real-time, automated facial recognition, for

example – airports and police forces don't ask public opinion before running trials or adopting the technology. There is loss of choice and autonomy and the loss of anonymity. Increasingly, every transaction – financial or personal – is being intermediated. People talk to their friends and Facebook takes a slice; they pay for a newspaper article and Apple takes a slice – and in both cases the data gathered is then repackaged, resold and repurposed. There is a lot wrong with Europe's GDPR but it *is* a valid attempt to restore the balance of power between these large, remote corporations and individuals."

Randall Mayes, an analyst at TechCast Global, observed, "Using an AI/deep learning analogy, the nodes are economic development, international competitiveness and the social impacts. China, Europe and the United States weigh the value of these nodes differently. For similar situations in the future, policymakers and businesses will not have to start from scratch in working with supply chains, medical responses and economic safety nets, rather they will have case studies for what works effectively. Each sector of the economy will experience transformations that enable it to perform more efficiently. Individuals who understand these changes and are prepared for them will become better off. One worry: Individual private data doesn't have economic value, but, collectively, private data does. Without a mechanism for compensation to individuals, technology companies will reap the economic benefits. Once possible solution is blockchain/Etherium which utilizes smart contracts and micropayments to individuals. Several companies are proposing placing electronic health records and our genomes in accounts where we can sell our data directly to pharmaceutical companies and bypass middlemen (tech companies)."

Chris Savage, an expert in legal and regulatory issues based in Washington, D.C., predicted, "Remote work will be part of the new normal. It is much easier to engage in surveillance of what employees are doing when more of what they do is mediated by computers/the internet. Therefore, I suspect that overall privacy will be degraded as a result of these changes."

Leiska Evanson, futurist and consultant, wrote, "People will not change their current online behaviours regarding the ways in which data privacy is balanced against their need to socialise. After a period of protected quarantines, lockdowns and illness, they will lean more on social media to stay connected, with less concern that their data is a commodity. Only if the service requires payment will users care, as this type of contract is well-known to be legally binding vs. free use still requiring due diligence, e.g., a bank or Amazon breach vs. Facebook selling data to third parties."

Maja Vujovic, a consultant for digital and ICT at Compass Communications, commented, "The idea of personal data protection will not only take a hit, it will have to be sacrificed altogether. Identity certification may get relegated to a consortium of big tech companies, based on their existing profiling data ownership, via social media and subscription data, in lieu or in support of state-certified identities."

Threats to work will intensify from automation, artificial intelligence, robotics and globalization

A share of these experts concentrated their concerns on the future of work. They predicted a number of things to happen in the coming years: In order to survive, businesses are reconfiguring systems and processes to automate as many aspects as possible. While artificial intelligence (AI) and robotics will enhance some lives, they will damage others as more work is taken over by machines. Employers may outsource labor to the lowest bidder globally. Employees may be asked to work for far less; they may have to shift to be gig and contracting workers, supplying their own equipment, and they may be surveilled at home by employers.

Gary A. Bolles, chair for the future of work at Singularity University, predicted, "A much higher percentage of people will work at least part of the week in non-office environments. Many workers will have 'portfolios of work,' a variety of work activities including a day job, gig work and startup activity. While this will encourage more variety and fluid relationships with hirers, it will also create more economic uncertainty and precarity for many. Many businesses will have accelerated their use of a range of enterprise technologies – from implementing digital nonhuman labor such as software bots to utilizing skills banks – to manage their increasingly fluid organizations. More workers and teams will use AI-fueled tools to help them coordinate and collaborate more effectively. Education will become significantly unbundled, with a range of learning contexts beyond traditional schooling.

"My hope is for a human-centric world that requires new technologies to be designed for the benefit of people, with penalties for what used to be considered negative externalities. Software will help humans to better understand, develop and augment their skills and help them find and create a broader range of work opportunities. Hirers will embrace software-fueled strategies to ensure that workers in nonstandard work roles will have many of the same rights as full-time employees, such as unbundled benefits and reliable shift work. As a result, high-tech and other companies will stop depending on nonstandard workers as a fungible commodity. Organizations will shift to a 'NetWork' model that maximizes the human potential of all their stakeholders, in a range of different work relationships with the organization. Teams will have the tool set that will allow them to dynamically and rapidly bond around problems to solve."

David Cake, an active leader of ICANN's Non-Commercial Users Constituency, said, "One significant worry is that companies may take advantage of an increasingly online workplace to use globalisation and informally set hours to continue to push workers towards increasingly economically uncertain and precarious employment. Some employers may try to shift costs towards workers using private equipment, taking on both expenses and liability and increasing economic divides. Another worry is that as employers unused to remote working in their industry

use it more they will begin to make increasing use of surveillance techniques on their workers, and this surveillance and control may become increasingly intrusive into workers' homes."

Barry Chudakov, founder and principal of Sertain Research, responded, "Individuals' personal and professional lives will merge. Work (performed online) and personal presentation (also performed online) will resemble each other, even become interoperable. Employment, having a job, will become increasingly STEM-dependent. For the rest, jobs will become scarce as the COVID pandemic gives employers plausible deniability to downsize. All workers' roles will continue to morph into some manner of tool manipulation and enhancement – creating software and hardware or robotics that support some aspect of the mirror world – while employee loyalty to a company diminishes or vanishes as employees become brands that are bought and sold like toothpaste. In effect, much of the economy becomes a gig economy while self-branding becomes as essential as a seatbelt. Economic security will be available only to those who can repeatedly adapt to multiple simultaneous accelerations and self-brand as they do so. This will affect our individual and collective sense of well-being since many will be unable to successfully adapt and reconfigure their careers and lives."

Seth Finkelstein, programmer, consultant and Electronic Frontier Foundation Pioneer Award winner, observed, "The key point is that the pandemic has decreased labor's power with respect to capital. When that's combined with extensive damage to the economy, the average person is going to be worse off. A major factor has been accelerating the winner-take-all trend of monopolistic corporations dominating their markets, thus away from jobs protected by unions. Now, there is a section of the professional class, the 'knowledge worker,' which may benefit somewhat on the whole. There's more online work, and greatly increased demand for more support of technological infrastructure. This group includes pundits, and hence basically everyone responding to this survey. However, it's a relatively small slice of all workers overall. Small businesses which are replaced with low-wage, no-benefits delivery jobs will not be nearly as well represented in media stories about employment changes. The pandemic has accelerated the long-standing trend for professionals to do telecommuting, internet meetings and similar. But it's made life literally much more dangerous for work which is not information-based, i.e., manufacturing where one must be in a factory or services which need to be done in person. This is another factor producing further stratification of society and dangerous levels of inequality."

Michael G. Dyer, a professor emeritus of computer science at UCLA expert in natural language processing, said, "COVID-19 will accelerate the trend toward more robotics (they can't get sick). Is this better or worse? It will obviously be worse for those who lose jobs in meat-processing plants or in warehouses but will be a benefit to shareholders and the public at large."

Benjamin Grosof, chief scientist at Kyndi, a Silicon Valley startup aimed at the reasoning and knowledge representation side of AI, wrote, "There is tremendous opportunity for the increased concentration of military power – including police power and political power – in the hands of a very small number of people due to the potential for effective surveillance and physical control, by using AI (e.g., facial recognition and integrated data analysis) and drones (e.g., to track, drug or kill). This is an unprecedented challenge for the whole world. It will start playing out in some nations over the next five years as well as beyond that for the next several decades. There is an urgent need for governments to make their 'default setting' a policy of strong privacy for individuals – including in shopping and communicating – rather than the current policy which results typically in cognitively burdensome, confusing and overall weak choices and protections about privacy."

Dan S. Wallach, a professor in the systems group at Rice University's Department of Computer Science, observed, "To look for dystopian aspects of technology in 2025, we can look for them today. One example is Amazon's invasive monitoring of its warehouse workers' productivity. It's easy to predict this sort of close monitoring stretching to all sorts of disciplines, ranging from farm labor through any of a variety of office tasks. Inevitably, that will come with pushes to 'optimize' productivity, creating stress and burnout. Relatively few workers will have the luxury of working at their own pace. Needless to say, more-invasive monitoring implies issues with privacy. If every conversation happens through a computer, will there still be a place for 'private' conversations? Will it be possible to separate one's personal life from one's professional life? It's easy to see concerns for people who have reason to hide their whereabouts (e.g., victims of spousal abuse)."

Rosalie Day, a policy leader and consultancy owner specializing in system approaches to data ethics, compliance and trust, commented, "In 2025, the pandemic will have caused the widening wealth gap to be hastened. American society will stratify a little differently with respect to who gains and who loses. Employment will mostly be better for the last half of Millennials through college graduates in 2020. Employers will cite experience with remote access, gamification and general economic malaise as further reason to cut total salaries. Older Millennials and Generation X will be lumped together as being too expensive. This will result in even more ageism and increased AI-driven ageism, and the 'out' generations' fortunes will fall even further. Retired Boomers who have good retirements will continue to have good retirements because the capital markets will still be driven by corporate boards that look like much they do today; and further, the same incentives will apply. The Boomers who have inadequate financial reserves who have stayed at home during the virus due to health risk will not be rehired. Their places will be filled with adults in their 20s who are not college graduates. Who knows the impact of the virus on anyone younger than 22 today? Every month without teachers who inspire will be a net negative. I can imagine productivity leveling off because the gains of machine learning and deep learning will be a wash or swamped by the losses of experienced middle managers and specialists. Since most data

scientists surveyed say that decision makers at their companies do not use their evidence to support important decisions, data will continue to be artificially valued. I expect reinvention of the wheel, or the not-well-founded conventional wisdom of consultants who have never worked in large organizations (for example, McKinsey's open-office floor plans to 'increase collaboration') to be prevalent."

Beth Noveck, director, NYU Governance Lab and its MacArthur Research Network on Opening Governance, said, "Especially with the need for social distancing, I am very concerned that more companies will turn to the use of AI-based recruitment, interviewing and selection tools to reduce the cost and increase the efficiency of hiring. Many of these tools perpetuate systemic bias by, for example, comparing new applicants to existing employees or creating arbitrary scoring mechanisms that serve to disadvantage diverse candidates, leading to discriminatory practices. In all arenas, I am concerned that the move to more life online as a result of the pandemic could lead to greater surveillance and abuse of personal privacy and private information by the tech companies providing us the platforms we now need to work and learn."

Katie McAuliffe, executive director for Digital Liberty, wrote, "In terms of employment, contract, gig and distance-based positions will become more important, and large employers will need to learn how to manage without micromanaging a dispersed workforce. The industries and individuals who adapt to this environment will be better off. I imagine a new type of economy will emerge – like the app economy after the introduction of the iPhone – but I don't know what that might look like. Automation has likely received a bit of a jolt, but humans will still need to maintain oversight and quality control – this makes us better off preventing injuries and creating distance but does decrease some job availability. Individual tutoring online will likely supplant or augment much of teaching, especially if schools don't start teaching coding. Learning to code early on will make people better off in terms of employment options."

Benjamin Shestakofsky, assistant professor of sociology at the University of Pennsylvania, observed, "The most vulnerable workers are most likely to see their privacy, well-being and economic security threatened by digital technologies. I fear that employers will continue to use technology to intensify work and subject workers to new systems of surveillance and control in ways that will jeopardize their well-being and economic security. Barring legislative and regulatory changes, low-wage workers will continue to be most vulnerable to these changes."

Jonathan Kolber, a member of the TechCast Global panel of forecasters and author of a book about the threats of automation, said, "More and more work functions will be automated by robots and AIs, reducing the need for human workers. This, coupled with the economic Depression I expect from COVID-related effects on hospitality, entertainment, transportation, retail, restaurant

and other service industries, will create increasing pressure for a viable and sustainable universal basic income (UBI) such as Michael Haines' market-oriented UBI proposal."

Chris Savage, an expert in legal and regulatory issues based in Washington, D.C., wrote, "More remote work will lead to significant contraction in commercial real estate (who needs a full-time office?) and less business travel, even when fear of infection has passed. This in turn will lower employment in those sectors."

Erhardt Graeff, a researcher expert in the design and use of digital technologies for civic and political engagement, commented, "The economic churn emerging from this pandemic is displacing workers across several industries. They will not return to pre-pandemic levels. We will see continued growth in consumers' appetites for online shopping, which will be matched by technological and logistical changes that will erase even more jobs. This workforce revolution will not see sufficient retraining or redistribution of jobs by 2025, meaning long-term unemployment for many and worse outcomes. Even if governments are able to increase their social safety nets to keep folks at a baseline standard of living, mental health problems from the trauma of the pandemic as well as from the loss of meaningful employment and concomitant losses of one's purpose and sense of self will mean post-pandemic life will be worse on average. I worry that governments and society will be on the hunt for silver bullets and put their faith in technology companies to produce 'solutions' for the complex challenges we are facing individually and collectively. Misplaced hope in this approach will delay work on structural changes necessary to actually address the social and economic upheaval wrought by the pandemic."

Richard Salz, senior architect at Akamai Technologies, responded, "My worry is that global society will get more divided into the digital haves, who can and do work from home or otherwise remotely, and the (for lack of a better word) essential workers who are the plebians on the backs of whom society will be built. And further, that the divide will grow. The gap between online and real-world workers will increase, so much so that it is unlikely to be bridgeable."

John Laird, professor of engineering at the University of Michigan, said, "For some workers, the new normal will be more remote work, but for many, remote work will still be impossible. There will be a push for increased automation, so one result will be an acceleration (not sure how much) of replacing many jobs. There will be an addition of new jobs, but they will probably be jobs requiring higher education/skill levels, making upward mobility more difficult."

Kate Carruthers, chief data and insights officer at the University of New South Wales, Sydney, wrote, "Unless we can come up with new solutions like universal basic income, life for many people will be worse. Post-COVID economic recovery will be challenging and many jobs and businesses will disappear. In the U.S. there seems to be a real risk of unemployment, food

shortages and civil disturbances into 2025. I expect to see a greater bifurcation of society – with those knowledge workers who remain employed consuming increasing amounts of digital services and online shopping – while those who are not part of the knowledge economy are increasingly gig workers in precarious employment. For knowledge workers, going to the office will become a choice and improvements in virtual meeting technologies will continue and make remote working even more possible. Privacy will increasingly be under threat unless specific jurisdictions regulate it. This includes facial recognition and other biometric data. Increasingly biometrics will become part of the authentication and access regime. Digital government services will continue to expand – except in the U.S., where they seem to lag."

Gus Hosein, executive director of Privacy International, based in the UK, predicted, "Jobs will take a while to recover. Industry will seek to cut costs through automation (not just robotics) and ignoring regulation as it gets rewritten (e.g., travel regulation may remove the hub-and-spoke system). … The reduction of people's jobs to logistics and distribution without economic and well-being security is an alarming trend that could be further enabled with the direction of innovation."

Michael Froomkin, professor of law at University of Miami Law School expert in legal and policy issues relating to new technologies, commented, "Robots will take over categories of unskilled and semi-skilled jobs. This will reduce the misery of doing those jobs but creates a risk of both short-run (skill mismatch) and long-run unemployment. AI and sensors will be used by governments for all sorts of repressive sorting. Tech companies will happily sell them the tools to do it."

Melissa R. Michelson, a professor of political science at Menlo College, responded, "The new normal will mean more children will be attending school either online or in a hybrid format, which means more parents and other caregivers will have to devote their time to supervising those children. This will impact their ability to do their jobs, and especially will reduce the ability of women – who are most likely to bear the brunt of this effect – to work and succeed in their careers. The new normal will mean individuals who are able to work remotely, which is likely to include people at higher levels of the socioeconomic spectrum, will have more income and job security and less chance of getting infected; those who are 'essential workers,' including delivery people, grocery employees and also staff in health care situations such as dental hygienists and staff and front office workers, in addition to doctors and nurses, will be more likely to have their jobs impacted and to contract the virus. The bottom line is that people who have the ability to use technology to remotely do their jobs will have better outcomes; those who are on the wrong side of the 'digital divide' and have less access to reliable Wi-Fi or have to share devices with household members will be more adversely affected. The gap in technology that separates people but was hidden because the gap is usually in their homes will become starker and more important."

Alexandra Samuel, technology writer, researcher, speaker and regular contributor to The Wall Street Journal and Harvard Business Review, said, "A worst-case scenario is that the shift to remote work turns into an engine of greater digital surveillance. Companies may trust senior managers to work from home, but too many organizations are responding to remote work by implementing various tools and mechanisms for ensuring workers are 'really' working – even if that just means scheduling back-to-back video meetings so that they know employees are occupied from 9 to 5. Such mechanisms are a self-defeating strategy (employees will be much more effective and productive if they're trusted, empowered and encouraged to structure their days in a way that is personally sustainable), but they may nonetheless take hold. If so, this will not only degrade the quality of working life, it will also further inure people to the supposed inevitability of digital surveillance, thereby opening the door to the further invasion of privacy by both businesses and governments."

Perry Hewitt, an executive with Ithaka, commented, "We will need both public policy and industry norms to prevent corporations from creating a virtual panopticon that prizes presence over performance. For blue-collar workers, policy protections are critical."

Jon Stine, executive director of the Open Voice Network, wrote, "As is currently evident in K-12 education, the digitally centric life that has been accelerated by the pandemic (remote working-shopping-entertaining) will further deepen the economic and digital divide. The hourly-wage (often entry-level) jobs lost during the pandemic (retail, hospitality) will come back only partially, and slowly. In retail, the closure of stores and shopping centers will result in significant job loss; in hospitality and entertainment, some 75%-80% of the jobs will ultimately return, but only slowly."

Tammy Katsabian, a labor and technology researcher doing postdoctoral work at Harvard Law School, said, "I'm afraid that technology will be used to increase surveillance both in the private life of a person as well as in her work life. More workers will be working from home (as part-time or full-time teleworkers) and will enjoy greater flexibility. Alongside that, however, they will also suffer from constant supervision by their employers. Employers will use AI to vet whether the worker is working in every concrete minute, the efficiency of the worker, etc. I'm also afraid that due to this international crisis that we are currently facing, the unemployed percentages will increase, mostly for unskilled workers. These workers cannot find any comfort in technology. They might have new positions that include constant work with a robot (such as in warehouses) – but the salary will be poor, they will not have any real connections with the other colleagues and the work will be boring and repetitive. This situation is not deterministic. It can be different, but if we want it to be different – we have to 'reclaim' technology and think about creative ways to use it to increase workers' participation, voices and rights in the workplace context. We can use technology as an instrument to ensure greater participation of workers at the workplace. We can use it to conduct online ballots, for instance, on decisions that are related to the workers' work-life and

conditions. The legal system has to be an integral part of this process. Workers' participation should be an essential part of any professional or economic decision that influences the workers (i.e., most of the ongoing decisions) by the law. To make this all processes more accessible and more productive, we need to use technology. I worry over the lack of social responsibility among tech developers. It seems as tech companies do not take into account the influence their product will have on human rights and workers' rights."

Doris Marie Provine, emeritus professor of justice and social inquiry at Arizona State University, responded, "I hate the thought of tech helping promote American workaholism at the top through 24-hour availability requirements and productivity measures, and at the same time leave much of the rest of the workforce without meaningful employment. I'd like to see tech embraced to eliminate truly awful jobs, like picking fruit in hot weather or searching for explosives in war zones. Achieving full employment will be a significant problem. Not everyone's brain is wired for coding, and we have a lot of folks who don't really appreciate education – adjusting realistically to human limitations in finding work, and making non-technological work rewarding and meaningful are challenges that we are not very well-prepared to meet. I worry that the American educational system and Americans are not well prepared for the resilience needed to 'keep up' with technological developments."

Paul Epping, chairman and co-founder of XponentialEQ and keynote speaker on exponential change, predicted, "We will see a 20-hour (or less) workweek, leading to less income and more spare time that has to be organised. This may lead to further global instability and, because the mindset of the human nature is still backwards, this may lead to wars."

The manager of a project focused on enhancing digital life said, "I expect a diversification of employment to remote modalities, as people will want to have a revenue stream that is less contingent on physical presence, which will lead to stratification, since not everyone will have time, education or bandwidth to develop alternate jobs. Being able to 'go digital' will be much more critical, and those whose jobs must be in-person will be far more vulnerable. … A growing role for bandwidth as a critical resource to participate in the global economy, but it still being unequally distributed, heightening general inequality. There will be an increasing concentration of both monopoly and monopsony power in the hands of only a few companies, combined with further weakening of organized labor, and the effective irrelevance of government and collective action with real-world effect, leaving functional decisions in the hands of a few large companies, which will nevertheless be operating at Dunbar-number human scales with respect to their decision making, meaning that the levers of power will be able to change the world, but in all-too-fallible hands. As E.O. Wilson has said, modern civilization and humanity are characterized by paleolithic emotions, medieval institutions, and god-like technology. That anyone whose skills don't transfer to digital/online will be systematically devalued or trapped at the lower end of the

economic scale. Massage therapy or in-person athletic coaching or teaching, trash removal, construction, etc., don't scale and can't go online."

Misinformation will be rampant

Many of these experts have worried in recent years about the impact of misinformation on people's trust and their confidence in democratic institutions. In this canvassing, their concerns take a dark turn. The pessimists now argue that digital propaganda is unstoppable. They worry over its ongoing impact as the rapidly expanding weaponization of cloud-based technologies divides the public, deteriorates social cohesion and threatens rational deliberation and evidence-based policymaking.

Bernie Hogan, senior research fellow at the Oxford Internet Institute, said, "Digital and computational propaganda is likely to continue to be an issue as long as profit-making enterprises are in charge of mediating our relationships to each other. Using the lowest-cost solution to receiving information is like trying to stay informed using only free newspapers from a city street corner – saturated with ads and cynical and sensationalist. Governments around the world are cracking down on arms-length national broadcasters like BBC and PBS while at the same time enabling corporate media. When people say defeatist statements like 'you just can't tell anymore,' they are really saying they are exhausted by having to cut through the noise. But I only see it getting noisier."

Barry Chudakov, founder and principal of Sertain Research, commented, "Inflating our identity through the trick mirror of social media will further distort presentation of self in everyday life, as verification of selfhood, information integrity, and fact accuracy become issues of paramount importance. We will find ways to verify our identities and seek to avoid those who are not who they say they are; we will struggle with factfulness, the antidote to global ignorance. With problems waxing even more complex, and invasive technologies such as facial recognition or predictive policing advancing to esoteric levels, we will be forced to address pressing issues using verifiable facts – otherwise democratic institutions will not survive. Thus, the new normal will encompass refereeing a facts-scrum: truth, lies, distortions, assertions, contradictory information, datasets, data streams from emerging technologies, analyses – all vying for our embrace and attention. This will foster a new media literacy, including a 'truth valuation' set of protocols, which will serve as a reality foundation and foster resiliency to organized disinformation. This 'truth valuation' is necessary because we are moving from the real world to the meta summation of the real world – a mirror world – brought to us virtually on screens where distortions and untruths can easily slip past our five senses, which we no longer use solely as world navigation tools."

