THE MOBILE CENTURY

THE UNKNOWN

ARTIFICIAL INTELLIGENCE

WOMEN IN SPACE

GEOSPATIAL AWARENESS

CRISPR

CYBERJUSTICE

STARTUPS TO SCALE UP

HOME/OFFICE WORK

SUSTAINABILITY

DIGITAL NEW DEAL

IOT AND SMART CITIES

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THE FUTURE
REIMAGINED

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Imagine, shape, build

I always felt alone.

As a small girl, when other female youngsters were not allowed to participate in the "dangerous" tree-climbing of the boys. I took part and loved the challenge.

As a young professional, when I was the only non-male political journalist around. A hard experience, with the precious appreciation of my readers as compensation nevertheless.

In politics, I climbed the career-ladder mostly on my own, getting a bloody nose now and then. And I often had to cope with an all-male-world (remember my time as EU-commissioner in Telcos!). Difficult, often. Fascinating, always.

And then two miracles happened.

First, my launching of the "women on boards"-directive provoked a strong reaction of the female professionals, who felt humiliated by the macho attitude of their male counterparts. They did the only wise thing to do: they assembled into professional organizations and built power by solidarity.

Second, I was introduced to GTWN. And I could see, in practice and worldwide, that in all interrelated fields of the world of digital technology, high-level female professionals play a fundamental role. For the first time I understood, that the new world of technology will do fine. Because the female factor will lead the power of technological innovation in the direction of values and respect for the human being.

Thank your for not only imagining the technological future through the lens of humanity, but also for shaping and building it!

Viviane Reding
Vice President, World Law Foundation
Former Vice President of the European Commission

Foreword

Welcome to the 2021 edition of the Global Telecom Women's Network (GTWN) flagship publication, The Mobile Century: Life and Work in the Digital Era (TMC).

The GTWN has for many years published a new edition of TMC during its annual gala GTWN Welcome Reception at the start of Mobile World Congress in Barcelona. 2020 was the first year where this event could not take place, due to the COVID-19 pandemic, and the planned 2021 event was postponed until mid year.

Despite this disruption, we decided to push on and use the opportunity offered by the stay-at-home orders in many parts of the world to leverage our colleagues' expertise to provide thought leadership on the future and how we can best plan for it. With more people wanting to live and work differently, we must grasp this opportunity to be bold and to plan more resilient, future-focused organisations. Notwithstanding the trauma and difficulties of 2020, we have been heartened by the triumph of science and technology that has led to the rapid development of vaccines to fight the virus. We have also witnessed a type of digital transformation 'on steroids', which has changed many areas of our lives almost beyond recognition.

This edition of TMC is a celebration of the work of many experts in the digital tech sector in a range of interrelated fields including: digital transformation; leading-edge information science; entrepreneurship and start-ups; education; investment and finance; public policy; the law; AI, IoT: urban design; digital culture and diversity. Together the articles provide a view of the future transformed by digital technology, but also reimagined in response to the developments of the recent past. The aim is to offer useful insights into the key issues facing us all as we emerge from the pandemic and to encourage us all to continue to work together to bring about positive change for a better future. It is also a recognition of the vital contribution that women continue to make to innovation in the digital tech sector.

We sincerely thank all of our authors and participants for their contribution to this project. We are also very grateful for the generosity of our platinum sponsor, CMS, without whom this edition would not have been possible.

Vicki MacLeod
Editor In-Chief
The Mobile Century

GTWN

FUTURE VISION

Putting people first in digital transformation

Keri Gilder, CEO Colt

> **As large parts of the economy and society go online, we need to consider the implications for current digital platforms and services, networks, data centres, cloud and other communications infrastructure, as well as the impact on our customers and our people.**

There has never been a better example of the power of the digital ecosystem than 2020. Ten years ago, the rapid transformation we went through would not have been possible. Taking businesses which used to operate out of big shiny buildings in the hearts of cities and keeping them up and running as their workforces were sent home to operate remotely was no easy feat. However, as with many rapid digital transformations, while there were victories in what was achieved there are still many things that need to be tweaked so that we can all benefit and thrive in this digital world.

As we begin 2021 and the immediate rush that we all experienced early last year has dissipated, many businesses will be looking internally to reflect on how they can set themselves up for on-going transformation. It is no different in our business and for the telecommunications sector more broadly. It was a privilege to facilitate the changes we were able to – keeping societies, communities and essential services up and running during an unprecedented time – however, we must continue to further optimise our organisation and industry so that we can keep pace with the new digital world and ways of working.

A big part of this will be building further intelligence into what we do. This doesn't simply mean utilising artificial intelligence and machine learning; we need to get better at creating insights around how customers are using our network and then we need to get more proactive with how we assist them in optimising their operations. One thing to come out of this last year is that the small to medium enterprise is never going to look the same. We will have to rethink the infrastructure part of our business; we know this makes the edge increasingly important, and technologies such as 5G will also have a role to play in the new networking landscape. Where we

once connected large buildings in metros, this is no longer the case with workforces becoming more disparate than ever – so we need to plan for this accordingly.

Another critical element of the new digital environment is ensuring that networks and the data they carry are secure. This is a challenge all participants in the digital ecosystem need to tackle together. We know that in challenging economic times the floodgates open to waves of crime. During the uncertain times of a recession, attackers exploit fears and already disturbed patterns of behaviour. In the current recession climate, where the impact of COVID-19 has already disturbed network patterns beyond recognition, vulnerabilities may be exposed more than ever before. A key point here is the fact many workers are now remote means that significant security gaps are appearing at the very time when many info security teams are most stretched. This is an issue we can't ignore as the stakes have never been so high. Organisations need to act by embedding security into the fabric of the network, at the network edge, in applications and across endpoints.

We also cannot ignore the people element in discussions about the digital economy and the digital ecosystem. From a technological standpoint, it's vital that we ensure people in rural communities don't fall behind due to poor connectivity, with this being a challenge the whole sector needs to be cognisant of. We can't let this lead to greater discrimination against these groups that either can't access or can't afford the connectivity or devices they need to be productive at home.

Another point here is we also can't let this new environment, that has meant greater flexibility for many, cause not only an innovation drain in our organisations, but also cause many to feel isolated. When I say innovation drain, I mean that it's very hard to replicate the organic innovative environment that generally comes from people physically coming together in an office-style environment. I'm sure we've all been on virtual brainstorms and often they don't have the same electric feel as they do when you're sitting with colleagues or partners in the room.

So, we need to think about how we structure our environments moving forward, so we can still foster that collaborative environment in the new

working world. Also, as mentioned before, isolation and poor mental health have been a big personal concern of mine during the pandemic. I think this is something as a leader today is critical we focus on. At Colt, most of us have been working from home since March last year. The safety of our people is paramount, and that has to extend to our mental safety. We have put in place a significant amount of mental health initiatives to support our people, and we must strive to reach those most critically in need by creating environments where those who are struggling to feel mentally safe can admit they need help to those around them. We also need to teach people to recognise the signs of depression and anxiety and encourage them to reach out to those who are struggling. We literally have never been more connected, and it's so important that we also use these connections for good where we can.

For me, all of the above has played a role in how we are hoping to approach this year. Taking on the role of CEO in May 2020 threw me headfirst into the digital ecosystem and I had to learn quickly how to best support our customers, partners and people through something we were all living for the first time, and management books on this topic have not yet been written. A big part of this for me was thinking about connections. Not only the physical connections on our Colt network; it was also about the connections we have with one another and with our partners and suppliers that make up and power the digital ecosystem. This led me to look inside Colt and to talk to our people around how they would improve and optimise our organisation. It also got me thinking about the key things that have always been in Colt's DNA and how we can build on those to ensure our business is agile enough to support enterprises as they move into the future. Even though it has been daunting at times to be a leader at this precise moment, it also has been a real privilege. Not only does Colt play a critical role in the digital ecosystem and will continue to do so, I feel we too can play a role in creating a sector that powers the way the world works, and also one that makes our environments more inclusive, connected and transformative than ever before.

Keri Gilder is the Chief Executive Officer (CEO) at Colt.

Appointed to the role in May 2020, Keri is responsible for executing Colt's strategy which centres around transforming the way the world works through the power of connectivity.

Before becoming CEO, Keri was Colt's Chief Commercial Officer (CCO), leading global teams across sales, presales and marketing, as well as working closely with the wider organisation to ensure Colt delivered for its customers.

Before joining Colt, Keri held several leadership roles at Ciena but was most recently its Vice President and General Manager EMEA, responsible for guiding Ciena's EMEA service provider and enterprise customers, as well as partners.

Keri is passionate about promoting Inclusion and Diversity, also leading Colt's Diversity Council, to ensure Colt is a business where everyone feels they can bring their true selves to work. Keri brings this passion to the wider industry, also supporting external mentoring and coaching initiatives. Prior to Ciena, Keri worked in multiple roles for Lucent Technologies, and she has also worked for Hughes Aircraft as a Network Engineer. Keri has a Bachelor of Business Administration degree with an emphasis in Management Information Systems (MIS) from New Mexico State University. Keri lives in London with her husband and two children and is based at Colt's head office in London.

Why we need a digital New Deal

Heidi Messer, Co-Founder and Chairperson, Collective[i]

While campaigning for the 2020 US Presidential election, candidate Andrew Yang warned that automation would jeopardize 1 in 3 American jobs. To avoid an unprecedented crisis, he proposed a universal basic income which he called the "Freedom Dividend", a policy which would guarantee a $1000 a month check from the United States government to every American adult. Yang argued that a universal basic income was needed to address the massive structural changes in how the U.S. economy would operate in a digital age, and that it would be the basis on which a stable, prosperous and just society could be built. The

Freedom Dividend and the conversations about the impact of automation on employment, and the role of government in providing income relief, died with his campaign.

But then came COVID-19. In April 2020, less than two months after Yang suspended his run for office, Congress passed a stimulus package totalling nearly US$1/2 trillion, putting cash into the pockets of millions of Americans. Why? It was the obvious solution to prevent massive unemployment and business displacement that everyone recognized would be as, if not more, dangerous than the

pandemic itself. Similar stimulus and relief measures were also implemented around the world, including in the UK, Australia and Europe – countries where austerity and fiscal discipline have been the catchcry of politicians for decades. And US politicians from both sides of the political spectrum ended the year debating a stimulus package double that of the earlier relief measures.

The COVID-19 crisis has shown itself to be more than a virus. It's been a crash course in the future. Senior citizens have flocked to Zoom. Colleges and primary schools are educating students online. Telemedicine has replaced in-patient visits. 3D printers are producing medical supplies. The global in-office workforce has shifted to almost entirely remote and the consensus is that where you work will be less of a consideration in determining for whom you work. Scientists, physicians, funders and manufacturers came together as part of an international collaboration, to help speed the availability of a vaccine. Google and Apple, fierce competitors, struck a landmark agreement to jointly use data to fight the spread.

The businesses built for the future became the must-have technologies for the present. Slack, Zoom and my own company Collective[i] (we provide AI-enabled forecasting, intelligence and collaboration tools for B2B sales organizations) all saw a huge uptick in demand as companies suddenly had to operate in the digital-first world and make decisions in an environment unlike any other they've experienced.

Like Yang's policy, what was perceived as futuristic fantasy suddenly became the status quo. The speed at which this transformation happened was both breathtaking and terrifying. The transition to digital happened in a matter of months. The companies leading the charge crushed earnings, grew market share and saw unprecedented adoption. By comparison, the transition to an industrial economy spanned two world wars and the decades following. The pandemic will pass but many of the changes in how we live and work will not. When the world re-emerges, our cities, our institutions and industries-- real estate, education, health care, insurance, hospitality, travel and countless others-- will never be the same. Now is the time to carefully consider how and what we rebuild. It's time for a digital New Deal.

Automation is coming and along with it the potential for mass unemployment. At the same time, new jobs will emerge posing a shortage of people with the proper skills. Under the quarantine, we saw a clear line-- essential workers and everyone else. And even then, many of the jobs we deem essential would be replaced by machines if the option existed. Would you prefer a robot or a person packing your Amazon order? An Uber driver, a self-driving car or a drone delivering your food?

On the other hand, many essential workers are in short supply. In the world we are experiencing it's clear that we need more nurses and therapists to help us heal, artists and athletes to entertain, scientists to innovate, engineers to create, leaders to inspire, journalists to report and a whole host of skills that are uniquely human. The line between where machines and humans add value is clear. The problem is we are over-indexed on at-risk work and have a shortage in the places where we need people most. Hence the paradox.

Without technology we are powerless and without people, we are hopeless

When China sneezed, we got more than a virus. The global supply chain broke with shortages of toilet tissue, paper towels, masks, gowns, ventilators. The problem also revealed the solution. 3D printing and robotics rose as alternatives to traditional manufacturing. The positives are clear. Automation neutralizes the threats external cheap labor, pandemics and geo-political squabbles pose to our supply chain. So is the challenge. A rapid loss of manufacturing jobs and an increase in poverty would threaten social stability.

The best antidote to unemployment and unrest is education. Education fuels the talent and creativity that technology and the new jobs that will be created need to thrive. We must bridge the digital divide and surface all the talent the world can muster. COVID-19 made it clear that every child needs connectivity and a computer. Curriculums must evolve with more teachers who can teach online and to the future. We have to decide now whether we want to expand opportunity for the next generation or be at the mercy of countries whose children have the skills to architect the future. The pandemic also revealed the elements of the global healthcare systems

that are clearly unsustainable. We underinvest in caregivers, prevention, wellness and primary care. Telemedicine, at-home diagnostics, health trackers and other forms of prevention and low cost delivery of medical services are a step in the right direction.

Civilizations are measured by their art. Right now in cities around the world, cultural institutions are in ruin and losing the war as places where cultural innovation flourishes. The businesses, institutions and cities that support innovation and creativity have been decimated. With no museums, theaters, concert halls and restaurants, we are restless and starved for stimulation. Millions of hard-working food purveyors, gig workers, aspiring actors, artists and musicians are without employment and any safety net. We will need a new model to create opportunity (and security) and compensate the creative class. And we must invest in artificial intelligence. The companies that flourished during the pandemic were able to adapt because this technology gave them minute by minute intelligence on how to deliver goods, entertainment, medical advice and more.

The speed at which multiple vaccines were successfully developed should be a model for all innovation. It is striking to see the potential for collaboration between industry and researchers supported by network scale data and AI. In software, there is the concept of agile. When an assumption changes, so does the direction of what's developed. This approach requires data to provide feedback, transparency to assess progress, trust in team members and the talent to execute. The governments who most successfully battled COVID-19 (South Korea, Australia, New Zealand, Germany, Taiwan

and Singapore) operated with agility. They provide a better model to address societal challenges-- test and acquire data, engender trust and collaborate with industry and citizens towards a shared goal.

Devastation can shed light on vulnerabilities masked by prosperity. Following the Great Depression, Frances Perkins, the first female member of a presidential cabinet, introduced the policies that protect modern workers -- Social Security, unemployment benefits, the 40-hour work week and an end to child labor. It was an industrialist, Lewis Brown, who recognized that Germany needed to be rebuilt that led to the Marshall Plan and decades of prosperity and peace. Perkins and Brown helped the world recognize that we needed to make life better for workers and restore the world's cultural and political centers to move forward.

This glimpse into the future has provided us with a drastic example of what works and what doesn't in the digital age. If we rebuild sustainable industries supported by a properly educated workforce, the future can be a massive improvement on what was. Opportunities (and horrible alternatives) have presented themselves during the COVID-19 pandemic. It is up to us to replace cultural and economic stagnation, massive unemployment and pervasive fear with opportunity, abundance and education. We can learn from this challenge and rebuild around the things that will make the world stronger. As Winston Churchill said, never waste a good crisis and in this one, there's no time to waste.

Heidi Messer currently serves as Co-Founder and Chairperson of Collective[i]®. Collective[i] (short for Collective Intelligence) hosts a network and AI/ML powered application that enables companies to predict, manage, and grow revenue. Prior to Collective[i], Ms. Messer co-founded and served as President of LinkShare, host to one of the world's largest online affiliate networks until its sale to Rakuten for USD $425m. She received her B.A. from Brown University and her J.D. from Harvard Law School.

Towards cyberjustice: how the law and AI will determine mankind's future

Marina Teller, Professor of Private Law, Nice Côte d'Azur University, France

Draw me the law of the future

"Draw me the law of the future!". Just like in *The Little Prince*, St Exupéry's[1] highly imaginative novella about a young intergalactic traveler, we wonder in this time of rapid and unpredictable change what the future will bring. As I study the intersection between the law and AI, I also wonder how the law and the legal profession's role will change as we progress further into the digital age. And just as it is in *The Little Prince*, I believe that this is first and foremost a philosophical question.

We would like to be able to tell this Little Prince that the law of the future will be different, because it will be re-invented. And that, as our utmost wish, we would like to be able to guarantee that it will be better – that we will have a "brave new law".

The world of tomorrow, a digital world open to AI, is definitely a new world, and its future lies somewhere between our hopes and our fears. Both scenarios exist and both outcomes are therefore possible. There are many people who fear the worst, and who are already warning about the potential negative consequences of the combination of the law and AI. But let's take the risk of imagining the best. *"I'm a pessimist because*
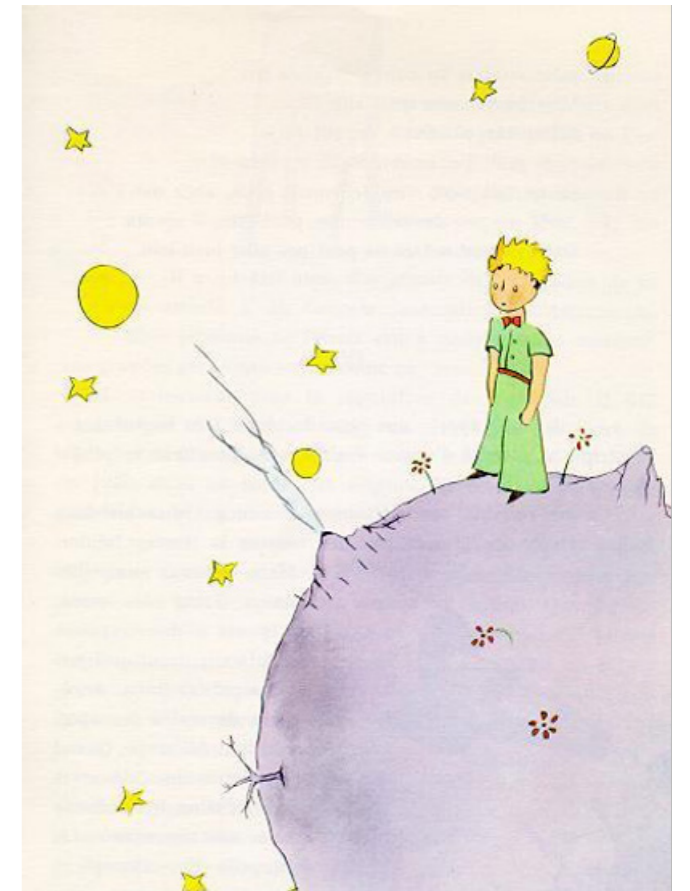
of intelligence, but an optimist because of will." [2] The future offers us all the possibilities, so let's be optimistic, by will, and re-imagine tomorrow's law.

The digital world and AI make us better beings, in a way. Indeed, because they force us to think

1   Antoine de Saint-Exupéry, Le petit prince, New York, Reynal & Hitchcock, 1943.

2   Antonio Gramsci, Gramsci's Prison Letters, Columbia University Press

about what we didn't think, to ask ourselves new questions and to question ourselves about our essential values. What is a human being? How can we preserve humanity? How can we maintain both ethics and the rule of law? These are the questions for us now, but also for tomorrow's lawyers.

Thinking the 'unthought'

We cannot shy away from these questions; we have to think these unthought-out things to their conclusion. This is necessary because, as we know, in the future technology will have unprecedented potential and power over us - including the potential to render mankind obsolete[3]. But while we can't predict the course of history, we do know that human agency is paramount, and that history is ultimately made by human will[4] and the decisions that we make. So, we have no choice. We must go forward and try to reinvent law for the digital age.

I believe that tomorrow's law will be better and more inspiring (at least we must do everything to ensure that this happens). Why do I hold this belief in the face of voices who claim the opposite? Because we have faced challenges many times before in human history where new technology has changed our lives and our destinies, and there are many of our colleagues around the world who now recognize the dangers and are working for a better digital future. The future forces us to question our present because we know that digital transformation is unstoppable. The future is actually with us now – it is what we decide now about the future that we want for our children and their children that will ultimately invent the future for them.

Questioning our actions, our interactions and our deepest being

Let us silence the pessimists. But let us also be clear: the challenges we face are immense. Technology has an unprecedented potential for destruction that could wipe out our institutions, our privacy, our free will, our freedom of thought and even our

integrity as human beings. We must be constantly aware of the potential impact of *transhumanism*, which promotes the transformation of the human condition by using advanced technologies to modify or enhance human intellect and physiology. We cannot ignore these challenges. Nonetheless, I see them as obstacles to be overcome and opportunities to create an "augmented law", which will suit future "augmented men", if in fact they become so.

Law, as a social regulator, must bring new rights, in order to protect the fundamental values of our society: to take into account new vulnerabilities so that AI is not a job-killer but a provider of new jobs, to offer everyone equal access to culture and education, to make sustainable development and the fight against global warming a reality. These are major challenges, but we know that technology can bring real solutions through the appropriate use of digital tools, connected objects, sensors, and the application of AI in agriculture and more broadly across society in the green tech revolution.

It is now up to the legal system, and those working within it, to provide the legal framework to prevent disaster scenarios. We need to avoid data collection and big data analytics giving rise to generalized surveillance that would spell the end of democracies; we must avoid "technological solutionism"[5] and build ethical and legal boundaries to technologies that enhance humans. In other words: the law will need to set rules to protect what is human in us all.

The law will have a difficult but magnificent mission of the utmost importance: to preserve fundamental human rights. This will require us to go beyond our current understanding, by imagining "future digital human rights" and "technologically sustainable development". I can foresee a time when governments will need to pass specific laws in order to prevent fundamental discrimination related to algorithmic bias. We are seeing new applications of big data and AI emerging: for example, in the medical field, where the use of health data could revolutionize the treatment of certain diseases. However, these new applications will require a legal framework for data access and processing which goes beyond what we have now

to ensure that personal data can be shared for the purpose of medical research. Lawyers will have to focus on the transition from big data to smart data, while ensuring that individual privacy rules are respected.

Towards cyberjustice

I am convinced that digital tools will transform tomorrow's law[6]. Cyberjustice is no longer a myth[7]. AI can replace humans in decision-making. While neither judges nor lawyers will be replaced by robots, AI will be a tool to assist them in decision-making, which can lead to a judicial decision through the use of legal data analytics. We have an opportunity to transform the law through this technology, to guarantee its effectiveness and reduce the cost to litigants, many of whom may have given up exercising their rights because of the cost and slowness of justice.

AI's contribution to the administration of justice[8] is a game changer for legal knowledge and

practice. New balances will have to be found in the distribution of power between technology and humans. The law will have to draw lines between the decisions that can be made by algorithms and those that cannot. It will therefore be necessary to rethink fundamental values and principles that will remain the prerogative of humans. It is at the heart of technological devices that the next battles will be played out: lawyers will have to find the art and the way to introduce the values held by law into these devices. The aim is to create a technology that will guarantee rights by default, thanks to new principles: equality by design, equity by design, compliance by design. Tomorrow's lawyers will need to work alongside coders and data scientists to perform these tasks. The development of a common language between the law and data science is an exciting prospect for all those who believe in sharing knowledge and who view human intelligence as a collective phenomenon.

May the future of the law strengthen this optimistic and reinvented vision of the future.