John Harlow, smart cities research specialist at the Engagement Lab @ Emerson College, wrote, "The role of technology in undermining democracy is my largest worry. As long as we are creating radicalization and conspiracy bubbles at scale, social media companies will remain massive threats to the stability of societies. Who mediates this? Who decides which technologies the public is offered? Who decides what tech companies affect which individuals' lives? Governments make many of these decisions, and from the Chinese Communist Party to ICE under Trump to [Philippine President Rodrigo] Duterte's recent anti-terrorism law, the world seems to be steadily slipping from the remains of Reagan-Thatcherism into a more authoritarian era, empowered by technology-based government tracking of ever more individual activity."

Alex Halavais, associate professor of critical data studies, Arizona State University, commented, "The question of misinformation has been central to the ability to battle the pandemic and it is likely responsible for the deaths of many Americans. I think this is the most concerning technological question of the decade: What are the systems that can help us to better assure that misinformation is abated and credible information is more widely spread? Relatedly, platform owners have entered into a new era in which they are being held accountable for allowing misinformation to propagate on their platforms. This remains an unsettled issue, but between now and 2025 there will be significant regulatory changes that may address these issues – but given the complexities involved, this is likely to be a fraught and contentious set of issues."

Marcel Fafchamps, professor of economics and senior fellow at the Center on Democracy, Development and the Rule of Law at Stanford University, wrote, "My main concern is the rise of the bots and their use for social control. When people get segmented into small disparate communities – i.e., virtual villages that, with work-from-home, will turn into actual residential villages – it will be easier to control them, e.g., by pitting communities/identities against each other. And we have seen how easy it is to manipulate opinion and behaviors online. … News has to be curated, whistleblowing has to be mediated, we need a strong media now more than ever – not a never-ending rumor mill. I am sure cavemen already had rumor mills. We deserve better, especially when rumors can spread across 8 billion people in a few hours."

Peter Levine, professor of citizenship and public affairs at Tufts University, said, "I hope we might see a social media platform grow to global scale with a business model that allows it to avoid the deep flaws of the current platforms. And I worry that deepfakes may make truth almost impossible to ascertain. Democracies have vulnerabilities that may be increasingly attractive to their enemies, both internal and external. Authoritarian states can monitor citizens (and overseas populations) more effectively with tools like facial recognition. We could see the first real cyberwar, with severe physical consequences."

danah boyd, founder and president of Data & Society Research Institute and Microsoft principal researcher, commented, "Because of COVID, people are paying a lot more attention to how data can be twisted for political purposes. I am hopeful that this will result in strengthening of data infrastructure. … People are getting serious about placing political pressure on tech companies to not amplify hate, racism and harassment. We're not even close to a good solution here, but I'm hopeful that we might see some serious regulatory interventions in the coming years."

Henning Schulzrinne, Internet Hall of Fame member and former chief technology officer for the Federal Communications Commission, said, "I worry that if the U.S. and other countries succumb to right-wing populism and become illiberal democracies they will find social media platforms helpful to stoke resentments and retain power. Perhaps at least some of the technology companies may enter an implicit bargain where they design their platforms to support the government in exchange for avoiding antitrust and other regulations or being exposed to unfavorable tax treatment."

Valerie Bock, lead at VCB Consulting and former lead at Q2 Learning, wrote, "Bad actors seeking to sow division have weaponized the attention economy. Social media platforms have been slow to understand and grapple with their complicity in this process. I find that my attempts to add information to conversations in which underinformed people are sharing confirmation-bias-confirming untrue 'evidence' is exhausting and a strain on my relationships with these folks. I despair that there is not a social consensus around where truth might reliably be found, and that purveyors of palatable untruth appear to be winning over my neighbors to the point where pointers I might make as evidence for my views are dismissed as 'mainstream media' as if that is synonymous with 'elitist publications not in touch with the common man.' It is not helping my cause that reporting in mainstream sources these days frequently features word choices which display a point of view. True objectivism never was possible, but it feels sometimes as if too many have just given up on attempting to present multiple angles on the events of the day."

Aaron Chia Yuan Hung, assistant professor of educational technology at Adelphi University, said, "People are thinking more about the ways that social media are being used as tools for propaganda and misinformation. Some companies have taken steps in mitigating that. This may not be enough, but it's a step in the right direction. Facebook is increasingly the outlier here in what they are doing, and I hope they will make meaningful changes to address concerns about it being used as a platform for misinformation and data mining of user information. Technology can also be leveraged to do better, more unbiased and quicker fact-checking. This can be made more effective if media literacy and media education becomes an integral part of every school. … Social media can be such a powerful tool for good, but it also tends to create echo chambers that increasingly divide people into more polar extremes. Conversing with people who are in a different part of social media can feel like talking to someone on a different planet. Technology makes it too

easy for people to talk over each other, or not talk to each other at all. My general feeling is that, although there are parts of society (of any country) that are deeply polarized and likely never to meet in the middle, there are a lot more people who are in the middle and either are not sure where they stand or have misconceptions that they collected over the years but *could* be changed if they are able to properly engage with meaningful dialogue. On social media, it's too easy to drown someone out with responses and hashtags that make it hard to follow conversations, let alone engage in them. This is not purely a technology problem – this is an argumentation problem. We need to debate each other better."

Ian Peter, a pioneering internet rights activist, wrote, "I think 2025 is too early for the necessary changes to be put in place by governments to address COVID-19. I suspect first reactions will be attempts to return to 'business as usual' – and these will not work. It is only after these attempted actions fail that better measures will be put in place. I am optimistic for a better world by 2035, but I think 2025 is too early for a recovery given the likely responses of world leaders. I worry, for example, about the difficulties companies have dealing with false information, and that some responses may lead to censorship and tech companies' ungoverned actions to determine which information we see or don't see. The free flow of information has never been more under threat but doing nothing about false information is not an option. This is a difficult problem requiring new levels of cooperation between stakeholders."

A professor of cognitive science and artificial intelligence based in New Zealand said, "My hope is that we make many changes. The main change is greater governmental and societal oversight of the big tech companies. These companies are hugely influential in determining how information flows within society, and I believe many of the trends towards authoritarianism and nationalism that we see in world politics are due to the new dynamics of information in society. These flows need to be better studied and understood, and the big companies are not good at participating in the necessary studies; they have a conflict of interest. When we have understood better how information flows within social networks and other internet networks, the big companies need to devote more resources to regulating these flows. They are already imposing censorship through recommender engines – but the current censorship is guided mainly by profit or public relations motives, rather than the social good. Democratic governments need to guide the way censorship happens, just as they impose broadcasting standards and regulations."

A telecommunications and internet industry economist, architect and consultant with over 25 years of experience now working as a researcher at one of the world's foremost technological universities responded, "We will see a step increase in cybersecurity threats – the expansion in attack surfaces because more folks are online is a sufficient reason for that – and the concurrent increase in risks to personal liberty of a surveillance society. We need to be clear on what we want in our society, but stopping it is unlikely to be feasible in my view. I

think more people will have more complicated relationships and understanding of digital technologies.

"Our dependency and social fluency with using it will be greatly advanced (e.g., everyone now knows how to use Facebook and Zoom), but folks will not wholly appreciate the new technologies and will not like the threats to privacy and cybersecurity and the political disruption of phenomena like 'fake news,' which are greatly and inexorably amplified by the dark side of social media. In giving voice to all and in enabling the viral spread of that voice, the internet and digital technologies have overridden more normal social and economic defense mechanisms against the destructive power of fear and hatemongering speech – it is too attractive as a consumption good for people to simply turn away and too powerful as a mode of expression to expect the perpetrators to simply disappear.

"Unfortunately, there are no silver-bullet solutions. Also, as a complementary effect, the boost to digitalization will accelerate other trends (although the adverse macroeconomic effects provide an offsetting dampening effect) such as the trend towards adoption of AI and other automation technologies that will involve a lot of capital substituting for labor, so a lot of disruption in employment markets that will not be limited to low-skilled workers. Lots of other white-collar trades will be ripe for offshoring and automation, like lots of legal work.

"In the short-medium term, I expect this to have significant disruptive effects requiring workers across the economy to retrain and be more flexible and adaptive. The overhang of COVID-19-related debt, grotesquely amplified by bad fiscal policies since 2016, will make it difficult to raise the funds for subsidy programs to aging populations, and the pension-fund risk is significant and could herald a global economic crisis that might make 2008 look like child's play. … The world is a more complex place and this requires more multidisciplinary, cross-disciplinary and cross-cultural engagement to address challenges; putting those together is hard. Digital technology is essential to support the multistakeholder types of governance solutions we need, but it is also very effective in implementing authoritarian solutions and in mobilizing ignorance and mob rule. It will be a battle to see whether our better halves can succeed."

Leiska Evanson, futurist and consultant, wrote, "Elections will be psychologically rigged with online gerrymandering, as echo chambers continue to evolve, shepherded by biased algorithms and AI. What is commonly referred to as AI is not AI, it is machine learning that eats data and spits out patterns – not all of which are useful. Tech companies will use the noise to sell themselves and bury the signals for profit."

Chris Arkenberg, research manager at Deloitte's Center for Technology, Media and Telecommunications, said, "The linkage between consumer data and online advertising is

becoming a pernicious system of programmable influence. Capture human behavior, model populations, personas and individuals, then target them with messages that can tip their behaviors towards a desired outcome: Buy my product, vote for my politician, hate my enemy. Like all technologies, there has been a savvy class of actors that figured this stuff out way before the masses. Hence, 2016, Facebook, YouTube, Russia, etc."

Daniel Pimienta, internet pioneer and founder and president of the Network and Development Foundation (FUNREDES), based in the Dominican Republic, commented, "The COVID-19 pandemic context has shown an aggravation of a worrying phenomenon that has been maturing for several years: the transfer into the non-virtual world of bad behaviors occurring online, especially in social networks (disinformation, hate and racist discourse). With the scientific sphere now impacted, hopefully a threshold has been reached and some positive reactions will emerge, for instance the reinforcing of existing laws towards criminal behaviors online. This will not prevent an extension of an already huge divide in the world between rather educated people with a capacity to evaluate information and not fall victim to fake news and people who have lesser information literacy. In a context in which more political leaders are targeting the second group, information literacy has become a paramount education priority. This has even reached emergency status today – perhaps even nearing the same level as global warming."

Jeanne Dietsch, New Hampshire senator and former CEO of MobileRobots Inc., said, "What concerns me most is technology's ability to enable people to magnify ignorance and misinformation."

Marita Prandoni, writer, editor and research associate with the Shape of History group, observed, "First of all, there was nothing normal about the state of the environmental or societal conditions before the arrival of COVID-19. Humans have altered the climate and since the Industrial Revolution we have been stressing our host Planet Earth through overpopulation, over-extraction of resources, declining levels of education and behaving as though we were above rather than of nature. Digital technologies have been a double-edged sword. … I hope hate speech is abolished from digital platforms and that there will be overwhelming support for flagging and shaming disinformation. Making people outliers when they try to deceive users or incite hate is the most effective way to dissuade such behavior. I also hope innovators can find more benign ways to build and distribute digital technologies – less harmful to both people and planet."

Ian O'Byrne, assistant professor of education at the College of Charleston, responded, "As COVID-19 forces societies into their homes and social distancing moves most interactions to digital spaces, the 'new normal' will require strong connections to the internet and stronger digital literacies. Sadly, these are two areas that many communities have not strengthened over the last decade or two. Digital literacy practices necessary for the safe use of the internet in individuals'

personal and professional lives is severely lacking in most contexts. I hope that education focused on identity, data privacy, security and open source uses of technology will receive more focus in our schools and create a more informed citizenry. Also, the internet is already uninterpretable for most of the populace. Algorithms created by corporations obfuscate the data collection and purpose of these platforms and tools. Internet access globally is also insufficient for most; many rural locations do not have the connectivity necessary to survive, let alone succeed in a global marketplace. This is exacerbated by net neutrality rules that seek to eliminate protections and competition in options. As these two components intersect, the situation will get worse as disaster capitalists are already looking for opportunities to gain a foothold in the post-COVID economy."

Fabrice Popineau, an expert on AI, computer intelligence and knowledge engineering based in France, commented, "Civilization cannot undergo development without some stability, and social networks are shaking stability; without speaking, people are subverting those systems to harm democracies. I am concerned about the role of social networks in political activism. Social justice warriors and 'cancel culture' are dangerous. Social networks are a new media, in the same way as printed books were a new media at the end of the Middle Ages. Social networks are revolutionizing the way people communicate. It will take time for people to learn to control the kind of monstrosity that these networks can give birth to."

Glynn Rogers, retired, previously senior principal engineer and a founding member at the CSIRO Centre for Complex Systems Science, said global environmental issues overshadow everything, writing, "Over and above the immediate COVID-19 crisis, climate change looms as the major threat to our way of life. There are a number of 'tech-related changes' that can at least ameliorate the impact. 1) Evolution of new forms of online social and professional interaction enabled by a ubiquitous high-speed internet based on software-defined networking technology. 2) The rapid deployment of electric vehicle technology with the required infrastructure of charging stations, etc., as well as the reduction of greenhouse gas emissions by the transport sector. This would have a major impact on city pollution levels both in terms of gas and particulate emissions, as well as noise. 3) The development and adoption of the hydrogen economy will enable us to maintain a reasonable level of transport of people and goods over large distances, preventing a major disruption of the economy and our way of life."

Art Brodsky, communications consultant and former vice president of communications for Public Knowledge, observed, "Social media companies and accompanying tech are dominating public discourse through their actions and – importantly – their inaction. They cannot be allowed to create an ecosystem and then disavow any knowledge of what they have done."

J. Francisco Álvarez, professor philosophy of science at UNED, the National University of Distance Education in Spain, said, "I hope that the necessary state intervention is aimed, at least

in part, at facilitating functional digital literacy that helps all citizens to join in techno-social transformation. It is essential that the public administration be concerned with generalizing digital training for full access to digital services. Governments have not been concerned enough with quality digital education, public library services and open access to knowledge. The focus should not be merely upon regulation of companies, but on offering public services and taking advantage of the possibilities of technology to improve the lives of citizens."

Barbara Simons, board chair at Verified Voting and former technology leader at IBM Research, responded, "So much damage is being done by the pandemic, both health-wise and economic, that it will take a long time to recover. Our elections are incredibly vulnerable to attack, especially by enemy nation-states. Even so, there are people who foolishly believe that internet voting is a good thing. Of course, it is actually the most vulnerable kind of voting available for government elections."

A researcher and professor of cybersecurity engineering observed, "Today's technology companies do not have to prove their products meet any level of success. Automobiles have to pass crash tests, and results are compared across various models; safety features are mandated. Software vendors require agreements that remove any level of confirmation and redress for the user. They should have to meet minimum acceptable standards for data handling, privacy and safety which can be compared across all vendors with similar products."

People's mental health will be challenged

A number of the respondents to this canvassing focused on the mental and emotional challenges that will be facing large numbers of people in the coming years. They argued that digital life was already high-stress for many prior to the required social isolation brought on by the pandemic. They believe the ever-deepening shift to tele-everything will diminish in-person contact and further constrict tech users' real-world support systems and their social connections.

Jonathan Grudin, principal researcher with the Natural Interaction Group at Microsoft Research, observed, "Human beings for millions of years lived in groups, interacting in person with people they knew well. Our need for that is most evident in children, reflected in the huge pressure to get kids back in school part or all of the time. Adults may adapt to living in a room from which they work and order food and other goods to be left outside, but there could be delayed costs in anxiety, depression and reduced empathy for other people."

Chris Savage, an expert in legal and regulatory issues based in Washington, D.C., wrote, "With less 'organic,' work-based, person-to-person interaction, people will become more isolated, with

negative mental and emotional health effects. Interacting with others is a benefit of working in an office or other group-working environment that people will lose with an increase in remote work."

Ian Higgs, a technologist based in Europe, noted, "The pandemic has forced many people to isolate themselves from others. This has reduced social interactions and increased stress for many. It has also been a source of social division as those who do not accept that there is a real risk brand those who are isolating as 'scared' and even 'cowardly.' Many, of course, do not have the resources or space to isolate themselves, and this has added another layer of division. The pandemic may ease, but the virus will be with us for many years yet. I fear that the above issues will remain and perhaps become entrenched in an increasingly divided society. These are not issues that can really be addressed by technology, indeed, a lack of access to technology is one of the issues that currently divide us and will continue to."

Mark Deuze, professor of media studies at the University of Amsterdam, observed, "What life under pandemic conditions has forcefully shown us is how much media are part and parcel of our everyday lives. It has been a crash course in digital literacy and accelerating trends well underway before the virus hit. On the one hand, it integrated the use of video calling, social gaming and online watch parties faster into our daily lives than we could have predicted. On the other hand, it has come with lessons learned about what losing oneself in media can produce (amplifying feelings associated with anxiety, loneliness and fear as much as experiences related to joy, a new sense of community and social support). As technology and life fuse beyond meaningful separation (or contradiction), we may be increasingly less likely and capable of effectively critiquing the role media and information technologies play in society."

The head of research at a major U.S. wireless communications trade association predicted, "Greater economic and social anxiety will drive down birthrates and promote more instability and lower household and family foundations, while increasing tribalism and its political exploitation create a vicious cycle of ultra-nationalism and hopeless rebellion. Individuals will manifest higher rates of anxiety, depression and despair. Increasingly, economic and social elites will be entirely out of touch with the growing numbers of economically distressed people, who will form a growing share of the total population."

Michael Muller, a researcher for a top global technology company focused on human aspects of data science and ethics and values in applications of artificial intelligence, wrote, "Unless there is an effective vaccine, I anticipate a permanent reduction in face-to-face social contact. This is likely to result in more 'social bubbles' that are analogous to 'new bubbles' that we have discussed in prior years – that is, people may be more likely to associate homophilously, with reduced ability for social interactions with people unlike ourselves. I hope I'm wrong, because we would experience reduced sense of community and we would stop learning from each other and from

each other's experiences. We might also form even more extreme political differences, polarized along contrasts of identity such as race and class. None of this would be good for democracy, or for sociality or for individual and/or collective human growth."

Holmes Wilson, co-director of Fight for the Future, said, "I worry that smartphones give kids just too much of the wrong kind of digital experiences and that this will get worse. I worry that the unsympathetic, always-handy punching bag that Mark Zuckerberg's Facebook presents will lead to a dramatic reduction of freedom of expression by well-meaning activists to new lows that America has never seen, and that this will reduce the power of internet-driven social movements like #MeToo, #BlackLivesMatter and #DefundThePolice. I worry that more people are becoming addicted to modern, always-available, always-amazing television and that David Foster Wallace's vision of the teleputer and life-destroying entertainment will keep becoming more true. I believe that Netflix is the most harmful technology company by far right now, in terms of depression fed and life hours destroyed in passive thoughtlessness. COVID-19 will make this a lot worse. It's going to be a rough winter for binge watchers (and I can't believe we think it's okay to use a word from alcoholism to positively describe television!)."

A professor of economics who is expert in employment, productivity and economic security observed, "Most importantly, the tech that creates physical, political and emotional distance between people is really worrying."

An anonymous respondent commented, "People will not know how to function in large groups face to face anymore. Emotional intelligence will spike downwards as people can't connect or read each other through online meetings. People will learn to hide their true emotions and needs from their friends, family and co-workers on the other side of the camera."

Christine Ogan, emeritus professor of journalism, informatics and computing at Indiana University, responded, "As people do more online work and have fewer interactions face to face, it will create and exacerbate the social divisions in our society. And the conspiracy theories we already see will be more of a factor in that division. If we don't interact as much socially, we will not be able to work through our problems as a country."

Eric Knorr, pioneering technology journalist and editor in chief of IDG, wrote, "Reducing face-to-face contact has a distinct psychological downside – isolation breeds depression and can reinforce belief systems that can flourish only if left unchallenged."

Stephan Adelson of Adelson Consulting predicted, "The virus will be part of our lives (to various degrees) for quite a while to come (at least another six months, potentially longer based on postrenal for a vaccine). Habits are formed relatively quickly. Masks, hand sanitizer and constant

concern for cleanliness are becoming habitual. These habits to protect our health have and will have an increasing impact on our emotional health. The constant effort for 'self-protection' creates underlying feelings of vulnerability that have no resolution, as our vulnerability is a fact that until now has not been so apparent. Living in a world of increased fear (even if it is slight) will impact society in negative ways. Additionally, with everyone wearing masks, social interactions and emotional discernment that depend on visual clues (such as a smile) are limited. This lack of 'smiles' reduces the happier emotions when coming into contact with strangers in public places.

"Since the beginning of the pandemic, there has also been an increase in obviously judgmental attitudes, as some who wear masks confront those who don't and vice versa. Assumptions regarding someone's political stance also seem to play a role in social interactions. The financial impact of the pandemic will continue to separate those who have from those who have not, increasing a growing emotional class war. These factors, along with others, are contributing to a reduction in positive social interactions and adding additional gaps between strangers while increasing 'fears' related to strangers and creating a new normal that is less friendly and more alienating. I believe that this trend of separation will continue and grow over time, increasing mental health illness across all sectors, increasing the burden of social programs. I worry that technology will increase separation and unhealthy behaviors."

A telecommunications law professional wrote, "I don't have a crystal ball, but I think that this pandemic will have both medium- and long-term disruptive effects on society. On the downside, the pandemic is both highlighting and exacerbating the difference between those who live on the edge of poverty and those who do not. It is also ripping a huge hole through the budgets of state and local governments which will harm public education, public arts projects and public infrastructure projects for a long time. Lots of companies will go out of business, and it is impossible to know what our retail landscape will look like in 2025, which has an impact for our community planning and for employment. It is also upending education in ways that I cannot even imagine – and causing huge emotional stress for parents of young children, particularly moms, that we are not handling as a society. The stress it is causing to our health care systems and health care providers is also so substantial and widespread that we will live with its aftershocks for a long time. More hospitals will close in rural and even less rural America.

Susan Price, user experience pioneer and strategist and founder of Firecat Studio, worriedly said, "Lots of people are hurting. Increased domestic violence, increased use of opioids and other drugs, increased mental illness related to the stresses of uncertainty and reduced mobility, options. Rapid change brings stress, which disproportionately impacts the most vulnerable."

Ravi Parikh, a senior technical staff member at a global software company, predicted, "Employees will fear layoffs and try to enhance their value by performing more and staying active on company networks more. Personal lives could suffer, and depression cases may rise."