6   See : Tania Sourdin, "Reimagining Justice with AI Technology": https://youtu.be/JpX7Pm71cewhttps://www.cyberjustice.ca

7   https://www.cyberjustice.ca See the remarkable work of Karim Benyekhlef, professor at Montreal University

8   See Kevin Ashley, professor of law at the University of Pittsburgh, Karl Branting, Chief Scientist in charge of the Machine Learning for Computational Law project at MITRE Corporation and Tom van Engers professor of law at the University of Amsterdam: https://youtu.be/rJfCP_JQVs0

Marina Teller is a professor of private law at Nice Côte d'Azur University. She leads a master's degree in banking law and fintech and a research program called Deep Law for Deep Tech with Frédéric Marty (CNRS). She also runs a 3IA Chair dedicated to smart technologies and AI. Her work is at the crossroads of deep technologies and law; how blockchain, smart contracts, AI systems and connected objects have important consequences for the legal system. Her research focuses on the regulation of algorithms ("An illustration of technological risks through algorithmic biases," Law and Connected Objects, The law and connected objects,2020 <halshs-02952872[1]>; "Ethics and AI: A Preamble to Another Right," Bank and Law,2019. <halshs-02952902[2]>; "Artificial Intelligence," Economic Law in the 21st Century,2020. <halshs-02952852[3]>; "The advent of Deep Law (towards a numerical analysis of the droit?) *Mixes in honour of Professor Alain Couret*, <hal-02550489[4]>

3   Physicist Stephen Hawking said the emergence of artificial intelligence could be the "worst event in the history of our civilization." https://www.cnbc.com/2017/11/06/stephen-hawking-ai-could-be-worst-event-in-civilization.html

4   Gary Olson, in Pessimism, Optimism and the Role of Intellectuals, 2019

5   Evgeny Morozov, To Save Everything, Click Here - Technology, Solutionism and the Urge to Fix Problems That Don't Exist, Allen Lane, 2013. See also: https://www.theguardian.com/technology/2013/mar/09/evgeny-morozov-technology-solutionism-interview

1   https://halshs.archives-ouvertes.fr/halshs-02952872

2   https://halshs.archives-ouvertes.fr/halshs-02952902

3   https://halshs.archives-ouvertes.fr/halshs-02952852

4   https://hal.univ-cotedazur.fr/hal-02550489

FUTURE
SCIENCE

The role of location in addressing global challenges

Dr Vanessa Lawrence CB

Accurate, reliable, up to date location information, known professionally as geospatial information, underpins some of the biggest decisions taken each day in many countries. Its use is vital to governments in supporting decision-making in many aspects of policy making and operational delivery from managing resources, administering services to tackling emergencies. In addition, most industries including the construction industry, the property market, utilities, insurance, defence and security, waste management, and logistics (among others), use location data and analytical tools to manage assets and risk and to support their activities, to enhance decision-making and to target customers.

Most people when thinking about location information, immediately think of Google Maps, Apple Maps and many other Apps on their phone without thinking about the origins and accuracy of the underlying data. Hence, in the early days of these Apps there were numerous stories of people driving into inappropriate places such as lakes and the sea because they were blindly following their 'Map App'.

Today, these Apps have come of age as not only do their owners licence the most authoritative datasets in a country, if they exist, but they also receive data passively from all our devices if we have our 'location services' turned on. From these sources, the underlying location data in these Apps is ever more authoritative and the direction algorithms working in the background are ever more effective; hence we have all learnt to be able to rely on our 'Map Apps'. However, building Map Apps to assist us to avoid traffic and arrive at our chosen destination is just one application of the use of accurate, reliable location information.

Figure 1: Illustrating 'everything happens somewhere'

'Everything happens somewhere' (Figure 1) is a phrase I wrote 27 years ago in a magazine called *GIS Europe* to illustrate the importance of location information to society.

Today, geospatial information is seen as the 'vital glue' which joins all of the information environments whether they be in government or in the private sector as 'location connects' all information. It also plays an important role as part of a national or organizational information infrastructure. Despite this so many countries still have ineffective and under invested geospatial information infrastructures. Geospatial information is often duplicated, scattered among many providers and users, with different degrees of quality and consistency and even in some countries is still 'protected data only released for official government use'. Easy access, sharing and utilizing such information remains, in many places, a challenge.

Therefore, in an attempt to remedy this situation, international initiatives to govern geospatial information have emerged, supported by the geospatial industry which globally was valued at

£300bn[1] in 2018. International programs have been set up as guidance frameworks and these include the Infrastructure for Spatial Information in Europe (INSPIRE) in the European Union and the Integrated Geospatial Information Framework (IGIF) via the United Nations Committee of Experts for Global Geospatial Information Management (UN-GGIM) more globally (Figure 2).

It is well understood that at a global scale geospatial information needs to be used to help understand and tackle some of the biggest issues facing the globe. This includes environmental issues such as climate change, disease control, food security, identifying poverty and inequality and underpinning the measuring and monitoring of United Nations Sustainable Development Goals (UN-SDGs). Hence accurate, reliable, up to date location information is a vital resource to assist the measuring and monitoring of the future health of the globe.

In a geospatial environment, data is normally organized into Foundation Themes. Many countries choose between 8 and 14 Foundation

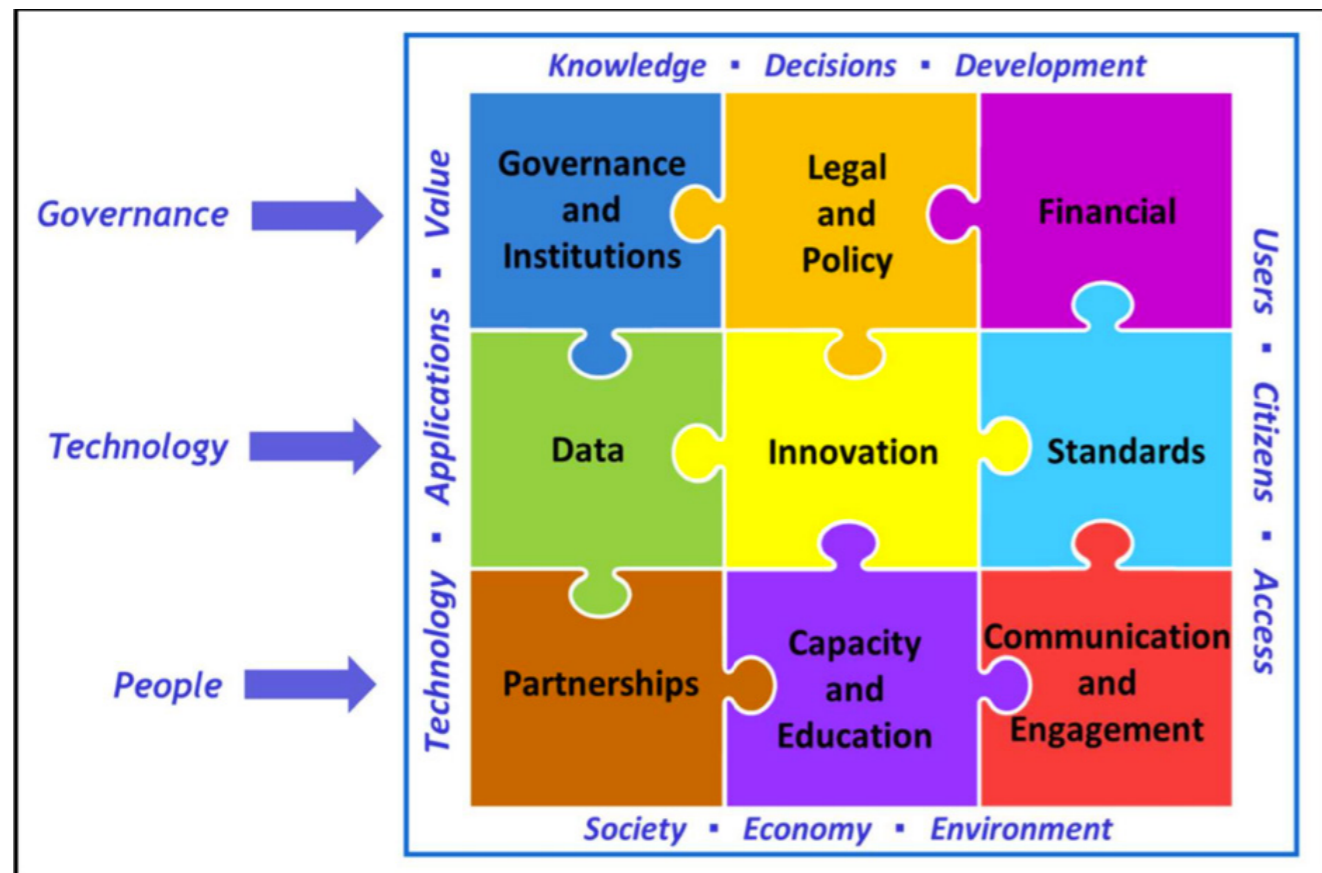1   GeoBuiz Report (2019) https://geobuiz.com/geobuiz-report-2019/

Figure 2: The Integrated Geospatial Information Framework (IGIF) is anchored by nine strategic pathways and three main areas of influence. Once implemented, the strategic pathways realize many benefits. Courtesy of UN-GGIM.

Themes to form their geospatial infrastructure (Figure 3) and these form the basis for their National Spatial Data Infrastructure (NSDI). The creation of the NSDI makes the efficient use of trustworthy data universally possible, by both the public and private sectors, *including* the Map App producers. The management of such data requires centralized governance mechanisms to ensure that Foundation Theme data is collected authoritatively for a country, shared as interoperable geospatial resources to be used by everyone and maintained to an agreed standard.

Taking the building of an NSDI to be an important role

organizations in the world. They all have wished to think through how the added dimension of location could make a difference to their decision-making. They are looking at either enhancing or building for the first time the information infrastructure of their country or their organization, or they are looking at the competitive advantage to be gained from using extra Information sources that other competing organizations have not yet discovered.

They soon understand that their investment in the geospatial infrastructure, working together with the many datasets that already exist within their organisations, enhanced by the use of location-

Figure 3: The contribution of the NSDI to the measuring and monitoring of the UN-SDGs (Courtesy of Greg Scott, UN-GGIM)

of a government, it is often welcomed that an NSDI is a significant contributor to the Gross Domestic Product (GDP) of a country. By organizing geospatial information within a NSDI an economic uplift can be expected to occur. In a study undertaken by the Boston Consulting Group (BCG) it was estimated that the fiscal uplift could total up to £14bn[2] for the United Kingdom alone.

The perspective I bring to 're-imagining the future' of this subject area is taken from spending the last five years assisting governments from both developing and developed countries and also briefing senior members of board rooms of some of the largest

aware algorithms, Data Science and AI, gives them an information advantage and assists decision-making.

With the addition of AI to geospatial decision-making processes, millions of calculations can be made per second assisting in the analysis of the terabytes of data within any locational data stack, – and the provision of consistent, timely results to the decision-maker.

It can therefore be concluded that the geospatial community and the AI community have a symbiotic mutually reinforcing relationship which assist statements such as 'By 2025, the UK will have a coherent national location data framework

2   UK Geospatial Commission (2018) https://www.gov.uk/government/publications/geospatial-commission-annual-plan-2019-2020

underpinning a flourishing digital society'.[3] This highlights the importance of geospatial information to a country; many similar statements are referenced around the globe.

Drawing on the recognition of this importance and the fact that 'everything happens somewhere' is vital to solving some of the globe's biggest challenges, it is necessary to consider how this data-centric location-based world can be enabled for those countries without adequate NSDIs, often located in the Global South. It is often these same countries that are already experiencing real suffering from climate change impacts.

Over the past 10 years, the use of location information has been successful in being used to tackle serious decisions in many industries from manufacturing to the finance markets as well as assisting the measuring and monitoring of the UN-SDGs and of course, more recently, underpinning much of the analysis undertaken in the COVID-19 pandemic.

It took the success of 'Map Apps' to truly make everyone aware of the benefit of good location information. As Governments globally prepare for the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow, Scotland in November 2021, as to how they will successfully move to net-zero, there is now an urgency for the benefit of accurate, reliable location information to be recognised - and, of course sustainably funded, to assist everyone to reach these targets.

As I close, I am imagining a world where every nation is underpinned by reliable, accurate, regularly maintained national location information held within an NSDI, assisting the disparity of nations to reduce and allowing everyone to measure and monitor, using a similar level playing field, our progress towards overcoming the many global challenges underpinning the future of our world.

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3   Unlocking the power of location: the UK's geospatial strategy 2020 to 2025 – published June 2020

Emmanuelle Charpentier and Jennifer Doudna first all-female recipients of Nobel Prize in Chemistry

Federation of European Microbiological Societies (FEMS)[1] . Reprinted from Science|Business[2]

1   Communication from FEMS. This article was first published on 12 October by FEMS.
2   Reproduced with permission. https://sciencebusiness.net/

Dr Vanessa Lawrence CB FRICS is working internationally as a senior advisor to governments, inter-governmental organizations including the World Bank and large private sector organizations.

In addition, Vanessa is a Non-Executive Director of the Satellite Applications Catapult and a Non-Executive Director and Trustee of the Alan Turing Institute, the UK's national centre for Data Science and AI, on the Advisory Boards of Seraphim Space LLP, the Space venture capital fund backed by the British Business Bank, the Spatial Finance Initiative and the Urban Big Data Centre. She is the Honorary Colonel of 135 Geographic Squadron Royal Engineers, an Affiliate Member of 601 Squadron, Royal Auxiliary Air Force and also a Trustee of the Royal Geographical Society, an Adjunct Professor at the University of Southampton and Visiting Professor at Kingston University.

From 2000-2014, she was the Director General and CEO Ordnance Survey, Britain's National Mapping Authority and from 2011-2015, she was a founding co-chair of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM).

The 2020 Nobel Prize in Chemistry has been awarded jointly to European Academy of Microbiology member Emmanuelle Charpentier (Max Planck Unit for the Science of Pathogens, Berlin, Germany) and Jennifer A. Doudna (University of California, Berkeley, USA) for "*for the development of a method for genome editing*".

Doudna and Charpentier are the first all-female recipients of the Chemistry Prize. Emmanuelle Charpentier is a French biochemist, microbiologist, and geneticist, recognized as a world-leading expert in regulatory mechanisms that direct processes of infection and immunity in bacterial pathogens causing diseases in humans. In 2011, she published a landmark article in Nature describing tracrRNA as a key component of the CRISPR-Cas9 system and demonstrating further the role of tracrRNA in the activation of the defense system in the human pathogen *Streptococcus* pyogenes and other bacterial species (Deltcheva et al., 2011).

Jennifer Doudna is an American biochemist, molecular biologist and geneticist and Professor and Chair in the Department of Chemistry and the Department of Molecular and Cell Biology at the University of California, Berkeley. Emmanuelle and Jennifer first met at an academic conference in Puerto Rico and, in 2012, together reported in a landmark article in Science how the bacterial protein Cas9 guided by the duplex tracrRNA-CRISPR RNA can identify targets in the invading DNA. They also described how the system could easily be programmed and re-purposed to edit any DNA target of interest (Jinek et al., 2012).

These ground-breaking findings revolutionized the field of life sciences, offering a tool for the researchers to cut DNA with great precision and to edit, correct and rewrite DNA in multiple organisms. At the beginning of 2013, scientists published the successful use of the CRISPR-Cas9 technology for gene editing in a variety of prokaryotic and eukaryotic organisms, ranging from bacteria to flies, fish, mice, plants, and human cells.

CRISPR-Cas9 has improved the speed, efficiency and flexibility of genome editing at an unprecedented

Left: Jennifer Doudna; Right: Emmanuelle Charpentier

These same features also call for extreme care in employing this novel technology, highlighting the need for continuous exchange of information between research scientists and policy makers for avoiding the risks involved in careless use of these unprecedented research tools. It is hoped that in the future, the CRISPR breakthrough may lead to the development of innovative treatments for disease and aging.

On hearing the news of being awarded the Nobel Prize for Chemistry, Emmanuelle said "*my wish is that this will provide a positive message to the young girls who would like to follow the path of science, and to show them that women in science can also have an impact through the research they are performing*".

Also read Emmanuelle Charpentier's biographical summary[1] on the FEMS Microbiology Letters website.

1   https://academic.oup.com/femsle/article/365/4/fnx271/4830095?utm_campaign=oupac-campaign:7636345&utm_source=Twitter&utm_medium=social&utm_content=post:480366236&utm_term=Oxford%20Journals

pace. This new tool is now used in molecular biology laboratories around the world and has the potential to revolutionize medicine by paving the way to finding new forms of treatment for currently incurable diseases. This new understanding enables researchers to rapidly model human disease genes in the laboratory, accelerating the search for new drug leads and opening new doors for the treatment of human genetic disorders.

High-speed networks will shape the future of the digital economy

Dr Lidia Galdino, lecturer at University College London and Royal Academy of Engineering Research Fellow.

When in August 2020 I led the research at UCL that recorded the world's fastest data transmission speed, reaching 178 terabits a second – or 178,000,000 megabits a second – I paused to reflect on what had led us to achieve this goal, and also my own personal journey from a young girl in Brazil to an engineering researcher in London.

In collaboration with the UCL team, Xtera and KDDI Research, by using a bandwidth of 16.8 THz, we were able to achieve speeds at double the capacity of any system currently deployed in the world.[1]

This speed per wavelength was very close to the theoretical limit of data transmission set out by famous American mathematician Claude Shannon in 1949. Working at Bell Labs in 1948, Shannon defined in mathematical terms what information is and how it can be transmitted in the face of noise. What had been viewed as quite distinct modes of communication--the telegraph, telephone, radio and television--were unified in a single framework.

So how did a young girl in Brazil, with an interest in maths and science, but with no knowledge of engineering, or indeed what engineering could do, manage to achieve this personal goal?

I was very fortunate to have a wonderful mother who didn't have the opportunity to go to university, but who had a vision for me to achieve my utmost potential in the world, and who steered me in the direction of engineering. I was at the time absolutely fascinated by the internet and its potential, but never imagined that I could somehow end up as a researcher in the field of high-speed data transmission. Like most young girls, I had only a vague concept of engineering, and did not understand that, in fact, everything is engineering. It underpins everything that we see in the world, and in our field of communications and electronic engineering, it now drives the very foundation of everything we do on a digital or mobile platform.

I also had a number of mentors along the way, among them, Prof Polina Bayvel, who invested their time and their interest in helping me navigate my way through the engineering world, and who encouraged me to set high goals for my research and my life. Now I try to pass on these benefits to the younger generation of girls and women who are entering the field, and may need encouragement, as I did, to see their future in engineering and science. I am proud to have been chosen as the Associate Vice-President of Women in Photonics in the IEEE Photonics Society. These organisations are continually striving to support and mentor women in these fields, and I am pleased that we are making great progress today.

The challenge – and the solution

Even before the COVID-19 pandemic so radically changed our working and living environments, it was obvious that digital transformation was an inevitable process that would transform all aspects of the economy and society. And with this transformation would come ever increasing demands for higher and higher bandwidth and internet speeds, to enable this new way of working, living and learning, to function. Therefore, when I was lucky enough to receive a Royal Academy of Engineering Research Fellowship, I made it my objective to work with UCL team and industrial partners to maximize the amount of data that can be transmitted through optical fibres, achieving the world's fastest data transmission speed, and help drive the future of the internet economy and society.

I have learned that it is very important for those involved in engineering and scientific research to learn how to communicate their passion for their interests, and also to relate this to the real world that everyone can identify with. This is perhaps not so difficult with this type of communications research, as most people, especially those actually in the digital tech sector, readily understand how vital it is to carry ever more data, at ever greater speed, across optical fibre networks. And of key importance is to maximise the signal quality and transmission bandwidth.

So the issue becomes: "how can we maximise the amount of information carried through an optical fibre, encoding the digital data in such a way as to 'squeeze' the maximum capacity out of existing optical fibre infrastructure, at the least additional cost?"

We achieved this by transmitting data through a much wider range of colours of light, or wavelengths, than is typically used in optical fibre. Current infrastructure typically uses a limited spectrum bandwidth of 4.5 THz. There are now 9THz commercial bandwidth systems, but we developed a new transmission system with a continuous bandwidth of 16.8 THz. We did this by combining different amplifier technologies to boost the signal power over this wider bandwidth. We also developed new Geometric Shaping (GS) constellations, or patterns of signal combinations, that make best use of the phase, brightness and polarisation properties of the light, enabling us to manipulate the properties of each individual wavelength, which enabled us to transmit data per wavelength closed to the theoretical limit described by Shannon.

Our research plans for the next three years are to expand the transmission distance that we have achieved, and above all, improve the quality of the signal to reduce as much as possible any 'noise' which interferes with the signal carrying the data. This noise is mainly introduced by the optical amplifiers, the transponders and the optical fibre itself, which continues to be the bugbear of internet researchers, reduces the speed of data per colour and at present puts a theoretical limit on how much data can be transmitted over optical fibre. This is the scientific challenge – to mitigate the linear and nonlinear noise when we transmit data over this wider bandwidth. Solving this problem will lead us to further increase the transmission data rate per fibre, maximising the potential of our existing infrastructure at the lowest cost possible.

Optical fibre underpins the global communications infrastructure and transports more than 95% of global internet traffic data. Over the last 15 years, internet traffic data has increased exponentially, and it is essential that we develop new technologies to meet future data rate demands while maintaining a low cost per bit. High-capacity, ubiquitous broadband communication infrastructure is essential to economic growth. It will enable new internet traffic types and new data services that will emerge with 5G, the internet of things and smart cities or as yet unthought-of future applications that will transform people's lives.

Dr Lidia Galdino received M.Sc. and Ph.D. degrees in electronic and electrical engineering from the University of Campinas, Brazil, in 2008 and 2013, respectively. Dr Galdino commenced a lectureship and a Royal Academy of Engineering Research Fellowship in September 2018 on the topic of "Capacity-approaching, Ultra-Wideband Nonlinear optical Fibre Transmission System", and a co-investigated in the EPSRC TRANSNET programme grant. She previously worked as a Senior Research Associate on the EPSRC UNLOC programme grant. She is Associate Editor of Optical Fiber Technology and part of the Technical Programme Committee for IEEE Photonic Conference (IPC) and Associated Vice President of IEEE's Women in Photonic.Dr Galdino was a co-recipient of the RAEng Colin Campbell Mitchell Award in 2015 for pioneering contributions to optical communications technology and named as one of the 2017 "Top 50 Women in Engineering under 35" by The Telegraph and Women in Engineering Society which features the U.K.'s top rising female stars of engineering.

Awards and Fundings
- Royal Academy of Engineering Fellowship (2018-2023)
- Top 50 Women in Engineers under 35, which "features the UK's top rising female stars of engineering" (2017)
- Co-recipient of Royal Academy of Engineering Colin Campbell Mitchell Award for "our pioneering contributions to optical communications technology" (2015)
- Brazilian Science without Borders Fellowship to join the Optical Networks Group (ONG) at University College London (2013)
- Ph.D. studentship funded by National Council for Scientific and Technological Development (CNPq)

WoMARS: The future role of women in space exploration

WoMARS team members Julie Hartz and Laurène Delsupexhe were interviewed by The Mobile Century

In the last two weeks of October 2021, an all-female crew of 6 scientists, engineers and geologists will begin a 14-day mission under Mars-like conditions. Being one of the few all-female Mars Desert Research Station (MDRS)[1] crews, the team believe this is a great opportunity to study the scientific, social, and medical performances of the team. In addition, each member of the team will conduct innovative scientific research related to their own field of expertise and their role as crew member at the MDRS.

Two of the 6 WoMARS team members - Crew Commander Julie Hartz and Crew Engineer Laurène Delsupexhe - share their thoughts on the future role of women in space exploration, as they continue to prepare for their mission. We wanted to understand more about the motivations behind this ambitious project, and what they hope to achieve for women's future involvement in space.

"The inspiration for the WoMARS project came about largely by chance", says Laurène Delsupexhe, who is now the Crew Engineer. "I met Marta, a materials engineer working on high temperature coatings for aerospace and space applications, and she encouraged me to get involved in astronaut training. I then set about bringing together a team of highly qualified young women with a variety of science backgrounds to demonstrate that it is possible to have an all-female space crew."

Laurène's first pick to join the team alongside Marta was Julie Hartz, who will take the role of team Commander. Julie is a geologist who has the special knowledge and skills required to lead a diverse team, and who also has the in-depth knowledge of geoscience required for the project. Together they set about identifying and bringing together the other members of the team, with the aim of covering a broad range of skills and backgrounds, to complement each other.

"We knew it was very important to ensure that we could cover a broad range of science disciplines with direct application to future space exploration", says Julie. "We were therefore very pleased to be able to welcome biologist Paula Peixoto to the team, as both crew biologist and health and safety officer. She has worked in a hospital environment and is highly trained in biological sampling and has a keen interest in helping to achieve the goal of furthering the participation of women in space exploration".

Realising that it would be critical to have team members who could work quickly under pressure, and apply engineering and problem-solving skills to any issues that may arise, the group expanded to include Cristina Reyel, an aerospace engineer who is passionate about all aspects of aerospace design and finding creative solutions to engineering challenges. Rounding out the team is Alice Barthe, an aerospace engineer and data scientist who will have responsibility for earth observational awareness and gathering and curating all of the data that emerges from their time at the MDRS.

"Our motivation is not to prove that that women

[1] https://mdrs.marssociety.org/ MDRS is a space analog facility in Utah.

alone should be involved in space exploration, and that we do not need to work alongside men", says Julie. "It is to prove to ourselves that we have the skills, and temperaments, to take the lead on important space projects. Women are no longer sidekicks, like they were shown in shows like Star Trek. They can be the commanders, the leaders who are making the key operational decisions."

It is also very important to the team to be role models for younger women who may be hesitant about taking the leap into space related subjects and occupations. "Young girls and women need to understand the breadth of engineering", says Laurène. "I think sometimes women fear that as engineers they will spend their lives in the back office of a manufacturer, never getting out and doing exciting and ground-breaking work in the field. Engineering is such a diverse discipline, and includes specialisations such as bio-engineering, or health related engineering, and of course space engineering. All of these areas offer great opportunities for women to make their mark, and to bring about positive change in the world."

Julie is also keen to show that the WoMARS team is comprised of six different female engineers and scientists, who have all taken a different path to reach the goal of space exploration. "It is important to have an engineering or space background", says Julie, "but of most importance are the human factors that enable the team to work together smoothly and without egos, to achieve our common goal. Above all it is the diversity of culture, background, interests and thought processes which will make this a successful team. Similarly, we need to encourage females of all backgrounds to grasp the opportunities that are now being presented by the future of space exploration, and to work towards achieving their life ambitions through space."

But how does a group of young women prepare themselves for space exploration? What are the key personality traits that are essential and how do you identify and build on those skills and qualities amongst the team? Given the severe restrictions in place across most countries during the COVID-19 pandemic in 2020, the team has not been able to meet in person but has had to rely on meeting via Skype or Zoom. This has added an additional challenge but has also forced them to think very carefully about the sort of training and preparation that they can do during this difficult time.

"We have engaged everyone in team building sessions", says Laurène, "and we have relied heavily on the program set out in British Astronaut Tim Peake's Astronaut Selection Test Book. Surprisingly, the emphasis is not as one would expect on higher level mathematics and science knowledge, but on co-ordination and the ability to work together in an isolated environment as one whole. The personality trait that this training identifies is above all honesty – with oneself and with the other members of the team. So once again, it is the human factors that are important, to ensure success in space exploration."

Julie agrees that, as Commander, she needs to be able to rely on each individual member of the team to put aside her ego, and to work tirelessly towards a common goal. "It is important that we all realise that we are pursuing something that is far more important than our own individual egos. We need to bring our best selves to the task and support each other where we need to."

While even today it is unusual for women to be engineers, let alone space engineers, the members of the WoMARS team are demonstrating that women can take on leadership roles in this most challenging area. For Julie, the role of Commander is new, and requires her to take on much greater responsibility, and to step up to be a leader. "I had never thought of myself in a leadership role", comments Julie. "It is true that my male colleagues would probably never question whether or not they were up to the task – either in this type of role, or else even just setting out to head a new start-up. They never seem to question themselves, whereas all too often, women often doubt their own abilities and may succumb to what has been called 'the imposter syndrome' – never believing that they are good enough."

Laurène agrees but thinks that this could also be an advantage to the team. "We don't take things for granted like others might", she says. "We are very aware that we need to prove ourselves and our ability to lead and carry out this important mission under difficult circumstances. Women often work harder to achieve our goals."

Both women see great opportunities for the future in space exploration and women's role in it.

"In the past it was just the government actors, principally the USA and the USSR who were involved in space exploration", adds Laurène. "Now there are many new private sector players involved, including SpaceX and Lockhead Martin. And many other countries are getting involved in space industries. It is important, in this new space age, that the public, including of course young women as well as men, engage themselves with the issues about the future of space, and what objectives are driving the investment in time and resources that many countries are making now in the space sector. It is important that the exploration of space is undertaken within a framework based on humanity and kindness. Future women leaders in space should, in the words of NZ Prime Minister Jacinda Ardern, be both compassionate and strong."

The WoMars Team Members

Julie Hartz
Commander and Geologist

Julie's initial background was in physics and geoscience that she acquired in her home country, Switzerland. After a year spent on travels and internships in marine biology and numerical modelling at the French National Geological Survey, she spent two years in Sydney, Australia, to specialise in geochemistry. Soon after she started her postgraduate degree at Macquarie University, Julie discovered the interdisciplinary field of Astrobiology and decided to dedicate her academic life to the search for life in the Universe. Her ongoing and already awarded research focuses on the traces of microbial life that are preserved in rock samples from Martian analogues.

Cristina V. Reynel
Crew Executive Officer

Cristina is an enthusiastic aerospace engineer passionate about all areas of aerospace design. She possesses natural leadership qualities and is an effective relationship builder with strong team-working and problem-solving skills, always trying to create a positive team environment. During her MSc, her group project and thesis were related to the Augmented Reality technology applied to Aircraft Maintenance. Currently she works as an Aerospace Design engineer at Caeli Nova. During her career she has gained essential skills such as how to work with different people and how to promote teamwork.

Laurène Delsupexhe
Crew Engineer

Laurène graduated with a Master in Space Transportation Systems (Launchers and Re-Entry Vehicles) from La Sapienza University in Rome. Prior to that, she graduated with a Diplôme d'Ingénieur from Ecole Supérieure d'Ingénieurs Léonard de Vinci in Paris and spent a year at the Politecnico di Milano studying for a Master in Aeronautical Engineering. She completed a 6-month internship at the European Space Agency where she joined the Vega program and worked on the SSMS (Small Spacecraft Mission Service) and Space Rider projects. Laurène is currently working for ArianeSpace, still on her favourite launcher, Vega, more particularly on the code behind the AVUM engine of the rocket's last stage.

Marta Ferran Marqués
Crew Scientist & Media Officer

Marta graduated in Nanoscience and Nanotechnology from the Autonomous University of Barcelona, Spain. She then completed an MSc in Aerospace Materials at Cranfield University, where she was offered a co-joint PhD position with Sensor Coating Systems Ltd. and Cranfield University. Marta's objective is to understand and improve the Thermal History Coating, a heat-sensitive luminescent coating that can detect and memorize temperatures up to 1'600ºC and potentially open up a range of new application opportunities. Marta received a Royal Commission for the Exhibition of 1851 scholarship, awarded annually for a period of three years to "young scientists or engineers of exceptional promise".

Paula Peixoto
Crew Biologist

Paula Peixoto graduated in 2017 in Nanoscience and Nanotechnology from the Autonomous University of Barcelona, Spain. She decided to pursue a Nanomedical career by completing an MSc in Translational Biomedical Research at Vall d'Hebron Hospital, Spain. Today, she works in the laboratory studying the pathogenesis of immune-mediated neuronal disorders. The main objective of her project is not only to understand how information is long-term encoded in the brain, but also develop an animal model that could help understand several neurological rare disorders.

Alice Barthe
Crew Data Scientist

Alice graduated as an aerospace engineer specialised in applied mathematics from ISAE Supaero in Toulouse. During her gap year she took the opportunity to spend one semester in the space engineering master of Kitakyushu Institute of Technology in Japan and another half year working for a space software start-up in Sydney, Australia. She worked as an R&D engineer in the Guidance Navigation and Control department in the UK, looking into technologies such as H-infinity control, nonlinear guidance techniques, LIDAR signal processing and Simultaneous Localisation and mapping. Alice is currently working for a Space Agency where she is looking at commercial applications for Earth Observation leveraging new digital technologies.

Interview by Vicki MacLeod, Editor-in-Chief of TMC

FUTURE
TRANSFORMATION

New investment models for telecoms infrastructure

Dora Petranyi and Anne Chitan, CMS

Out of the turbulence of 2020, one sector is emerging rejuvenated – telecoms. The new mega deals, especially when it comes to digital infrastructure, attest to it[1]. This is the acceleration of a trend, rather than a new phenomenon. If anything, lockdowns imposed to handle the COVID-19 pandemic have only served to accelerate demand[2].

In the last couple of years interest by investors and governments in passive network infrastructure, in particular upgrading existing networks to optical fibre, has grown exponentially. New financial models are starting to emerge to meet the huge need for cash deployment for this attractive independent class of assets[3].

The attractiveness for markets and investors of digital infrastructure, especially fibre, is due to the certain inevitability that comes with it – the inevitability that it will drive the future. This means an advantage for first movers both in terms of revenue and exit, especially in situations where there is little or no competition with only one existing network to meet the increasing demand for connectivity.

Telecoms infrastructure has always been capex intensive and one of the major cash-draining features of telecom companies' businesses. Some financing models like network sharing have been used in recent times to alleviate this burden on individual operators. However, this approach is no longer sufficient as there is now a surge in demand for an upgrade of telecom infrastructure, especially from copper to fibre, driven by increased data consumption and the requirements of 5G.

Drivers of fibre investment

Looking at the growth of global mobile data traffic in recent times clearly shows the imperative. It reached around 33EB per month by the end of 2019, and was estimated to be at 51EB per month by the end of 2020 and is projected to grow by a factor of around 4.5 to reach 226EB per month in 2026[4]. On the consumer side, this increase stems from the growing consumption of online videos and the growing number of connected devices. On the business side, the digitalisation of the economy is also fuelling an increasing demand for data, data speed and lower latency. This is driven by new hyper connectivity technologies and 5G[5]. According to Ericsson, 5G is forecast to account for 45 percent of global mobile data traffic by 2025. To support this dataflow at the right speed and with lower latency, the copper network can be boosted but this has its limits and business clearly needs networks to be upgraded to fibre.

Further, much of the future success of 5G and the

acceleration of its availability depend on another technology – fixed fibre access[6]. Other telecoms infrastructure requires it too: data centres need fibre to carry the amount of data to and from them, subsea cables need to connect with terrestrial fibre, etc.

There are strong political incentives behind the fibre upgrade. Nations are competing with each other to drive digitalisation and growth of their economies, especially through the adoption of new technologies like 5G. 5G is expected to create USD 13.2 trillion in global economic value by 2035 and generate 22.3 million jobs[7]. But while there is a broad consensus about the potential benefits of 5G deployment, in practice there is a huge disparity between countries or even within countries in terms of policies and regulations adopted in support of such political ambitions.

Individual countries still show big differences in terms of fibre deployment. This is especially true where due to a lack of economies of scale, it is difficult to make a solid business case to support investment in infrastructure by the existing market players. This is the challenge that investors in telecoms and in infrastructure are facing. A number countries have deployed fibre extensively, but others are lagging behind[8]. In Europe it is particularly striking that the countries with the two largest economies have some of the lowest FTTH penetration figures[9].

Even where the political message focuses on the performance of the network (for example measuring access to gigabit broadband (ie download speed of at least 300Mbit/s3)) rather than nature of the network (copper/fibre/other), there is a general acceptance that the next generation of telecoms and connectivity will require more fibre and more fibre to the premises.

The upgrade is costly and requires huge investment. For example, in Europe the European Council estimated in 2017 that €137 billion would be required to complete the rollout of FTTH across

all the EU28 countries to meet the Gigabit Society targets.[10]

And costs vary greatly on a country-by-country basis[11]. These variations are due to local specificities of the market (eg consumer preferences, geography, etc.) but also legal or regulatory differences rendering the build more or less expensive.

Altnets, Infracos and Towercos

Governments are mainly looking to the private sector to foot the enormous bill for all of this new investment. Telecom companies have been exploring alternative financing models for a few years, as other network upgrades have been reaching their limits. The opportunities for the private sector are not just in terms of the technology itself but also in financing where new models are being developed to attract investment. As investors become more familiar with these new models, transactions have increased in size and value, which explains the new mega deals.

One of the most successful trends is based on separation of passive infrastructure assets into other vehicles and finding separate financing for those. Some alternative network companies (the "*altnets*") have set themselves up to fill this void where incumbent operators have not invested (for example building the last mile of fibre to the home). However, in recent times, telecom operators around the world have themselves begun to set up new company structures for fibre roll-out – either by splitting their businesses (essentially between passive infrastructure and connectivity services) and seeking separate financing for each, or by separating their passive infrastructure into a special purpose vehicle funded by an infrastructure fund (independently or as joint ventures).

These new *infracos* are operating their networks either for all players on a neutral basis, or for one telecom operator, depending on the ownership of the passive assets, the business model and the risk appetite. It is clear that investors and banks wanting to invest in these new class of assets are favouring

1   For few examples see: acquisition of Deutsche Glasfaser by EQT for EUR2.8bn – KKR to sell ultrafast German internet business in €2.8bn deal | Financial Times (ft.com); the sale by Altice Europe of a 49% stake in its Portuguese FTTH network to Morgan Stanley for EUR1.57bn – Altice completes sale of €1.57bn stake in FTTH wholesale (capacitymedia.com); the announcement that Australia NBC will spend ASD3bn on fibre roll out COVID-19 forces Australia broadband upgrade as internet use surges | Financial Times (ft.com); Oi investing R$3,531 million in capex in Brazil – Oi bolsters FTTH business with more Capex | TelecomLead

2   See CMS recent report where 92% of the respondents confirmed that the pandemic has accelerated their digital transformation [https://cms.law/en/media/local/cms-cmno/files/publications/other/cee-digital-horizons-report]

3   https://cms.law/en/media/local/cms-cmno/files/publications/publications/financing-infratech?v=1

4   Ericsson Mobility Report November 2020 (https://www.ericsson.com/4adc87/assets/local/mobility-report/documents/2020/november-2020-ericsson-mobility-report.pdf)

5   Smarter factories: How 5G can jump-start Industry 4.0 | McKinsey & Company (https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-blog/smarter-factories-how-5g-can-jump-start-industry-40)

6   How 5G and fiber became 5iber | ITProPortal (https://www.itproportal.com/features/how-5g-and-fiber-became-5iber/)

7   WEF_The_Impact_of_5G_Report.pdf (http://www3.weforum.org/docs/WEF_The_Impact_of_5G_Report.pdf)

8   Fiber to the premises by country – Wikipedia (https://en.wikipedia.org/wiki/Fiber_to_the_premises_by_country)

9   FTTH Europe Panorama (ftthcouncil.eu) – But note in the UK after a relatively slow start the pace of build as quickened up with now 14% homes served by full fibre (doubling the figures in 18 months – OFCOM – Connected Nation Update Summer 2020: https://www.ofcom.org.uk/__data/assets/pdf_file/0017/202571/connected-nations-summer-update-2020.pdf

10   FTTH Council Cost Model 2017_final.pdf (https://ftthcouncil.eu/documents/Reports/2017/FTTH%20Council%20Cost%20Model%202017_final.pdf)

11   For example in Asia, see: Fibre to the home: Shared fibre infrastructure is key – The Financial Express (https://www.financialexpress.com/opinion/fibre-to-the-home-shared-fibre-infrastructure-is-key/1736692/)

the model of a neutral host network supported by an anchor tenant operator but opened to others as well. This is because this model has the benefit of guaranteed revenues, while the competition is focussed not on the infrastructure itself but on the services running on that infrastructure.

Investing in a fibre network is clearly more attractive in more densely populated areas, while first movers also get an advantage and competition to serve the best areas is therefore intense. This can leave less populated areas behind, thus creating or exacerbating the digital divide. There is of course a natural advantage of being a single network in an area due to a lack of competing networks willing to build out that part of the market but this may not be enough. Governments have considered many options and approaches to try to make these less populated areas attractive.

Beyond the obstacles to competitive market entry, the interest in fibre investment has been further encouraged by the success of passive infrastructure companies in relation to other asset classes. In 2019, out of the top 10 worldwide telecoms companies in terms of return to shareholders three were towercos[12]. So the expectations of investors are huge, once they are made aware of the peculiarities of these markets.

Hybrid financing

It is fair to say, however, that the main change recently has been the entry en masse into the market of infrastructure funds, as well as pension funds and institutional investors, who have longer investment horizons which fit the nature of fibre as an asset class, akin to a utility. In fact, telecoms are now featuring as part of the "core" assets for infrastructure funds (rather than core +). This can be seen as a type of serendipitous alignment of the agendas of the corporates seeking investors and the infrastructure investment funds. It has the immediate advantage of offering access to a much wider pool of funds, while it offers the opportunity for more flexibility and creativity in financing terms.

This has led to the emergence of *hybrid financing products* with features from both sides and aligning with the agendas of both parties. This fluidity means that the financing products and transactions are able to be tailored to the specific circumstances – market and regulatory - of each fibreco.

Risk factors: consumers, regulators and foreign players

There are a number of risks associated with this type of investment. There are concerns whether consumers will be willing to pay more for services on the upgraded network. In the UK, OFCOM's 2020 Communications Market report in fact found a decrease in consumer spending on telecoms even though consumers were in fact consuming more data, at a faster speed. The reason may be that some paid services (voice calls and text messages) are being replaced with "free" OTT services, explaining the decrease in spending. Leaving aside the ongoing debate regarding these OTT services and the competition between companies providing those and more traditional operators, this begs the question whether consumers will be willing to pay more for more connectivity if it feels like they are getting more for less[13]. In Ireland, the regulator has asked specifically that question and the results are not encouraging[14]. So if consumers are not ready to pay more, is it worth the investment in new networks, especially in less densely populated areas? The answer is a clear yes, it is just that the financing models are different from the norm and investors need to be educated in how this new infrastructure market works in order to adjust their expectations.

A further complication has also sometimes been introduced by governments themselves, who have offered various forms of investment incentives with different degrees of success. Some incentives have in fact discouraged private investors due to concerns that over reliance on government subsidies may undermine the business case, and what will this mean when those subsidies cease, or when investment conditions are not met?[15]

Further, in addition to the source of funding, there is still uncertainty about regulators' attitudes to infrastructure sharing by telecoms operators. Some regulators still insist on infrastructure-based competition as a basic principle, and hence, they are restricting the options for sharing resources and joint projects.

Regulators have also taken relatively timid steps, leaving more risk for market forces and the private sector. There are some policy questions here about the potential need for protections for independent investors, as operators are in a much better position to cover the costs of a network upgrade[16].

Another difficulty is the renewed interest now being shown by governments in who is in fact behind telecoms infrastructure and the flurry of new laws that have been introduced since COVID[17]. Even if it may be justified for other reasons, this could potentially restrict the size of the investor pool, though considering the feeding frenzy of investors over fibre at the moment, there is little evidence so far for this.

We believe that more regulatory and government policy guidance is needed, based on a call for collaboration in fibre and 5G investment. This will ensure the type of growth that has been predicted based on the use cases for these technologies.

There is no one size fits all finance model

New financing and investment models need to address each of these challenges, which are often specific to a certain country or region. This means that one size does not fit all. Each financing structure, even if it is based on the shared neutral network model, needs to be adjusted to fit in with local circumstances.

This may be counter-intuitive when one considers that what is being built eventually has no geographic boundaries, which should support the need of a harmonious strategy to create a seamless network. Instead, we have a fractured approach (including in the way the network is financed) which is divided by national, regional and sometimes even local boundaries. And while the immediate impact on financing may not be obvious, as the new network is in relative infancy, this fractured approach could have a negative impact once the build has reached a critical mass and mergers are on the cards. At some stage (probably earlier than later), what will be needed is a regional, national or supra-national approach to maintain or achieve competitiveness.

To fit all of these jigsaw pieces together will require a momentous financial investment and to convince private investors to take the risk. Analysts need to assess what works well or less well from country to country and governments and industry need to be brave enough to harmonise their approaches. Meanwhile, the great benefit of current financing models has been and remains their fluidity. These emerging hybrid financing products are test beds for what will ultimately prevail, if indeed they are supported by the right regulation to build the network of the future. In this way we can meet the competing needs of all stakeholders - consumers, governments and of course business investors and we can reshape the map by tweaking an ancient wisdom: "share and conquer".

12   Unlocking and Building Value in Telecom | BCG (https://www.bcg.com/en-gb/publications/2020/tmt-value-creators-unlocking-building-value-telecom)

13   https://www.ofcom.org.uk/__data/assets/pdf_file/0026/203759/cmr-2020.pdf

14   https://www.comreg.ie/comreg-survey-shows-demand-for-better-broadband-remains-high/

15   Financing Stimulus for FTTH (ftthcouncil.eu); Microsoft Word – New EC Guide v 17.docx (europa.eu) (https://www.ftthcouncil.eu/documents/Reports/FTTH_Finance_Report.pdf)

16   Fury as Alternative UK Fibre Networks Hit by New Openreach Fee UPDATE4 - ISPreview UK (https://www.ispreview.co.uk/index.php/2020/12/fury-as-alternative-uk-fibre-networks-hit-by-new-openreach-fee.html)

17   https://www.cms-lawnow.com/ealerts/2020/11/new-mandatory-uk-fdi-regime-to-control-foreign-investment

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Dóra is the Co-Chairman of the Regulatory Committee of the Hungarian AI Coalition and led on formulating the response of the Hungarian AI Coalition to the EU consultation request regarding the EU White Paper on Artificial Intelligence, A European Approach to Excellence and Trust. She is also a member of the Hungarian Council of Copyright Experts and a member of the Digital Civil Code Review Working Group, being the only outside counsel in the team. She is also the first and only lawyer to be a member of the co-regulatory committee between the local telecommunications' regulatory authority and the Association of Hungarian Content Providers. She is also a member of the supervisory committee of UNICEF.

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African 5G challenges and opportunities for TMTS investment

Laureen R. Cook, Executive TMTS Adviser, Extelcon, LLC

Of the 7.4 billion people on this planet, over 4 billion do not have access to the Internet. Of the 2.5 billion people living within 3G/4G network coverage, 1.6 billion live outside the areas of mobile broadband network coverage. Of those without internet access, 75% are concentrated in 20 countries which are disproportionately rural, low income, elderly, illiterate and female. According to the World Bank, a 10% increase in broadband penetration equates to a 1.38% increase in GDP in developing countries. Further, a 10% increase in mobile penetration equates to a 0.81% increase in GDP and a 10% increase in Fixed Line penetration equates to a 0.73% increase in GDP. 5G and Fixed Broadband connectivity are dependent on the quality, capacity, and latency of backhaul connectivity either terrestrially, via fiber or microwave and/or via satellites (LEO/MEO/GEO), in order to accelerate economic growth.