An anonymous respondent observed, "Increased reliance on the internet for basic services (groceries, medicine, retail) and work will increase social isolation. In turn, this will decrease emotional well-being and pro-social behavior. I think that the way employers view employment options will change the most, and there will also be a decrease in privacy due to employers forcing themselves into employees' private homes."

3. Hopes about life in 2025

While they anticipate an array of problems in the years ahead, these experts offered hope on a notable number of fronts over the next five years. It wasn't just the optimists who said they see the near future as promising in many regards; most of the respondents who predicted digital life is likely to be mostly worse in 2025 for most people also shared some hopes.

Some believe humanity is now more likely to recognize the need to reinvent or at least revamp some major systems, including market capitalism. A share also predicted that education, health care and/or workplace activities will evolve for the better. Some argued that advances in technologies such as artificial intelligence, smart cities, data analytics and virtual reality could make human systems safer, more humane and more helpfully productive. Some said better communication of more-accurate information can dramatically improve emergency response to future crises.

Many said they hope tech firms will now work to change their practices or encourage and support governments' steps to overcome the many challenges wrought by instantaneous digital communications. They hope to see people come together to overcome inequities and embrace social justice initiatives. They expect that smart systems enabled by AI, virtual reality, augmented reality and machine learning will enhance social connection. They expect that the broad embrace of telework may help most people a better work/home balance that may also benefit the environment.

When asked to share their predictions, most of these experts chose to state their most fervent desires. Many of the statements in this section are not really "predictions" for 2025 as much as they are expressed as dreams for the way things could turn out under the right circumstances. Some admit their hopes are unrealistic; others do not think they could be implemented by 2025.

This section opens with several comprehensive statements about likely hopes for 2025. They are followed by sets of statements sorted under themed headings.

Ben Shneiderman, distinguished professor of computer science and founder of the Human-Computer Interaction Lab at the University of Maryland, commented, "I've seen great progress in my life, so I expect that to continue. The end of Trump's presidency, with its many indignities and murderous decisions on COVID-19, will lead to a better life for many people. While technology raises many serious problems, efforts to limit malicious actors should eventually succeed and make these technologies safer. The huge interest in ethical principles for AI and other technologies is beginning to shift attention towards practical steps that will produce positive change. Already

the language of responsible and human-centered AI is changing the technology, guiding students in new ways and reframing the work of researchers.

"While social robotics is likely to be the next Google Glasses [a reference to a product that was released ahead of its time], I foresee improved appliance-like and tele-operated devices with highly automated systems that are reliable, safe and trustworthy. Shoshanna Zuboff's analysis in her book 'Surveillance Capitalism' describes the dangers and also raises awareness enough to promote some changes. I believe the arrival of independent oversight methods will help in many cases. Facebook's current semi-independent oversight board is a small step forward, but changing Facebook's culture and Zuckerberg's attitudes is a high priority to ensuring better outcomes. True change will come when corporate business choices are designed to limit the activity of malicious actors – criminals, political operatives, hate groups and terrorists – while increasing user privacy."

Joshua Braun, associate professor of journalism at the University of Massachusetts, Amherst, observed, "We're really at a crossroads right now, what with the unthinkable scale of unemployment, the horrific and disparate impacts of the virus on the most marginalized groups in society, the heightened awareness of grave racial injustice, and horrendous problems with our elections. I'd like to think that these issues will create a mandate for sweeping structural changes, and that's my hope. But it also seems entirely possible that wealth inequality, precarity, structural racism and authoritarianism will simply be compounded by official responses to the virus and the protest movement that secure advantages for the haves at the expense of the have-nots.

"I'm skeptical that the culture of the Silicon Valley and its offshoots, typically dominated by white elites, is going to be any sort of salve here. The business model of surveillance capitalism is now firmly entrenched and many of the most successful tech companies profit at the expense of their users' privacy and autonomy. Yes, major tech companies may respond to capital strikes by advertisers, like the #StopHateForProfit advertiser boycott of Facebook, which includes mega-corporations like Unilever. But there are sharp limits to how much reform we can expect from having corporate giants discipline one another, and outsourcing decisions about appropriate public discourse to tech companies is a strategy destined to fail.

"At the same time, positive social movements, not just virulent ones, are building awareness and solidarity through social media. I'm also hopeful at the efforts of scholar-activists like Ethan Zuckerman, who aim to build compelling public alternatives to the for-profit tech empires that have subsumed our public discourse. I think people are beginning to view the protection of their privacy and the moderation of speech online as being about more than personal responsibility, but as an appropriate topic for legislation and regulation. This is very positive, but whether regulatory reforms can be effective or whether they become captive to deep-pocketed tech giants remains an open question."

Paul Saffo, chair for futures studies and forecasting at Singularity University and visiting scholar at Stanford MediaX, said, "The pandemic's trajectory has laid bare long-standing weaknesses and divisions in the U.S. system and will force us to confront those challenges. The response will not begin until well into 2021, and even then it will have its stalls and setbacks. As Winston Churchill famously observed, 'Americans will always do the right thing, but only after they have tried everything else.' This is a moment when some Americans are clearly determined to try 'everything else,' but sanity will return."

David Mussington, a senior fellow at CIGI and professor and director at the Center for Public Policy and Private Enterprise at the University of Maryland, wrote, "The democratization of computing and communications technology suggests that the advantages of large institutions for risk-awareness and response may be eroding. Communities may be able to exercise greater self-help and self-protection through local cooperation. This also leads to the empowerment of disadvantaged groups to more effectively point out discriminatory or standards-breaking behavior, imposing costs on offending individuals who previously acted with impunity. Black Lives Matter and the emergence of smartphone video and citizen protest is an aspect of this kind of future – at least in democratic countries.

"I hope for greater access to the global internet and access to digital services including financial system access. Greater access to information and the ability to leverage skills for distance-agnostic employment. Lower energy intensity of production, lowering environmental stress. Greater access to medical information and educational resources in order to re-skill those who have lost employment due to individual or systemic economic changes. The ability to live further from urban centers could lower population density in big cities, enabling more-livable environments and more-optimal transportation infrastructure efficiencies. …

"Unauthorized private sector surveillance through digital marketing and security services poses a particular challenge. Additionally, governmental repurposing of private data for government services and tracking of citizens may thwart proper oversight. New transparency mechanisms will be necessary to keep these trends in check. Companies' claimed ownership of sensitive personal identifiable information and intellectual property will become more contentious, as private citizens seek to claim ownership of data about them and their activities. Legal and standards progress will need to be made to adapt economic and political conditions to meet new citizen sensitivities. The needs of minorities (protection, inclusion) will need to be respected – but progress cannot be expected to protect these needs without direction – and probably legislative interventions."

Calton Pu, professor and chair in the School of Computer Science at Georgia Tech, noted, "The crisis forces us to focus on the essentials of life and economy. For example, the luxury brands have

fallen quickly. This focus on the essentials will help most people to improve the important aspects of their lives. Technology, e.g., mobile phones and internet, have become essential in the new normal. We use the internet and mobile apps to help entire sectors of economy work (e.g., schools) through the pandemic. For those people who have been in isolation, for example, access to internet enables communications with friends and family. Without technology, we would not be talking about the 'new normal.' The society would not be anywhere near normal. Technology is where the 'new' of 'new normal' is. In a way, we are fortunate that the digital technology had already advanced sufficiently that we were able to leverage it to create the new normal without much trouble. For example, online shopping was developed over the last few decades, and it was ready when the pandemic hit. Similarly, online education has been developed over the years, and schools were able to adopt the same tools when physical contact became dangerous. Many other examples abound. Although the technology was already mature, the degree of our reliance on the technology is 'new' to many. … The real question is whether there is hope for rational decisions by the politicians and the public on making life better, and what 'better' means."

Bernie Hogan, senior research fellow at the Oxford Internet Institute, responded, "Crises tend to provide the motivation for change that would otherwise be seen as 'not now.' The internet has had many moments up to this point, but this might be the moment where distance working and flex working are seen as a net positive. The gig economy is collapsing around us, and for good reason. Just because a worker's job is flexible does not mean that the business can absolve itself of responsibility for the many ways in which work intervenes in our lives, from health care to wages for time spent. Seeing how real employees are working at a distance elevates gig work by allowing us to see the organisation as more than just an office. Normalising the idea that I can have a meeting from afar simplifies a lot of work life. That idea is likely to persist after social distancing has (hopefully) abated. I do worry whether this is yet another opportunity for state-sanctioned information technology surveillance to creep further in our lives. Fortunately, this time around the pushback was swift and coherent while privacy enhancing technologies were available at the outset.

"One fundamental change needed is a shift towards greater ease of management of the address book. This simple list has been traded in for lecherous social media because people worry about how they are going to stay in contact. Having a common standard across platforms and local privacy-aware management of contacts will be a sea change. It will upset the monopolies of audiences that currently happen on Facebook Inc.'s properties, and it will hopefully enable third parties to innovate again in this space. Facebook has locked down its API for friend lists and stifled the creative innovation that was a staple of its apps a decade ago. Now it should be legislated."

Doug Schepers, a longtime expert in web technologies and founder of Fizz Studio, predicted, "I believe things will get better for most people, including in the digital arena, because of

reassessment of priorities due to the pandemic. It's hard to know on what time scale these changes will occur and under what circumstances. The primary factor for whether things will improve or degrade will be the result of the U.S. presidential election, which of course will be affected by the pandemic in multiple ways. I hope for advances in digital voting; distributed and accountable governing, with more recorded on video and available by live webcast; more secure, more private messaging for text and video; better broadband infrastructure; decreased reliance on fossil fuels and more public infrastructure for renewable energy. My answers are mostly U.S.-centric:

- *Education:* The new emphasis on remote learning will put pressure on educators to revamp their pedagogical and assessment methodologies and will likely result in improvements for students with disabilities. The 'curb cut effect' [in which regulation and programs designed to benefit vulnerable groups often benefit all of society] will lead to improvements for all students. In higher education, the move to remote learning will likely be a disruption of 'old boy networks' and economic disparity that could result in greater equity to wider populations. However, this assumes that improvements to infrastructure (below) are taken seriously.
- *Rural public infrastructure:* The pandemic has led to greater awareness of the poor state of our rural internet-access infrastructure, which has been largely left to inadequate private-company investment and subject to 'market forces' (i.e., lower population density means lower profits, so rural broadband has been ignored). Now that remote services are seen as more essential, there could be enough public pressure for the government to mandate better rural high-speed and high-capacity infrastructure (supplemented by 5G networks). This will be emphasized by the diaspora from high-population cities into smaller cities and even rural areas by wealthy people who want to flee the health risks of the big cities.
- *Remote working:* Many companies have abandoned their insistence that workers work from the office. This will put greater financial power behind digital-remote-work resources, such as video conferencing, distributed project creation, collaboration, management and other services. The quality of these services will have to improve. More people will be able to work from home and from lower-cost regions (again, see public infrastructure).
- *Voting, governing and social justice:* Voting and governing will likely have more digital components going forward, despite known and unknown risks. The increasing use of the 'social media panopticon,' where mobile phone videos document antisocial behavior by citizens and law enforcement officers alike, has dramatically increased during the pandemic, partly as a function of increased tensions, partly because many people are spending more time on social media. This has already increased awareness of the need for more substantive reform in policing. The backlash will likely also increase privacy laws, akin to the European laws against photographing or publishing photos of individuals."

The chief scientist for a Silicon Valley-based artificial intelligence company wrote, "People and organizations will be more comfortable, skilled, effective and, overall, accustomed to

interacting remotely for work, health care and socializing. They will be more willing to trade off reductions in commuting effort and real estate property expenses for the sake of other aspects of life, including to have more time in their day, more physical space and closeness to nature and lower stress overall. For many kinds of work, that will create more career security because one will have more choice of what organization to work for and be less tied to the particular geographical location of the employer or customer. The rise of AI will result in increases in productivity. That creates an opportunity for society to economically distribute the benefits of productivity increases widely to the individuals in society. I wish I could say that employment and economic security will be improved, but whether that will happen depends much more on political activism to combat the fundamentals of economic inequality and to install more rational policies such as universal health care; that's likely to take many more years than just five."

Social justice will get priority

Many of these experts argue that the reawakening of public movements for social justice and economic equality may create more-responsive government and sociopolitical systems that are more attuned to diversity, equity and inclusion. They hope for changes that will address digital divides – both in access and in tech and information literacy. Some say there will be a reckoning for technology companies and their leaders.

David Karger, professor at MIT's Computer Science and Artificial Intelligence Laboratory, said, "I'm very hopeful that the current social justice movements and their reflection in activism about the damaging impact of current social media platforms will lead to a renewed effort to create digital public spaces that exist for the benefit of citizens rather than advertisers. This requires substantial work towards reducing the manipulation and falsification of information and giving individuals more power to curate their own information feeds. …

"I believe that capitalism is an effective way to steer work to where it can have the most effect, but I fear that our current system has lost the ability to properly value certain intangibles of individual welfare, that steering effect is broken. Solving the problems of the underprivileged doesn't generate enough measurable value, so the companies with the talent and resources to do so are instead directing their efforts towards luxuries for the well-off. I think a key role for government is to materialize the value implicit in social goods, in order to attract companies to provide them. I fear that our current polarized government is simply unable to do that. Technology has also created an irresistible drive towards monopolies. Economies of scale are everywhere, and our technology lets us use them optimally. When I can use the internet to find a product anywhere – a ride, a vacation rental, an education, a meal – the best provider will win everywhere. Again, government is the only real defense, but it hasn't been functional."

Meredith Whittaker, a research professor and co-director of NYU's AI Now research institute, commented, "Efforts like the Just Data Lab, Data for Black Lives, the Algorithmic Justice League, the STOP project in New York and the Anti-Eviction Mapping project illustrate the power of community-led efforts for justice and accountability that employ technological methods. What is interesting about these efforts, however, is not the tech. It is that they all understand justice as a primary concern and employ tech where and when appropriate to achieve this end."

Peter Padbury, chief futurist at Policy Horizons Canada, predicted, "There will be: More-flexible work arrangements, including more people working virtually for some part of the work week. More use of digital work platforms that enable companies to track work and be more flexible and adaptive as needed. Dramatic leaps in AI use as it is built into digital work platforms for routine tasks for high and low skilled work. More gig work and more virtual gig work; many people are their own micro-enterprise, as companies try to reduce their overhead costs. Access and affordability of digital infrastructure will become important public policy issues regarding equity and competitiveness, and there will be growing demands to address income inequity. Detailed health tracking will be accepted by a majority as a valuable public good after it proves essential in ending the pandemic. There will be a reinvention of health care and education to improve service and reduce costs as we learn the lessons from several COVID-19 waves."

Andrew K. Koch, president and chief operating officer at the John N. Gardner Institute for Excellence in Undergraduate Education, wrote, "We have to address the underlying conditions that allow COVID-19 to plague us in more than biological ways – structural racism and classicism. These conditions are both the foundations and the buttresses of our current chaotic and moronic national response to COVID-19. I cannot envision a future that does not use digital technologies in deeper ways. For the very fortunate, entire ways of doing work have shifted online – and with that shift has and will come innovation. You don't put tens of millions of workers into an online environment for months if not years and go back to the old way of doing work. But there are many who cannot do their jobs using digital technologies.

"For the nation to actually be better, we must have intentional policies focused on digital development – with a keen focus on the digital divide. We must have policies – based on constitutional privacy guarantees – that actually see that people are the power specifically named in 'We the people.' The individual rights of those people have to be protected in the digital present and future. Corporations may have been classified as 'people,' with their rights protected by Supreme Court rulings. But people actually are the persons – individually and collectively – who live, work, thrive, fail or die in a digital future. For 2025 to be better, the nation needs leadership at all levels – not simply in the Oval Office – that creates, enacts and modifies policies that uplift the oppressed and cure the afflicted. The nation needs educational, technological, environmental, medical and other forms of responses that help guarantee the well-being of the people – the right

to good health, a family sustaining wage, the means for all to thrive equitably in a society that has a well-established and codified history of race- and class-based stratification. Digital technology must be a part of this. But without a thoughtful approach based on continuous improvement and equity, digital technology will simply make the well-off better and the less-well-off less well when compared to those who thrive in 'the new normal.'"

Marcel Fafchamps, professor of economics and senior fellow at the Center on Democracy, Development and the Rule of Law at Stanford University, commented, "Tech-related change could mitigate some of the forces I foresee. But it would have to be directed at political participation. One area where much more needs to be done is in the elicitation of preferences – e.g., using different voting rules such as voting against your least preferred candidate, voting by ranking options or assigning points to different options and candidates, revisiting rules of parties, elections systems and the like. The second issue is organizing political participation in a way that leads to beneficial outcomes. The rise of social media has occasionally allowed mobilization to take place, but it remains a highly volatile, manipulable medium where bots and disinformation rule. I have zero trust in social media in improving democracy, just like I have no trust in malicious gossip and tabloids to have done so in the last 30 years."

Benjamin Kuipers, a professor of computer science and engineering at the University of Michigan known for research in qualitative simulation, observed, "We are facing a stark choice between two futures, and I choose to be optimistic about how it will come out, though I am not willing to predict how likely that outcome is. The dire future involves everyone making choices to maximize their own benefit. The optimistic future involves people recognizing that the welfare of everyone is important to the success of our society. In particular, everyone needs to trust, justifiably, that the processes in society are working for everyone's benefit. This trust is necessary for widespread cooperation, which is required for society to thrive. Without that widespread trust, society is likely to devolve into a dystopia. Our society will fail, and we will be taken over by others. The average person must be able to count on having a meaningful job with adequate income to support a family. Each person must be able to count on health care, child care, education and elder care, even if those are not economic profit centers. Technology can continue to create vast wealth, but that wealth must be shared with all in the society, not just concentrated in a few. We must be able to trust that the information collected about us is treated appropriately, respecting our individual wishes about our privacy. My hopes and worries are more about economic equity than specifically about technology. We have the opportunity to understand the critical role that trust and cooperation play in the success of a society. If we can encourage trust and cooperation, our society will thrive and succeed. If we cannot, it is likely to fail. If we are pursuing the right goals, tech-related changes will make things better. If we are pursuing the wrong goals, tech-related changes will make things worse. Do it wrong, and Darwin takes you away!"

Giacomo Mazzone, head of institutional relations for the European Broadcasting Union and Eurovision, commented, "Nobody could realistically predict how digitalization will evolve in the post-COVID-19 world. Technology could change life for the better in theory. My hope is that a new global order will be established to insert these changes into a global framework. This is similar to what it was like in November 1945, after World War II, when all countries of the world worked toward building a future path based on human rights. That frame lasted for nearly 50 years and produced the Convention on the Rights of the Child and the International Covenant on Economic, Social and Cultural Rights. Then we crashed into the wave of new nationalism (from Trump to Bolsonaro, from Johnson to Xi Jin Ping), and since the turn of the century multilateral institutions are proving their impotence against the bully-ism exercised by various countries against others and even on their own citizens. Digitalization of the world will have an impact on nation-states' regulation worse than the destruction and deaths provoked by World War II.

"Let's look at some basic examples. For instance, teleworking is a wonderful innovation that could potentially reduce pollution provoked by commuting to work, make urban centers less congested and favor more decentralization. What is the impact on social rights when workers are isolated and fragmented against an invisible owner who could hire and sack them via a simple tweet? What sort of impact will there be on taxation when each individual worker could de-localize himself by seeking and teleworking for an employer in another country with a more favorable tax regime? Another example [in need of regulatory attention] is privacy. Today personal data online provides immediate benefit to advertisers and sales agents. Tomorrow, artificial intelligence combined with big data can be used to interfere with or to condition the lives of citizens."

John Verdon, a retired complexity and foresight consultant, said, "The pandemic has revealed to all the real power of a sovereign nation to issue currency (see Modern Monetary Theory) to support any initiative it deems worthy and that there are the resources within the nation to fulfill the initiative. That means there is no barrier to such a nation providing universal health care, universal basic income, free education throughout life, building new infrastructure for the digital environment and renewable energy (e.g., to meet the challenges of climate change) as well as renewing aging infrastructure. The neoliberal economic paradigm has died – and politicians are enacting new policies, protections and systems for human and global flourishing. Renewable energy has transformed global energy geopolitics – and thus geopolitics – if not by 2015, certainly by 2030-2035. With ubiquitous renewable energy, access to water (via desalination) ceases to be life-determining. Ubiquitous access to the internet (via Modern Monetary Theory and policies enacting more of the digital environment as public infrastructure). With the transformation of the economic paradigm (via MMT) new institutions will be created to ensure the equitable distribution of information and resources – the eradication of neoliberal monopolies and privateering (this may take longer than the 2025 time frame, but if the change is not clear by then we are in real trouble). Renewable energy and AI and robots are rapidly changing the

transportation paradigm which in turn will see many weak signals of new urban design. Despite COVID-19, the future will see more densely populated cities but with more common spaces/places for a more walkable and more social collective life (not communes but more like co-housing complexes, with both autonomous space and common space/workplaces)."

Aaron Chia Yuan Hung, assistant professor of educational technology at Adelphi University, said, "COVID-19 has revealed many underlying inequities in our health care and education systems that have been invisible to most of society. This awareness is a small but crucial step in making positive changes. Certainly, a lot will depend on the outcomes of the 2020 elections, but, at the very least, these inequities are no longer in the shadows. The pandemic, together with the protests and economic downturn, has put a lot of people who may have seen themselves in different categories into more-similar groups. The degree of change will depend on who has the power to make changes. … The use of digital video has been particularly powerful. It has been used as a key source of data to document the aftermath of the pandemic, the protests, the counterprotests and so on. It has become an important storytelling device. The new normal will be a double-edged sword, but I'd prefer to lean towards the optimistic. Technology has been used to document injustices and inadequacies in institutions. So far, it has been used for the better. The use of digital video to publicly shame those who, for example, don't wear masks or who don't do proper social distancing, getting them 'fired' on social media – all of this can feel like vigilante justice and it has its issues, for example, when the wrong person is identified and targeted. This will certainly be the trend in the future, but we need to tread carefully."

Andrea Romaoli Garcia, an international tax lawyer active in multistakeholder activities, wrote, "The COVID-19 pandemic showed the weak points of society and forced government leaders to recall the importance of scientific knowledge for better decision-making. Applying this experience to emerging technologies, we will have stronger institutions that corruption will find difficult to erode."

Anthony Clayton, an expert in policy analysis, futures studies and scenario and strategic planning based at the University of the West Indies, responded, "My hopes lie in the migration of public administration to online, the move to greater transparency in government information systems and the use of big data analysis to address social and economic problems in areas such as education and health care."