Globally, 22% of the world's population does not have access to, or is not connected to, the Internet. The percentages change dramatically by geography when we compare the European Union at 2% to that of Latin America at 9%, the USA with 15%, the Asia Pacific Region at 21%, the Middle East at 22% and Sub-Saharan Africa, where 57% of the total population does not have access to, or is not connected to the Internet. While the development of Fiber Infrastructure projects has increased over the past several years, generally this is a slow moving process primarily due to: a lack of investment due to the 100's of millions of USD's required in Capex for funding, the low rate of financial return and high

risk associated with these projects, government policy & regulations, political instability and macro-economic factors.

Barriers to IoT application expansion: eEducation, eHealth, eAgriculture, eUtilities, etc.

Investment lags in Africa due to the 10 plus years it takes for patient capital to be recovered in some countries. Currently, there is approximately 1.2M km's of fiber in Africa, with another 500K km's required to achieve cross continental connectivity. Fiber projects are capital intensive, at a cost of US$30,000 per km or more to deploy, depending on the geography. Government policy needs to promote the private sector by providing an enforceable regulatory framework based on high standards of corporate governance. Policy needs to address telecoms related issues such as: rights of way, licensing, taxation, interconnection, and cross-border connectivity. Political instability, coupled in some cases with limited protection of foreign investments, inhibits access to the foreign funding required for these capital-intensive projects. Low income levels and population density outside of urban areas contribute to both increased costs and longer returns on investment. These issues coupled with a lack of digital literacy and local content, which currently equates to only 30%, represent

some of the key challenges that are required in order to increase broadband penetration rates in Africa.

Broadband infrastructure investment is key

Broadband contributes twice the growth in GDP than that of mobile in developing countries and is a requirement for 5G to truly be realized due to its large capacity capabilities and low latency parameters providing front/backhaul connectivity. Subsea Fiber connectivity along the coasts of Africa has been key to increasing capacity and connectivity on the continent via Subsea projects since 2009: SEACOM, TEAMS, EASSY, SAFE/SATS-3/WASC, GLO-1, ACE, WACS, with A2A, 2Africa, Equiano, & PEACE currently under development. These projects have collectively brought hundreds of terabytes of potential capacity to Africa, and have provided onward connectivity to Europe, Asia, the Middle East and the Americas either directly or by connecting into other Subsea cables. African Broadband projects/companies such as PCCW, WIOCC, Liquid, BCS, CMC, Link Africa, CSquared, Sparkle and Orange are some of the companies providing terrestrial connectivity across multiple countries in Africa, driving affordable connectivity further inland on a per Mbps/Gbps basis to landlocked countries, fixed & mobile operators, ISP's and ultimately the end consumer at reduced rates.

Additionally, Towerco's in Africa have played a role in significantly reducing the cost of providing mobile broadband service and have contributed to the acceleration of mobile coverage to rural Africa. In conjunction with the Mobile Network Operators (MNO's), Tower Companies such as IHS, Eaton, Helios, and American Towers, amongst others, collectively own and/or manage over 350,000 towers throughout Sub-Sahara Africa, providing a central point of interconnection for terrestrial Fiberco's and Satellite providers to connect to the MNO's, allowing for co-location of valuable power and fiber assets to be coordinated for development. An additional 300,000 towers are anticipated for development throughout the continent, with many more opportunities available for Small Cell and Wifi operators as 4G and 5G becomes a reality across Africa.

Challenges and opportunities for the TMTS industry

Clearly Africa is a continent in which we as the TMTS industry can make the greatest economic, social, and governance impact. While some governments are more advanced than others, most are working closely with the World Bank, the GSMA, and the Developmental Funds Institutions. Today, the OTT Players such as Amazon, Facebook, Google and Microsoft are showing a willingness to invest in Africa which brings the issues pertaining to

regulatory, policy and taxation into greater focus, alongside traditional funding sources.

When we look closely at Africa we see many challenges related to network deployment costs, fragmented or non-existent network coverage, particularly to rural areas, low affordability of mobile & fixed broadband services, high illiteracy rates as related to digital skills & educational resources, and the lack of local content. Additionally, as we approach the transition from 3G/4G to 5G in Africa, there will be a growing need for Tier III/IV Data Centers in order to host and store the exabytes of data required for video and bandwidth consuming BtB and BtC IoT applications that will require secured Cloud Storage and IT Services. While some may view these issues as obstacles, in reality, they represent commercially viable opportunities for investment and entrepreneurship throughout the end-to-end TMTS ecosystem across Africa.

Laureen is an Alumna of the IFC (World Bank), where she was the Principal TMT Adviser, in the Global Telecoms, Media & Technology Investment Sector. Currently she is the Founder & CEO of Extelcon, LLC, providing technical and commercial oversight to the Investment Banking Community, Regulators, and TMT & Satellite industry sectors as Lender's Technical Adviser for multi-billion USD telecoms & technology companies. Prior to joining the IFC, Laureen was with Alcatel-Lucent (now Nokia), as Vice President 4G/LTE Strategy & Innovation. She is a founding Director of the Global Telecommunications Women's Network (GTWN), and is a BOD member of Rising Tides III, a European based Angel Investment Fund, providing financing to female led IoT start-up companies. She holds an MSc in Telecommunications Engineering from Rochester Institute of Technology, and an MBA from Long Island University in New York.

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Using IoT to drive smart city design and efficiency post COVID-19

Alicia Asin Perez, CEO Libelium

Telehealth

Temperature Screening in shops and offices

Since the start of the COVID-19 pandemic in early 2020, the narrative around smart city design and the application of IoT based technologies has changed quite considerably. Before COVID the discussion around IoT and smart cities revolved largely around how to monetise the technology, how to save money and also how to satisfy regulatory requirements around privacy and security.

However, during 2020 as governments around the world have prioritised containment of the virus, the discussion about IoT and its potential has evolved. The focus has been less about personal privacy, and worries about big data collection and surveillance, and more about the need for everyone to stay safe and healthy, to ensure that we can all return to business and social activity as quickly as possible and recover lost productivity. This has in

Enabling social distancing in Public Transport

turn led to a new perspective on how to ensure an appropriate balance between safety and privacy protection, or a type of 'partial privacy', which only recently would have seemed unthinkable to many.

We have also seen the discussion around smart cities turn quickly to the challenge of how to guarantee safer spaces, support social distancing, and adapt to the way citizens move around. These are all huge issues facing planning professionals worldwide. We believe that smart environmental monitoring technology has the answers to many, if not all of these issues, and that it should form a fundamental part of the response and way forward. We are working with town planners, architects and government authorities to demonstrate how smart sensor-based technology can redefine how citizens interact with their built environment and with their fellow citizens.

One of the key issues confronting local authorities, as well as businesses, as we emerge from lockdown, is a lack of trust in the health and safety of the city environment. And without re-establishing trust, governments and industry will find it difficult to relaunch economic and social activity in a safe and reliable manner. Neither governments nor businesses want to be in a continual pattern of lockdown, followed by re-opening and then the need to go back into lockdown again. This pattern, which has played out across many large cities around the world during the pandemic, has drained community spirit, sapped businesses of income and potential, and has led to a mountain of public debt.

It is clear that a new approach is needed, which will be based on the effective application of technology to ensure safer public spaces.

So what changes to city authorities, as well as large industries, need to make in the post COVID era, and how can smart city design help them successfully implement these changes? How can IoT based applications help prevent and limit the spread of COVID-19?

Some examples which have already been implemented or which are in the planning stages, include:

- A fever screening system, which has enabled authorities to ease lockdown restrictions and to go back to a new normal. This was developed in 2 weeks.
- Adapting customer capacity tracking systems, (which were initially designed to monitor and analyse shopping behaviour and direct market to customers), to queue management systems which monitor adherence to capacity restrictions and automate queuing in shopping centres
- Remote health monitoring, via telehealth platforms, to enable continuation of treatments while patients are at home
- Real time monitoring and reporting of mobility of citizens and the availability of public transport or parking spaces, to enable citizens to make informed decisions about how to move about and ensure social distancing.
- Hotel and large event capacity monitoring, which has been implemented in Spain, to enable operators to remain open and comply with health restrictions.
- Water and waste management systems, which are a crucial early warning indicator of infection rates and locations
- Optimization of cleaning and sanitization services, to ensure standards are complied with.

While these pandemic related applications are top of mind for many, other ongoing challenges for public health and well-being have not reduced during the pandemic and will also need to be addressed anew once the height of the pandemic has passed. These include air pollution and climate change related health impacts of life in big cities, as well as other issues associated with the built environment in a big city.

The construction and housing industry will now become central to many of the ways that we can adapt to the new post-COVID environment. The lengthy lockdowns and stay at home orders put in place in response to the pandemic around the world have led to a new understanding of the importance of safe and healthy home environments, and how important the home and its environment are for the physical and mental well-being of citizens.

As the major economies begin to emerge from the initial pandemic response and enter a 'new normal' some issues that the construction sector will need to address, and will be able to respond to efficiently using smart city design include:

- How to ensure the sustainability of construction though monitoring and reporting, including the environmental[1] impact of the construction phase: noise, pollution and polluted water spills.
- Responding to the demand for more intelligent buildings Post-COVID there will be additional requirements and motivations for people as they consider the purchase of new homes:

  - The number and quality of open spaces in urban areas with sufficient availability of green[2] and healthy areas near to homes.
  - The need for safe and sustainable energy

1   https://bit.ly/38DP85Z

2   https://bit.ly/36vxMWd

Smart water monitoring

Smart building monitoring in Lebanon

facilities[3].

· New sources of income to reduce building maintenance costs, including renting out shared parking[4], increasing the use of solar energy[5] on roofs, and intelligent rostering and monitoring of waste collection.

As a consequence of this increasing awareness of the value of smart city design, and the big data that is generated in the process, there has been

an increasing focus on the need for transparency of data collection and its use in the service of democracy through making the information available for everyone. There is also increasing awareness of the full potential of smart city planning in transforming and improving our way of life and well-being, which goes beyond the purely technical issues of sensors and cloud platforms. As we all emerge from the pandemic and begin to reconstruct our economies and social groups, it is hoped that this growing realisation spreads and that IoT technologies continue to play a major role in smart city design.

3   https://bit.ly/3lv7HN8
4   https://bit.ly/38EjTYo
5   https://bit.ly/3kswRLb

Alicia Asín is CEO and co-founder of Libelium, a Spanish IT company that designs and manufactures technology for IoT applications. Alicia is a computer engineer focused on how the IoT can change our world and improve companies' competitiveness and citizens' quality of life.

Libelium's technology is present in more than 120 countries worldwide, developing projects to monitor and improve efficiency in agricultural crops, with environmental control systems to prevent climate change, and any application such as water management, parking control and industrial environment.

She is a frequent speaker at international conferences on issues related to Smart Cities, the Democracy of the IoT based on the big data and the importance of security and privacy in the new IoT era. "Since we entered the age of information and telecommunications in the 70's we had not seen anything similar to the Internet of Things in terms of its potential impact on process change and power to create a new business ecosystem. The IoT is more than a new generation of the Internet, it is the next technological revolution —horizontal and global— in which we will finally see the digital and physical world blended", Alicia Asin says.

In 2016, she was awarded with National Computer Science Prize for her career, progression and internationalization of her company. A few months later, the business association CEPYME awarded Libelium as international company that exports the 90% of its annual turnover. In 2017, Alicia Asín received the Award "Rey Jaime I" fom His Majesty the King and Queen of Spain, the highest distinction for scientists, researchers and entrepreneurs. In 2018, th CEO of Libelium was recognized with the "silver medal" of the Women Innovators Award by the European Commission. In 2019 she was selected by Forbes magazine in the international ranking "top 100 most creative people in business".

Sustainability is driving investment in technology

Gema Esteban Garrido, Global Head of ESG, IG4Capital

It is undeniable that one of the key current trends is sustainability. Far from being just a marketing campaign, today sustainability is intimately linked to business strategy, consumer behaviour and capital deployment.

Consumers now expect brands to take a stand on societal issues. Younger generations are buying with an eye towards environmental and social drivers. 72% of Gen Zs consider a company's purpose when deciding what to buy[1].
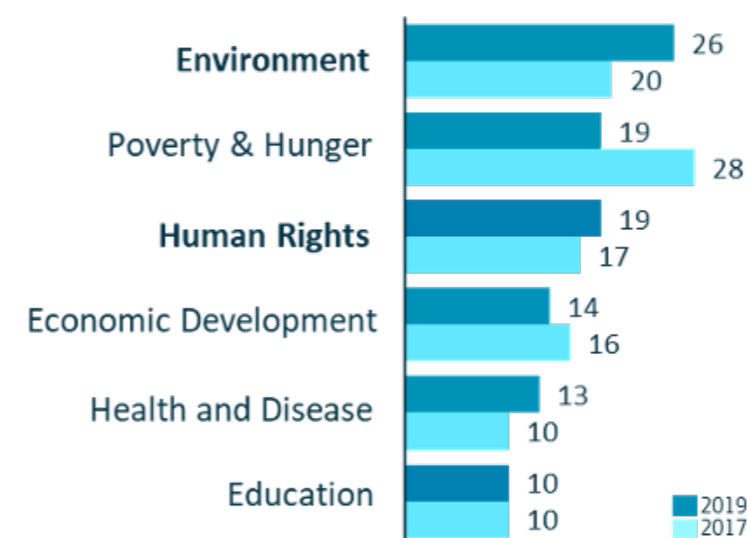
Greta Thunberg's global fight against climate change, coupled with the impact of Extinction Rebellion[2] and the David Attenborough's BBC series "A Life on Our Planet"[3] have together created a global movement of climate activism. During 2020,

1   Source: Edelman Trust Barometer/Porter Novelli-Cone
2   https://extinctionrebellion.uk/
3   https://www.netflix.com/title/80216393

according to The Guardian, NGOs report fourfold increases in investments in carbon-reducing projects in developing countries.

During 2020 we all have witnessed many natural disasters as a result of climate change. These events include unusually fierce bushfires in Australia due to prolonged droughts around the country; flash floods in Indonesia; continued Amazon deforestation; swarms of locusts in Asia,-East Africa,-India,-Middle East as a result of the increase in temperature; cyclone Amphan, which was classified as one of the most powerful, deadly tropical cyclones ever to impact Bangladesh and India; as well as fires which burned more than four million acres across California, about doubling the previous record of nearly two million acres set in 2018. The world has started to wake up and climate activism is becoming a new reality.

Priorities Gen Z want companies to address

Priority	2019	2017
Environment	26	20
Poverty & Hunger	19	28
Human Rights	19	17
Economic Development	14	16
Health and Disease	13	10
Education	10	10

Such *social revolution* has become a focus of companies not only because of the change in their customers' behaviour, but also in the attitude of their potential employees. According to the 2020 Edelman Trust Barometer, which measures the change in societal and cultural values, 79% of adults would consider a company's mission and purpose before applying for a job and 56% of them would consider that company culture is more important than salary when it comes to being satisfied at work.[4]

And of course, investors are paying very close attention to what is happening around them and changing social trends and taking decisions accordingly. In the financial world sustainability is now best known as ESG investing (which stands for Environmental, Social and Governance). ESG is a strategic approach where a company explicitly acknowledges the relevance of the risk and opportunities linked to Environmental, Social and Governance factors which impact the long term returns of an asset or a company.

Amazon deforestation in 2020

And of course, investors are paying very close attention to what is happening around them and changing social trends and taking decisions accordingly. In the financial world sustainability is now best known as ESG investing (which stands for Environmental, Social and Governance). ESG is a strategic approach where a company explicitly acknowledges the relevance of the risk and opportunities linked to Environmental, Social and Governance factors which impact the long term returns of an asset or a company.

Investor groups are putting increasing pressure on companies in relation to their performance against longer term ESG factors. Impact investment, a term first coined by the Rockefeller Group in 2007, refers to the creation of a quantifiable impact that delivers both societal and financial returns. A new breed of investor is redefining the parameters of the capital markets. This kind of investor is not only driven by profit, but is mission driven and seeks to shape a better world to leave behind to the next generation. Sustainability-related investment already accounts for more than 43% of total managed assets in the world. This trend is only set to rise, with the likes of mainstream investment houses such as Bain Capital, BlackRock, Credit Suisse, Goldman Sachs and JPMorgan Chase, alongside smaller firms and entrepreneurs, all having business and investment strategies that are geared towards both profit and purpose.

This shows a clear recognition by both investors and companies alike that it is in their best interests to address all of the negative global megatrends impacting society, which will over time create drag on global economic prosperity. This is because basic inputs such as energy, water or land are scarce and expensive and need to be managed carefully, while the prevalence of health and income inequality will lead to increasing instability.

Technology and ESG

There is a clear intersection between technology and sustainability. Both trends are intertwined and each fuels the other. AI, IoT and 5G are technologies that drive business efficiency which may contribute to reductions in energy consumption and therefore fewer CO2 emissions. As an example, Telefónica, the Spanish telecom operator claims there is a potential saving of 20% of water from the application of IoT in agriculture, as well as 30% savings in street lighting or 23% from using big data applied to energy efficiency[5].

The next generation is now becoming aware of the important relationship between technology and sustainability. Girls are also getting involved in addressing climate change through the application of technology coupled with social activism. This is often referred to as the Greta Thunberg effect.

For example, in the U.K., a programme called FutureMakers[6], created by Sage Foundation, teaches young people how they can use Artificial Intelligence (AI) to solve social problems that matter to them. Within the programme, which is committed to gender balance, two girls, Jenatie Ganesharajah and Stacy D'Souza, have come up with object recognition software to catalogue marine life, to contribute to achieving the United Nations Sustainable Development Goal #14. The girls realised that 3 billion people around the world depend on marine and coastal diversity for their source of protein, and that many fish species were being rapidly depleted through uncontrolled fishing. They used image recognition of different fish to develop a publicly available catalogue of marine species. The software enables people to photograph fish and other marine animals, upload these images to a website and label and store them for future reference. Participants can also earn points to donate food to people who are dependent on the ocean for their nutrition.

Another example is "Impossible Foods"[7], one of my favourites. The 'impossible burger' was created by Stanford University Professor of Biochemistry Patrick O. Brown, who decided to devote an 18-month sabbatical to the goal of eliminating intensive animal farming. The company is backed by Google Ventures, Khosla Ventures, Viking Global Investors, UBS, Hong Kong billionaire Li Ka-shing's Horizons Ventures, and the Gates Foundation. The product gives people the taste and nutritional benefits of meat without the associated negative health and environmental impacts.

The company's researchers analyse animal products at the molecular level, then select proteins and nutrients from plants to recreate the experience and nutrition of meat products. It is a

pure technology company. The company says that, in comparison to making a ground beef burger patty from animals, making an impossible burger uses 95% less land and 74% less water, and it emits about 87% less greenhouse gas.

COVID-19 Impact

Inevitably COVID-19 has had a huge impact on everything and of course on how ESG and technology have evolved. In terms of ESG, this is a continuation of an existing trend, as both 2018 and 2019 have seen ever increasing pressure on companies to respond to environmental issues. The COVID-19 crisis has not only brought on the greatest recession since World War II, but investors are also calling it the 21st century's first "sustainability" crisis and one that has renewed the focus on climate change, acting as a wake-up call for decision makers to prioritise a more sustainable approach to investment. In 2020 we saw investors raising issues such as human capital (employee H&S, maintaining employment); capital allocation (share buyback programs, dividends etc.); community impact and supplier relationships, etc. A notable example has been the impact on access to capital. While in 2019, 82% of bonds issued were green and only 18% social, in 2020 the social category has overtaken green bonds by 53% to 47%. This confirms the investors' appetite for sustainable investment, and the increasing

4   Source: Edelman Trust Barometer / Korn Ferry / GlassDoor

5   https://bit.ly/3nTY2ky

6   https://joinfuturemakers.com/

7   https://www.impossiblefoods.com/

momentum and focus on environmental goals. Many policymakers and investors have come to view the crisis as a wake-up call that accelerates the need for a different approach to investing, with parallels being drawn between the hitherto unforeseen risks of a pandemic and the now well recognised threat of climate change.

Regarding technology, we have seen a quantum leap in digital adoption after COVID-19. Companies have accelerated the digitalization of their customer and supply-chain interactions and of their internal operations by three to four years. The share of digital or digitally enabled products in their portfolios has been accelerated by a remarkable seven years, while consumers have shifted much of their consumer behaviour to online channels.

Sustainability, or ESG, and technology are really linked to a company's core business and therefore to its P&L, its valuation and its impact on society. But we still need to work very hard in order to ensure that the focus on ESG is given even greater priority in order to really make a global impact. It is time to rethink how we consume, how we behave, how we manage our companies, and what legacy we want to leave for the future.

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Gema Esteban Garrido is a Senior Leader & Board Member, an expert in identifying trends in sustainability and applying creativity and strategic vision to top management decision making. Gema sees sustainability and ESG as key for companies in any sector if they want to survive and thrive in the future. She is an expert on ESG investment both from a Private Equity and from a corporate perspective: An ESG Global Advisor at IG4 Capital, a private equity specializing in impact investments in emerging markets, Gema is creating a proprietary methodology to embed ESG into the IG4 Investment cycle. IG4 are driving their portfolio companies towards the highest ESG standards with a special focus on social applications. Previously, as ESG Investors Director in Telefónica, Gema was instrumental in: the issuance of the 1st Green Bond of the telecom industry worldwide (EUR 1 bill in 2019, EUR 500 mill in 2020); staging ESG Roadshows with more than 300 investors from the USA, Europe, Canada and Australia; and leading other initiatives to position Telefonica as a global leader in sustainable innovation and achievement of the UN's Sustainable Development Goals.

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Video gaming: the future of virtual

Simay Dimic, Co-Founder, Recontact Games

Once seen as a peripheral part of the digital media and communications industry, the video game sector is fast being recognised as a key driver of economic and social connectivity into the future. Its potential has been clearly demonstrated during the COVID-19 pandemic, where lockdowns and physical isolation have led people to seek new ways to form connections with others. Video gaming has been one of the clear winners out of a very bleak and disastrous period in our human history.

Many in the video gaming sector have been busier than ever since the beginning of the pandemic. In fact, we have felt in some ways that our work in the industry has suddenly become recognised and valued like never before. Working in the production and distribution of video games, I have of course long recognised the potential of the technology to foster and grow social and business connectivity, in contrast to the stereotypes we often see in commentary on the social value of the industry.

As the virus spread and shelter-in-place orders and curfews were put in place, many millions of people became trapped in their homes for weeks and even months at a time, virtual connectivity in all of its forms became a vital tool for both business and society at large. Video games and VR became a means of escaping from the reality of being locked inside four walls day and night. During lockdowns worldwide, many have turned to mobile games as a form of entertainment and diversion. There are now estimated to be 2.6 billion mobile gamers in the world. As well as Netflix Party film viewings, Zoom, Teams and Skype chats, and many other online video and VR applications, video games have enabled many people, some for the first time, to experience the community of online gaming. Gaming over video chat has replaced person to person interaction and has become a social lifeline for many. As a result, the industry is starting to be recognised as a major force in the future of the digital media landscape.

Video games: diverse and transformative

As a game producer my passion and my aim is to make people fully understand that the gaming industry involves and is enriched by many different disciplines and people of many backgrounds. Far from the stereotypes often shown in the media - with the emphasis being on gambling, violence and addiction - the online gaming community encompasses people of all ages, genders, backgrounds, nationalities and outlooks, and is thus arguably one of the most diverse and inclusive sectors in the digital tech sector.

Because of this inherent diversity, I've always believed that video games have a multi-disciplinary power to overcome difference, to change the world and empower the younger generation in the 21st century. Games can generate a world-changing transformative movement. Interactive power through participating in a game arguably provides more visceral insights to the user than either a book or a film can do. Many creators are now using games as a powerful storytelling medium, or as a tool for education and communication of ideas. There is also the growing sector of competitive online video-gaming known as e-sports, which are aired on mainstream US media such as Fox and ESPN, and which are now becoming hybridised with real sports through the involvement of major sports stars as players, online characters and as investors.

The business of gaming

According to estimates in a May 2020 report by industry analytics firm Newzoo[1], the global game market was predicted to generate USD 159.3 billion in revenue in 2020. That would equate to 9.3 percent year-over-year growth and mean that the global video games sector is three times as large as the cinema and music industries. In contrast, Disney has reported losses throughout all of 2020, while the movie industry as a whole lost billions in 2020 according to multiple analyses as the shutdowns restricted or closed many sectors of the traditional entertainment and leisure industries. Furthermore, the gaming industry was predicted at the time to surpass USD 200 billion in revenue in 2023. The growth over 2020 may in fact show these to have been under-estimates of the industry's potential, as we anticipate that the market will in fact generate USD 217.9 billion in 2023.

All game segments saw an increase in engagement and revenues as a result of the CoVID-19 measures During the past year, we have seen the biggest growth in mobile gaming, as many internet cafes have been closed during the pandemic and the accessibility of mobile devices and smart phones has been growing around the world. According to Newzoo, mobile gaming will account for USD 77.2 billion in revenue in 2020, an increase of

13.3 percent from 2019. Of the USD 2.7 billion total gamers playing in 2020, 2.6 billion will have been playing on mobile devices. However, only 38 percent of these will pay to play games on mobile, according to the analysis.

Gamers and gaming are becoming more sophisticated. New era game creations will be differentiated by the evolution of human mobile interaction. Video streaming and 5G will have a key role to play in reimagining the future of gaming, as the technology becomes deployed in a broad range of areas, including healthcare, education, business, entertainment, sports, aged care and of course online conferencing. The technology will also rapidly evolve, through the increasing application of AI, AR and haptic (touch) technologies which will combine to change the consumption habits and preferences of gamers and other users.

Reflecting this potential, the game industry saw an estimated USD 20.5 billion in acquisitions, investments, and IPOs in the first nine months of 2020, according to game investment tracking firm InvestGame. The first three quarters of the year saw 211 gaming deals, 112 platform and tech deals, 89 esports deals, and 25 deals in other categories. Those deals generated USD 15.35 billion in value for gaming companies, USD 3.97 billion for platform and technology companies, USD 685 million for esports companies, and USD 504 million for others.

1   https://newzoo.com/insights/articles/newzoo-games-market-numbers-revenues-and-audience-2020-2023/

2020 Global Games Market
Per Device & Segment With Year-on-Year Growth Rates

Mobile **$86.3Bn** +25.6% YoY

Tablet Games **$11.4Bn** +7.3% YoY

Smartphone Games **$74.9Bn** +29.0% YoY

PC **$37.4Bn** +6.2% YoY

Browser PC Games **$3.2Bn** -8.7% YoY

Boxed/ Downloaded PC Games **$34.2Bn** +7.9% YoY

Console **$51.2Bn** +21.0% YoY

2020 TOTAL **$174.9Bn** +19.6% YoY

22% · 6% 2% · 20% · 49% · 43% · 29% · 29%

Mental health and VR

The pandemic has caused a mental health crisis around the world. Lockdowns have led to a new level of anxiety, depression and claustrophobia among the general population of all ages. Doctors are now turning to a contemporary solution - VR. When I talk to neurobiologists who work on VR, they say immersive technology has a unique ability to convey a sense of just 'being there'. What we definitely need in lockdown is a sense of being able to escape to wherever we would like to be. It might be walking in the mountains, being down by the beach, or just simply hanging out with friends, which we can do without even leaving our couch. There are many scientists around the world who have been discovering the surprising health benefits of VR, from treating PTSD, to pain management, to stroke recovery, and to managing dementia and alzheimers".

I believe that in the near future doctors could start prescribing video games and Virtual Reality to treat a range of mental health conditions, instead of just relying on medication. However given this potential, it is a concern that according to technology research firm Omdia, only 26 million consumer headsets[2] are owned globally. Once there is more understanding of the range of potential health benefits, we expect this number to increase significantly by the end of 2022.

2   https://www.cnbc.com/2020/05/02/coronavirus-could-be-catalyst-to-reinvigorate-virtual-reality-headsets.html

A new form of playable arts

Our motto at Recontact Games is that we are making playable arts. We aim to build games on the basis of a cinematic experience, applying direct game dynamics, not using the usual multiple choice storytelling model. We are bridging the gap between what were considered separate genres by combining cinema and video games into a new art form through pioneering technologies. Recontact integrates all branches of audiovisual art forms – cinema, photography, video, art, music and literature – all in one game.

Building on our experience and strengths in this area, we are so excited to be releasing an upcoming new game called Recontact:London. This project clearly demonstrates how playable arts are becoming reality. The lead actor in the game is Ross Mullan, who plays the character Whitewalker in the world-famous Game of Thrones television series, and who has also made a name for himself in projects such as Doctor Who and Clash of Titans. The original music which has been composed for Recontact:London is performed by 60 amazing symphonic musicians from a leading orchestra. The action takes place in parts of the British Museum, which was used by the Recontact Team for shooting the key scenes. This combination of genres with real life experience has enabled us to create a unique artistic experience for gamers. We believe this approach represents the future of video gaming.

Simay is the co-founder of Recontact Games, an Istanbul & London based brother (Eray Dinc) and sister (Simay Dinc) duo with backgrounds in the film industry in directing & producing. Their expertise in these fields is reflected in their award winning cinematographic mobile game series 'Recontact' which been lauded in the industry for its original content and approach. Simay is an executive board member of OYUNDER, which is a non-profit association founded for the purpose of supporting and representing the Turkish Game Industry as well as the founder of "Women in Games TR" that aims to promote the involvement, as well as the energy and creativity, of women in this industry.

The education ecosystem is key to entrepreneurial success

Margie Worthington-Smith, E³, South Africa

FUTURE
EDUCATION

Entrepreneurship is often touted as the key to economic and social advancement, and reduction in youth unemployment recovery post pandemic. As an entrepreneur with many years' experience, I agree that the goal of unleashing human potential and innovation is paramount in this regard. However, as an educator as well, I believe that too little attention is often paid by technologists to the whole ecosystem surrounding education of the young, and that addressing some of the long-standing challenges in education, especially in developing and disadvantaged societies, will lead to greater entrepreneurial success overall.

While not an expert in digital technology myself, like many others in the educational field, I have had to rapidly adapt to online learning as schools were closed during the COVID-19 lockdowns in South Africa. This has forced me and my colleagues to quickly adapt our teaching methods and styles to the new remote learning experience. For some, teachers and students alike, this has been a welcome and liberating experience. As in many places around the world – both developed and developing economies – this experience of 'digital transformation on steroids' has exposed a range of underlying issues in education and in society that we knew were there, but which have been put under the microscope by the pandemic.

The digital divide is something that has been talked about for many decades already, at the international, regional, national and local level. However, there was, I think, little recognition of the extent of disadvantage amongst pockets of our societies when it comes to access to education, which has now been exposed across all nations. In South Africa, this has spurred on the effort that we began post-apartheid, to drive systemic change in the educational system, and educational outcomes of all children and adolescents.

The holy grail in this regard has been the desire to spread equality of opportunity throughout all communities, with the ultimate goal of a significant reduction in youth unemployment. In other words, we have been seeking a relevant and effective educational answer – which includes digital solutions – which does not perpetuate and exacerbate disadvantage.

So, what has the pandemic and our response to it taught us – both about our objectives and also about how we need to go about achieving them? And what is the role of entrepreneurship in this picture, and how can we bring about cultural change in education to achieve our broader goals?

Let's first clarify our understanding of "entrepreneurship". For us it is the notion of being an "entrepreneurial" rather than an entrepreneur in the accepted understanding of the word. An "entrepreneurial" is like a millennial – but rather is someone of the search and discovery generation who believes in "if it's going to be, it's up to me". An entrepreneurial has an opportunity-seeking mindset that drives purpose in the search for an intersection between his/her interests and abilities

that also serve the needs of their fellow human beings.

An entrepreneurial is self-directed in the pursuit of opportunities that create value for others and through this empowers him/herself.

Having observed the response to online learning over the past year, and the individual responses of both educators and students to the challenges we have faced, I firmly believe that the key lies in creating and perpetuating a new type of educational culture. A culture of educational entrepreneurship – a mindset that will motivate the young to learn through their pursuit of solutions to meaningful problems and who therefore seek lifelong improvement.

The issue is not only and fundamentally one of access to technology – although of course this is a pre-requisite to being able to get online and take advantage of all that the online world can offer. But even if we do solve this challenge, and can give everyone equitable access to technology, the challenge runs much deeper. The issue is one that goes to the core of the educational ecosystem.

What do I mean by the educational ecosystem? Everything from the question of why education should be different; to how we should learn differently for the 21st century; to what that means for the way classrooms are set up, the way the timetable and curriculum are organized and run, to teacher training and skills requirements; and to the reward system that is put in place to encourage young people to develop an entrepreneurial solution-seeking mindset.

In South Africa, we have initiated a new approach by developing and trialing a locally adapted learning model of playful project-based learning. A pilot scheme was introduced in 2018 and culminates at the end of 2021 in a "blueprint" to be presented to the Education Department. The pilot is being rolled out in all 9 provinces, where the concept and its implementation can be evaluated.

In this process we also continue to focus on the role of teachers as coaches – a role which they have embraced during the remote learning experience during the pandemic. Here the teacher has become a motivator, a sounding board, and a mentor: all roles that are familiar to the entrepreneurial

community, but which have not been seen as a traditional part of the teacher's interaction with students.

In addition, we have recognised that teachers require their own particular support in challenging times such as these. We have partnered with the Praekelt group[1], the creators of Nurse Connect, to develop a Teacher Connect application connecting 333 schools and 6,000 teachers across the country. This app works via WhatsApp to empower teachers with new resources, and with connection to other teachers, to develop tailor-made solutions for their students – all based on the key elements of the SA learning model.

This model is driven by the goal to prepare teachers for their changing role in delivering engaging, meaningful learning opportunities that prepare solution-seeking learners to be able to engage purposefully in life after school – either as entrepreneurs, being employable or continuing their education or life-long learning. (Hence the name E³ (cubed) – i.e. the 3 Es of entrepreneurship, employability and education). As teachers are the key drivers, they need to be happy and intrinsically motivated by feeling driven to improve their mastery, their purpose and their autonomy. These elements of motivation and happiness are key to the teacher development model currently under construction. The learning model includes scaffolding tools (technological or otherwise) that support teachers to shift from the transmitters of information to being flexible facilitators of learning. Besides flexibility, teachers need to apply pedagogies such as experiencing, conceptualizing, analysing and applying where and when appropriate to ensure that the process is learner-centred.

Core to the SA learning model is the element of play. We believe this should be present in all learning throughout the inquiry, problem and design phases of project-based learning. This learner-centred approach takes place within the 7 critical key principles specific to the SA context of Ubuntu – the notion that "I am because we are". These 7 learning principles are SPECIAL i.e.: Socially interactive, Purpose driven, Enjoyable, Curiosity inducing, Iterative, actively engaging and Learner-centred.

All of these elements of the SA learning model

and the SA teacher development model create an ecosystem where learners will have honed their competency and mindset tools over 13 years of iterations that will result in them having a solution-seeking mindset that ensures that they are actively engaged and participating in life after school.

In this and other ways we are developing a whole of ecosystem approach to tackling the problem of educational disadvantage, and ultimately the root causes of economic and social disadvantage.

Margie's life has been driven by the desire to improve the lives of South Africans and particularly the youth. Margie established two civil society organisations – the job-creation organization, Triple Trust, in the 1980s and The Institute for Entrepreneurship in the 1990s. The latter focuses on developing learning materials to inculcate an entrepreneurial mindset in young South Africans. Margie has spent time as Executive Director of the Allan Gray Orbis Foundation, established to identify, grow and support high potential young South Africans to be high-impact entrepreneurs. She is a founding member of Activate Leadership, an organization with a network of over 4000 young South Africans, established to provide growth and connection opportunities for young people to become active innovators for public innovation. Currently Margie is the Executive Programme Director for E³(cubed) – a non-profit organization which is also a unit in the SA Department of Education. Its mandate is to prepare teachers through SA-designed learning and teacher development models that will result in learners who are prepared for life after school – thereby ensuring the lowering of the enormously high levels of youth unemployment in South Africa. The goal of E³ is to inspire 100% of learners to complete school and for 100% of these learners to study further, get a job, or start their own enterprises. It does this by using student-centred learning, including projects and games, in the existing curriculum to better prepare learners for the modern economy.

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1   https://www.praekelt.org/

The New Nordic School model

Pia Jormalainen, Co-Founder & CEO New Nordic School, Finland

> "
> **Only by changing education can our children compete with machines. We need to move away from teaching knowledge to teaching something unique that machines won't master: soft skills such as teamwork, strategic thinking, empathy, and more.**
> **– Jack Ma**
> "

There is a global learning crisis in our schools; the global education system as it stands today is struggling with outdated, high cost, poor quality and location-bound education. Schools around the world still focus on teaching knowledge that the students memorize for standardized tests instead of focusing on teaching skills that the students need when entering work life. We are at a critical crossroads in education on how we move forwards and innovate. We can either try and improve the current failing education system with incremental but diminishing returns or create a new system that is desperately needed for our next generation.

We live in a world where the future is unknown. Our children need a different skill set that includes critical thinking, creativity, collaboration, and communication – these are the 4 Cs. Education needs to evolve. We at New Nordic School believe that no one should be judged at any given moment; *every student has potential.* We encourage and support them to share their learning not through standardized tests but through evidence of authentic, enduring understanding. In our schools, learning is made relevant and brought alive by applying subject knowledge and skills to real-life problems drawn from the UN Sustainable Development Goals.

New Nordic School was founded in Finland in January 2018 by Pia Jormalainen, Suzanne Perkowsky and Janne Jormalainen. We at New Nordic School are transforming the educational journey through our K-12 solution. We use the renowned competency-based Finnish curriculum as our core, integrated with best pedagogical practices from around the world to create a personalized, multidisciplinary, and purposeful educational system. This places a strong focus on learning with joy, a school that promotes well-being, character building and fosters lifelong learning.

The New Nordic School Educational System consists of the *Nordic Baccalaureate curriculum*, innovative pedagogy, and the Smart Learning Platform. The system is available from pre-k to grade 12 and can be implemented in new and existing schools. The curriculum is fully integrated and interdisciplinary and provides personalized and purposeful learning. The four stages that transcend and link all areas of learning are: Exploration – Early Years Stage, Foundation - Elementary School Stage, Formation - Middle School Stage, and Direction - High School

Stage.

Mindfulness

In today's digital age, everything moves faster and stress levels, especially in children, keep rising. Rather than fighting for children's attention, mindfulness gives teachers the means to guide children to focus on being present in the moment. Our philosophy of mindfulness, for our staff and students, empowers everyone to think for themselves, lead their own teaching and learning and shape their own future, based on their interests and desires and not on external factors.

Mindfulness helps reduce stress levels, increase interest in learning and also increase learning potential. It guides in how to be in relationships with others, in ways that are socially and emotionally more intelligent. This, we believe, is the strongest asset against bullying.

Innovative pedagogy

Our pedagogical approach moves from a teacher-led classroom to a learning environment where students are empowered to lead their own learning, supported by teachers. Our curriculum integrates core competencies from the world-renowned Finnish National Core Curriculum with content and skills to create interdisciplinary and purposeful units of learning called Quests. The UN's Sustainable Development Goals (SDGs) are implemented as learning themes throughout the Quests.

Students have autonomy over the phenomena they investigate in each Quest and are mentored by teachers to synthesize content knowledge into personalized portfolios. In their portfolios, students show evidence of personalized applications of core competencies and content knowledge in innovative ways throughout the learning process.

Our pre- and post-implementation training upskills teachers and equips them with the skills and pedagogy to empower students for an unknown future. Our training does not focus solely on the renowned 'Finnish way' of teaching, but rather an international and future-ready approach that brings teachers autonomy in the classroom. New Nordic School's Smart Learning Platform supports the teachers by decreasing their time spent on

> **We live in a world where the future is unknown. Our children need a different skill set that includes critical thinking, creativity, collaboration and communication.**
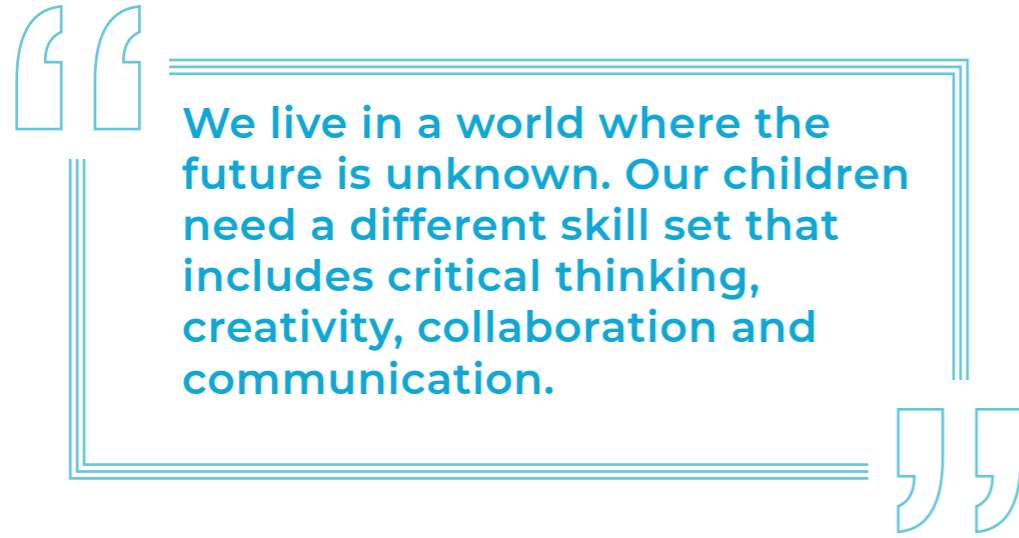
lesson planning and assessment.

Smart learning platform

We have created an integrated AI-driven technology solution which automates planning, creates dynamic suggestions of grouping and activities, and suggests next steps of personalized learning for students and teachers. Our platform solves two key educational problems:

· Mass scaling quality education by personalizing lesson planning for teachers
· Providing personalized professional development through intelligent content delivery.

By capturing data at each stage of our learning cycle, we are able to utilize artificial intelligence, big data analysis, machine learning and automation to optimize personalized learning integrated into our technology eco-system.

The pandemic as awakener

The COVID-19 pandemic has provided us with an unexpected opportunity to rethink and redesign assessment methods. The pandemic hit the world at the time when students in many countries were preparing for standardized tests. Standardized tests may provide useful benchmarks to ensure that students have fundamental knowledge at any given point in time, but they are not reliable indicators of future success at work, and they do not adequately prepare today's students for the realities of the modern workforce.

As many of the tests had to be cancelled during the pandemic, universities had to suddenly find new ways to evaluate an applicant's knowledge and skills for course entry. Test scores are just one piece of the puzzle of university admissions. We need to look at alternative or more comprehensive pathways which are not heavily reliant on grades and knowledge but draw upon various sources of evidence that evaluate the whole student which puts wellbeing and happiness at the heart of decision-making; portfolios and community action being just a few examples. Of course, subject knowledge is important and there is a place for it in education and careers. However, focusing on the skills and competencies needed to assemble that subject knowledge into meaningful and innovative solutions is how we set the stage for young people's future success in school and society.

We hope this experience enables parents, educators, investors, and governments to rethink how learning should take place, especially with the advent of new technologies. If used in the right way for personalization, technology will enhance learning and move us forward, but unfortunately, it will still not overcome the impact of poor teaching methods.

The future will rely on hybrid learning

The COVID-19 crisis forced schools worldwide to wake-up to the lack of means of delivery in times when bricks & mortar schools cannot be accessed. Many EdTech companies are trying to solve the problems of outdated, high cost, poor quality and

location-bound education by providing stand-alone solutions adding to the complexity of the teacher's life without solving the actual problem of outdated systems, including the curriculum.

To address the problems New Nordic School is providing a transformative, future-ready and complete educational system. As part of our Smart Learning Platform, we are developing a hybrid school solution that will deliver in part an automated personalized future-ready curriculum to all students regardless of ability.

The hybrid school solution:

· Enables schools to provide highly scalable, instructor-free, schedule-free learning
· Brings personalized learning to each student, learning at their own pace and interest
· Showcases the student's progress, achievements, and competencies from all the activities and learning inside and outside of the school
· Improves the student's self-awareness and understanding of their learning journey

Our Solution combines 1) a future-ready proprietary K12 curriculum, 2) a proprietary machine learning-driven automated software and 3) our proprietary delivery and implementation mechanism to deliver

a fully developed Hybrid School globally at scale through a licensed business model. Our hybrid school solution enables knowledge-based subjects to be taught online, while social competencies and skills are taught in the classroom. Our outcomes ensure more students have access to quality education and leave school better equipped for today's world and an unknown future.

The New Nordic School educational system is already demonstrating its value as a new approach to the education and development of the next generation. It has already been implemented by many customers in India and France and its deployment is rapidly advancing with numerous new schools opening in India in 2021-2022 and a preschool in Finland.

It provides a solution for societies who are seeking a new approach, to ensure that the skills and knowledge achieved by the younger generation are equal to the enormous challenges in front of them. We invite all educational institutions and those interested in the future of education to embrace this new approach.

Pia Jormalainen is an internationally experienced leader with over 20 years of diverse experience in global business and marketing, in corporations and government agencies, as well as start-ups. Prior to co-founding New Nordic School, Pia helped start-ups scaling and internationalizing their businesses and completed her eMBA at Hanken School of Economics. Pia has lived and worked in Germany and Finland.

FUTURE
ENTERPRISE

The future will require a shift in work culture and mindset

Myrtha Hurtado Rivas, Global Head, Legal Brand Protection, Novartis International AG.

Undoubtedly, the characteristics of work will continue to evolve. We have already experienced a major change triggered by the combined impact of the COVID-19 pandemic and the increasing spread of advanced technology. However, many things were already being transformed and the pandemic has simply accelerated the trend. Trying to figure out what work will look like in future is a difficult exercise. I believe that we should all involve ourselves in the process rather than merely submit to it.

The pandemic has accelerated in many ways changes that were planned at a much slower pace and has shifted many real-world interactions to virtual ones. I believe many of the changes are here to stay. There are numerous articles telling us that we will never go back to the old normal; most explain how companies will need to adapt to it.[1] The pandemic has proven that many changes can be implemented more rapidly than previously expected - in particular, with respect to an increase in flexibility and productivity. This is an insight and upside that we should retain for the future.

For managers, a critical element will be how to get and maintain the engagement of all team members. As workers we will need to understand that our role is no longer defined by our title or job profile, but rather by our skills and capabilities. Bearing this in mind, I believe that the changes we have faced and the ones to come present us with many opportunities. This will not be the case in all industries and for all employees, but instead of being paralysed by the fear of losing our status quo, we need to embrace those opportunities. This is not to ignore that these changes may create further social injustice and it may also take time for the benefits of the changes to be realised and to bring about positive social impact.

Remote working for all?

I work as an IP lawyer in an international company and have held global responsibilities for the past 14 years. Therefore, when the pandemic hit us, I was already used to interacting with many of my team members via video calls and online chats. In addition, for the last six years I have been able to work one day a week from home, so that I was pretty much set up for working remotely. In addition, I spent the last decade trying to achieve a healthy work life balance, with varying success, so carving out private time to remain physically and mentally fit during lockdown was not entirely new to me. Still even for me, working from home on a permanent basis for several weeks in a row was not easy and the challenges varied according to the phase of the pandemic that we as a team were facing.