Rob Frieden, a professor of telecommunications law at Penn State who previously worked with Motorola and has held senior policy positions at the Federal Communications Commission and the National Telecommunications and Information Administration, commented, "The post-COVID-19 'new normal' more clearly identifies gaps, deficiencies, inequities and comparative disadvantages that previously were less visible and easily ignored. For example, it's harder to deny

the digital divide exists when families don't have a large-screen format for accessing homework and must use a smartphone or seek paper assignments. It's harder to consider the digital divide closed when a single location within a census tract has broadband while lots of people drive to the parking lot of schools and libraries to access a Wi-Fi network. It's difficult to believe that until recently schools had to shut down their Wi-Fi network to prevent off-hours access. Perhaps citizens and their elected officials will wise up to the 'mission accomplished' narratives exemplified by the FCC's conclusion that most internet service providers meet or exceed their advertised broadband service speeds. The pandemic showed that while ISP networks could accommodate a 20%-30% increase in aggregate demand, the acquired bit transmission speed declined significantly in many locales. I am not confident that people can use new technologies, such as grid networking, for 'self-help.' The carriers have successfully blocked even the prospect of municipal WiFi in over 12 states. I'm glad to see the FCC belatedly embrace new thinking about universal service funding, such as reverse auctions.

"But post-pandemic, I also see more of the electorate balking at having to pay a 26% universal service funding 'contribution' in their monthly bills. See https://www.fcc.gov/general/contribution-factor-quarterly-filings-universal-service-fund-usf-management-support. I hope creative communities will resort to technological self-help to find ways to achieve more accessible and affordable broadband. Perhaps the expanded, 6 GHz WiFi frequency band will offer a new vehicle for experimentation. However, the key lies in policy which stops sending recurring subsidies to carriers. They have no incentive to achieve progress when that would reduce their subsidy."

Jon Lebkowsky, CEO, founder and digital strategist at Polycot Associates, wrote, "So much depends on political leadership after 2020, as well as corporate leadership especially with social media tech companies whose platforms have been essential to propaganda efforts and the spread of crazy theories in the U.S. and elsewhere. And we're also seeing growing uses of AI technology for both surveillance and sousveillance. By the time COVID risk has diminished, we'll feel sufficiently snake-bit that we'll continue to proceed with caution, to avoid exposure risks. So, there'll be long-term effects on sociality and transportation, and on the way we live and work."

Tracey P. Lauriault, a professor expert in critical media studies and big data based at Carleton University, Ottawa, Canada, shared her wish for the future: "I hope for future data and technology governance in which residents, civil society, academics and the private sector collaborate with public officials to mobilize data and technologies when warranted in an ethical, accountable and transparent way to govern the data and technological systems large and small in our homes, cities, countries, etc., as a fair, viable and livable commons, and balance economic development, social progress and environmental responsibility. Governance here is ethical, accountable and transparent. These principles apply to the governance of social and technical platforms which

include data, algorithms, skills, infrastructure and knowledge. Also, the design, operations and use of these data and technologies is participatory, collaborative and responsive. Government, civil society, the private sector, the media, academia and residents meaningfully participate in the governance of … these and have shared rights and responsibilities.

"This entails a culture of trust and critical thinking that is fair, just, inclusive and with informed approaches. Also, the uses for data and technologies need to be fit for purpose, can be repaired and queried, use open-source code … that adheres to open standards, and is interoperable, durable, secure, and, where possible, locally procured and scalable. Data and technology are used and acquired in such a way as to reduce harm and bias, increase sustainability and enhance flexibility. When warranted, automated decision-making and these systems will be legible, responsive, adaptive and accountable. Furthermore, data management is the norm, and custody and control over data generated by smart technologies is held and exercised in the public interest. Data governance includes sovereignty, residency, open by default, security, individual and social privacy and grants people authority over their personal data. There is also an intersectional approach taken to how people are classified in these systems, and the purposes for the use of these data are clear. Finally, it is recognized that data and technology are not always, nor the exclusive solution to many of the systemic issues people face, nor are there always quick fixes. These problems require innovative, sometimes long-term, social, organizational, economic and political processes and solutions. People with lived experiences also ought to be part of the solution, in other words 'if about or for us, then *with* us.'"

Alan D. Mutter, a consultant and former Silicon Valley CEO, wrote, "It is possible programs will be enacted – finally! – to support less-affluent members of society and to aggressively address institutional racism, endemic economic inequality and accelerating climate destruction."

Morgan G. Ames, associate director of the University of California, Berkeley's Center for Science, Technology & Society, responded, "A small, still-marginalized, but growing movement is looking critically at the role of automated surveillance and decisionmaking in society. They not only shine light on some particularly problematic systems but propose a variety of mitigation strategies that repair some of the damage these systems have done. Moreover, while the turn to online education has once again highlighted the stark inequalities between different students, it has also opened up opportunities for addressing these inequalities with a robust, publicly funded online education system. I hope that the current conversations around a national fiber network and greater investment in schools could result in a more robust public education system by 2025, integrating but not relying on technologies."

Seth Finkelstein, programmer, consultant and Electronic Frontier Foundation Pioneer Award winner, wrote, "In my wildest dreams, at the most optimistic, I hope the pandemic provides the

impetus to break the logjam over standardizing online health records in the U.S. One big problem is that everyone knows that private management of standard U.S. online health records will be a money machine that'll make Scrooge McDuck's money bin look like a wading pool. Thus, every corporation with a chance at this prize jealously guards its potential for a monopoly. If the needs of U.S. public health finally provide the political will to go to a common system where nobody owns it, this will be an enormous benefit. There's many ways this could go wrong, but in terms of not wasting a good crisis, it's at least theoretically possible it could go right."

Jay Owens, research director at pulsarplatform.com and author of HautePop, predicted, "People working from home will tend to have more engagement with their local communities, and volunteering and community organising will flourish."

Maggie Jackson, former Boston Globe columnist and author of "Distracted*:* Reclaiming Our Focus in a World of Lost Attention," wrote, "This is an inflection point in history, a true crossroads moment. Deep changes to society, especially regarding technology, could blossom in multiple directions. … While the pre-pandemic backlash against technology inspired important questions to be asked about tech, culture and human experience, the global conversation around these issues nevertheless bogged down in narrow finger-pointing around how much tech companies were to blame, without needed hard discussions around personal accountability. We need to leave behind the insufficient idea that technology or the people who make it are doing something to us and ask what we all can do at a higher level to shape technology for the future. I also think that the very endemic values and habits that technology promotes toward neat, packaged clickable answers and binary thinking impede our society's ability to move forward in re-envisioning technologies that preserve our humanity. … I imagine that our experiences of technology will splinter, and issues of survival will eclipse crucial unresolved questions related to how technology disconnect/connects us; what effect tech has on our psyche even in small measures; and what it means to be a human."

Edson Prestes, a professor of computer science at Federal University of Rio Grande do Sul, Brazil, commented, "Unfortunately, along with all of the benefits come new threats. They tend to mainly be directed at people from vulnerable communities. Elders are victims of fraud. Children can be exposed to abusers. Communities are being manipulated by all types of players, including government leaders who consider fake news to be example of 'freedom of expression.' Hence, we, as global society, should find ways to mitigate all these dangerous situations in proactive ways, possibly even before they happen. The digital domain adds new dimensions to society, and we have just started navigating on it. One recent example of movement towards governing digital technologies is the UN Secretary-General's unveiling of a roadmap on digital cooperation that contains concrete actions for the digital domain. These actions are being pursued by global multilateral, multistakeholder and multidisciplinary teams. I believe despite all of the negative consequences brought with COVID-19, we, as society, will understand we need to reinforce our

knowledge, infrastructure and voice in the digital domain. The intense use of the digital domain showed some of the benefits and risks that the internet and future advances in artificial intelligence may bring to our society. This awareness of the digital domain will promote a deep reflection about our society, so we are better prepared and actively engage in the discussion and elaboration of public policies to create a brighter world.

"I'm very optimistic that technology can be mostly beneficial in our global society. Several authors, including myself, have been writing about the use of robotics and artificial intelligence in working to attain the UN's Sustainable Development Goals. Digital technology can promote and increase the quality of life and standard of living of people around the globe, facilitating access to public services, good education and better and new jobs and diminishing barriers, reducing inequalities and promoting peace. What concerns me is doing nothing, that is, leaving the decisions that can impact our lives for other people to take. Society should be active in the debate, regulation and governance of technology. However, this will only be possible if we, as citizens, have a clear understanding about the perils of the digital world. We cannot leave it to technology companies to regulate themselves and, consequently, our lives. We already have had a small glimpse of self-regulation in our society. Violations of human rights principles are already taking place due to the misuse of technology. If we do nothing, we will only amplify the world's status quo, which by the way, is far beyond being fair."

Paul Epping, chairman and co-founder of XponentialEQ and keynote speaker on exponential change, predicted, "The only constant is change. By 2025, more people will have access to information at 5G speed, including people in countries who are currently underserved. Their intellectual capabilities and drive to create a better life will shift the balance in our economies. People continue to underestimate the speed of exponential growth of technologies and the accompanying deflationary effect on the economy. People are doing far more themselves, digital services are cheaper and far more scalable and less labor-intensive. One of the variables of the GDP is unemployment. A lot of work will be done online by you and me. This is productivity, but it is not included nor calculated and thus has a negative impact on the GDP. This is just one example of deflation. People will be increasingly dependent on the online world and the algorithms that determine a major part of our lives (with intended and unintended consequences).

"The main benefit of the global crisis is that we have the opportunity to collaborate worldwide, circumventing all sorts of country-related boundaries. The level of openness of the use of the internet will determine integration of intellectual connections (collective intelligence => DIY communities), business connections (distributed autonomous organizations => DAOs), ideological communities (e.g., circular economy, green energy, CO2-decrease activists). All of these new organizations are purpose-driven to make the world a better place to live. This will

ignite ideas to solve the world's biggest problems as activists build on each other's insights. The drive is to make life better for all, therefore a lot will be open source and free to use."

Doris Marie Provine, emeritus professor of justice and social inquiry at Arizona State University, commented, "Tech can, and has, been used to maintain and exacerbate current power relations. Perhaps a much more progressive tax structure that actually is implemented can push back against the growing inequality we are seeing in the U.S. and elsewhere. Tech has not been part of the solution. Tech's power in influencing government policy is another concern. Where there is wealth, there is political power in this country, especially after Citizens United and other decisions equating money with speech and turning a blind eye to the lack of a level playing field for political influence. Public funding of elections and controls on truth in political advertising (as Mexico has, for example) might help."

Warren Yoder, longtime director of the Public Policy Center of Mississippi, now an executive coach, responded, "2020 was the final break from the 20th century, which reached its stated centenary so well and then went so quickly awry. In response to 9/11, the American allies blundered into two ridiculous wars. In response to the Great Recession the emergent monetary stimuli benefited the rich but left everyone else worse off. Now the response to COVID-19 in populist-led countries is increasing the death toll. Finally, people seem to be ready for real change. The Black Lives Matter movement burst aflame after sputtering for years. Guaranteed income and other ideas only recently outside the pale are being seriously discussed. Much depends on the American election and the next administration to set the direction for this belated century. The old liberal-conservative division is gone."

Mark Monchek, author, keynote speaker and self-described culture of opportunity strategist, said, "The COVID-19 pandemic is a symptom of capitalism's inability to evolve into an economic and social model that is sustainable. My hope is that the collective WE, including all of our planet's inhabitants, will be able to change our beliefs and behaviors fast enough to arrive at a much more inclusive, reverent and collaborative way of coexistence. … We will learn to better integrate technology-empowered communication like video conferencing with in-person communication. We will consciously assess the needs of a situation and employ the best set of practices and tools, rather than react from habit. Also, we need to provide access to technology to the entire world, giving access to the web and the tools needed to access it to people and communities that currently don't have access."

Marvin Borisch, technical manager for Red Eagle Digital, based in Berlin, predicted, "By 2025 I expect our lives to change dramatically. … People are starting to see the benefits of technology for things other than home entertainment, and tech connectivity has become even more important for work. We are learning to dig deeper, to verify and to find comfort and identify discomfort in

information. From today's perspective it seems like we, the humans of planet Earth, are starting to shine more light on the fact that global problems need global solutions. With this 'new normal' we can and hopefully will start to find global solutions and an informative reawakening of individuals. We will start to be more critical about new things but also learn how to turn this critical thinking into decisions. In short, we humans will stop regressing in regard to applying critical thinking and move on to make better decisions about our uses of digital technologies. See it as a young child who had hesitated just as it began taking its first steps but then started to walk more confidently toward a destination."

People's well-being will prevail over profit

The structural holes in capitalism have been exposed in the pandemic, according to a number of the expert respondents to this canvassing. The more optimistic of them hope that businesses may start to value serving the greater good above the typical goals of market capitalism. Some suggest that government-led responses to these problems could arise, including broader and better-funded social safety nets woven to provide universal health care, universal basic income and/or funding support to provide broadband as a basic utility. A share of these respondents say they expect there will be a reckoning for technology companies and their leaders.

Dmitri Williams, a communications professor at the University of Southern California expert in technology and society, wrote, "I don't worry about tech and tech companies as much as I worry about the outsized influence of capital in American life. We are increasingly in a system created to maximize corporate profits, not aimed at improving citizens' lives or their social mobility or to advance the core values of democracy. Tech accelerates trends, and if companies continue to make decisions on our laws, it will make that worse via a lack of privacy and the shifting of citizens into being merely consumers. However, we have the power to shift those trends so technology can be harnessed in favor of the citizen side of the equation. This is a seesaw, and right now it looks bleak. In the long run, our core values may emerge and be more resilient."

Ethan Zuckerman, director of MIT's Center for Civic Media and associate professor at the MIT Media Lab, commented, "As we entered 2020, we were starting to ask important questions about our relationships with the large tech platforms. Were we giving them too much of our data? Should they have control over what speech was acceptable and unacceptable? Should we have more control over our digital spaces and online interactions? Before we really resolved any of these questions, COVID-19 forced us into a new reality in which many more of our interactions are online, and often through these platforms. We should worry about the difficulty of planning and executing a shift from the platforms and paradigms we are starting to question in 2020 towards new models for online interaction that honor our individual agency and our community values."

Tim Bray, a technology leader who has worked for Amazon, Google and Sun Microsystems, said, "I hope that privacy activism will cripple and perhaps kill the current model of AdTech and the Google/Facebook duopoly that sucks all the profit out of the online advertising ecosystem, leading to a rebirth of a wider spectrum of interesting, fresh-voice advertising-funded publications. I worry that abusive governments in a higher proportion of the world will use internet technology in the Chinese pattern, to surveil, control and oppress their citizens."

Willie Currie, who became known globally as an active leader with the Independent Communications Authority of South Africa, responded, "I'm hopeful that by 2025 many people will have technology at their command as opposed to the current situation where people are at the command of technology. People will become wiser to the manipulations of algorithms, and greater accountability will be demanded of all platforms with respect to user control, privacy and usability. Algorithmic regulation will have developed to a point where user interests are prioritized and the oligopoly of the tech giants will be pulled back.

"This will unfold partly because the COVID-19 shift to online work and communications will increase pressure on the arbitrary and frankly lunatic behavior of Silicon Valley executives, owners and techies to behave less as czars and more as democrats. The biggest challenge will be to get a collective grip on tech as a hyper object that is at once global and individual in its reach and regulate it in the human interest. Anyway, this may all be wishful thinking, but I feel the fact that our lives will be more fully online will force accountability on the tech industry. We have been guinea pigs in an unethical tech experiment, conducted by the tech industry with the collusion of governments. I expect there to be a reaction from the public and political leaders who understand the implications of what is happening to this technological excess of power and control. So, the tech-related changes that I hope to see in the next few years relate to regulation. Regulation, regulation, regulation. I think we have passed peak tech innovation. It is now all about managing what we've got and restoring some stability to important social, political and economic functions that have been disrupted by tech excess. You don't know what you've got till it's gone – similarly with journalism, music, democracy, etc. These will not necessarily return to how they were before, but their reorganization will have to be done."

Greg Sherwin, vice president for engineering and information technology at Singularity University, observed, "The hope is that humanity's social immune system will advance and minimize the many harmful and self-harmful effects of a novel relationship with newer technologies. That technology will no longer be popularity viewed as a cure-all for all humanity's ills but a measure of some tools that can create as many problems as they attempt to solve if they are not wielded with consciousness. The worry is that the global economics of technology will continue to exacerbate economic inequality, divide society, erode the middle class, decimate political will and favor more growth-at-all-costs approaches. With the old guard replaced by a new

guard of technology behemoths, I worry that we will see the decline of innovation, a greater emphasis on patent and copyright litigation and the general defense of virtual monopolies and the status quo."

Charles M. Ess, a professor of media studies at the University of Oslo expert in information and computing ethics, said, "There are a few signs that the large-scale technologies and the companies that produce them are moving in more humane directions. The IEEE project on developing ethically aligned design is one example among many in the expanding discourse and debate around ethical AI; recent decisions to stop the use of AI in facial recognition systems is also encouraging. On a good day, even the largest tech giants have to be responsive to their customers and customer pressure, hence Google's and Apple's efforts to ensure privacy, whatever their shortcomings may be in these domains. To be sure, these corporations can powerfully manipulate and interfere with our efforts to communicate, organize, etc. And there's always the danger that projects such as the IEEE's, much less the recent disasters with 'ethics committees' drafted by Google and Facebook, will amount to little more than 'ethics-washing.'

"But there is apparently growing pressure in the direction of 'virtuous design,' 'eudaimonic design,' etc. – i.e., design and deployment of technologies more centrally oriented towards fostering human/e flourishing in a strong sense, not solely conspicuous consumption, corporate efficiencies, and corporate profit – along with attention to 'digital detox' and other strategies for monitoring and regulating our use and consumption of these technologies. Should these continue to expand and enjoy more success, then one can be perhaps cautiously optimistic that at least many of us in the more privileged positions and countries will find good ways to rebalance our lives more strongly in favor of contentment and flourishing. But all of this will also require new forms of digital literacy, ones that are shaped and are far more fully informed by a holistic sense and understanding of what constitutes and contributes to human and social well-being, and thereby what political and economic institutions are required for fostering and contributing to such well-being (robust democracy and all of its requirements, as a start). Ideally, this would include a new Enlightenment, one that would help the rest of us develop the understandings and capacities needed for greater (relational) autonomy and community – and a technically informed understanding of how these technologies work, their affordances, potentials and downsides, etc., coupled with an increasing ability to determine and control them for our own humane and social purposes."

Andy Opel, professor of communications at Florida State University, said, "Technology can make our lives more efficient. A huge issue is the failure of the tech sector to produce cradle-to-cradle devices that are easily recycled and upgraded. Fair Phone is an example of a modular digital device. Without policy interventions that require circular production, tech companies will

accelerate extractivism and consumerism, endlessly pushing 'new features,' creating toxic waste streams and trapping consumers in cycles of never-ending payment plans."

An information science expert wrote, "The extreme economic inequality and separate realities of the most successful technology platform companies is worrisome, thus some comeuppance is predictable by 2025, even if their concentrated economic power continues to increase. I actually expect technology and technology companies to be more in tune with the public good in 2025 than today, and not just in a sideshow/corporate social responsibility/PR fashion. Companies abusing their customers or competitors or the planet will be the newly unsustainable ones by 2025, so they should be worried, starting today."

Warren Yoder, longtime director of the Public Policy Center of Mississippi, now an executive coach, predicted, "I expect the American-based tech monopolies to be broken up because regulation is seen as too likely to fail. The tech sector has become way too centralized. This is diminishing innovation, reducing consumer choice and incentivizing big tech companies to lobby for regulation that cements in their dominant position. If this trend continues, big tech will govern the world in with a neo-authoritarianism that I find deeply disturbing."

Nigel Cameron, president emeritus at the Center for Policy on Emerging Technologies, commented, "The relentless monopolists must be curbed, or Google and the others will simply roll up yet bigger shares of the economy. Antitrust must get back into the blood of our politics in bipartisan fashion; Judge Bork's baleful legacy needs to be buried. I'd also challenge the whole idea of 'free' – either outright by outlawing barter (which ironically is now the basis for a huge slice of the economy), or at least require data-barter companies like Facebook and Google to offer a fee-for-service alternative; $15 a month and you get to use the platform in complete confidence, and every three months consumers are required to reaffirm their choice after being reminded in tobacco-health-warning simple language of what's happening to their data. We'll likely see the continued erosion of jobs. Labor markets may just never recover from the jolt of 2020, as tech takes over more roles and unemployment levels keep creeping up (see my book, 'Will Robots Take Your Job? A Plea for Consensus'). That will likely lead to better social provision, creeping toward European notions of the welfare state, especially if the anti-Trump backlash is severe and gives Democrats control of the U.S. Congress for the next few years."

John Verdon, a retired complexity and foresight consultant, wrote, "I worry about the privateering of information and creativity (the enclosure movement) implicit in the neoliberal paradigm of capitalism. This entrenches deep inequity in social structures, processes and experiences and actually diminishes the flourishing of the human mind and spirit. Always and everywhere technologies can be weaponized – there is no technology designed for good that can't be used for ill, and there is no technology designed for ill that can't be harnessed for good. The

determining capacity is the 'response-ability' of our institutions and our systems of governance. All technology should be open-source, transparent and all copyrights/patents significantly constrained for very limited timeframes. It is not technology itself, it is the business model and supporting economic paradigm, that enables the deeply malevolent use of technology to create monopolistic dependencies and haves-and-have-nots and users-and-used."

Terri Horton, futures strategist and founder and CEO of FuturePath, predicted, "In the new normal of this decade, Gen Z and Gen Alpha, with values deeply rooted in transparency, truth, ethics and inclusion, will hold brands accountable for the promises of 2020 to address equity, social justice and sustainability issues. They will unzip and inspect brands and employers, with more precision than previous generations, for demonstrable strategies, actions and outcomes tied to societal challenges. They will continue to reward the winners and cancel the losers. As employers acquiesce to the COVID-19-adjusted new normal, the workplace – while highly AI-infused, data-driven and surveilled to spur productivity, performance and engagement – must become more humanized as employers seek to use data for good and to support workers in fulfilling their potential both personally and professionally."

The director of a business consultancy said, "My hope is that tech and networks will accelerate a winner-take-all world. Structures that exist today have dumbed down thinking, and this has resulted in less choice and a concentration of wealth. Unless the plan is for information to be set free and more equitably enable everyone, technology will simply strip everyone of their money. The ownership models of business need to shift. Services that are effectively utilities – Uber is public transport, AT&T, etc. – are public information trusts and should be treated like the power grid, which is also a utility. Delivery to home is like the U.S. Post Office, so take a look at Amazon. Being able to share info/data in a world where data is free 'peer-to-peer,' even if that world is somewhat slower, will more correctly mimic human behavior and it will likely work to make a better world."