The activities with the highest potential for remote working are in the finance, insurance, management, business services and technology areas. Similarly, hybrid models of remote work will be available after the pandemic to the same category of highly skilled, highly educated and well-paid minority.

Should we just assume then that those working

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1   Gregor Jost, Deepak Mahadevan, David Pralong and Marcus Sieberer, How COVID-19 is redefining the next-normal operating model, McKinsey & Companies, December 2020, p. 2.

in intellectual property, or even more broadly, in legal services, will navigate these changes easily and quickly? We tick many of the boxes: most IP professionals have a higher education, have basic skills that enable them to use tools enabling them to work remotely and need to be flexible to adapt to the different clients and may have encountered an international component in their work and hence are used to virtual collaboration.

A recent analysis by McKinsey narrows down the industries, occupations and geographies that will benefit from this change[2]. Activities in many areas of manufacturing, laboratory work and agriculture cannot be done remotely. And whereas some other activities can be done remotely this does not always mean that they can be done as effectively as in person. We all have experienced this where a more direct exchange and for which empathy may play a critical role, such as coaching, building relationships, onboarding new team members and the like. Let alone classroom learning. We have also experienced a magic moment between humans during live interactions; I dare say that very few of us can recall such moments during a zoom call. This is important as those magic moments can be decisive in decision making, negotiations, learning, etc.

Further we should not assume that all workers, even those in advanced economies, have equal access to high-speed connectivity. If more people are to work remotely in future, governments will need to make serious investments in broadband infrastructure.

In all these considerations, the human factor cannot be ignored; the best technology in the world will not result in higher efficiency and productivity if our work culture fails to adapt. The risk of loss of engagement and isolation of workers is a serious consideration and we should all take appropriate measures to minimize these possibilities[3].

We need a cultural and mindset shift

The way start-ups work today is often promoted as

a desirable workplace model, where small cross-functional teams are enabled to make decisions and collaborate to tackle a specific task or group of tasks. The required talent to tackle the task can be sourced from any department within the company and/or is contracted just to work on this specific task. Technology and big data are used to enable the teams to be efficient and it will also create an environment where try and fail until you succeed is acceptable. At the same time technology will allow managers to follow on progress without the need for constant interaction and presence. This could translate into a structure where common processes exist to avoid creating redundancies and small teams would tackle the specific tasks entrusted to them within the framework of the corporate mission and values.

Critics may argue that achieving the corporate mission and values will always take second place behind profitability and shareholder interests. This neglects the impact that purpose and reputation have in the eyes of the consumer. Consumers now want to understand a company's purpose, which will impact how we define and prioritise tasks and link them to that purpose. If team members know how their own work relates to that purpose, they will feel greater engagement and will also experience a greater level of independence and motivation through working in a flatter hierarchy.[4]

The collaboration between companies in the pharmaceutical industry during the pandemic may have reduced the autonomy and ownership of outcomes of the individual companies, but the positive impact on the industry's reputation has been an important gain as well as a significant boost in motivation and engagement for employees.

AI will further transform our work

Another change that I expect to see over the next 10 years comes from technology. Leaving aside the risks associated with artificial intelligence (AI) for a bit, I believe that a lot of improvements can come from AI supported tools. Every morning I get a nice email telling me that I have certain meetings coming up and documents are attached to the

email based on the subject of each meeting. What if in the future the AI assistant were to search not just my inbox, but my entire electronic archive? This would substantially reduce the amount of time I have to spend looking for the appropriate document or email. My electronic assistant already blocks out time in my calendar for so-called focus sessions, and all I have to do is just confirm the choice. What if tomorrow we could set a limit on the number of meetings per day, and anything extra would automatically be rescheduled to the next available date?

Balancing benefits and costs

When thinking about how I picture myself working in ten years from now I can foresee further changes. But how would I ideally want to work? What are the costs and potential negatives of some of these new workplace benefits?

In my company, we started a cultural change journey a couple of years ago that includes many of these elements. We are trying to achieve an unbossed environment. We took inspiration from the book by Lars Kolind and Jacob Bøtter titled Unboss.[5] This approach aims to change the work mindset, empowering workers to take decisions at the lowest possible level in the organisation. To a certain extent a shift in power takes place. Combining this mindset with the launch of a vast e-learning program, the company aims at updating the skills of team members and energizing them.

Distributed working was introduced this year and in essence, it allows team members to work from home – within the country boundaries - whenever he or she wants. This freedom of choice comes, however, with a new responsibility: determining how and where to work. Some may see this as a way for a company to free themselves of a certain level of responsibility for the wellbeing of their workers. To this way of thinking, some of the measures which have been implemented now and to a certain extent are here to stay even after the pandemic, can be viewed as merely ways to reduce costs: i.e. building rental, maintenance and staff facilities like canteens and kindergartens for children of employees. Will this lead to an increasing emphasis on individual

responsibility of each person in our society? If so, it could undermine the largely accepted role of the employer today as provider of a social safety net through such things as above-market minimum wage, parental leave and promotion of gender equality[6].

A further impact will be the need for continuous upgrading of skills and qualifications, which raises the question of who will pay for this ongoing education? Let us face it; most of us, even those who work in technically advanced sectors, will need to be continuously re-trained to stay up to speed with all of these new technological developments. The upcoming changes are not limited to the use of basic digital tools. They will require a plan to achieve new levels of digital literacy in the long term.

We must also acknowledge that we are fundamentally creatures of habit. Do you remember when you had to switch from reviewing things on paper to doing so on a screen? How easy – or not - was it to convince people to stop printing and only keep electronic copies? Those were small changes in comparison to the changes we are already facing and will be facing in the near future. In addition, AI based tools will not only replace humans with robots in some manufacturing jobs. It is rather that humans will need to use AI based tools to increase efficiency and get better results. However, when productivity is increased the number of workers needed will decline, we have seen this with call centres and in many other business services areas.

A decade ago, we faced the challenge of defining and then outsourcing routine jobs that did not require company internal knowledge. In this sense, new technologies will also redefine what routine jobs are[7]. Similarly, as during the period of outsourcing, we hope to free up time for more added value tasks, but headcount reduction still may materialize. Even in the legal environment, these changes will take place and it is high time for us to ensure that our colleagues are reskilled in other areas so they can switch roles more smoothly.

In a recent Gartner HBR White Paper "Reconciling Cultural and Digital Transformation to Design the

2   Susan Lund, Anu Madgavkar, James Manyika and Sven Smit, What's next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries, McKinsey & Companies, November 2020, p. 2.

3   Susan Lund, Anu Madgavkar, James Manyika and Sven Smit, What's next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries, McKinsey & Companies, November 2020, p. 13.

4   Gregor Jost, Deepak Mahadevan, David Pralong and Marcus Sieberer, How COVID-19 is redefining the next-normal operating model, McKinsey & Companies, December 2020, p. 3.

5   Lars Kolind and Jacob Bøtter, Unboss, Jyllands-Postens Forlag; 1. Edition, 2012

6   Future of Work Trends Post-COVID-19, Gartner for HR, Long-Term Impact & Actions for HR, 2020, p. 5.

7   Kalyan Kumar and Rakshit Ghura, Reconciling Cultural and Digital Transformation to Design the Future of Work, White Paper, Harvard Business Review Analytic Services, p. 3.

Future of Work"[8] there is discussion of the scarcity of skilled workers and the fact that companies may not always be in the situation to be able to attract the required workers with high salaries or other monetary incentives. Short-term workers, independent contractors, freelancers and the like are filling the gaps. They are highly sought after. The employee no longer that needs to convince the employer of his capabilities, but rather the employer that needs to convince the person to come and work on a specific project for this specific company.

Gartner states also that almost a third of companies have a cost saving motive for replacing their full-time workers with contract workers. Where there may be some upsides to being a contract worker: higher flexibility to manage private and professional obligations, higher autonomy to decide for whom to work on and on what, and higher autonomy to decide where to work, it also comes with a higher risk of economic insecurity. Non-permanent employees are facing the highest economic pressure and have least access to financial support during the current economic crisis. In order to better understand the needs of employees, companies are increasingly using people analytics. This trend is likely to increase and we will need to delimit carefully what can be done by companies and what can't due to privacy and other concerns.

Preparing ourselves for the future

If we accept that some changes triggered by the pandemic are here to stay and others are to come soon, how can we best prepare ourselves? I suggest we use this extraordinary experience to define how we would like to work in the future and to compare this to what we think is reasonably possible.

I attended a TEDx Basel Women event at the beginning of December 2020 where Rebecca Ivey from the World Economic Forum shared her predictions for the future of work. She foresees a reduction in the number of working days per week. Referring to how the five-day working week was introduced in the US by Henry Ford in 1926 without a pay reduction, she made a compelling case for a four-day working week to give workers more free time. While this

may seem very attractive and may be appropriate for specific industries, we need to ensure that all potential impacts are being considered and the system remains flexible and can be adapted to individual needs. I am also concerned about the possibility of exacerbating further the already existing social gap/inequality between a highly educated, well paid minority of the work force and those working blue collar jobs. Primarily, the jobs that might suit a four-day working week will be for people delivering services and that often will have some type of higher education and skills that will allow them to take advantage of digital tools.

Consider letting go of titles and defined roles; try rather looking at your strengths abstractly. Then, let us assess if we have the required skills and define the training needed. What are the skills worth investing in? Do not shy away from asking your current employer for training or learning opportunities. Keep an eye on developments in your work environment; try to be part of the change. Finally, as things are becoming more fluid within corporate structures think about managing your network accordingly. Having access to the right contacts may become even more important in small cross-functional teams focused on delivering on specific tasks.

Myrtha Hurtado Rivas joined Novartis International AG in 2016 to lead the trademark, domain name and copyright function across all Novartis divisions, i.e. Sandoz, Novartis Pharma and Novartis Oncology, globally. Her breadth of experience in intellectual property comes from an extensive and diverse education; time spent at the Swiss Federal Institute of Intellectual Property in Bern, five years at Novartis Pharma and almost 5 years at Sandoz. She has particular expertise in intellectual property, anti-counterfeiting and domain name law, international business law, change management and the pharmaceutical industry, including defense and enforcement in these areas.

She is also the founder and executive producer of Leaderching, a weekly podcast in Spanish and English which covers topics around leadership and diversity.

Myrtha is involved in various IP associations, in particular she is the Chair for the INTA Anti-Counterfeiting Committee for the term 2020-2021 and the Chair of the ECTA WIPO-Link Committee. Of Peruvian heritage, she speaks German, French, English, Italian and Spanish fluently which enables her to take a global perspective. Her current appointment at Novartis has provided her with the opportunity to oversee the Legal Brand Protection function of one of the pharmaceutical industry's leading players, as well as to contribute to policy making.

How the COVID-19 pandemic changed the outlook for business

Dr Elisabeth Slapio, Managing Director, Cologne Chamber of Commerce and Industry.

The Chambers of Commerce and Industry in Germany, as self-governing peak industry groups representing the business community, are involved in many government measures to support the economy. They advise companies in their regions. Thanks to their constant intensive contact with their member companies, they provide politicians and the government administration with a real picture of the economic situation facing the German economy.

The pandemic has impacted many countries in Europe severely at a time when many national and global problems also need to be solved simultaneously. In addition to important energy and climate protection goals, the main focus is how to modernise the national infrastructure. Furthermore, the impact of digital transformation forces us to rethink our approach to achieving change in the economy and society. It is also an open question how the pandemic will ultimately

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8   Future of Work Trends Post-COVID-19, Gartner for HR, Long-Term Impact & Actions for HR, 2020, p. 6.

affect the way we all live together within our democratic structures.

At the Cologne Chamber of Commerce and Industry, it is my task to define what challenges need to be considered regarding the future of work, the future of investment and indeed the required infrastructure. Especially in the fields of innovation and the environment, there are changes which we identified would help us to overcome the COVID-19 crisis and the resulting recession.

A major concern we had as the pandemic progressed, was whether many of the government financial support measures that were introduced would enable business to survive the pandemic. For example, globally operating companies, such as the automotive and aviation industries, are dependent on substantial support due to massive downturns and subsequent losses. Small and medium-sized enterprises also needed support to bridge the COVID-19 period and emerge on the other side. There is a real risk that these companies will not have the financial and factual basis for a future resumption of business operations due to a lack of liquidity.

During the pandemic, the government in Berlin co-ordinated the development of the laws and regulations needed to address the public health emergency with the 16 federal states. This federal system distinguishes Germany from many other states in Europe. On the one hand, it can result in different framework conditions in each of the federal states. On the other hand, it also promotes individual solutions in the very differently structured regions of Germany.

At first sight, this process seems quite complicated. But it proves its worth wherever regional particularities of the economy make different solutions meaningful.

In terms of our day to day business, this means that the Chambers of Commerce and Industry in North Rhine-Westphalia work closely with the state government and its ministries to support the regional economy with appropriate measures.

Our main task is to represent the interests of business and industry in political discussion and in administration. Because of the severe impact of the pandemic, this task has become more challenging

and more urgent. Many issues have needed to be discussed intensively and resolved more quickly than usual. At the same time, the need for concrete help for our member companies has continued to increase.

Every day throughout the pandemic new regulations have been introduced setting out new rules that business must comply with. Companies have lost customers and have had to put their employees on part-time work or close the business entirely for liquidity reasons. At the same time, trade relations with other countries have been changing. Supply chains are under pressure because production processes have been stopped or reduced. It is clear that COVID-19 has had a very negative impact on all sections of the economy.

We are experiencing worldwide that the functioning of the healthcare system is reaching its limits. And the future also leaves open how a new basis for the economy can be created at the end of a pandemic. In addition, the clearly noticeable changes in civil society pose major challenges for the future of all of us. This is why we are working very closely with national and international business associations to explore these challenges and find solutions. We can only master the future if we solve the current issues together.

The Chambers of Commerce and Industry have been giving great attention to future changes that we believe will occur as a result of the pandemic, particularly for small and medium-sized enterprises.

In particular, the main issues we have discussed with experts from business, science and academia are:
- What effects do the changes in global industries have on medium-sized suppliers?
- What is changing in logistics, is the "just in time" practice obsolete?
- Is the new regionality an alternative model to global supply chains?
- The new world of work – what is it going to look like? Do we need more mobile workplaces and home office space?
- How will our employees, their working environment and the entire civil society develop in the future?
- Are there new opportunities for climate protection and energy supply to safeguard

future generations?
- Is ecology a new opportunity for a modern economy?
- Finally, we have seen that digitalisation cannot solve all problems. Is this the end of the hype and the belief in a limitless digital future?

The Chambers of Commerce and Industry in Germany are an essential component of the

economy and its democratic processes. Therefore, our employees are continuing to work tirelessly to support our members to emerge from these difficult times.

As managing director of the Cologne Chamber of Commerce and Industry Elisabeth Slapio is currently responsible for the business unit Innovation and Environment. In addition to supporting various industries, inter alia: companies of all levels of trade, information and communication technology companies, the tasks of her section include topics of innovation, technology and higher education, energy and environment, as well as the management of electronic government for the sixteen Chambers of Commerce and Industry in North Rhine-Westphalia. Furthermore, she represents the Cologne Chamber of Commerce and Industry in several national and international committees as a (board) member, e.g. member of the DIHK Committee for Information and Communication Technology, board member of BioRiver eV, member of the University Council of the Ruhr-West University and member of the International Board of the Global Telecom Women's Network (GTWN).

The case for a new employment framework

Alison Woods, Partner (Employment), CMS

It is no longer news to report that the world of work is likely to be changed forever as a result of the pandemic. From the initial shock and adjustment to a new working mode, attention is now turning

to the extent and nature of that change, and the consequences for workplace related policy and legal frameworks of a permanent change to working conditions and expectations.

> **"Intelligence is the ability to adapt to change."**
> **- Stephen Hawking**
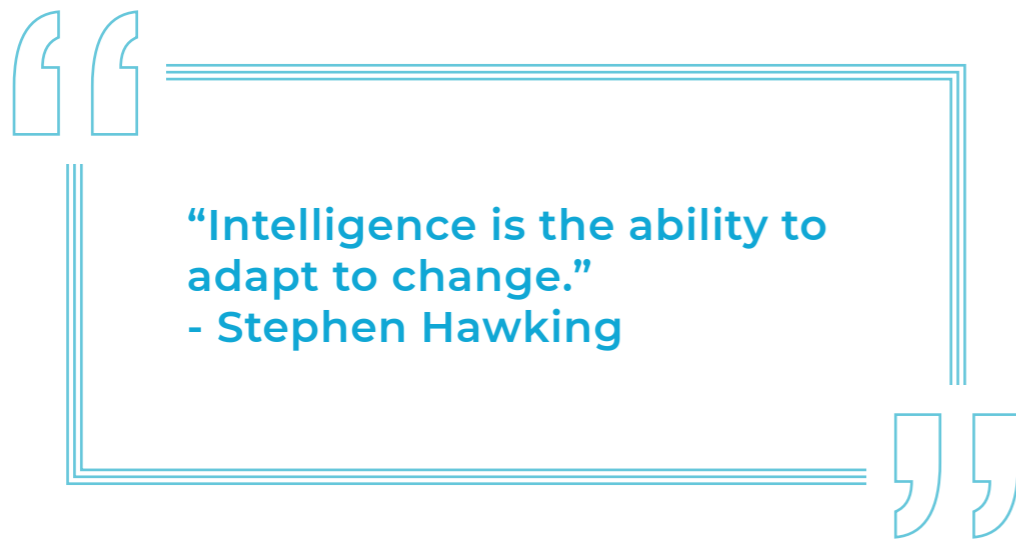
The 'new normal' is a phrase that has been coined many times since the start of the pandemic but in reality the lasting impact of 2020 may be to create working lives where there is no single solution or norm. In a matter of a couple of weeks we went from a pattern of work still largely based on "working 9 to 5" in an office environment, mostly in the CBD of major cities, to many of us having to suddenly fit work around our domestic and parental duties at home in the suburbs on a 24/7 basis. The complexity of the situation we are likely to continue finding ourselves in, notwithstanding the news of effective vaccines, will see a need to be able to find ways to thrive in ongoing uncertainty. This is a post-VUCA reality, where adaptive leadership skills will be needed so as to accept the absence of simple or permanent solutions to the challenges ahead. It is also a time when we need to reconsider what it means to 'go to work', and how we can best organise and regulate the relationship between home, work, family, employees and employers into the future.

A new concept of flexible work

For many years there has been a focus for workplaces of creating community; breaking down barriers (literally) in ensuring open plan had become the norm. Some employers even allowed workers – mainly young mothers, it has to be said – to work "flexibly", often on a 4 day a week basis. In hindsight, these 'social experiments' with workplace arrangements seem rather unambitious and tantamount to tinkering at the edges, rather than real reform. But until the reality of 2020 hit,

to have suggested that entire workplaces could be transported home, and remain effective, would have been met with healthy scepticism.

The difference during the pandemic is that there has been an understanding and consistency created in all employees, and all employers, being faced with the same extreme situation. Had it been that an individual employer wanted to attempt this move voluntarily in any other time, while their cohorts or competitors did not, it may very well have failed. Then there has been the impact of necessity – with no alternative, employers had to accept the reality of what faced them including (in some cases more quickly than others) ensuring that necessary equipment was provided at short notice.

The end of the office?

This may be the beginning of the end for the office, at least for the office as we have known it. Employers are looking closely at their office accommodation costs, as leases come up for renewal, realising that they can save a substantial part of their budget by reducing their office floor space. Surely a solution that would drive down employer costs while simultaneously driving up work-life balance would be an irresistible path post-pandemic? However, as we have moved from dealing with COVID-19 in crisis mode, to managing this as an ongoing reality, the cracks in this ideology have been revealing themselves.

This is not a question of whether businesses now choose to revert to pre-pandemic ways of working. Many are actively saying they don't wish to, with

well-publicised examples of organisations who were early adopters of permanent home working. Many others accept that agile or home working is here to stay in some form. For it to succeed, and to avoid the cultural and legal fallout that may otherwise sit behind it, employers and individual managers will need to be active in addressing a number of issues. The following is a short list of some of the issues that managers, and workers, need to be aware of, as we settle down into a new hybrid working model.

The potential for new inequalities

The pandemic has been unequal in its impact on workers. The nature of contracts has been at the front of this, with the winning ticket (relatively) being for those in higher paid, permanent and white-collar roles. Gender has also played an important part. To the extent staff have had caring and other domestic responsibilities, the evidence available points towards women having carried a much greater share of these.

A study by the IFS and the UCL Institute of Education[1] found that, during lockdown, mothers were materially more likely than fathers to be spending their working hours simultaneously caring for children. This resulted in mothers doing, on average, a third of the uninterrupted paid-work hours of fathers. At the same time, client surveys consistently support the proposition that women were more able to adapt to working remotely, and that men have been much more enthusiastic about the prospect of a return to the office. What will this mean in future about inequalities in the workplace. Will women choose (or have) to be the ones working from home, while men largely choose to return to the office; and what will this mean for the workplace environment and the prospects for advancement of those who stay home? Now is the time to take advice and plan carefully around how these new ways of working should be reflected in how employees are allocated work, rewarded and appraised. Engagement and equality should be front of mind. This could mean having an agreed 'base' day, where (in due course) everyone comes to the office so that face to face meetings don't exclude anyone; or leading from the top with managers – male and female – sharing their stresses and

successes in managing remote working.

Grey areas need to be clarified

While we may not realise it, working from home comes with many legal and other implications that need to be addressed by both employers and employees. Laws vary as to the responsibility that employers have for 'tele-workers'. In large part however, the framework of regulation has understandably been built around the idea that most workers will be at their employer's workplace most of the time. We have already seen many countries face waves of claims related to casual workers and their rights and status, in circumstances where legal protection has sometimes seemed ill fitted to the reality of the modern workforce. It should come as no surprise if claims from homeworkers are next on the horizon.

Of course, as workplace and employment laws and regulations differ between countries and regions, it is important for everyone to be aware of the rules governing working conditions in their own area and understand how these may be impacted by the change to working from home.

A key issue that employers were faced with at short notice at the start of the pandemic was whether or not they needed to have a *work from home (WFH) policy*. Such a document could cover the expectations of both sides – such as minimum (and maximum) working hours; provision of office equipment; adherence to company policies on workplace health and safety; and responsibilities of employees to undertake their duties effectively in a timely manner, regardless of location.

Many senior managers had not turned their minds to this issue until this year; it may have been considered a 'niche' issue in the company, one that was handled on a case by case, exceptional basis by the HR department. Suddenly when all of the company – including executives and indeed the CEO – found themselves having to work from home, the existence and details of a WFH policy took on a much greater importance and urgency. An employment lawyer can of course help with this, but it is also important that senior management understands the issues and adopts a reasonable approach consistent with the policies. Managers, who themselves are coping with all the

1   https://www.ifs.org.uk/publications/14860

same pressures, will benefit from training and opportunities to discuss challenges, so the policy can be robust – ensuring managers and employees alike can and will engage with it – and that it can adapt as we continue to learn from the evolving experience of home working.

Is my workplace safe?

Employers have a duty of care for ensuring a safe working environment, even where that work is carried out at home. On the other hand, employees need to take responsible precautions while doing their job.

Even before the pandemic struck, many companies already had a checklist to encourage employees to assess their own workspace, ensuring safety and also documenting awareness of risks. Once the bulk of workers were working from home, self-checking became the only practical option. Over the months of the pandemic this highlighted the need to move from emergency response to more long-term set up.