Daniel Pimienta, internet pioneer and founder and president of the Network and Development Foundation (FUNREDES), based in the Dominican Republic, responded, "My hard-to-reach hope is for the end of a business model imposed by Google and major internet technology and content corporations in general that is based on advertisement revenues, which has helped to trigger the social and economic disasters we are experiencing. My primary worry is the continuation of (and amplification by AI resources of) the use of personal data as the engine of the business model."

Irina Raicu, a member of the Partnership on AI's working group on Fair, Transparent and Accountable AI, commented, "I have hope that developments in differential privacy and encryption and efforts such as federated learning will achieve more ethical data mining. And there

is also a growing push for various tech companies to delete their users' data, which would also make life better for users."

J. Nathan Matias, an assistant professor at Cornell University expert in digital governance and behavior change in groups and networks, said, "In 2025, the public will be less patient with the promises and excuses of technology firms on the social impact of their products and policies. Instead, companies will be expected to provide evidence of their impact. In some areas at least, this evidence-based evaluation of digital power will satisfy critics and help companies turn a corner in public perception of their impact. Evidence-based governance of digital power will be important in 2025 because even more of society will depend on digital connections, from education to work to civic life and public health."

Jonathan Taplin, author of "Move Fast and Break Things*:* How Google, Facebook and Amazon Cornered Culture and Undermined Democracy," wrote, "My greatest hope would be for Facebook to change from a tool of disinformation and social disruption into a community organizing platform for a decentralized America. This would require getting rid of Safe Harbor laws, so that Facebook would have economic incentive to act like the publisher it actually is. Slowly, politicians and interest groups would stop using it as a propaganda tool. That void would be filled by community groups and nonprofits using Facebook Groups to organize at scale."

Gus Hosein, executive director of Privacy International, based in the UK, observed, "We may become more mindful of decentralisation and distribution in tech devices and infrastructure. That's not to say that it's better than centralised intelligence models, but with the focus centered on clouds, AI systems and tools such as contact-tracing apps the presumption toward centralisation has been too strong. With the death of centralised social media, the discourse will become even more broken for a while until we find new ways to communicate and use media. I believe we can surmount that with a focus on building a humane society and an infrastructure that prioritises people and how we drive markets to do that over the type of market efficiency that drives profit decisions over our humanity. I'm not saying this as anti-market, rather I think markets have become obsessed with internal-facing restructuring for efficiencies for investment (e.g., securitisation of debt) and market growth without considering other things because they were deemed 'costly.' I hope we reevaluate this. The 'innovator' narrative has run its course and has been proven to be both a myth and a hazard for how we value innovation. Please let's kill that noble inventor image and return to how we saw Gates and Microsoft in the 1990s and IBM in the 1980s. Then we may better scrutinise them and how they conduct business."

Joan Francesc Gras, an architect of XTEC active in ICANN, wrote, "COVID has begun to relieve public fears of going all-in on the habitual use of technologies. Digital transformation has accelerated all sectors. Society has suddenly been virtualized, technology companies – now

emerging even more as absolute economic leaders – have conquered the top of the mountain. We have been reminded that you can pay with your smartphone nearly everywhere and that we can avoid expensive and polluting train and plane trips to meet for a few hours. Science and technology are at the center of global competitiveness and security. If this situation gives a successful boost to cryptocurrencies, the future of large banks will also change. We will have more inequality and more poverty. Social and economic outcomes will depend upon the correct setting of the world's priorities. A more humane economy will give better results. Maybe it is necessary to NOT return to normality and instead do things differently. Let's change the world then!"

Anne Collier, editor of Net Family News and founder of The Net Safety Collaborative, responded, "I hope to see real momentum in the platform cooperativism movement – and of course more funding, legal support and success for platform cooperatives – which I see as the sequel to 'the sharing economy' that was actually on the trajectory of worker exploitation in the pre-COVID-19 economic reality in the U.S. As tragic as the pandemic has been for so many people, health-wise and economically, it may have had the positive effect of shaking us off a trajectory of income disparity and planet degradation as well data exploitation, which platform cooperativism eschews, with its aim of giving participants/members ownership of their data and their businesses."

The quality of life will improve

A portion of these experts argued there will be beneficial externalities to the changes spawned by COVID-19 in the coming years. For instance, some argue the transition to home-based work will reduce urban air pollution, overcrowding and transportation gridlock and will improve quality of life, family life, accommodations for disabilities and other human-centered enhancements.

Susan Crawford, a professor at Harvard Law School and former special assistant in the Obama White House for science, technology and innovation policy, said, "Like clean water, functioning public health infrastructure and stable electricity, world-class internet access – persistent, cheap, ubiquitous and symmetric – is clearly something everyone from every walk of life needs in order to thrive. Along with every other infrastructural/social values failure that has been made obvious, the COVID crisis has revealed just how inadequate the American 'things could turn out great!' approach to internet access continues to be. The status quo is clearly intolerable for great numbers of people. …

"Like many workers in the knowledge industry, I'm happy to be working remotely, on my own schedule, near my own kitchen. I recognize what a privilege it is to hold a job down in this fashion. I hope that remote work, remote health care and remote education remain key elements of most peoples' lived experience; it would be good if people could work where they choose to live. I'm

hopeful that non-tech, 'we're all in this together' sympathies will expand, take hold and become part of the fabric of life in America in a way they have not been for decades. I recognize that this hope is unreasonable, but I still have it."

Jay Owens, research director at pulsarplatform.com and author of HautePop, said, "The normalisation of working from home (broadband, video conferencing, collaboration tools) will create more flexible employment and offer some positives for workforce participation for mothers and people with disabilities. High-convenience online retail and delivery services will have negative consequences for urban space (see the collapse of the High Street) but some convenience benefits. We will be presented with a dazzling array of entertainment options, as some distraction from the collapse of a functioning public sector. Trends in place pre-COVID, such as the modal shift towards electric vehicles, will hopefully continue, with some positive environmental consequences. Consumer spending will tip towards investment in the home and domestic space, hopefully encouraging spending on energy-saving and green technologies such as home insulation, improved double glazing, solar panels, ground-source heat pumps and so on. The average person working from home may have reduced commute times and other positives for work-life balance. Some people may use this moment to be more engaged parents, with benefits for their own well-being as well as that of their children."

Al Sisto, CEO at Tern PLC, wrote, "The new normal in 2025 will be at the intersection of the old normal and the shape of living during the lockdown of the COVID-19 crisis. For example, we are learning that many businesses can exist in a work-at-home structure and students can learn subject material in online classwork. As a result, 2025 will be less about efficient rapid transit, affordable housing and school districts, and more about quality of life. As a result, current urban planning strategies are defunct. We will also see the application of technology to restructure retail, services and manufacturing. As we are now learning, offshoring has created a huge national risk. People were hungry for more forms of human interaction during the crisis – as demonstrated by the crowding of parks, beaches and restaurants when the lockdown was cut back in 2020's early summer – are key indicators that online shopping and grab-and-go orders do not completely satisfy human needs. Main Street storefronts and restaurants operating in 2025 will have learned to create atmospheres and service levels available today in only the most exclusive establishments. Education will need to reembrace the arts and athletics as key instruction for developing individual definitions and concepts of teamwork. I believe technology will enhance the renewed adoption of these practices, as we are learning that a browser-based experience is as fulfilling as an impersonal interaction at a brick-and-mortar establishment."

Chris Arkenberg, research manager at Deloitte's Center for Technology, Media and Telecommunications, responded, "At the human level, more jobs will emerge on top of the next wave of technological transformation. The internet has created entirely new jobs, as have cloud

and mobile. Likewise, 10 years ago there wasn't even language to describe a social media influencer or professional esports player. As the human population grows, innovations will come along to yoke their labor to productivity."

Adam Sah, an investor and adviser to startups who previously worked at Google's Public Sector Engineering Group, predicted, "Life will be better for some people ('digital winners'). … Improvements include flexible work schedules and locations, which make it (potentially) easier to interweave professional and personal lives. Post-COVID, people won't freak if your kid screams in the background or there's honking from the NYC street. Self-driving vehicles are a clear-cut improvement for the majority of people, who overwhelm the ranks of livery drivers who need to find another gig job. Improved treatment options are pretty clear-cut wins. As much as people love to hate it, Western health care is actually nicely optimized. What it lacks is a spokesperson to post on social media every time someone has a good health care outcome that was only made possible by recent technology advances."

Leiska Evanson, futurist and consultant, disagreed about telework gaining significant ground, writing, "Remote work will not become mainstream. Most management is learned physically – years of playing on the playground, leading a sports or debate team, heading a volunteer club or doing education/personal projects. Most of humanity is built on close physical ties – family, friends, neighbourhoods, tribes, towns, cities, countries. Undoing centuries of human relationship and business practice is simply not feasible over five years. Furthermore, technology services in companies are currently stretched thin providing and assisting users remotely; chief information security officers will most likely centralise services once more with company computers and use only company networks."

Anne Collier, editor of Net Family News and founder of The Net Safety Collaborative, observed, "Disruption and the loss of 'normalcy' gives us pause and compels us to look around and see where we are. I suspect that all this tech use – for social connection, school, work, entertainment, shopping – in the middle of an extended techno-panic (or a tech-focused moral panic) is helping us be more nuanced about technology's effects. It's no longer binary: good or bad for us; nor, as tech historian Melvin Kranzberg said, is it neutral. It's a spectrum. It's complicated. And it's just here. So, what are we going to do with that? That's the approach that the most 'calm and confident' parents interviewed by the authors of the new book 'Parenting for a Digital Future' took. … As for the 'new normal' and what it will look like in 2025 where tech is concerned:

- There will be pretty solid consensus in many societies that 'screen time' is a useful term. Parents, pediatricians, mental health practitioners and others who work with children will be asking about the types and contexts (home, school, social) of screen use and looking at it in the

context of children's fundamental needs: a healthy diet, physical activity, social activity and sufficient sleep.
- 'Screens' will be even more part of formal education, and digital inclusion/access will be a key part of societies' social justice discussions.
- School schedules, like work ones, will be more flexible, and 'work at home' will be commonplace for people of all ages, so;
- Even U.S. society will be well down the road of figuring out how to make child care available to parents in all income brackets."

An anthropologist and writer noted, "What will have changed the most is our sense of being a part of a community greater than where we live or work. The pandemic reminds us that we are affected by the decisions and actions of those far away from us physically, those whom we can now reach much easier than we could 100 years ago. I think global conversations among the average person in the Millennial and Generation Y cohorts will become the 'new normal' as will wider efforts at cooperation beyond government-initiated cooperation.

"What will have not changed much at all? The percentage of people in my country – the United States – who resist any sort of change at all, and who resist cooperation for whatever reason: sexism, racism, an ego-driven definition of what liberty and freedom are. They will still be there, firmly rooted and a constant challenge to every bit of change (good and bad) in the years between 2020 and 2025. Perhaps even on a level that involves violence.

"As far as technology is concerned, I think the new normal will include a better understanding of and strategies for dealing with the isolation and vulnerability of elders and those living alone via technology. I think we will also see an advancement in VR technology and encouragement to explore the world that way. In fact, previously crowded tourist and other destinations may cap the number of attendees, much like some natural spaces already do, daily and work to offer VR alternatives for those who can't travel, for education and for those locked out of attendance because of the capping of crowds.

"I think we'll see an even greater push for access to health care, perhaps an understanding that health care costs can be out of reach even for our doctors and nurses. There will be a growing focus on the health care needs of families dealing with age-related dementia, which will bring an even greater focus on all aspects of mental health care and the burden to which families (and women) supplement health care for the elderly. I believe we might find ourselves doing a fair bit more of community and social sharing and trading via technology as the requisite part of being in a community. For example, the sharing of talent to help parents entertain and educate children when needed. We'll also see a greater intrusion of technology into our private lives as not everyone

has a way to stage where they engage in video conferencing [and] as it becomes a norm for everything from work, to family gatherings, to hobby and trade meetings and events.

"I hope technology increases each individual person's reach to community and support – that it decreases isolation and that it provides access to collaboration in areas that might have been out of reach for some. I worry that the digital divide will only get bigger, not smaller. Companies still have too much power over the most basic element of access to online technologies – even in fairly populated areas it can be impossible to get anything more than a cellular-hotspot internet connection, while others are zooming along via broadband. This can have enormous implications when it comes to equity in education, but it also limits us having a shared culture, shared sources of news and entertainment, and can limit basic needs – like telemedicine and online ordering of groceries."

Peter Levine, professor of citizenship and public affairs at Tufts University, predicted, "People who are able to return to pre-pandemic modes of working and socializing will mostly do so. Based on the experience of 1918-1919, I don't expect people to change their preferred ways of communicating and associating much. But I do fear that a range of companies and associations may go bankrupt, leaving people without the same opportunities. Among the entities that may be most at risk are metropolitan daily newspapers, mass transit systems, and small-scale bricks-and-mortar retail."

Eric Knorr, pioneering technology journalist and editor in chief of IDG, commented, "My hope is that the current disastrous response to the pandemic will induce a permanent political change, giving rise to a global society where science is embraced, common interests are recognized and demagoguery is exposed and rejected."

Joel Arthur Barker, futurist, lecturer and author, noted, "I chose 'mostly better' with some assumptions. 1) A vaccine will have been found and distributed at no cost for COVID-19 and a more generalized vaccine for new viruses. The key is 'no cost' because the cost of not having people vaccinated is much higher. 2) The world has begun spending large amounts of money to slow down climate overheating. This spending will increase good paying jobs around the world even as it begins to draw down the CO_2 in the air. Also, carbon will be captured from the CO_2 and used to make all sorts of carbon products, especially graphene and graphene derivatives which will sequester the CO_2 in useful and long-lived ways. The money needed to pay for these things will come from the world's military budget because the world will have decided that that is the greatest threat to humanity and Gaia."

Deirdre Williams, an independent researcher expert in global technology policy, responded, "I prefer using the term 'now normal." Normal is always a standard, although it may change over

time. The standard now is probably *not* the standard that will be 'normal' in 2025. The virus appears to be carrying out a ruthless pruning process that may affect world demographics and may also change global priorities for the investment of resources. The 'average person in 2025' will probably have a more convenient but less private life. The virus reminds us that there is such a thing as 'too big,' so I think big cities, big political groupings, will begin to break down into many smaller but networked units. I hope for an improved awareness at 'average person' level that will lead to a similar breakup of big businesses – multinational corporations – but I am more pessimistic about this. I would make Forster's 'The Machine Stops' required reading in all schools. I hope for more government transactions being available online – a reduction in queueing, chasing papers, driving, wasting time – but this will probably take more than five years.

"I've observed beneficial changes over 50 years, but five years may be a bit too short for this one. For example – when I first moved to Saint Lucia in 1972, *everyone's* driving license needed renewal in January. There was only one place this could be done, and there were long, *long* queues in the hot sun. Staggering the due dates helped a lot. Now, the queue is shorter and it is indoors in an air-conditioned building. You still need to go to two places, but they are both in the same building. One is to submit the forms, and one to pay. This process is being digitized. My worry is the opportunities governments and corporations have to manipulate and indoctrinate the 'average citizen.' Perhaps we should add Huxley's 'Brave New World' to the reading list. The proliferation of new projects, initiatives, platforms. Divide and rule?"

Mike Sellers, director of the game design program at Indiana University and an AI researcher and consultant, said, "In particular I believe the following will see marked, nonlinear improvement over the next few years: more universal access to health care; more equitable funding and incentives for education; better work-life balance (including but not limited to more work-from-home situations); and continued acceleration of adoption of renewable energy sources (wind and solar in particular). One big unknown is the near future of transportation; are we able to get to Level 5 self-driving cars? If so, this will make for great economic upheaval (e.g., loss of truck-driving jobs), but it will also do a lot to relieve existing sprawl, as the 'live in the suburbs, work in the city' model may finally be dethroned in favor of more, smaller economic centers."

Robert W. Ferguson, a hardware robotics engineer at Carnegie Mellon University's Software Engineering Institute, wrote, "We will see renewed interest and support for public health, for public health policy and for universal health care. Companies will require vaccination records for employment. There will also be additional recognition of the need for a new policy on climate change. Everyone living in a city saw how much cleaner the air was during April-May when fewer automobiles were on the road. Many discovered that it is possible to work remotely much of the time. There is still value in casual conversation in the workplace. One needs a chance to mull over an idea with a colleague. Perhaps we will learn to be more cautious about conclusions from

machine learning. Causal analysis has already demonstrated our ability to extend philosophy of science. It also forces the researcher to make explicit about the way in which he considered the problem. Unsupervised machine learning, on the other hand, is still fundamentally flawed. The data contains biases, so we have discovered a pattern that suffers from what Rene Descartes said: 'We do not describe the world we see. We see the world we can describe.' The data is sampled based on the pattern set by the data collectors. They are simply unaware of their own biases. Unsupervised machine learning is generally malfeasance and bad practice."

Thomas Birkland, professor of public and international affairs at North Carolina State University, predicted, "What is not going to change, I think, is the way in which we value human connectedness and the need for us to be physically among other people. Once this pandemic passes we will be able to gather in groups again, at sporting events, conferences, in bars and night clubs, at concert venues, and we are going to notice how deeply good this feels, and how we don't want to lose this again. But while the pandemic is happening, people are learning how to use technology to at least partially fill this void, and people are going to learn that they like some of these tools. It's a pity that it took a pandemic to teach these lessons."

Sean Munson, professor of human-centered design and engineering at the University of Washington, said, "In general, we will give more care and intention to when we gather in person versus when people are remote, so that companies and other organizations can be more person-friendly."

Mark Maben, a general manager at Seton Hall University, commented, "Post-pandemic, we will live in a much more digital and technological world than we did on Jan. 1, 2020. This will be true in every country across the globe. In the United States, the technological impact of the 'new normal' will be seen in two profound ways in which the pandemic will reshape America by 2025: through an increase in remote work and a decline in employer-based health insurance. The massive unemployment caused by COVID-19 has finally awakened a critical mass of Americans to weaknesses inherent in a health insurance system that is dependent on employment. Simultaneously, the pandemic has also helped telemedicine flourish. The benefits of telehealth during COVID-19 will drive the creation of a form of health care and health insurance that isn't employer-based and relies heavily on technology to control costs. Whether this will be a public or private form of health care/health insurance will depend on a number of factors, but the need for such an alternative has never been clearer to consumers and policymakers alike. Released from the bonds of employer-based health insurance, individuals will be better positioned to flourish as entrepreneurs, small-business creators or independent workers.

"The pandemic has also accelerated the switch to remote work and helped dispel the notion that people are less productive when they work from home. The improved worker productivity

that many businesses have seen during the outbreak, coupled with the improvement to the bottom line that comes from having a smaller facilities footprint, means companies will be adopting policies that encourage work from home on either a flexible or full-time basis. Small businesses will be changing, too. Curbside pickup from local shops will continue after the pandemic. While companies like Staples, Amazon and Kroger will utilize autonomous vehicles for contactless delivery of household and business supplies, so too will small businesses use technology to alter the way they deliver goods and services. There is always a dark side to digital technology, but the pandemic is giving us a once in a 100-year opportunity to reshape market capitalism into something more responsive to the needs of workers and our society. Our current reawakening on social justice, economic inequality and the need for a more activist government will help drive digital technology to uses that benefit most people."

Joseph A. Konstan, distinguished professor in the department of computer science and engineering at the University of Minnesota, said, "We're going to see at least two big changes as we move to a new normal: 1) A rethinking of the benefits of, drawbacks to and alternatives to physical presence. This could lead to greater options for remote work, greater empowerment (and job-to-job mobility) for workers, new models of education, less business travel and – possibly as a result – fairer hiring practices as well (less discrimination based on appearance and against those with mobility limits or no caregivers). I have some hope that even as travel for leisure increases, total travel may not, with positive environmental impacts. 2) Sustained awareness of, and I hope action to rectify, racial and ethnic discrimination. Technology use is central here. There are many other things to be aware of, the lack of 'off' time being one, surveillance being another."

Scott Santens, professional writer and full-time advocate of unconditional basic income (UBI), observed, "We haven't adopted universal basic income yet, and technology is continuing to cause people more economic insecurity and distress instead of liberating them with more access to resources and more time to access those resources. In order to escape the economic ramifications of the novel coronavirus crisis, we will have to implement some form of basic income guarantee, and also move to shorter working weeks, most likely in the form of a four-day week. These changes will themselves lead to a lot of other positive changes. People will have more power, more freedom and more time. Due to being trusted more, they will also have more trust in institutions, and each other. UBI and shorter weeks will also lead to a redefinition of the inherent value of work, and thus people will be reoriented more around spending time with friends and family and letting automation do more of the work. There will be less time spent traveling to and from places of employment, and more time spent working at home, doing both paid and unpaid work, and also more time spent enjoying life. We'll also see less depression and better health due to greatly reduced economic insecurity and increased social cohesion. I hope technology will be seen as something that should be making everyone better off, not just some people, and that, as a result, the paychecks not being provided to machines will instead be provided to every citizen in the form

of universal basic income. I also hope that we have come to see our data as ours, and thus everyone starts getting paid for their data."

Yves Mathieu, co-director at Missions Publiques, based in Paris, wrote, "For the average person in 2025 it will be normal to conduct social relationships online. Real meetings will receive a higher social value. People will focus on relationships that matter. Being together will be more appreciated. Personal risk management will be different; people will be more informed about risks and will accept physical distancing. The use of technologies other than the telephone to keep in contact will be more common. Online medicine will be practiced more on a global scale. It will be possible for a U.S. resident to consult a physician in Asia, for example. I hope that individual technologies for personal health monitoring will be cheap and widely used to allow a more efficient practice of medicine at a much lower cost. I hope refugees will be equipped with devices that will give them more protection against criminal organisations, more connection with 'guardian angels' and much higher chances of survival. I hope that all over the globe people will have their life spans extended by 10+ years due to better information about the quality of their food thanks to technologies. I hope voting will be easier for all, so the level of participation to elections and public decision-making will reach 90+% of voters. I worry about the global ignorance about what is done with individuals' digital data and the high level of tech illiteracy."

Doris Marie Provine, emeritus professor of justice and social inquiry at Arizona State University, said, "Competition with China may encourage Americans to think more about what it means to be an American – especially the balance between government and the private sector. For national security, I'd like to see strong investment in tech in the U.S. compete successfully with more control-based economies. How to preserve innovation while doing a better job of protecting Americans from harm will be a big question that is finally coming into focus. With Black Lives Matter and associated movements, we will also be thinking more about membership and exclusion and disadvantage. Technology can demonstrate the realities of inequality, but without strong political commitment, nothing will change; digital tools may assist in this examination.

"The new normal will also have more room for technological solutions to problems of getting together. Hopefully, there will be less business travel and more Zoom meetings. I don't see a permanent online move for primary and secondary schools, but the trend at colleges and universities has been in this direction for some time. It's cheaper and solves space limitations. I hope to see more work-from-home businesses and more laddered workday start and finish times to relieve the crowded roads and the resulting assault on the natural environment. I'd like to see shorter workdays and workweeks, with a growth of interest in physical self-improvement and caring for each other and animals and plants. At a cultural level, these technologies of working from home may make kids more reluctant to act out in adolescent ways. There will be lots more college-aged kids living at home, with working parents, and maybe live-in grandparents (since

nursing homes and assisted living are going to be less sought after). That intergenerational mix and the economic situation may drive our young people in a more responsible direction. At the same time, youth has a lot to say to the older generation on inclusion of all stripes, so there should be a good give-and-take that will affect political choices on all sides."

Warren Yoder, longtime director of the Public Policy Center of Mississippi, now an executive coach, responded, "I expect a resurgence of trust in life sciences with a successful COVID-19 vaccine. I expect that there is some serious grappling with the future of AI now that we are past its hype cycle and into a dawning realization of the things it can and cannot do. And I hope for a genuine reworking of the social contract to restore respect for labor (broadly defined) and increase its share of the economic and cultural wealth we produce together. I hope some degenerative diseases start to yield to the life sciences: cardiovascular disease, kidney disease, autoimmune disorders, neurodegenerative diseases, diabetes. There are large groups of people denied full lives by chronic disease. With scientific advances, useful technology would become quickly possible. So much of human life is a struggle that could be made substantially easier. I hope augmentation tech moves from the experimental to common and affordable: smart glasses that work for sight-impaired people, brain stimulation for epilepsy, exoskeletons for manual workers, assistants for the elderly. I hope for new approaches to artificial intelligence. We seem to be stuck with the same techniques in machine learning, natural language processing, pattern recognition. Let's think more deeply about using the edges to inform the graph. Or embodied computing. Or think about how computation-built environments work and might be improved (think about the contemporary monetary/banking system as an example)."

Willie Currie, who became known globally as an active leader with the Independent Communications Authority of South Africa, observed, "My life under lockdown in South Africa is entirely governed by access to mobile and fiber broadband. I do executive coaching on Zoom, Skype or WhatsApp. I order food, things and entertainment online. I do Pilates online. I'm learning to play the piano online. I'm marketing a book online. Last week I facilitated a workshop online. I no longer fly. Driving a car is minimal. I'm unlikely to return to the real world to do these things as a matter of normality. Going out for any of these things is likely to be the exception rather than the norm. I expect this will be what it is like in 2025."

Nigel Cameron, president emeritus at the Center for Policy on Emerging Technologies, predicted, "Business travel will drop 50%+ long-term, with a huge impact on airlines and hotels and big impact on the conference industry (I suspect that will shrivel by more than half, it's an industry that's been ripe for disruptive innovation for many years). There will be big environmental benefits, of course, but this will be a disaster for many workers in these sectors. Teleworking will be a standard option in many businesses, government departments and so on. Hybrid tele/office working will be common as we learn what has and has not worked during the

Great COVID-19 Experiment. Workers gain social benefits of course, but this also leads to potential big savings for employers. One development I've expected for years is the formal expansion of coffee houses into teleworking centers – Starbucks putting in printers and video-conference rooms, for example, creating halfway houses between home and office. In education, I suspect there are big potential savings out there, and the possibility of enhanced experience if hybrid models emerge for secondary and postsecondary students – say two days a week on campus, three days at home, with master-teachers in massively open online courses (MOOCs) delivering big slices of the curriculum. The experiences of Los Angeles and San Diego school districts and other major education departments will likely lead to radical changes, especially as there are big potential cost savings. Schools' physical footprints can be halved, there will be fewer teachers needed and I expect big moves into this space by tech companies. Also, pandemic preparedness will finally be taken seriously at many levels, and many of us will keep wearing masks when we travel. With greater dependence on digital provision I suspect privacy concerns will, as it were, be mainstreamed and lead to big shifts in the way data is handled, though this could move the other way as people care less. This crisis may be what was needed for [MOOCs] to take off for high schoolers and college students, and for lifelong learning. Also, I suspect many of us will continue to have groceries delivered, as sophisticated ordering systems are rolled out by every supermarket chain and other suppliers."

Garland McCoy, president at the Technology Education Institute, responded, "I think life will become much better in the future because of technology. It will challenge humans. Humans need challenges, they need to fix things, they need to be busy in ways that accomplish useful outcomes. I believe there is a learning process that seems to have helped humans adapt and change in mostly positive ways. So, I will press ahead with my optimism and look for a future where we will have learned from both the medical and social challenges we are currently facing. That being said, we are quickly approaching the world population tipping point where the UN and other scholarly entities see an extension of what has been unfolding in Japan, Russia and Europe (regardless of the immigration waves). A fundamental transformation will need to take place as consumption of resources and consumer-driven economies will be challenged. We will be seeing the beginning of this in 2025. We have never experienced the precipitous decline in human population, and it will shake society to the core – I know, where is the optimism in this?"

Valerie Bock, lead at VCB Consulting and former technical services lead at Q2 Learning, said, "I expect a 'new normal' for office workers will involve only part-time commuting to an office. I hope this will not mean a complete abandonment of face-to-face team gatherings, because it really does matter that people gather in full bandwidth in situations that allow for casual chit-chat before and after formal gatherings. The importance of quality child care and quality child education will have been driven home to fathers and mothers forced into the emergency no-care/home-school scenario. Having been exposed to the worst-case online learning scenario, parents will be skeptical

about signing kids up for online educational experiences. This is a shame, since excellent online learning programming does exist. But it's best used in concert with high-quality in-person tutoring, which even the most dedicated parent struggles to balance against their own job responsibilities. Telehealth should also become much more widespread, fulfilling its promise now that health care insurance companies will pay providers for offering it. The option of not dragging one's sorry sick self to the doctor's office to infect everybody there will be a major increase in quality of life for all concerned, but especially for those in underserved rural areas."

Dmitri Williams, a communications professor at the University of Southern California expert in technology and society, wrote, "Technology is a disruptor, and the pandemic is accelerating its power in several areas in ways we can see and others that will become clearer later. Work-from-remote is the obvious one. This may lead to efficiency, social distance in a bad way and perhaps to some new setting of priorities. Getting Americans out of cars is likely to be a net positive, while jobs lost to automation will be a net negative. Education was ripe for disruption, and in fall of 2020 we will see a large shift in how universities and colleges grapple with their roles and how people see them. I expect a lot of smaller colleges to fail and top-tier ones to survive, but the net effect may be more access to more information by more people in the long run, and that's a good thing. Our general reliance on digital tools for socialization has been in overdrive during lockdowns, and I hope it's shown the importance of physical presence. We miss each other! When we can reconnect, I hope we'll have learned something about this, though convenience and shallow relationships will still play an outsized and harmful role. Our well-being has suffered in the crisis. Here's hoping we learn from all of this and emerge with a commitment to valuing healthy lives over just having more apps. Technology should free up our time for things that matter. Getting out of cars would be a huge boon for our well-being, our free time, the safety of our neighborhoods and the cleanliness of our air. If telework allows more of us to use that new time for things that contribute to community and our social lives, that will be a big upside. If it's merely more working hours to squeeze out of the middle and lower classes, it will set the stage for upheaval."

Neil Davies, co-founder of Predictable Network Solutions and a pioneer of the committee that oversaw the UK's initial networking developments, commented, "I expect less 'forced travel' to work (cubical farms) and fewer low-value, face-to-face meetings, the hope being that a broader assessment of true opportunity costs – not just money – will have started to become the norm. The hope is that the bravado and ego posturing often present in the pre-COVID meeting culture is, rightly, contained and that respect for such things as supporting family, engaging in nonwork pursuits, improved attitudes to racism, sexism, etc., bear some fruit. I expect the rise of a reflective approach to life, which will be necessary because of climate emergency issues."

Gary L. Kreps, distinguished professor of communication and director of the Center for Health and Risk Communication at George Mason University, responded, "As dependence on the use of digital communication technologies increases due to the pandemic, it will force greater investments into building our digital infrastructure, technologies and programs, providing new and improved ways to use digital tools to achieve goals. It will increase opportunities for interactions and collaborations between people and improve access to relevant news and information. It will also improve access to needed social support. The public is becoming increasingly dependent on technology and technology companies, so any disruption in digital services can block achievement of important tasks and goals. I hope digital services companies will be responsive to needs."

Moira de Roche, chair of IFIP IP3, predicted, "The new normal will be much more flexible, technology-enabled working environments. Individuals will use a variety of devices to interact and do work. Technology will be a must-have, not a nice-to-have. Individuals need to exercise a duty of care to keep themselves safe when using technology. Everyone needs 21st-century digital skills, especially a knowledge of privacy and security. Access to medical care will improve due to online services being provided – these must be responsive so that they can easily be accessed from mobile devices. Data prices will come down. Employment opportunities will be available everywhere, no longer bounded by geographical locations, however, this will change our view of employment security as many more people will be freelance and have to take care of their own medical insurance, retirement funds and savings for bad times. The way employment is viewed will be quite different. Daily routines will mostly be affected for the better, as people will not have to commute to their workplaces every day, reducing stress and allowing individuals to work to their own patterns (early start, late start, etc.). My hopes are for improved data access and lower costs with 5G and beyond, improved access to learning opportunities and a restriction in the need to attend school or university, with a concomitant leveling of the playing field as access to quality education will not be dependent on socioeconomic factors."

Fernando Barrio, a lecturer in business law at Queen Mary University of London expert in AI and human rights, said, "The increasing use of digital technologies in agriculture and food production would allow a more sustainable increase in the volume of food produced in a context of population growth and environmental protection. The expansion of smart farming can result in more and better food while using less arable land. The combination of smart farming with urban farming can also increase production while reducing the CO_2 produced by food transport."

Kevin T. Leicht, professor and head of the department of sociology at the University of Illinois, Urbana-Champaign, wrote, "My biggest hope (and that is really all it is) is that technology-related changes will be used to reduce inequality and advance the dignity of every human being. For example, it should become very difficult to hide and launder money and avoid taxes. It should

become very difficult to engage in off-the-books employment of unskilled people, paying them less than minimum wages and violating safety, wage and hours laws. It should be possible to deliver basic health care any place that can get an internet connection. It should be possible for governments to make royalties from the scientific innovations they start via funding from public agencies. There are a lot of 'shoulds' here of course. These are hopes."

An anonymous respondent commented, "In my most hopeful moments, I wish for the development of algorithmic systems that are capable of, and worthy of, the trust we would have to place in them, for us to rely upon the advice, recommendations, warnings and guidance about the choices we face in the short and long terms. These trusted systems would course have to be 'smart,' but they would also have to have developed a capacity for understanding the moral and ethical systems of value that each of us have developed (or are developing) for ourselves. These systems would have to be strictly constrained against sharing information and inferences that they have developed in order to serve our interests with others that we have not specifically granted access to information (and inferences) about us, our status, our goals, our strengths, our weaknesses, etc. We will continue to be assessed by other algorithmic systems, but I am only referring to those systems with which we establish a relationship specifically for the purpose of gaining insights/guidance about how we should proceed toward the future."

Gary M. Grossman, associate director in the School for the Future of Innovation in Society at Arizona State University, responded, "My hope is that information technology will force the transparency necessary to bring about global change rapidly. This will not be automatic nor absent a share of conflict. However, while the path will not be straight, it will tend toward positive directions for democracy. Indeed, it already has. Much more is to come. The COVID-19 pandemic has demonstrated the extent to which the 'old normal' reflected a world full of nations with much less capacity than was reasonable to expect. Even authoritarian regimes, presumably with their governing rationale of being powerful enough to solve problems, have shown very clearly their social, political and economic bankruptcy. New forms of governance are needed and there can be no doubt as to this because we have arrived at a point, thanks to technology, where secrets are no longer possible to keep. This alone will be progress. The 'new normal' of 2025 will look different in many ways from 2020, and we will be on the road to many new institutional forms. Technology companies are currently operating in a 'Wild West' type of environment. This cannot and will not last. Life will stabilize and new patterns will emerge, as has happened in every period of human social evolution. Further, centers of power are too decentralized for any one platform or interest to prevail globally. I consider this to be a good thing."

David Karger, professor at MIT's Computer Science and Artificial Intelligence Laboratory, observed, "Rapid technological progress has created many opportunities to do things differently from the past, but we creatures of habit have often stuck to the old ways. The pandemic has forced

us to change, broken us of our old habits and helped us realize the benefits of new approaches. We'll see far more working from home, shopping from home and learning from home. In academia, we've talked for years about moving our conferences online 'someday.' That day is here; it's hard to justify burning carbon for thousands of people to travel thousands of miles just because it's more fun to grab drinks together in person. We're making strides in infrastructure for online learning in fall 2020; that infrastructure will remain even when the pandemic is over. In knowledge work, work-from-home won't be universal (many people need a better environment than they can find at home), but it will be common. I expect many companies to evolve towards time-shared spaces for employees who only come in a couple of days per week. We might even see two companies sharing real estate, so one company can be onsite Monday-Tuesday and another Wednesday-Friday. The move towards online encounters has certainly highlighted the limitations of existing technology, and I expect a huge burst of activity and progress in VR/AR, not to create fantasy landscapes but simply to create a full illusion of presence in online meetings. The main remaining reason for in-person encounters is social. I expect activity in cities will evolve away from business and productivity – much of which can happen online – and more towards leisure activities."

Chris Caine, president and founder of Mercator XXI, previously with IBM for 25 years, predicted, "Business models will be changed significantly. People will be more socially conscious of our interdependencies with each other. Government will address gaps in the social and economic supply chains that the pandemic revealed. And a new focus, appreciation for and investment in health care and scientific research will come forward to help prevent future impacts of virus-like pandemics. Public sector management practices will be different and more real-time. We will develop a more mature and complete understanding of the power of new technologies (i.e., AI, machine learning, remote sensing) as well as of the risks to society and individuals. We will improve life because new, civilized protocols will be created to govern behavior that aligns with societies' civil norms. These protocols will allow new technologies to be applied to aspects of our lives that will reveal the power of having more information upon which to make more real-time, informed decisions and the accountability that vastly increased transparency will bring with it."

Dan S. Wallach, a professor in the systems group at Rice University's Department of Computer Science, wrote, "By 2025, I expect that the population will be immunized against COVID-19, and we'll certainly be capable of resuming the 'old' normal, if that's what we want. What will change in the meanwhile is that we're (by necessity) getting much better at distance working and learning, meaning we'll be able to get together in person because we *want* to, rather than because it's the default. Just considering 'work from home,' it's easy to see a sea change in people working where they live versus where they work. There's no need to physically be in Silicon Valley to do a wide variety of software development tasks, nor to physically be in New York to do a wide variety of

financial tasks. As with too many other things, there's going to be something of a divide between poor and rich workers. A low-income professional doesn't just need the right credentials and clothes to get hired. They need the right sort of home-office environment. This suggests a market opportunity for 'hot desking' services, where you rent a 10x10 foot cubicle with a decent network and computing facilities. If done right, this could be pretty cool. Imagine all-in-one services where you've got daycare adjacent to an office facility. If a substantial fraction of office work shifts from in-person to remote, that will have a variety of downstream impacts. There will be less commuting, less pollution and less air travel for business meetings. That also means more development in suburbia and less development in downtown areas.

"On the flip side, what we're almost certainly figuring out right now are the limits of work-from-home, especially in K-12 and higher education. Everybody who thought that online education would render the traditional university obsolete is now observing what that would be like, and so far, it's not looking very attractive. For similar reasons, work-from-home will inevitably hit its own limitations. William Gibson famously said (in 2003) that 'the future is already here – it's just not evenly distributed.' To that end, we can look at what's really expensive or exotic today and assume that such things will become cheaper and more widespread. That's likely to include things like faster residential broadband. Similarly, you can look at home health-measuring smartwatches. Today, at the high end, you get heart rate measurement, including abnormality detection, blood oxygen saturation and a variety of AI-driven features on top of that (sports activity measurement, sleep cycle measurement, etc.). That sort of thing will become much more present. It's also easy to predict electric cars and solar panels becoming cheaper and more popular. All of these changes plus the broader adoption of work-from-home will have real impacts on fossil fuel usage and thus impacts on pollution, although the bigger impacts will be well beyond 2025."

David Cake, an active leader of ICANN's Non-Commercial Users Constituency, said, "I expect long-term changes of more flexible working hours and conditions, reduced commuting, climate-change improvements and increased health, hopefully leading to improved physical well-being for many. These will be balanced by increased workplace surveillance by other means than the physical, less employment security and serious risks of physical and emotional conditions made worse by lack of regular contact, so the amount of improvement in the average person's life will depend on government and employers' choices about how to balance more flexible options with a changed range of services that are important to offer. Full acceptance of the practicality of virtual workplaces in industries that had not previously considered it will change established norms in many industries that had previously taken a physical workplace as a necessity, and full acceptance of it should force workplaces to properly deal with issues like disability, family care responsibilities, costs of commuting, the downsides of urban centralisation and many other

problematic issues. For many workers who are essentially knowledge workers, this increased flexibility, total or partial, will improve quality of life significantly."

AI, VR, AR, ML will yield good

While many experts worry about the trajectory of technological change and the implications for the power of tech firms and privacy, a portion of them noted there could be any number of improvements in the human condition thanks to advances in artificial intelligence, virtual reality, augmented reality, deep learning, machine learning and natural language processing. Among other things, many believe the changes in sophisticated technology will make virtual spaces feel much more real, in-person and authentic.

Jeff Johnson, a professor of computer science at the University of San Francisco who previously worked at Xerox, HP Labs and Sun Microsystems, predicted, "I hope better speech recognition, automatic translation, captioning, autocorrect, etc., will have many useful applications. Better (lighter, longer-lived, smaller) batteries will improve many existing devices and enable many new ones. More ubiquitous Wi-Fi will mean more universal internet connectivity, which will be a positive development. More universal internet connectivity will make it possible to find devices, possibly making theft (and even kidnapping) a thing of the past. And, in the right hands, drones have a variety of applications that could really improve society. I worry that tech companies will continue to exploit human psychological weaknesses, e.g., promoting addiction to mobile phones and social networks, thereby distracting people from leading productive, useful lives. And that, in the wrong hands, drones have a variety of nefarious applications that could really damage society."

Henry E. Brady, dean of the Goldman School of Public Policy at the University of California, Berkeley, responded, "Here are some of the possible uses of emerging technologies: Better and more immersive online communications technologies. Better ways to use technology where it can be useful and to have 'in-person' (perhaps over the internet) one-on-one interactions. Better health-monitoring devices and ways they can be made useful to individuals and to public health authorities (the latter requires dealing with the vexing issues of privacy). Better ways to distribute goods using technology. Driverless delivery vehicles. Online supermarket shopping that 'feels like' going down the aisles of a grocery store and that is linked to an automated packaging and delivery system. Better ways to deliver services – this may be the hardest to improve. I am very worried, however, that some of these might also destroy jobs and thereby increase inequality. … I am worried about algorithmic fairness, and I think that serious questions have to be raised about who owns all of the technology that will be created. One version of this problem is 'who owns social media data?' but an emerging one is 'who owns the robots and driverless cars?' The average citizen needs to have some ownership over this capital if we are to have an equitable and fair society. I am also worried about the threats to privacy from all of the data that can be used and combined. On

the one hand, this allows us to manage problems better, but it also allows an authoritarian regime to 'manage' people in ways that are worrisome, as we are seeing in China."

Jonathan Kolber, a member of the TechCast Global panel of forecasters and author of a book about the threats of automation, commented, "I expect that the emergence of quantum computing will make transactions more secure by 2025. This will notably affect financial activities and other transmissions of secure information and it will continue to proliferate thereafter. I also expect VR and AR to begin migrating into professional and educational areas. VR with zero latency, 4K visual acuity and comfortable headsets should be replacing in-person meetings. This will further accelerate the trends toward remote work collaboration which were already accelerated by COVID-19. The combination of zero-latency VR with quantum computing and AI should enable the generation of evolutionary 'virtual worlds' that conform to the laws of physics. Within such worlds, people will be able to create new kinds of societies, with realistic social and technological systems that evolve. Unlike existing societies, these will not be constrained by legacy systems, and may embody systems of sustainable technological abundance. The evolution will result from experiments within these 'evolutionary societies,' each of which will offer experiences and support values consensually supported by its participants. Over time, some such societies will become attractive enough that participants will begin the process of instantiation to the real world. In this way, Celebration Societies and other evolutionary societies will be born. Such design may even take the form of a contest or contests, with winners receiving actual land when their design is instantiated on uninhabited land, such as re-greened desert."

Michael G. Dyer, a professor emeritus of computer science at UCLA expert in natural language processing, said, "Technology for improved virtual reality will also accelerate over the coming five years, but I do not see widespread use of the sensory suits, body motion sensors, 3D glasses, multimedia databases and network bandwidth that are needed for full 3D virtual experiences (which [will] not become more common until 10 years from now)."

A distinguished professor emeritus of engineering wrote, "I hope there will be innovations in tele-presence and multiparty interaction that make face-to-face meetings less important, but I'm skeptical. This need to see and touch each other is deep in our biology."

A global intelligence expert observed, "My hopes lie in the application of AI, mostly in areas in which repetitive human action is required. Two examples come to mind: 1) The transportation application AI as an active partner in man-in-the-loop operators. Here is your AI executive assistant that observes the operator's routine habits and errors and, from those two inputs and others, offers real-time advice to operators to aid in risk mitigation and accident avoidance. 2) More – much more – of what is already underway in medicine. Specifically, chart readers and

radiologists should be on the verge of extinction because AI is better than humans; it filters out and eliminates that. This will assist in decreasing patient death. This is already happening."

A journalist and industry analyst expert in AI ethics said, "Technologically, we'll achieve things we never were able to do before, such as AI-brain connections, nanotechnologies, AR/VR/XR, autonomous robotics, etc. Could all of those things be used for good? Yes. But we must evolve our thinking if the good is to outweigh the bad. Until we value the right things (humanity as a whole and its well-being), technology cannot solve the world's problems itself. It's simply a tool. There's a lot of room for innovation and creativity, and even more room for oppression until we change our thought patterns."

Jon Lebkowsky, CEO, founder and digital strategist at Polycot Associates, noted, "It's clear that virtual gathering has become the new normal, and I think that will stick, which means that platforms for meeting (e.g., Zoom, Google Meeting, Microsoft Teams) will continue to evolve and thrive and will be widely used."