Examples of equipment provided to remote workers during the pandemic have replicated almost all items you would find in an office workstation, including laptops, office chairs with suitable lumbar support, and standing desks. Other companies have encouraged employees to salary sacrifice and purchase what they need for their home workspace. However, this approach requires caution as it may not abrogate the employer's legal responsibilities to provide a safe working environment.

Safety has also extended to safety of data, and businesses have gone from managing data security principally through controlling the location of data, to needing a developed approach that reflects the reality of having a distributed workforce. This is of course a particular concern where employees are dealing with sensitive customer information and may not have a secure connection to the company's digital environment.

Mental health has deteriorated

What happens, though, if your employees are just not coping with working from home? Many households have been placed under enormous strain during the pandemic. The lack of personal control has also been felt acutely by many employees, who have had very little option in how and where their time has been spent. Mental health has deteriorated as we have all sacrificed time with friends and family, as well as colleagues. Often, it is reported that work has bled into all the life spaces left vacant. Hopefully this, and the mental health impact, will reduce in a post-pandemic world, but this may still be some time away, and the issue of isolation is not one that will disappear. Employers need to consider how to provide support, both now and in the future.

As part of their duty of care, employers need to ensure there is an ongoing response to this. It is a complex issue, where it is not always clear where the line lies between business and personal responsibility. However, where employees are working and living on their own, employers who have been most successful in maintaining morale have not shied away from keeping an open dialogue with teams about the issues arising. Of course, this has included sharing resources and ideas for coping at home, and a range of online activities that are not directly connected to work. Where possible some have also arranged outdoor meetings, walking partners etc. From discussion with our clients, it is clear that there is no single fix to this issue; communicating well (from the top and at grass roots) and taking small regular steps to connect and support is proving most effective.

Privacy: a new work battleground?

A further consideration which may not immediately occur to employers is the impact on employee privacy, which may well be another potential battleground. We have long since reached the place where the ethical aspects of utilising a particular technology are as important as the practical ones. The ability to effectively manage performance, productivity and attendance across a distributed workforce is almost certainly going to entail some forms of monitoring going forward. However, the ability for employers to do this, and to introduce measures which do not overly intrude into employees' private lives and circumstances, will depend on individual countries' privacy laws, as well as workers' expectations.

This may become one of the most contentious issues to arise out of the switch to home based working post pandemic, given that privacy laws were already becoming increasingly restrictive, just as the technologies for surveillance and monitoring have become ever more sophisticated and accessible.

Alison Woods is an employment partner and co-head of the UK employment team at international law firm CMS, also sitting on the board of its international employment group.

Alison supports a wide range of international clients from sectors including energy, media, technology and consumer products, and has done so for twenty years. Having a particular interest in business transformation, Alison supports organisations through periods of significant change. She is named as a leading individual by Legal 500, and Band One ranked by Chambers and partners, where it is noted "She is commercially focused, with a no-nonsense approach".

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Preparing for a future unseen: why we need a new inclusive leadership model

Suzanne Grant, CEO, Canadian Advanced Technology Alliance

I often say that technology moves at light speed, while adoption happens at human speed. A few years ago, Industry 4.0 was the theme of a manufacturing conference in Montreal, Canada. There was a lot of excitement onstage, as if 4.0 technology had been teleported from space for a never before seen reveal. I leaned over to my host Jeffrey and whispered "what is all the fuss about

`- is any of this new"? Jeffrey Dungen's[1] Internet of Things (IOT) Montreal based company, Reely Active[2], had won The World's Best Start-up Award 6 years earlier.

What was new, however, was the embracing of Industrial IOT. The room was all in for connecting machines, and robots, from expansive geographies, sending sensor captured data to the cloud. Big data, machine learning and predictive analytics would deliver unthinkable macro predictive efficiencies changing industries forever.

4.0 and artificial intelligence (AI) assisted computer vision was already well underway in driverless vehicle technologies, but the enthusiasm for Industrial IOT observed that day in Montreal was the start of mainstream revolutionary-level adoption.

At the time, I was leading a med tech company in the brain machine interface space. You might call it Industry 4.0 meets biology. The interface is a tiny chip replacing a damaged retina. Bionic retinas allow blind people to see and ours would simultaneously communicate and record neural responses.

By supporting the bionic retina with IOT, gaming and simulation, cloud, predictive analytics and machine learning, human neural response data analysis could be used to optimise the input or "brain code", vision clarity and further our understanding of the brain. Using IOT, cloud, machine learning, with a retina implant was novel then. We had imagined a superior system using our tool box of technologies, collective expert and luminary knowledge, collaboration, creativity and possibility.

Exploring the brain frontier

Today, the convergence of rapid advancements across 4.0 technologies, like tiny inexpensive smart sensors, predictive data analytics, simulation, animation, the Cloud and 5G to interconnect them, is catapulting obvious benefits and driving unprecedented adoption.

Ray Kurzweil[3], Director of Engineering at Google, and co-founder of Singularity University claims the Cloud is subject to the law of accelerating returns – doubling its power every year. Kurzweill predicts that by the 2030s we will reach the singularity - the time when advances in technology, particularly in artificial intelligence, will lead to machines being smarter than humans. We will have the ability to extend our neocortex cognitive capacity by connecting the biological thinking part of our brains to a synthetic neocortex in the cloud via *The Internet of Medical Things. (IOMT)*

Driverless vehicles are amongst us now, but steering the future and shaping how we wish technologies to impact our lives and communities, needs critical human thinkers in the driver's seat. Diversity of minds to collectively imagine a future we can not yet see is essential.

Bryan Johnson[4], CEO and Founder of Kernel[5], is one entrepreneur exploring the brain frontier. He invested $100M of his own money in a quest for technologies that would make our lives better and is developing brain machine interfaces to augment our cognitive power. He argues that progress is no longer linear, based on doing the same things faster and more efficiently within existing frameworks. He believes our brains lack the cognition to keep up with what's coming.

As the rapid development and potential social impact of technologies bend what we know to be true, how can today's world and community leaders and educators prepare for an exponentially changing world pushed by technology not yet invented? How can leaders imagine the unseen and prepare frameworks to help their people navigate to their potential?

CATA*Alliance* and its members are striving for a better world

While Big Tech headlines frequently focus on the interruption of progress, like device addiction, election interference, identity and security issues, The Canadian Advanced Technology Alliance[6] is motivated to drive a better world.

Darwin AI[7] (Waterloo, Canada) works with organizations that are trying to leverage the most powerful form of artificial intelligence known as deep learning. They are making AI more robust so the decision making process of this technology can be understood. CEO, Sheldon Fernandez[8] explains "The idea of trustworthy AI is critical. Think about the benefits to a leader that is using AI to do any kind of predictive operation. They don't just want to know about the predictions but why the AI has made that prediction." Darwin AI recently used their technology in partnership with Lockheed Martin to help accelerate COVID-19 Diagnosis.

When asked what collaborating leaders need in their tool boxes to support a better tomorrow for people and the planet, Fernandez provided a surprisingly non-technical reply. "A peripheral interest of mine has been humanitarian work. You will sometimes hear artificial empathy, or artificial humanity almost. We are talking about the future of our species, developing that empathy for the other is so critical". Fernandez believes the tools for AI can support things like disaster recovery, identifying mass atrocity sites and crimes of that nature. Detecting hate speech for example.

Robin Strachin[9], CEO of SIMBL[10], is a Metis business enabler and solutions architect from Toronto. SIMBL's current project, Cloud Cities, is a one stop citizen-facing overlay pulling together and simplifying multiple digital municipality services. Strachin's passion project is more unusual, however. *IndigenousChat* is destined to preserve thousands of aboriginal languages threatened with extinction. Her chat bot, powered by deep learning, can teach itself verb based languages.

The United Nations is aspiring to preserve over 7000 indigenous languages, many under threat of extinction. An early step in cultural revitalization, and even reconciliation, is preserving language. Strachin further explains the benefits " In doing this you can open up people to the inter-generational oral stories and legends that the elders, the holders of the language, have access to. That can lead to the art and the legacy culture behind the stories, to be amplified, both generally, and by a NewGen of aboriginal arts and culture that have their roots in those legends".

On the subject of future preparedness, Strachin sees one of the problems being that the 'old guard' is still present. As new recruits and younger people join organisations, they are adopting old paradigms. Until you have people coming in and adopting new technologies, you aren't going to solve future problems adequately. She adds; "There's this massive sea change where old structures, old ways of doing things are breaking down in 2020 though. You can almost see it - like a wave. 2020 was all about breaking things down, seeing old ways that weren't working. 2021 – the new paradigms are coming."

Robert Smart[11] is a new Canadian from the UK. He has been simplifying the qualification and certification process for students, and defence and multinational employees for 25 years. Today his Ottawa based company, Vametric[12] uses video to provide evidence capture and validation for skills (all forms both hard and soft), process, productivity safety and apprenticeships. Their Valid-8[13] software platform overcomes race, gender, and disability challenges by providing a fair and transparent means to prove applied skills.

Soft skills and aptitude should drive education

Having technology that allows remote assessment

1   https://www.linkedin.com/in/dungen/
2   https://www.reelyactive.com/

3   https://su.org/about/faculty/ray-kurzweil/
4   https://www.bryanjohnson.co/
5   https://www.kernel.com/

6   https://cata.ca/about_cata/
7   https://www.darwinai.com/
8   https://www.linkedin.com/in/sheldonfernandez/?originalSubdomain=ca
9   https://www.linkedin.com/in/robin-strachan-10233111/
10   http://www.simbl.ca/

11   https://www.linkedin.com/in/robert-smart-15830041/
12   http://www.vametric.com/
13   http://www.vametric.com/learning-management-validation-assessment/

of any skill or process has helped to overcome COVID19 barriers and has seen educational and apprenticeship programmes carry on despite the pandemic. A remote ability to measure knowledge and soft skills is important in a country like Canada where 400,000 immigrants are welcomed annually. New Canadian employment and productivity is often hindered by a lack of international competency equivalencies.

How can educators develop curriculum for jobs skills not yet imagined? Robert Smart has seen a shift; skills are far easier to teach than attitude and aptitude. He says " soft skills, if you've got them - I can teach you, I can coach you. If you don't have those, you might have the best skills but you aren't gonna be able to evolve the business." So how do you measure those when everyone is an individual and everyone has different empathic ability? In this case you are trying to come up with models that don't exist.

New leadership for a future unseen

As the crisis caused by the global pandemic passes, we should not forget the lessons learned. Future crises are inevitable, with ongoing threats such as climate change, food insecurity, a post pandemic economy with crushing public debt and a deepening divide between the 1% and the 99%. Technologies are anticipated to drastically contribute to unemployment by replacing human jobs with robots and vehicles that drive themselves.

To meet the complex challenges ahead, our leadership teams need to include people who understand the myriad of new technologies, their capabilities and how they can be pulled together. We also need to bring in the creatives and the philosophers, the social scientists and visionaries, artists and visualisers. We need a more creative and listening mindset, far more collaboration and frameworks that accommodate more unknowns. Our decision tables need to be larger, more inclusive and led more creatively and with more empathy. To succeed and overcome the challenges ahead our leaders need to make a paradigm shift toward agility, greater generosity and decision making at lightspeed.

Suzanne Grant is the CEO of the Canadian Advanced Technology Alliance. The Alliance is a group of C-Suite emerging technology leaders who accelerate the adoption and export of Canadian technologies. CATAAlliance creates pathways to people, opportunities and funds, enhances private and public policy collaboration, and amplifies the brand of Canadian Technology. Suzanne is also Co-Chair of the the E-Crimes and Cyber Council, a joint body of the Canadian Association of Chiefs of Police & CATAAlliance. She was previously co-founder and Chair of the medical technology early stage company iBionics.

Supporting start-ups to scale-up: the CMS equIP programme

Jo Eckersley, CEO of Bubbl Tech and Liliana Reasor, CEO of SupraFin were interviewed by The Mobile Century.

The CMS equIP Programme[1] is dedicated to supporting start-ups who are intellectual property rich. Once selected for the programme, participants receive a number of benefits, including discounted legal advice on a range of issues key to the success of growing start-ups as well as access to a global network of industry leaders and mentors.

The Mobile Century (TMC) spoke to two participants in the equIP programme to understand how they started out on the path towards successful tech start-ups, and to discover how membership of equIP has helped them to succeed.

Jo Eckersley, CEO of Bubbl Tech.

Since running the school shop at 14, Jo has been a serial entrepreneur. Her passion for great customer service led to Bubbl, a new award winning mobile customer engagement tool that is disrupting the world of mobile advertising and marketing. This ground-breaking technology supercharges existing mobile apps with geolocation and rich media location-based content. Her business development and management credentials come from a long career as an innovation consultant to technology start ups, and as a PR and marketing expert across multiple brands. She is also passionate about leading with heart which reflects the company culture that emanates from Bubbl.

TMC: Can you tell us how and why you were attracted to a career in digital technology, and what sparked your interest in developing a service like *Bubbl*?

Jo Eckersley: I have always had a strong interest in the creative industries and began my career in media and advertising before moving to drive communications and marketing through my own PR agency in a diverse range of creative industry sectors. From my beginnings in PR with these businesses, it was a natural progression for me to set up an innovation consultancy, helping creative businesses to understand the potential application of digital marketing and technology to the creative arts, particularly in the fashion and jewellery sectors. When I started 15 years ago, not many people in these industries were making the connection between the creative process and digital tech: even today people are sometimes amazed when they realise the potential applications of 3D printing, body scanning, robotics and data analytics to their businesses and to their interaction with their customers.

TMC: So how did you progress from this beginning to a broader interest in developing and applying digital technology to PR and marketing?

Jo: I had the fortune to be selected to be one of the first monitoring officers for Innovate UK. My job

1　Further details are available from our platinum sponsor CMS at https://cms.law/en/int/insight/start-ups

was bit like the judges in the TV show, Dragons Den, in that I helped select projects for UK Government funding, and then monitored and accompanied them on their start-up journey. I also contributed to a UK Government White Paper on digitalisation of the creative industries, and the need for knowledge transfer between universities and business, to unlock the creative potential of the UK. This in turn fed my desire to help bring the advantages of digital technology to an industry that I love. For me, the creative industries now cover not just fashion, design, music, performing arts and jewellery, but also software design. All of these industries are able to benefit from the appropriate integration of digital technology to their production, marketing and consumer relations.

TMC: And so how did you go from there to creating your own technology start-up business?

Jo: I started to seriously question the direction that marketing was taking in the digital space. Businesses were not taking full advantage of the opportunities that digital technology presented to them, they were clinging to an old fashioned approach, on the one hand shying away from digital to improve process and service, but at the same time falling victim to a rapidly emerging world where advertising online was using third party data to dictate to the customer what they like and dislike, controlling interaction with a Brand, and frankly treating the customer as a commodity, rather than a real individual.

So to help change this I decided to start *Bubbl*– a simple plugin for any app, with API's and a cloud-based platform that let businesses serve high quality conversational content like video, podcasts or surveys, or deep links to articles or m-commerce, for mobile users. The content is contextual to time and place and is triggered by geolocation. Bubbl plugs into any existing Brand app and works without the app even being open, making it really easy to use.

In contrast to other digital marketing tools for mobile, Bubbl enables direct engagement with a mobile audience, where the consumer also retains control of their data and their privacy.

TMC: What has been the market and industry reaction to Bubbl?

Jo: We have a lot of traction with clients in the entertainment sector, who see the potential in particular in the geo-fencing capabilities of our product. Event organisers can trigger location relevant content and enable access to various value-added material to specific groups of users, which in turn allows them to more effectively engage with their audience. But the potential applications are in fact unlimited – from hospitality, to retail, to banks, to tourism. This potential for meaningful customer engagement is being recognised, in that we have already received a number of awards. We were named one of three finalists in AdTech Europe in 2018 and are one of Tech London Advocates Createch top 50 ones to watch in. the UK. I was also very flattered to be named by my peers as one of the five rising stars in Computer Weekly's Most Influential Women in Tech in 2019.

TMC: What technology advancements are you planning in the near future to further enhance Bubbl's value to its clients and customers?

Jo: Once 5G is more fully rolled out, we will be able to take advantage of geofencing down to about a 10cm radius, as opposed to current location-based services, which can only identify a location down to 5 meters on Android devices, and 50 meters on IoS devices. We will be able to target and engage with customers on an ever more precise and differentiated basis. Rather than having a broadcast type approach, where everyone receives marketing regardless of relevance, Bubbl will turn any app into a tool for brands to really build their own community turning their app into a communications hub. We believe this will enable a revolution in m-commerce and experiential events, bringing new revenue streams and opportunity to the growing mobile marketing sector.

TMC: What drew you to the CMS equIP programme, and how has it helped you in your start-up journey?

Jo: As a start-up in the creative sector, we were always crucially aware of the importance of legal protection for our intellectual property assets. We had been working with a solicitor from another firm from the beginning, but our growing needs led us to seek out a legal firm with much wider industry and geographic coverage. After all, as we plan to scale up the business, we want to be sure we are adequately protected in all jurisdictions that we operate. The equIP programme has enabled us to

take advantage of legal advice where needed, at a much reduced price (very important for a small start-up); but importantly it has also provided us with a clear framework and pathway as we continue to grow the business. An unexpected benefit was the network of industry peers we have found through the programme, as well as supporters. It is a real bonus to be able to take advantage of the expertise and experience of others who are going through this journey with us and those who have gone through this journey before us.

TMC: What is the one piece of advice you would like to offer to other female entrepreneurs who may be starting out on their own journey in the digital tech space?

Jo: Simply to trust your own instincts, to keep your eyes on the goal of using digital technology for economic and social good, and to find a support group, like that of the equIP programme, that can help support you when the going gets tough.

Liliana Reasor, CEO SupraFin

Liliana Reasor is a Blockchain & Fintech entrepreneur with 20+ years of experience in fintech and investment banking. She is the founder and CEO of SupraFin, the first wealthtech platform for cryptocurrencies. She is considered a fintech, blockchain, and cryptocurrencies thought leader. She was selected as one of the Top 100 Global FinTech Women Influencers and Leaders in 2015, 2016 and 2017 by Innovate Finance. Prior to becoming an entrepreneur, she worked in FinTech (portfolio & risk analytics) and investment banking at JP Morgan, Bank of America, Deutsche Bank, Morgan Stanley, and Moody's Analytics in the US and the UK. Liliana has a M.S. in Computational Finance from Carnegie Mellon University, an MBA from UCLA Anderson, and B.S. in Petroleum Engineering from UNI. She won the top finance award at UCLA Anderson, graduated top of her class at Carnegie Mellon University, and was valedictorian at UNI.

TMC: Liliana, can you tell us what brought you into digital tech in the first place, before you began work on your fintech start-up, SupraFin?

Liliana Reasor: It was a natural transition for me, as I have worked for more than 20 years in the financial services industry, including trading, corporate finance, investments, M&A and risk and investment management software. I recognised the trend to digitalisation of financial services very early on and decided that the future lies in the digital transformation of all aspects of finance. Once cryptocurrencies came on the scene, it was clear that they could transform the investments and capital markets industry, and that all areas would become reliant on fintech for future growth and innovation.

TMC: So what do you think were the internal drivers of your interest in creating a fintech start-up?

Liliana: I really believe in using technology for good – to benefit consumers and the general population, especially in an area such as finance, where the vast majority of people find it challenging because

finance is a complex industry. For example, many high-net-worth individuals rely on investment advisers to help them manage their investments. On the other hand, the majority of people do not have the resources to hire financial advisors, and this is where technology has started to play a key role to allow the automation of financial advice for the benefit of the masses. Technology first allowed the creation of online brokers; however as time passed by and technology improved, then in 2008 it became possible to start automating some aspects of financial advisory for the benefit of the people. The use of technology to automate some of the investment advisory aspects became even more important with the arrival of cryptocurrencies, as they are quite complex to analyse. As people are drawn to investing in assets classes with large potential returns like cryptocurrencies, then I knew there was a huge need in automating the investment management process for cryptocurrencies for people that could otherwise invest in the worst cryptocurrencies or fall prey to scams.

TMC: How does SupraFin work, then, to achieve these aims?

Liliana: SupraFin is a smart wealthtech digital platform that helps people create customized and diversified portfolios of cryptocurrencies. Customers can use the platform either via an app, or online. The platform leverages proprietary investment and risk models exclusively built for cryptocurrencies to evaluate and select the best cryptocurrencies and to recommend diversified portfolios of cryptocurrencies. The platform asks a few questions to customers to figure out their cryptocurrency risk preferences and then based on that it recommends a diversified portfolio of cryptocurrencies. Then, they can modify the portfolio or buy the recommended portfolio at a push of a button. SupraFin is integrated with cryptocurrency exchanges that do the actual purchase of cryptocurrencies. Once the portfolio is created, the client can check the performance of his or her crypto investments through the platform and will get an automatic alert if the platform determines that, in order to stay within the target risk of the portfolio, it is necessary to rebalance their portfolio as the risks may have changed.

TMC: Can you give us some more detail about the range of crypto assets from which the SupraFin platform selects its proposed investments.

Liliana: There are thousands of cryptocurrencies and they are currently considered to fall within four broad classes. Firstly: *exchange tokens* which are based on public blockchains (e.g., Bitcoin, Litecoin, Ethereum); secondly: *utility tokens*, which are tokens issued by companies to customers in exchange for future products and services and that are put into some public blockchain like Ethereum; thirdly *stable tokens*, which are those tokens backed by relatively stable collateral like the US dollar and that are provided by some public blockchains like Ethereum; and finally security tokens, which are tokens backed by securities such as equity or bonds, again Ethereum has been the dominant blockchain for many of these tokens. We are focussing on exchange tokens and stable tokens for now. We have plans to add utility tokens and security tokens to our investment offering in the future.

TMC: What do you see as the major challenges that you have faced as a female led start-up in the fintech sector?

Liliana: As a UK based start-up, I think there are a number of challenges here and in Europe that are less prominent in the US market. In the US, especially California, there is an entrepreneurial mindset and culture and there are plenty of venture capitalists who are prepared to back new start-ups. Many people who want to establish a start-up in the US get friends and family to kick in some seed funding, and using this, they approach other investors through their networks. There are many investor networks in the US, but this is only just starting to become more usual here in the UK

and Europe.

As a woman also, I think that the investor culture in Europe and the UK is not yet ready to support women as much as men, especially in a male led field such as fintech. This adds a further level of challenge to overcome, when people are not used to women entrepreneurs in fintech. I am lucky that now I have managed to engage with some leading finance professionals who enjoy working with strong women in fintech and who believe in SupraFin's vision and who are helping SupraFin broaden its investor network. Also, I am pleased to hear about the work of the Global Telecom Women's Network (GTWN), and how they and their allied networks are helping female entrepreneurs.

TMC: So how has the equIP programme helped you in addressing these challenges?

Liliana: I joined the CMS equIP programme in May 2020, during the UK coronavirus lockdown. I had got to know the CMS team earlier, as they held some cryptocurrency events that I attended. But then I was fortunate to be contacted by the program manager and invited to participate. This came at the right time for my business, as I knew that I would be facing many legal questions as my start-up grew, and I needed access to affordable legal advice. So far, the program has held some great virtual events, and has introduced me to a range of other entrepreneurs and advisers. I also have a monthly teleconference with my equIP contact, to see how I am getting on, and if there are any issues that I need help with. I look forward to seeing what will happen in the program from here.

TMC: What about the policy and regulatory framework that surrounds cryptocurrencies? Is it still the "wild west" of finance, or are governments and regulators starting to understand the need for more regulatory and policy oversight of this sector? Are there gaps that you believe need to be considered and acted upon?