Alexandra Samuel, technology writer, researcher, speaker and regular contributor to The Wall Street Journal and Harvard Business Review, predicted, "The shift towards remote work could and likely will inspire innovation in remote-collaboration and remote-work technologies, which is great. But what would be really transformative is a mental and behavioral shift in how people work with these technologies. The longer we're at home, separated from our IT teams, the greater the pressure to develop individual competency when it comes to choosing and using digital tools. If home-based workers invest in the tech skills that make this possible (and if companies empower workers to make their own choices, rather than forcing them into a common, easier-to-surveil toolkit), the tech marketplace will be more sophisticated in another five years. More knowledgeable and sophisticated tech consumers will not only create a market for more advanced and sophisticated workplace tools, they may also create more demand, pressure and business opportunity for social and recreational platforms that offer choice instead of simply plug-and-play. Think: Video games that offer opportunities for co-creation or mixed-mode play because gamers are now more adept at customizing their game play, building their own mini-apps or stories within games, or simply setting up their consoles and game rooms so that streaming video or multi-screen play becomes a lot more feasible. Or think in terms of participatory theater and video projects that invite people to collaborate because it's no longer so daunting to get on screen or run the controls for a live interactive event. Perhaps even imagine a world in which people feel so comfortable with tech configuration that they actually dig into the privacy settings of their social networking platforms, taking the steps to protect their individual privacy and thereby pushing the big social networking platforms towards a business model that doesn't depend on unfettered access to user data."

June Anne English-Lueck, professor of anthropology at San Jose State University and a distinguished fellow at the Institute for the Future, commented, "For the global middle class, digital technologies will provide access to work, education, care and social connectivity. Robotic agriculture and other food-tech innovations will keep the supply chain working and reassure consumers about the 'healthy hands' that touch their food."

Colin Allen, a cognitive scientist and philosopher who has studied and written about AI ethics, wrote, "I expect 1) Better virtual meeting spaces that will allow 'free' circulation of participants within a virtual space (already under development). 2) Zoom should zoom. What I mean by this is that there should be a software layer between the camera and videoconference feed that automatically zooms and pans to allow the participant to be standing/moving around while remaining in frame and focus."

Christine Ogan, emeritus professor of journalism, informatics and computing at Indiana University, said, "Applications like Zoom will become far more sophisticated and interactive in a way that simulates face-to-face contact more – and there will be lots to choose from. Online education will advance along with this technology allowing for the kinds of instruction that are now difficult – dance, music, demonstrations of processes, laboratory instruction of all kinds."

Tim Bray, technology leader who has worked for Amazon, Google and Sun Microsystems, responded, "I hope that mobile device hardware improves to the point that ubiquitous augmented reality will become practical, as this has the potential to dramatically improve the human experience of the internet and the world more than anything else I see on the horizon."

Jim Witte, director of the Center for Social Science Research at George Mason University, wrote, "My greatest hopes for tech-related changes in the new normal lie with a renewed interest in virtual worlds. While the allure of Second Life and similar platforms faded in the early 2000s, immersive and engaging digital environments offer a means to recapture some of what is lost through physical distancing. Advances in hardware, rendering of objects and flexibility of sensors, as well as in software can dramatically improve the virtual world experience, further blurring the line between digital and analog, as well as between synchronous and asynchronous interactions. Advances in AI can lead to agents (scripted bots behind representations of human actors) that act and interact in a 'natural' fashion that supplants avatars (virtual world representations of human actors guided by humans). As with any technology, however, whether smart agents are used for good or evil will depend on how they are deployed and the social and economic order within which they are embedded."

R. "Ray" Wang, principal analyst, founder and CEO of Silicon Valley-based Constellation Research, commented, "I hope computer vision and AI are used to prevent violent crime and be

quickly applied to apprehend those charged with a deadly crime. Improved natural language search and brain wave navigation will help improve accessibility to those with disabilities and help them navigate the internet."

Kate Klonick, a law professor at St. John's University whose research is focused on law and technology, said, "I am optimistic that we will create new and better ways to interact with each other, whether through 3D meetings or improved audio and visual experiences. I am also optimistic that this experience will revolutionize the technology and techniques in the biomedical industry around vaccines."

Andrea Romaoli Garcia, an international tax lawyer active in multistakeholder activities, urged, "AI should be adopted to audit government decision-making processes for more transparency and to assure the processes focus on public interest. AI can be used as a forensic tool to audit judges and verify the principle of impersonality in decisions. The coronavirus pandemic highlighted the need for investments in education and health as a way to accelerate economies. All countries face an economic recession, but technology will be used to accurately integrate demand and supply, avoiding losses and reducing risks. The Internet of Things, AI and blockchain can be applied to transportation planning, and they can be applied to employment processes and lead to more jobs. This is an encouraging scenario, but it is impossible to achieve if there is no investment in seeking a society that is free from corruption because, currently, organized crime has overtaken most of the global cash flow."

Charlie Kaufman, a security architect with Dell EMC, wrote, "There is enormous potential for improvements in software that enables people to work together. We have been focusing on making teleconferencing as similar as possible to face-to-face meetings, missing out on opportunities to have a superior experience. For example, when multiple people are competing for airtime to express their ideas in a meeting, in a face-to-face meeting it often goes to the most aggressive. In virtual meetings, things get awkward as there is a delay in people discovering that they are talking over one another. In a meeting where listeners get to *vote* on who they want to hear more from a whole new social dynamic could develop. It's also possible that all parties could talk simultaneously but be heard serially by listeners."

Ben Shneiderman, distinguished professor of computer science and founder of the Human-Computer Interaction Lab at the University of Maryland, commented, "As human-centered AI becomes more common, interest in user-experience design will grow. Already, Google is offering MOOCs for training UX designers more widely, helping to promote the design excellence that made web-based services and mobile device apps such successes. Google's People and AI Research guidelines are a good step forward and Apple Design Guidelines are even more effective in clarifying that the goal in high levels of human control *and* high levels of automation. The

misleading directions of humanoid robots and full machine autonomy will continue to be promoted by some researchers, journalists and Hollywood script writers, but those ideas seem more archaic daily. AI and machine learning have a valuable role, maybe as the embedded chips of the future, important, but under human control through exploratory user interfaces that give users better understanding of how the embedded algorithms perform in meaningful cases that are relevant to their needs."

Monica Murero, director of the E-Life International Institute and associate professor in Communication and New Technologies at the University of Naples Federico II, predicted, "In 2025, I expect the 'new normal' for the average person will be AI-based human-machine assistive technology embedded in smartphone apps, tablets, wearable, cars, pets accessories and other realms. I see 'external' devices in this way: 1) Playing a central role in home-focused professional and personal practices. 2) Devices such as AI-enable smartphones playing a pivotal role in mobility. 3) I see a slow rise of implantable AI-based devices that will overcome the separation between external and mobile points of assistive technology. Individuals' personal lives will become more and more enabled by digitalized practices. I foresee the rise of 'internet-mediated digital agents' (interdigital agents) taking over more and more repetitive or time-consuming tasks and creating convenience and dependency for users. Regarding economic security, I do not expect dramatic changes in Europe (where I live) in the next five years. Privacy and security will still be at risk, possibly even more. I hope that tech-related changes, for example AI-based digital health, will accelerate knowledge in any field, particularly in health care and well-being so more people can access science and have positive outcomes in the coming years in convenient and safe ways."

Fabrice Popineau, an expert on AI, computer intelligence and knowledge engineering based in France, responded, "I hope that AI and digital technologies will be used for more-efficient education. Education is the key for a global better good. There are many efforts in public and private research, and it is a difficult area. One of the main difficulties is related to data collection because it bumps into privacy. Not all countries value privacy the same way."

Jerome C. Glenn, co-founder and CEO of the futures-research organization The Millennium Project, wrote, "Tele-everything increases. This reduces environmental impact and increases family life for those now able to work at home. AI applications increase. This reduces labor, costs, accidents, and for some, augments and improved labor productivity. Together, tele-everything and AI will free people to begin to make a living by connecting to those around the world who will pay for what they want to do, eventually leading to more of a self-actualization economy."

Mike Sellers, director of the game design program at Indiana University and an AI researcher and consultant, observed, "One big unknown is the future of AI in daily life. I have long believed that we will see the 'virtual concierge,' but the problem remains stubborn. I think we'll see AI

improvements along the lines of an Alexa+ in the next few years, but not to the point that AI in production achieves anything like the informal goal of making computers act like they do in the movies. I hope for far greater adoption of renewable energy (especially solar and wind) on a nonlinear growth path. Shutting down of more coal and oil plants due to economic nonviability. Some level of augmented reality in daily use, though I think five years is still early to see this in ubiquitous use."

Glynn Rogers, retired, previously senior principal engineer and a founding member at the CSIRO Centre for Complex Systems Science, predicted, "The drastic response to the COVID-19 crisis has forced a reevaluation of the way in which work and other group activities are performed. … It can be expected that incremental evolution of the technologies involved will enhance the effectiveness and desirability of working from home with consequent improvements in productivity. The well-understood and critical role of body language in communication provides a major challenge for display technology and video transmission. Enabling this emergence may well require the full implementation of the Internet Quality of Service technology explored by the IETF some two decades ago as well as the widespread deployment of software-defined network technology. The latter in particular would enable internet service providers to create specialised products to support new forms of online social and professional activity that would come to be experienced as entirely natural, i.e., the 'new normal.' Over and above the immediate COVID-19 crisis, climate change looms as the major threat to our way of life. There are a number of 'tech-related changes' that can at least ameliorate the impact:

- Evolution of new forms of online social and professional interaction enabled by a ubiquitous high-speed internet based on software-defined networking technology.
- The rapid deployment of electric vehicle technology with the required infrastructure of charging stations, etc., as well as the reduction of greenhouse gas emissions by the transport sector. This would have a major impact on city pollution levels both in terms of gas and particulate emissions, as well as noise.
- The development and adoption of the hydrogen economy will enable us to maintain a reasonable level of transport of people and goods over large distances, preventing a major disruption of the economy and our way of life."

Michael Wollowski, a professor of computer science at Rose-Hulman Institute, said, "People will more seamlessly integrate technology into their lives. We will be required to be 'on' (or available) at an even higher rate than is expected today. This will add more stress to our lives. Perhaps AI can help; think along the lines of a personal digital assistant that answers most of the trivial questions people might ask you, or one that politely suggests that someone will call them back."

Greg Shatan, a partner in Moses and Singer LLC's intellectual property group and a member of its internet and technology practice, wrote, "The evolution of the Internet of Things will bring more and cheaper smart devices and smart homes. I hope for faster, cheaper connectivity. More equity in connectivity, so that your income and where you live do not dictate whether you have internet connectivity, broadband access, etc. More smart, time-saving technology. Cheaper hardware! Where is the $100 laptop?"

John Lazzaro, retired research specialist in electrical engineering and computer science at the University of California, Berkeley, responded, "As an optimist, I believe the sort of 'giant leap' I experienced as a word-processing user in the 1980s will happen again, to improve the way groups of humans virtually interact using cameras and microphones. If I knew how to make that leap, I would be out there working on it myself. But I believe that out of the millions of K-12 and college students who have been frustrated with their remote education experience, hundreds of them have ideas on how to solve the problem, and several of them will succeed beyond our wildest imagination."

Smarter systems will be created

A share of these experts expect that municipal, rural, state and independent services, especially in the health care sector, are likely to begin to be modernized to better handle future crises. They say services and systems should allow for quicker identification of emerging threats and better sharing of critical information with citizens in more timely and helpful ways.

Chris Arkenberg, research manager at Deloitte's Center for Technology, Media and Telecommunications, predicted, "Automation, data analysis and machine intelligence will continue to slowly transform every industry to be more efficient, more transparent and less wasteful. Overall, this should lead to greater flexibility and resiliency against disruptions but with a lighter carbon/resource/pollution footprint. With the ability of sophisticated AI to model complex systems, we may become better able to understand and manage our impact on them. Everything from global supply chains and energy flows to pandemics and economic mobility could yield to data insights that enable better outcomes. Arguably, we as humans have been very good at building things at scales beyond our own ability to understand them. This results in unforeseen outcomes, adjacencies and mismanagement. Designing for emergence is really tough, but machine intelligence is able to address such complexities and scale."

Nathalie Maréchal, senior research analyst at Ranking Digital Rights, observed, "By 2025, employers and employees will become more comfortable with working remotely and using technology to increase efficiency and productivity. At the same time, we will have a better understanding of what technology cannot substitute for, at least over time. … Beyond the use of

technology for work and learning, we will also have confronted the limits of technology for all kinds of uses, including public health. By then, the consensus will be that so-called contact tracing or exposure-notification apps are not worth their costs, and that more human, analog processes are much more efficient and effective. … I am hopeful that in five years, we will have a widely available vaccine for the novel coronavirus (even if it doesn't provide long-term immunity), a global public health system that is prepared to react to the inevitable next pandemic and social infrastructures that are resilient to this kind of disruption. But it's going to get worse before it gets better."

Lee McKnight, associate professor at the Syracuse University School of Information Studies, wrote, "By 2025, I expect we will be on a new, long-run, more sustainable growth path with a new wave of crisis-spawned innovations finding wide application and new uses. Just one example of how daily life will be smarter in 2025: The wastewater in hotels, cruise ships, ports and airports, office buildings and schools will routinely be monitored for an 'early warning' indicator of a hazard. A wide array of innovations in sensed and computed conditions developed after the pandemic will also improve other aspects of life. Communities will take control with their own secure cloud architecture to guard against viruses of the computer type and malicious actors. These systems can build in governance of privacy, security and human and property rights, improving well-being by confirming individual and community autonomy even in this dangerous world. The economic and social inequities made blatantly clear by the pandemic and the racial and economic injustices also very apparent today will remain a focus for social and political action, and this will impact everyday life. … We all have been forced in 2020 to face the need for trusted (blockchain-including, rights-upholding) cloud-to-edge services. To ensure those digital technologies are not misused as surveillance technologies, or are not routinely stealing user's data, certified ethical AI will be required by any municipality before it agrees to deploy anything. Life will be better when smart buildings do not only optimize on energy use or on economic efficiency, but also on disease prevention. Planes, trains and cruise ships will similarly all be smarter, and be able to give health report cards or at least share data to Open Data Observatories worldwide for civic scientists to also contribute to the health of their and other communities."

Paul Henman, professor of social sciences at the University of Queensland, commented, "There is no doubt there are going to be changes from pre-COVID-19 to the new normal post-COVID-19. … The various experiences of health systems (including public health and communicable disease) and safety net/social security responses are likely to have an ongoing effect on sociopolitical discussions about the quality, design and funding of health and social security systems. … There will be some tech-related change, but more social changes involving tech. The new normal is being constructed out of our experiences of having to use tech to navigate our worlds during COVID. These experiences will create 'lessons' for how we use tech in ways we may not have wanted to or have considered feasible prior to COVID."

John Lazzaro, retired research specialist in electrical engineering and computer science at the University of California, Berkeley, observed, "The pandemic has reshaped the way patients access health care in the United States, and the current view is that some of the changes may be permanent. To quantify these changes, I quote from several interviews by leaders of Kaiser Permanente (KP), an integrated health care system that serves 12.5 million members in the United States. According to KP, telemedicine has grown from 18% of all visits pre-pandemic to 80% at the end of April 2020. KP physicians performed as many video visits in a day as they did in an average month in 2019. Pandemic-era oncology patient consultations have been 95% virtual. KP's current view is that once the pandemic is over, the 'new normal' will be about 60% virtual, 40% in-person. With this setup in mind, I address how digital technology may impact these changes. As described in the KP interviews, virtual visits rely on doctor-patient communication, aided by whatever visual information a well-placed smartphone camera can deliver to the doctor. What is usually missing is the point-of-care data collection that a physician assistant collects during the pre-consultation (blood pressure, heart rate, SpO2, temperature, body weight, etc.), condition-specific measurements the doctor may take during the visit (stethoscope, etc.) and quick-turnaround lab tests that may be needed to confirm a diagnosis (flu diagnostics, urinary tract infection tests, etc.). Remote patient monitors and at-home lab tests for many of these measurements have long been available. However, monitoring is usually prescribed for use by a patient who has been diagnosed with a particular condition.

"In my view of the 'new normal,' when one signs up with a health care provider, part of the 'new member welcome kit' will be a remote monitoring console, capable of the most common measurements taken during an initial consultation with a primary care physician. When a patient signs up for a video visit, she may be instructed to use the console to take certain measurements in advance. Ideally, the console will have a low-bandwidth cellular data link, so that measurement results will be accessible by the physician before the video visit. The hope is to increase the odds that a patient can be successfully diagnosed during the video visit. Reference: These statistics are from website interviews with Dr. Richard Isaacs, CEO and executive director of the Permanente Medical Group, Dick Daniels, Kaiser Permanente Executive Vice President and CIO and Dr. Stephen Parodi, associate executive director of The Permanente Medical Group, and from an editorial written by KP oncologists in the journal JCO Oncology Practice."

Kenneth A. Grady, adjunct professor at Michigan State University College of Law and editor of The Algorithmic Society on Medium, wrote, "The new normal will involve greater use of technology to monitor and respond to people's health. The trend to use digital devices to monitor health was established by the time of the pandemic. The relative ease patients and health care professionals had switching to telehealth, and the associated reduction in cost, demonstrated that some health care practices could benefit from digital technology. As the technology to monitor

health becomes less costly and more accessible (e.g., attachments to smartphones that enable monitoring health metrics), telehealth becomes a more attractive alternative.

"The counterforce of privacy concerns will remain well past 2025 and will serve as a check on the growth of digital technology in health care. Just because something can be done, doesn't mean it should be done or that it will be accepted. We see a steady stream of ways in which companies abuse the privilege of having data about people's lives. The temptation to misuse the data seems to overwhelm even the most conscientious of companies. Regulatory controls, penalties and public shaming seem to have little effect on preventing misuse. Of course, not all companies misuse data and not all incidents involve egregious abuse of the trust placed in those who have access to data. Nevertheless, the risks of data misuse present a formidable counterweight to the benefits of the data. Unfortunately, the pandemic seems to have exacerbated the challenge. Those companies that had already amassed great data troves have grown more powerful and have found additional ways to gather more data. The impact regulating trillion-dollar companies could have on the economy will be balanced against the perceived benefits of the regulation. It is unlikely that any legislative body will want to pass legislation that could harm such companies, especially given that the projected time for the economy to recover from the pandemic lasts well past 2025. This will leave consumers having to answer the question: How much privacy risk am I willing to incur in exchange for the perceived health care benefits I may get?"

Alexandra Samuel, technology writer, researcher, speaker and regular contributor to The Wall Street Journal and Harvard Business Review, predicted, "In the best-case scenario, the temporary income supports that some countries have put in place will establish an enduring basis for cushioning the impact of automation and economic dislocation. We will finally address growing income inequality by providing a guaranteed basic income for everyone. We will embrace the shift to remote work and the reduction in business travel as the necessary (but insufficient) ingredient for reducing our collective carbon footprint, and rebuild the economy around working from home, online, so that a shift to virtual work enables long-run sustainable growth in place of a relentless acceleration of climate change. We will double down on the 'temporary' experience of online socialization and recreation, making the arts more broadly accessible and normalizing the idea of social connection as an anytime, anywhere part of our lives. But that requires governments to commit not only to short-term income supports, but to long-term changes in tax policy so that the winners of automation and digitization actually pay enough taxes to subsidize a guaranteed income. We need to restructure our economies, our businesses and our personal expectations so that we're not holding our breath until commutes and travel return – we're actually embracing a work-from-home, low-travel future. We need to evolve our conversation about 'real' life and 'real' theater and 'real' friendship so that we stop framing our online experiences as second-best, and instead find the ways to make them deeply satisfying. Sadly, I don't see a whole lot of that happening, with the possible exception of a wider and more enduring shift to remote work. What's

missing are the business and government economic policies to ensure that that shift actually provides widespread social benefits, and not just a cost saving on office rent."

Neil Davies, co-founder of Predictable Network Solutions and a pioneer of the committee that oversaw the UK's initial networking developments, wrote, "There will be a plethora of new (probably local and small-scale) solutions to displaced needs such as work socialisation, face-to-face training, etc. Looking back at small-scale responses that occurred in the 1990s might well point to the style of solutions that emerge, e.g., shared workspaces that are accessible by foot or cycling, the disintermediation of current delivery chains, etc. This is predicated on effective digital service delivery that is trustworthy and fit for purpose. There is already a preexisting technical movement – one I've been actively involved in for 10+ years – that is now beginning to bear fruit at an international body level where *real* technical change occurs, defining technical engineering standards that will shape the digital delivery supply chain market. The emergent outcome of this is to reduce the power of the 'presenteeism' management style; reduce the lure of high-density conurbations (where will the 'smart city' be? in the 'smart town'?) – again to head towards a more sustainable resource-consumption profile. This will be because more options will be available where people can pursue a career without the necessity to kowtow to the near-feudal structures that are prevalent today. The risk? The winners in the feudal structures of today force patterns of behaviour/interaction that actively undermine the potential effectiveness – their fear (however that is wrapped up) driving them to resort to abusive use of the de facto 'golden rule' of today, which is: Those who have the gold make the rules. I hope we start to get effective and assured (hence trustworthy) service delivery in the digital supply chain in regard to fitness for purpose and economic and environmental sustainability. This is all becoming a utility of the level of reliability of electricity supply (in say, the UK), one where failure to deliver is a rare and noteworthy (if not newsworthy) event. The issues of performance isolation, assured service delivery, etc., will have been recognised as the overarching factors that are, to a large extent, independent of the latest 'G'ness (4G, 5G, 6G …) that is being hyped. Once the 'applied physics' nature of these constraints is recognized, then perhaps the industry can recognise where they are reinventing previously failed approaches and better engage with the science of their industry, all of which could mean upheaval within existing technological islands we have today. Much if not nearly all of the commercial delivery structure in the digital supply chain today is based – and actively required to be through legislation – a set of transferable or dominant-cartel monopolies. There are dangers and benefits in such monopolistic power. Like most technology, this is in principle morally unaligned. It is the human structures that shape the moral outcomes. The commercial structure forces vast waste – think way over 50% of underlying assets are not available to create overall systemic economic value. The systemic shortcomings of the IP protocol and the delivery stacks built on it lie at the heart of technical factors that underpin the set of monopolies that exist today. The worry is that this cartel of monopolies increases its stranglehold, the existence of their service delivery models

destroys any alternatives, they become 'too big to fail' and the world ends up in a more fragile position."

Cliff Lynch, director at the Coalition for Networked Information and adjunct professor at the University of California, Berkeley, commented, "We have done idiotic things with supply chains in seeking 'optimization' at the expense of resilience in many parts of our society. These were terrible choices that often crept in gradually under the guise of efficiency and cost savings. Some of this has become very clear, and hopefully it will be rolled back, ideally deliberately undone. Resilience needs to be a much more fundamental goal in everything we do as a society and an economy. There's been a huge investment in biotechnology (broadly), and in vaccine technologies, diagnostic technologies, and epidemiology (including tracking and modeling tech) that I hope will serve us in good stead in the future."

Oksana Prykhodko, director of the European Media Platform, an international NGO, noted, "The COVID-19 outbreak has led to dramatic increase of the use of digital technologies, and this is very positive outcome. Over the past few years we have seen a lot of negative aspects of the wider use of technologies – from violations of privacy by tracking applications to more crimes because of lack of experience of newcomers to digital age. Nevertheless, I am sure that in 2025 the 'new normal' will be better because of a lot of decisions in various sectors regarding privacy and other issues, and also due to a higher level of digital literacy. I am a fan of global multistakeholderism, in which people across nation-states and across various parts of society work together to improve outcomes, and I expect a new culture of decision-making by 2025. I worry about the marginalization of those who do not have access to the internet or the knowledge and capacity to become proficient at participating in digital life. I welcomed the UN decision that access to the internet should be a human right, but we need more practical tools to ensure this right, such as Universal Service obligations on the government level and private initiatives such as the Future of Life Institute's work investigating artificial intelligence."

Jeanne Dietsch, New Hampshire senator and former CEO of MobileRobots Inc., said, "The use of AI to optimize the logistics of resource use could dramatically improve our nutrition, education, health and even our social interactions. The addition of sensor feedback into automation of all types, from traffic handling to regulatory regimes, could greatly improve the functionality of our systems."

Mirielle Hildebrandt, expert in cultural anthropology and the law and editor of "Law, Human Agency and Autonomic Computing," wrote, "I'd like to see more preparedness for the next pandemic and other potentially catastrophic events, including a thoughtful balance between well-organised human interaction and digital support to counter threats to public health, to support and guide migration due to catastrophic climate change and to quickly reorganise supply chains if

needed. There should be more and better ways to involve citizens in the development of digital systems that will run their lives, especially at the level of infrastructure (Internet of Things, connected cars, remote health care, teleconferencing, financial transactions, renewable energy and smart grids, etc.)."

Katie McAuliffe, executive director for Digital Liberty, commented, "Life will be different. Change is hard and often painful, but humanity overall has a remarkable ability to adapt. We will continue to adapt to new routines over the next few years, as comfort levels will remain variable. The obvious beneficiary of the pandemic is telehealth. Individuals, regulators and businesses have been forced to accept and incorporate it – this makes us better off."

Alex Halavais, associate professor of critical data studies, Arizona State University, said, "My hopes are largely around sociotechnical systems, rather than the technology itself. I have great hopes that the move to high-quality online education may provide access to those who live in parts of the U.S. and the world that would otherwise not be possible. There are also very real possibilities that this will provide opportunities mainly to those who already have access. Already, we have seen the growth of automation, particularly in food services, accelerated by the pandemic. Movement of more people out of food preparation, delivery and similar positions was already underway, but it was made more pressing by the potential for infection. Obviously, automation is a mixed blessing and poses significant social challenges."

Andrea Romaoli Garcia, an international tax lawyer active in multistakeholder activities of the International Telecommunication Union and Internet Society, observed, "The 'new normal' after the COVID-19 pandemic will bring change to the economic, health, education and business sectors in different ways. Challenges and existing critical points in society have been exposed. It is clear that decisions made by any one country affect the entire planet because we all share planet Earth. Life will be better for most people than life was at the time the pandemic began – for instance, the smart cities process is gaining accelerated improvements."

A scenario that looks back from 2025

One respondent started his answer in the year 2025 and looked backward. **Stuart Henshall,** a director with Convo Research & Strategy, shared this scenario: "It's Jan. 21, 2025, and I'm hoping the year ahead is much better than the last five. America has elected the first Independent People president and Cabinet and it is directing the great reallocation. The hope is that the old parties are finally being snuffed out. The platform has shifted to community and commons.

"Financial markets are in ruins, so the allegiances and institutions managing daily lives are again increasingly scientific, fact-based. The last four years have seen 90% of the U.S. population

lose all their savings, years of rioting and large-scale flight from the cities. Masks were just a Band-Aid in 2020 until the moment in which the suffering went beyond politics. By early 2021, despite an overwhelming democratic majority and health care providers declaring bankruptcy protection, it was increasingly clear no one was ready to address bankruptcy laws. As long as the same people acting as the country's 'rulers' were protected, they hid behind the curtain and the financial shenanigans were able to continue. The concentration of wealth had accelerated over the last two years and government continued to hold on by issuing law-and-order responses. Protesters, rioters and militant responses to them made it dangerous to leave your neighborhood.

"When COVID-19 arrived, many Americans were unhappy about the tactics proposed to track and trace the virus. However, by 2022 it was clear that collective community intelligence (motivated by personal and family safety concerns) would be expected to be gathered about anyone nearby who might present a known risk. And the awarding of [social credit] 'plus points' for those who help others and boost community spirit were winning over large groups of people. This shift enabled many to see the power of community again. However, the real power was in the AI that was working to bring people together and overturn biases.

"Open source software began to have an impact and, concurrently, communication began to bypass traditional providers to shift to emerging 'free-slow' exchanges. Meanwhile, self-isolation, 'cells' and 'bubbles' were counterproductive. As AI systems worked to create safe, productive community meetings and protests, an agenda for real change started to emerge. The cost of a broken economy was clear, the numbers of people who had reached out and brought strangers into their lives to provide assistance brought forth a 'the more you give the more you get' credo.

"However, rebuilding trust would be hard without the reestablishment of principles. Companies and financial markets had been shown to have no principles in this period. Without anchors or guarantees it took the full economic collapse for people to see that a winner-take-all mentality resulted in most people being broke and broken. By 2023 there was some shift towards both the sharing economy and working co-ops. It became increasingly obvious that many of the services we need as part of life were something we all needed to take part in. Amazon became the people's target. With most Americans spending 50% of their discretionary funds there, it was clear that 'delivering goods to home' at size and scale was a utility like the post office. There were only two ways forward: Either the people should own Amazon, or the government should.

"The government was slow to move, community-based private networks based on semantic knowledge representation (SKR) started to thrive, as the dollar became increasingly worthless. The black market thrived, and income had gone underground. So, we arrive at the promise of 2025. While communities are more stable, health care remains in crisis and there is nowhere safe for your money outside local private networks, which are no longer small. IDs are authentic and

shared however the individual wishes, and the individual owns all the information about themselves, from where they have been to what they have bought. Finally, individuals are able to broker their information. The information economy is finally evolving to a world where the people controlled their information. All searches are transparent and monitored by millions of AI bots. All bots are open source. In this world, no bot can be owned for profit. All are for the betterment of all, with bots checking on bots. As Alexandria Ocasio-Cortez takes the podium, the 'free bots' are already dismantling the information economy. The utility of the future is a New Deal for you and me. The amendments to the Constitution are expected to pass within the first sitting of the new Congress."

About this canvassing of experts

This report is the first of two to come in 2021 that will share results from the 12th "Future of the Internet" canvassing by the Pew Research Center and Elon University's Imagining the Internet Center. Experts were asked to respond to several questions via a web-based instrument that was open to them from June 30-July 27, 2020. The first report illuminates the insights 915 respondents shared about the potential "new normal" for people and technology by 2025 in light of the COVID-19 pandemic. More than 10,000 experts and members of the interested public were invited to share their views. The results published here come from a nonscientific, nonrandom, opt-in sample and are not projectable to any population other than the individuals expressing their points of view in this sample.

Respondent answers were solicited though the following prompts:

> ***Life in 2025:*** *There have been significant debates since the emergence of COVID-19 about its potential impact on global society. Much of the conversation has centered on the transformation of people's social interactions, their physical and mental health, economic and social divisions, the nature of work and jobs, local, national and global politics, climate change and the globalization of goods and services. Of course, the evolution of people and technology could play a major role across some aspects of the "new normal" in years to come.*
>
> ***The question:*** *Consider the changes that are being set in motion by the COVID-19 outbreak and the way societies are responding. Do you predict these changes will lead to life in 2025 that is…*
>
> *Mostly BETTER for most people than life was at the time the pandemic began*
>
> *Mostly WORSE for most people than life was at the time the pandemic began*
>
> *Not much different from the way things would have turned out if there had been no pandemic*
>
> ***Follow-up question:*** *If you expect change, what do you think the "new normal" will be for the average person in 2025? What will have changed most? What will not change much at all? We are particularly interested in what you think will happen to the way people use and think about technology. Please describe what you think the "new normal" will look like with regard to the use of digital technologies in*

individuals' personal and professional lives, their daily routines, their well-being, their privacy, their employment and economic security.

Follow-ups about digital technology in everyday life in 2025:

What hopes do you have for tech-related changes that might make life better in coming years?

What worries you about the role of technology and technology companies in individuals' lives in 2025?

Results for the quantitative question regarding how life in 2025 will compare to life in 2020:

- **47%** said life will be *mostly WORSE for most people in 2025* than it was at the time the pandemic began.
- **39%** said life will be *mostly BETTER for most people in 2025* than it was at the time the pandemic began.
- **14%** said life in 2025 *will not be much different* from the way things would have turned out if there had been no pandemic.

The web-based instrument was first sent directly to an international set of experts (primarily U.S.-based) identified and accumulated by Pew Research Center and Elon University during previous "Future of the Internet" studies, as well as those identified in a 2003 study of people who made predictions about the likely future of the internet between 1990 and 1995. Additional experts with proven interest in digital health, artificial intelligence ethics and other aspects of these particular research topics were also added to the list. We invited a large number of professionals and policy people from government bodies and technology businesses, think tanks and interest networks (for instance, those that include professionals and academics in law, ethics, medicine, political science, economics, social and civic innovation, sociology, psychology and communications); globally located people working with communications technologies in government positions; technologists and innovators; top universities' engineering/computer science, political science, sociology/anthropology and business/entrepreneurship faculty, graduate students and postgraduate researchers; plus some who are active in civil society organizations that focus on digital life; and those affiliated with newly emerging nonprofits and other research units examining the impacts of digital life.

Among those invited were researchers, developers and business leaders from leading global organizations, including Oxford, Cambridge, MIT, Stanford and Carnegie Mellon universities; Google, Microsoft, Akamai, IBM and Cloudflare; leaders active in the advancement of and

innovation in global communications networks and technology policy, such as the Internet Engineering Task Force (IETF), Internet Corporation for Assigned Names and Numbers (ICANN), Internet Society (ISOC), International Telecommunications Union (ITU), Association of Internet Researchers (AoIR) and the Organization for Economic Cooperation and Development (OECD). Invitees were encouraged to share the survey link with others they believed would have an interest in participating, thus there may have been somewhat of a "snowball" effect as some invitees invited others to weigh in.

*The respondents' remarks reflect their **personal positions** and are not the positions of their employers; the descriptions of their leadership roles help identify their background and the locus of their expertise.*

A large number of the expert respondents elected to remain anonymous. Because people's level of expertise is an important element of their participation in the conversation, anonymous respondents were given the opportunity to share a description of their internet expertise or background, and this was noted, when available, in this report.

In this canvassing, 65% of respondents answered at least one of the demographic questions. Seven-in-ten (70%) of these 591 people identified as male and 30% as female. Some 77% identified themselves as being based in North America, while 23% are located in other parts of the world. When asked about their "primary area of interest," 37% identified themselves as professor/teacher; 14% as research scientists; 13% as futurists or consultants; 9% as technology developers or administrators; 7% as advocates or activist users; 8% as entrepreneurs or business leaders; 3% as pioneers or originators; and 10% specified their primary area of interest as "other."

Following is a list noting a selection of key respondents who took credit for their responses on at least one of the overall topics in this canvassing. Workplaces are included to show expertise; they reflect the respondents' job titles and locations at the time of this canvassing.

Sam Adams, 24-year veteran of IBM now senior research scientist in artificial intelligence for RTI International; **Vincent Alcazar,** a retired U.S. military strategist experienced in global intelligence; **Micah Altman,** a social and information scientist at MIT; **Morgan G. Ames,** associate director of the University of California, Berkeley's Center for Science, Technology & Society; **Stuart Armstrong,** a futurist and research fellow at a major UK university's futures think tank; **Joel Arthur Barker,** futurist, lecturer and author; **Robert D. Atkinson,** president of the Information Technology and Innovation Foundation; **David Barnhizer,** professor of law emeritus and co-author of "The Artificial Intelligence Contagion: Can Democracy Withstand the Imminent Transformation of Work, Wealth and the Social Order?"; **Marjory S. Blumenthal,** director of the science, technology and policy program at RAND Corporation; **Gary A. Bolles,**

chair for the future of work at Singularity University; **danah boyd,** principal researcher, Microsoft Research, and founder of Data and Society; **Stowe Boyd,** consulting futurist expert in technological evolution and the future of work; **Henry E. Brady,** dean of the Goldman School of Public Policy at the University of California, Berkeley; **Tim Bray,** technology leader who has worked for Amazon, Google and Sun Microsystems; **David Brin,** physicist, futures thinker and author of the science fiction novels "Earth" and "Existence"; **Chris Caine,** president and founder of Mercator XXI, previously with IBM for 25 years; **Nigel Cameron,** president emeritus, Center for Policy on Emerging Technologies; **Kathleen M. Carley,** director, Center for Computational Analysis of Social and Organizational Systems, Carnegie Mellon University; **Jamais Cascio**, distinguished fellow at the Institute for the Future; **Vint Cerf,** Internet Hall of Fame member and vice president and chief internet evangelist at Google; **Georges Chapouthier,** neuroscientist, philosopher and writer, an emeritus professor at Sorbonne University, France; **Mary Chayko,** author of "Superconnected"; **Barry Chudakov,** founder and principal at Sertain Research; **David Clark,** Internet Hall of Fame member and senior research scientist at the MIT Computer Science and Artificial Intelligence Laboratory; **Adam Clayton Powell III,** senior fellow, USC Annenberg Center on Communication Leadership and Policy; **Christina J. Colclough,** an expert on the future of work and the politics of technology and ethics in AI; **Susan Crawford,** a professor at Harvard Law School and former special assistant in the Obama White House for science, technology and innovation policy; **Kenneth Cukier,** senior editor at The Economist and coauthor of "Big Data"; **Neil Davies,** co-founder of Predictable Network Solutions and a pioneer of the committee that oversaw the UK's initial networking developments; **Rosalie Day,** policy leader and consultancy owner specializing in system approaches to data ethics, compliance and trust; **Abigail De Kosnik,** director of the Center for New Media, University of California, Berkeley; **Amali De Silva-Mitchell,** futurist and consultant participating in global internet governance processes; **Jeanne Dietsch,** New Hampshire senator and former CEO of MobileRobots Inc.; **Stephen Downes,** senior research officer for digital technologies, National Research Council of Canada; **Bill Dutton,** professor of media and information policy at Michigan State University, former director of the Oxford Internet Institute; **Esther Dyson,** internet pioneer, journalist, entrepreneur and executive founder of Way to Wellville; **David Eaves,** public policy entrepreneur expert in information technology and government at Harvard's Kennedy School; **Peter Eckart,** co-director of Data Across Sectors for Health (DASH) at Illinois Public Health Institute; **Glenn Edens,** professor at Thunderbird School of Global Management, Arizona State University, previously a vice president at PARC; **June Anne English-Lueck,** professor of anthropology at San Jose State University and a distinguished fellow at the Institute for the Future; **Susan Etlinger,** industry analyst for Altimeter Group; **Daniel Farber,** author, historian and professor of law at the University of California, Berkeley; **Marcel Fafchamps,** professor of economics and senior fellow at the Center on Democracy, Development and the Rule of Law at Stanford University; **Seth Finkelstein,** consulting programmer and Electronic Frontier Foundation Pioneer Award winner; **Charlie Firestone,** executive director and vice president,

Aspen Institute Communications and Society program; **Rob Frieden,** professor of telecommunications law at Penn State, previously worked with Motorola and held senior U.S. policy positions at the FCC and National Telecommunications and Information Administration; **Edward A. Friedman,** professor emeritus of technology management at Stevens Institute of Technology; **Michael Froomkin,** professor of law at University of Miami Law School, expert in legal and policy issues relating to new technologies; **Arnaud Gahimbare,** network administrator at the East African Court of Justice; **Jerome C. Glenn,** co-founder and CEO of the futures-research organization The Millennium Project; **Valentine Goddard,** the founder and executive director of the AI Impact Alliance; **Mike Godwin,** former general counsel for the Wikimedia Foundation and author of Godwin's Law; **Kenneth Grady,** futurist, founding author of The Algorithmic Society blog; **Erhardt Graeff,** researcher expert in the design and use of technology for civic and political engagement, Olin College of Engineering; **Benjamin Grosof,** chief scientist at Kyndi, a Silicon Valley AI startup; **Glenn Grossman,** a consultant of banking analytics at FICO; **Wendy M. Grossman,** a UK-based science writer, author of "net.wars" and founder of the magazine The Skeptic; **Jonathan Grudin,** principal researcher, Microsoft; **John Harlow,** smart-city research specialist at the Engagement Lab at Emerson College; **Brian Harvey,** emeritus professor of computer science at the University of California, Berkeley; **Su Sonia Herring,** a Turkish-American internet policy researcher with Global Internet Policy Digital Watch; **Mirielle Hildebrandt,** expert in cultural anthropology and the law and editor of "Law, Human Agency and Autonomic Computing"; **Bernie Hogan,** senior research fellow, Oxford Internet Institute; **Terri Horton,** workforce futurist with FuturePath LLC; **Gus Hosein**, executive director of Privacy International; **G. Philip Hughes,** senior director for the White House Writers Group and veteran of many senior foreign policy posts in the White House and the U.S. departments of State, Commerce and Defense; **Stephan G. Humer,** lecturer expert in digital life at Hochschule Fresenius University of Applied Sciences in Berlin; **Alan Inouye,** senior director for public policy and government, American Library Association; **Larry Irving,** Internet Hall of Fame member and former head of the National Telecommunications & Information Administration; **Shel Israel,** Forbes columnist and author of many books on disruptive technologies; **Maggie Jackson,** former Boston Globe columnist and author of "Distracted: Reclaiming Our Focus in a World of Lost Attention"; **Mark Jamison,** professor at the University of Florida and visiting scholar at American Enterprise Institute, previously manager of regulatory policy at Sprint; **Jeff Jarvis,** director, Tow-Knight Center, City University of New York; **Jeff Johnson,** professor of computer science, University of San Francisco, previously worked at Xerox, HP Labs and Sun Microsystems; **Paul Jones,** professor emeritus of information science at the University of North Carolina, Chapel Hill; **Anthony Judge,** editor of the Encyclopedia of World Problems and Human Potential; **David Karger,** professor at MIT's Computer Science and Artificial Intelligence Laboratory; **Frank Kaufmann,** president of the Twelve Gates Foundation; **Michael Kleeman,** senior fellow, University of California, San Diego, and board member, Institute for the Future; **Alexander Klimburg,** director of the Global Commission on the

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A selection of institutions at which some of the respondents work or have affiliations:

AAI Foresight; AI Now Research Institute of New York University; AI Impact Alliance; Access Now; Akamai Technologies; Altimeter Group; American Enterprise Institute; American Institute

for Behavioral Research and Technology; American Library Association; American University; American University of Afghanistan; Anticipatory Futures Group; APNIC; Arizona State University; Aspen Institute; AT&T; Atlantic Council; Australian National University; Bar-Ilan University; Benton Institute; Bloomberg Businessweek; Brookings Institution; BT Group; Canada Without Poverty; Carleton University; Carnegie Endowment for International Peace; Carnegie Mellon University; Center for a New American Security; Center for Data Innovation; Center for Global Enterprise; Center for Health and Risk Communication at George Mason University; Center for Strategic and International Studies; Centre for International Governance Innovation; Centre National de la Recherche Scientifique, France; Chinese University of Hong Kong; Cisco Systems; Citizens and Technology Lab; City University of New York; Cloudflare; Columbia University; Constellation Research; Convo Research and Strategy; Cornell University; Council of Europe; Data Across Sectors for Health at the Illinois Public Health Institute; Data & Society Research Institute; Data Science Institute at Columbia; Davis Wright Tremaine LLP; Dell EMC; Deloitte; Digital Grassroots; Digital Value Institute; Disney; DotConnectAfrica; The Economist; Electronic Frontier Foundation; Electronic Privacy Information Center; Enterprise Roundtable Accelerator; Emerson College; Fight for the Future; European Broadcasting Union; Foresight Alliance; Future Today Institute; Futuremade; Futurous; FuturePath; Futureproof Strategies; General Electric; Georgetown University; Georgia Tech; Global Business Network; Global Internet Policy Digital Watch; Global Voices; Google; Hague Centre for Strategic Studies, Harvard University; Hochschule Fresenius University of Applied Sciences; Hokkaido University; IBM; Indiana University; Internet Corporation for Assigned Names and Numbers (ICANN); IDG; Ignite Social Media; Information Technology and Innovation Foundation; Institute for the Future; Instituto Superior Técnico, Portugal; Institute for Ethics and Emerging Technologies; Institute for Prediction Technology; International Centre for Free and Open Source Software; International Telecommunication Union; Internet Engineering Task Force (IETF); Internet Society; Internet Systems Consortium; Johns Hopkins University; Institute of Electrical and Electronics Engineers (IEEE); Ithaka; Juniper Networks; Kyndi; Le Havre University; Leading Futurists; Lifeboat Foundation; MacArthur Research Network on Open Governance; Macquarie University, Sydney, Australia; Massachusetts Institute of Technology; Menlo College; Mercator XXI; Michigan State University; Microsoft Research; Millennium Project; Mimecast; Missions Publiques; Moses & Singer LLC; Nanyang Technological University, Singapore; Nautilus Magazine; New York University; Namibia University of Science and Technology; National Distance University of Spain; National Research Council of Canada; Nonprofit Technology Network; Northeastern University; North Carolina State University; Olin College of Engineering; Pinterest; Policy Horizons Canada; Predictable Network Solutions; R Street Institute; RAND; Ranking Digital Rights; Rice University; Rose-Hulman Institute of Technology; RTI International; San Jose State University; Santa Clara University; Sharism Lab; Singularity University; Singapore Management University; Södertörn University, Sweden; Social Science Research Council; Sorbonne University; South China University of Technology; Spacetel Consultancy LLC; Stanford University; Stevens Institute of

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Complete sets of credited and anonymous responses can be found here:

https://www.elon.edu/u/imagining/surveys/xii-2021/post-covid-new-normal-2025/credit/

https://www.elon.edu/u/imagining/surveys/xii-2021/post-covid-new-normal-2025/anonymous/

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