Liliana: When you consider the financial services sector generally, the banking sector is heavily regulated and controlled by government licences, laws and regulations. Many governments are now starting to understand that cryptocurrencies are the future, and that they might underpin most if not all of the financial transactions and assets in the future. The UK Government, for example, now

has a regulatory framework for cryptocurrencies. Based on the UK Government framework, security tokens are regulated, for example, because they are linked to securities, which are already regulated. Other types of cryptocurrencies like exchange tokens for example, are not regulated because the UK Government does not want to stop innovation, and it does not regulate technology. Also, in the UK, cryptocurrency companies like exchanges and custodians have to register with the FCA for anti-money-laundering compliance (AML).

TMC: What is your advice for people wanting to become entrepreneurs and establish a start-up?

Liliana: First and foremost, you need to have the right team in place. This can be a challenge in itself, and I am very lucky with the great team at SupraFin. Secondly, you need to identify who can provide you with the funding that you will need to set up and grow your business. The needs of the business will change over time, and therefore the funding you need will also change, in both volume and character. Thirdly, you need to have a vision, and be passionate about what you are doing, and you need to persevere, otherwise you will not make it. Passion is contagious – it infects everyone around you. And perseverance is very important – I remember Arnold Schwarzenegger, who is himself a great entrepreneur, said that you need to embrace failure. Not because you aim to fail, but because you need to face your worst fears of failure, and this will liberate you from those fears so that you can succeed. Then if things don't go exactly according to your plans, you can pick yourself up and try again, you will not give up.

Interview by Vicki MacLeod, Editor-in-Chief of TMC

Contract law: how to navigate risk in an uncertain world

Ingrid Silver and Jonathan Andrews, Reed Smith LLP

2020 will be remembered for many things. The COVID-19 pandemic quickly changed the world as we know it, causing worldwide lockdowns and mass reliance on technology. The Black Lives Matter (BLM) movement shook the world, whilst tectonic shifts in the relationship with China, trade negotiations in the lead up to Brexit, death of Ruth Bader Ginsburg (a particularly great loss to the legal profession), and the US presidential election (and its unprecedented aftermath) all caused much consternation.

2020 was undoubtedly a year of great change – some might even say a year of chaos. As lawyers, it is sometimes said that our role is to bring order to chaos. Therefore, we should perceive the events of 2020 as an opportunity to re-evaluate how we engage with the rapidly transforming world around us and attempt to make sense of the chaos that we are facing.

What chaos *are* we currently facing?

Many will be familiar with the "known knowns", "known unknowns" and "unknown unknowns" concept popularised by then US Secretary of Defense Donald Rumsfeld, in 2002.[1] In attempting to understand different levels of certainty, there are some observations we can make:

- *Things are happening faster and bigger.* The BLM movement has been around for many years and the issues that it addresses are not new. However, the movement erupted and became a global phenomenon overnight, largely due to social media.
- *Existing trends have been accelerated.* For example, high street retail was already in difficulty before the pandemic but that decline has since been accelerated due to lockdowns. On the other hand, tele-working, tele-health and tele-education which have been possible and available for a long time have become embedded in our day-to-day lives.
- *Unexpected things are happening more.* Within a few months, the emergence of a new pneumonia-like virus in Wuhan, a province in central China which was until then little known in the rest of the world, led to mass illness which within a few months brought entire economies to their knees. This may seem like a truism, but as the world becomes more complex and interconnected, and everything is getting faster and bigger, consequences and outcomes become more difficult to predict.

Overall, the changes we are seeing are being amplified by technology and globalisation. Since globalisation and technology are unlikely to slow down, it is highly likely that the associated change, chaos and uncertainty are fundamentally here to stay. The real question is not how do we deal with what's happened or is currently happening, but rather how do we deal with the fact that we don't know what's coming next?

The need to change our approach to contract law

Traditionally, contracts have been founded on clarity and certainty. Without clear and unequivocal drafting, terms and clauses can lend themselves to varying interpretations increasing the risk of disputes. It follows that uncertainty is a thing that lawyers are least comfortable with. Our focus on things that are within the control of contractual parties means that we give minimal attention to changes happening outside of the contract. In an environment where external circumstances are fast-changing and filled with unknown unknowns, it becomes clear that our approach to contracts is no longer fit for purpose.

By identifying our approach to contracts, we intend to start a discussion about how we can address change through using the current legal tools at our disposal, but also with tools that go beyond the strictly legal realm. These tools, together with their shortcomings, are dealt with below.

Common legal tools at our disposal

In the legal profession, we have common contractual tools that we often turn to as mechanisms for dealing with certain types of uncertainty. However, to make the best use of them it is important to recognise the limitations of these tools, one being their sometimes binary and inflexible outcomes. Therefore, they do not necessarily provide the best route for parties that are navigating fast-changing circumstances.

Force majeure (FM)
An FM clause is intended to excuse a party's performance if an unforeseen event outside of that party's control prevents performance. Since the COVID-19 pandemic, we have seen a shift towards the inclusion of pandemics in FM clauses. An FM clause can have broad wording in an attempt to include a range of events or it can list specific events (or a bit of both). The difficulty is that judges tend to enforce FM clauses strictly - meaning that, if an event is not listed in the FM clause, a judge is unlikely to uphold the event as FM. Although pandemics are becoming a permanent feature of FM clauses, we are unable to predict and explicitly include other unknown unknowns.

Frustration
Where an FM clause does not feature in a contract, frustration is a common law doctrine that could be relied upon when a frustrating event entirely beyond the parties' contemplation takes place. Frustration could therefore be a useful tool for unknown unknowns. Parties that contracted prior to COVID-19 are likely to be able to rely on frustration in light of the pandemic. However, a limitation arises for parties contracting in the wake of COVID-19, who would arguably have contemplated a pandemic. This makes frustration an inflexible legal tool when an event, like COVID-19, is continuing.

Warranties and Indemnities
Warranties and indemnities allow parties to allocate risk and liability by providing a mechanism to seek compensation and/or recover losses upon a specific event. The focus of these provisions is often about known knowns, and it is here that their limitations in a fast-changing world become more obvious. They are often drafted tightly at the request of the party giving them, which means that they are rarely of assistance in the face of unknown unknowns.

Termination of contract
A termination clause provides the primary mechanism for a party to exit a contract. In changing circumstances, a termination clause is useful because it can be widely drafted to capture, for example, termination for convenience. However, it is important for a party to properly assess its position before making a knee-jerk reaction to terminate; bringing the contract to an end in this way is a binary solution that can damage commercial relationships, and it ultimately ends in an unsuccessful contract for both parties.

Repudiatory breach
A repudiatory breach allows the innocent party to treat the contract as being at an end where the breach is serious and goes to the core of the contract. This common law tool could provide a non-contractual termination route for the innocent party when its counterparty breaches conditions of the contract during changing circumstances. However, much like contractual termination, repudiatory breach results in a potentially damaged commercial relationship and an unfulfilled contract.

Additional legal tools for flexibility and adaptability

There are other legal tools which are not typically used for managing unreliability, but which could usefully be applied to do so. These are provisions that typically focus on the parties' obligations and

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1   https://digitalcommons.wcl.american.edu/cgi/viewcontent. cgi?article=1898&context=auilr

how they are being carried out under the contract. The key advantage of such tools is that they are extremely versatile; they can be drafted in as much detail as required to capture the nature and degree of information that would be most useful to the particular contractual relationship when facing changing circumstances.

Reporting obligations
Reporting obligations are often included in a contract to ensure that a party reports on financial (or other) performance. To tackle unknown unknowns and to create an early warning system, it is possible to incorporate reporting obligations on other information. Some examples in light of COVID-19 could be reporting on use of the furlough scheme or any change of management. The clause also allows parties to specify the frequency of reporting as necessary. From a holistic perspective, the aim of inclusion of reporting obligations is generally to force a counterparty to focus on the issues they have to report on.

Change management
A change management clause is usually incorporated when a contract has large or complex deliverables that require collaboration between parties. The clause allows either party to notify the other when there needs to be a change in scope of activity under the contract. It also provides a mechanism whereby the parties can reach consent on the change within specified timeframes and agree on any other changes that will flow from it. In changing circumstances, the inclusion of such a clause can provide an effective mechanism that delivers a solution suiting both parties. It can also create better prospects for delivering a mutually satisfactory outcome rather than termination for breach. This is particularly so when faced with "unknown unknowns", given that a change management clause allows the contract to adapt to changing circumstances, whereas termination merely ends the existing relationship without providing a framework for future dealings.

Dispute escalation
Similarly, a dispute escalation clause can provide a framework clearly identifying who needs to be involved and any specific timeframes when an issue arises between parties. This clause could reduce dependency on formal dispute resolution mechanisms which may be less available in a crisis (as was the case with the court system in the early

stages of the pandemic) and reach an agreement that meets both parties' interests without the high cost.

What to focus on?
The key points to capture when employing these additional tools are:

- *Who* needs to be involved?
- *What* information would a party benefit from knowing in order to take decisions in a changing circumstance?
- *When* would a party need to know the information by?

Looking beyond legal tools

As the world continues to rapidly transform, we should be shifting the paradigm in terms of how we approach contracts. We identified above that we should view legal tools from a different perspective, but we should also re-evaluate how we engage with the businesses we support and the industries we work with. It may become clear that we do not necessarily sufficiently understand the vulnerabilities of businesses within the industry or how business models might be challenged by fast-changing circumstances. Therefore, when we talk about re-engaging, we mean re-visiting our knowledge of that particular industry with a fresh perspective.

We should also consider the data points relevant to businesses that we are not currently capturing. An example is climate change risk and the significant impact it could have on several industries. Importantly, we should ask ourselves: are we equipped to understand relevant data points and what skills, tools or disciplines could we turn to? Some theories around useful skills are:

- The importance of hybridity[2]: in circumstances of ambiguity, it is more effective to combine at least three areas of expertise rather than simply rely on one. By using a hybrid approach, we can address ambiguous problems with more meaningful and complete solutions. For example, a lawyer could combine legal, technological and psychological expertise. Or it may be better for small teams with diverse skill

2   See work by Dev Patnaik, e.g. https://consciousleadershipweekly. com/016-dev-patnaik-empathy-business-culture-conscious-capitalism/, for more information.

sets to work together.
- *The O-shaped lawyer*: lawyers of the future should develop rounded skills and new approaches to working in the profession. In the face of unknown unknowns, an open, opportunistic mindset could especially help lawyers avoid getting stuck in a risk-averse rut.

What other tools are available to us? Demystifying the jargon

Automation can be useful for scaling a particular approach, for example building in reporting obligations to a set of contracts. It is also useful in evaluating existing agreements and identifying relevant provisions. At the beginning of the pandemic, a company could have benefitted from using automation to review all its FM clauses to see if pandemics were covered.

Smart contracts are a piece of code that is performed automatically without human intervention, for example an automatic transfer of ownership or funds. These contracts are not flexible by nature, but they could have a valuable place in delivering certainty and accountability during unknown unknowns by ensuring that external circumstances do not affect the performance of a contract.

AI and machine learning are a computer's ability to perform certain tasks based on data that has been inputted. AI is completely dependent on the data that is inputted so it is difficult to input around unknown unknowns. However, upon learning the data, AI can help us to process and employ it in an efficient way.

Agile development is a technique employed in software development processes, which involves a lot of iterative processes and in-flight testing to minimise flaws in the end-product. There are learnings that lawyers can take from agile development to improve the output of our work during changing circumstances[3].

The human element

Organisations across sectors are increasingly considering how diversity of background, identity

3   See the Business Agility Movement for more information.

and thought, especially in leadership positions, can make a difference in dealing with unknown unknowns. There is substantial evidence that diverse teams and diverse leadership are generally more successful and make better decisions. Harvard Business Review found that diverse (including cognitively diverse) teams are able to solve problems faster than less diverse teams[4], and a white paper from online decision-making platform Cloverpop found that when diverse teams made a business decision, they outperformed individual decision-makers up to 87% of the time[5].

In terms of practical examples, it is worth considering how countries with female leaders have responded to COVID-19. Data from a report called *Leading the Fight Against the Pandemic: Does Gender 'Really' Matter?*[6], confirms that COVID-19 outcomes have been better in female-led countries, and among the best responses were New Zealand and Iceland, the only countries to date to have had more than two women elected as head of state or government. There is also evidence to indicate that the same trend has been replicated across business sectors.[7]

Looking beyond gender to other forms of diversity, such as intersectionality, another noteworthy example is the strong performance of Norway's COVID response. Norwegian prime minister, Erna Solberg, is openly dyslexic, and her leadership during the pandemic has been strongly praised as playing a key role in this national achievement. The key takeaway is that diversity is a key asset when it comes to approaching how we deal with unknown unknowns.

Living in a changing world

2020 – and probably also 2021 - will be remembered for their chaos. Organisations across all sectors have been, and in all likelihood will continue to be, affected. Businesses across the Entertainment and Media sector, for example, have had to adapt to severe restrictions on in-person gatherings, but have also benefited from an increased focus on live streaming, and, in some cases, from greater take-up of remote and flexible working reducing

4   https://hbr.org/2017/03/teams-solve-problems-faster-when-theyre-more-cognitively-diverse
5   https://www.cloverpop.com/hacking-diversity-with-inclusive-decision-making-white-paper
6   https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3617953
7   https://www.bbc.co.uk/news/business-54974132

the amount of office space required. Organisations would be wise to recognise this chaos, examine how it affects their work, and ultimately embrace the increased rate of change we are currently seeing – because it is probably here to stay.

Ingrid Silver is a partner in the Reed Smith global Entertainment and Media Industry Group operating in the space where media, communications and technology converge. Her understanding of often conflicting cultures and expectations of all sides and engagement with a wider variety of stakeholders has enabled her to broker complex and innovative deals and provide strategic, solutions-focused advice on key industry developments throughout her distinguished career. She joined Reed Smith in 2017 having been drawn to the firm's international base and largest entertainment and media group of lawyers in the world. Ingrid's clients include blue-chip corporates as well as early-stage innovators and disruptors. Much of her work is international. In addition, Ingrid is European President of the Global Telecoms Women's Network, a member of the IBC Council, Special Advisor to the Mobile Ecosystem Forum, an investor, Board Member Mobile Market Association MMA and a qualified French/English translator.

Jonathan Andrews is an associate solicitor in Reed Smith's Entertainment and Media team. He has experience in a range of work, including transactional management for key clients and advisory matters regarding developments in copyright law and international jurisdictions. He has undertaken secondments to leading international clients Bauer Media and GVC, where he dealt with Commercial Agreements, Terms & Conditions, Licensing, Intellectual Property, Data Protection and Defamation. An advocate of inclusion in the workplace, he is a member of Bauer Media's Diversity and Inclusion Forum (Belonging at Bauer) and the Law Society's Equality, Diversity and Inclusion Committee, and in 2020/21 was named the UK's 4th most influential disabled person in the Disability Power 100 List and ranked #13 on the global OUTstanding LGBT+ Future Leaders List.

Evaluating the risks and opportunities of working from home

Alison Pennington, Senior Economist, Centre for Future Work, Australia

Lockdowns imposed in response to the coronavirus pandemic in Victoria meant that entire cohorts of workers who previously interacted in the flows of the daily commute – the morning coffee, dropping kids off at school – were suddenly pulled apart and isolated from each other, connected only by the occasional masked "hello" on the street. Businesses and workers moved fast in March 2020 to implement new remote-working models. Almost overnight, hundreds of thousands of private homes were transformed into workplaces.

As Melbourne emerged from these lockdowns, we acknowledged our public health success had not come without immense sacrifice. Healthcare and other frontline and essential workers exposed themselves to the virus to help keep us safe. Hundreds of thousands of low-paid workers in customer-facing sectors were pulled off the job to stop the spread.

But COVID-era work sacrifices are not simply dependent on what industry you work in. It also matters on what work conditions people had coming into the pandemic, with those in insecure jobs the first to be discarded in the crisis. The pandemic has shone a light on the growing scourge of insecure work. Around half of all employment in Australia has one or more dimensions of precarity including casual, temporary, part-time insufficient-hours

work, and self-employment. Precarious work contributed to the community spread of the virus, such as in the private aged care system where widespread practices of multiple jobholding led to transmission between facilities.

As 2020 drew to a close Melbourne had not yet fully returned to the office. Up to half of private sector workers and a quarter of government workers were finally allowed to return to the office on 18 January 2021, with further easing of restrictions planned, depending on continued success with containing transmission. However, public health orders, employer demands to reduce crisis-era labour costs, and workers' preferences means that working from home seems certain to become a permanent feature of the new world of work: surveys suggest that 81 per cent of workers at home want to keep working from home in some capacity.

Relaxation of top-down workplace practices seems one silver lining of the new working from home (WFH) regime, as employers are forced to shift their focus to output rather than presence. Employers could well learn people work better without others breathing down their necks.

Personally, I have found there's much to like about WFH. I've finally unpicked my blue-collar work ethic to white-collar work, understanding getting the best from your brain doesn't mean smashing it for eight hours straight. I sometimes intersperse work with playing music, with the piano sitting next to my work desk. However, as well as moving to Melbourne just in time for the lockdown, my neighbour started renovations – a months-long bespoke "mate's job", no swift commercial job. Working life became waking abruptly to circular saws followed by endless days of a "soothing downpour" of white noise through my headphones. It is sitting in my closet under a blanket doing radio interviews. Needless to say, I'd like to return to an office – at least on those very loud days. There'll be workers like me; home workers who want some hybrid between home and external office work. The opportunity to share workspaces with others..

We estimate at the Centre for Future Work that around 30 per cent of the Australian workforce could feasibly work from home: a total of about 4 million workers in total. But that total could not be achieved overnight: it will take time for necessary adjustments and systems to be established. Likely

no more than half that total (or perhaps 15 per cent of workers) are able to work full-time from home right now. In many respects, people who can work from home are relatively well-positioned to get through the pandemic crisis. They can continue to earn an income but are insulated from the contagion risks associated with most other workplaces. In contrast, those who continue working outside their homes, despite the lockdown, must confront frightening health risks: most acute for health care workers, of course, but also for many other, often low-wage occupations (like retail clerks, drivers, and cleaners). While they are fortunate to keep working in (relatively) safe conditions, Australians working from home (and other offsite locations) nevertheless confront several important challenges and risks as they migrate their work to a new location. Social media posts dwell on the mental and emotional challenges of home work: like the temptation to wear pyjamas all day, or the distractions of Netflix and the refrigerator. But there are far more serious issues to be considered, as millions of Australians make themselves a coffee, get dressed (hopefully!), turn on their laptops and get to work.

Moreover, the COVID-19 pandemic is sparking a more lasting shift in the nature of our work. Various home work, telework, and remote work arrangements were already becoming more common before the pandemic, reflecting a range of motivations: including lower labour and infrastructure costs for employers, and greater convenience and flexibility for workers. Now home work is experiencing a more powerful, sudden impetus. And normal employment patterns will not suddenly be restored, even once the health emergency has passed and we are able to go back to work. Private businesses will be organisationally and financially battered by the pandemic; consumer-facing industries will face continuing health-related restrictions on their activity; and desperate workers will seek any means of supporting themselves, including various independent ventures conducted from their own homes. Some workers may prefer to continue working from home, and hence demand flexibility to do so after the pandemic passes. Others will be longing to get back to normal work, and the human interactions that come with it. For all these reasons, therefore, working from home will likely become more common in coming years. For millions of workers, indeed, it will become the 'new normal.' Since this form of work is here to stay, it is important to consider the economic and legal issues that will

have to be considered as the trend becomes more common.[1]

Working from home doesn't suit everybody

People able to work from home are more likely to be professionals in permanent, full-time and better-paid work. In many ways, we have been protected from the worst health and economic impacts on workers. Though this doesn't mean high economic and social costs haven't been incurred by the WFH workforce. Risks and costs are mounting, including upfront and ongoing costs of running a home office, long work hours, income and job insecurity for employees with high caring demands, and the absence of a national WFH work, health and safety program.

Keeping up with our jobs while confronting the constant anxiety of a global pandemic crisis has hurt many people's mental health. Half of those working from home report increased stress, depression and self-harm. UK research suggests we face a tsunami of musculoskeletal workplace injuries as workers make do with dining tables, coffee tables, and desks ill-designed for eight or more hours of work. This is why we need a new system of workplace protections for workers facing increased isolation and the risk of work intensification. France introduced a law requiring employers to implement software prohibiting emails from being sent outside office

hours – this one I like!

But under current workplace laws, employees remain powerless to get out of the house and return to a formal workplace post-pandemic without a corresponding entitlement to return to the office. As the recession deepens, millions of unemployed and insecure workers will continue to face great hardship. The fiscal costs of this mass displacement will be huge, but longer-run social costs – poverty, exclusion, despair, non-participation, declining health – will be even greater.

Working to build more secure labour markets is about reducing risks that major events don't hit the most vulnerable hardest. Job-creating investment, quality public education and skills systems, income supports, and extending minimum labour standards like collective bargaining are critical to an inclusive post-COVID recovery.

While flexible work arrangements are generally beneficial, it will be important for workers to maintain personal choice in the decision about whether to work from home, and to have the right to come into work when that is preferable. When Australians can once again move freely and leave the home for work, employees should be able to reject working from their private homes if it is unsuitable to their needs. The pandemic is our clarion call to create not just more jobs, but good quality jobs that reconnect millions to the experience of decent, ongoing work. Though we're fatigued, this is where the work really starts.

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1 See the full report and its recommendations here https://www.futurework.org.au/working_from_home_in_a_pandemic_opportunities_and_risks

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The future of work for women – Women4Impact

Sahar Albaharna, Innovation and Technology Expert, Bahrain

During the COVID-19 pandemic and its response we have seen significant shifts in the way we learn as well as the way we work. The world of work, as we knew it, has changed beyond recognition and probably for ever. The unprecedented acceleration in digitalization has upended our daily routines, our presumptions about where and how we can work, and what we need to do our jobs effectively. Economy-wide digitalization represents many more opportunities than challenges in relation to the creation of a better world of work for everyone.

It has, however become equally clear since the start of the pandemic that women's economic participation has been disproportionately impacted by the crisis, with many of the roles traditionally undertaken by women being restricted or even halted during government lockdown measures. As countries around the world emerge from these restrictions, women's economic participation and recovery will be an essential part of the solution to the global unemployment crisis that is emerging post pandemic. It is also clear that urgent reforms to employment opportunities for women are needed as they have the potential to produce significant macroeconomic gains.

We know that when more women join the workforce, there are many economic and social benefits, not just to the women themselves, but to their families and to the broader society. When women are enabled to participate in the workforce and utilise their skills and abilities, economies tend to grow more, while it also contributes positively to women's well-being. Despite this, according to the International Labor Organization[1], women's

participation in the workforce globally is still only around 49% of capacity, compared to 75% for men. And this comparison does not take into account the disparities in income levels between both groups and the resultant disparities in opportunities and outcomes.

Women4Impact

As the impact on women's participation in the economy became apparent, Women4Impact was co-founded by a global group of changemakers and innovation experts, with the purpose of unlocking women's full potential, leading to a better world. In line with our purpose, the team's activities are driven by a belief in the benefits of cocreating solutions, collaborating, and finding new and innovative ways of solving problems regarding women's economic participation. First, we wanted to understand the *challenges* women face in order to come up with relevant solutions.

Women as primary caregivers

Many women leave the workforce early in their careers to take care of their children or sick family members. Of course, many women do not find these family commitments, to children and elderly relatives, a burden, and choose to stay at home with their children or take care of family members and some decide to continue work on a part time basis only; both choices are perfectly fine. It is only when women find they don't have a choice and are not given the opportunity to contribute to the economy that it becomes a serious problem for them personally but also for the economy.

Female entrepreneurs

Research shows that women have less access to funding when launching their businesses compared to males. They also have less access to mentoring and fewer connections that would support them in their entrepreneurial journey. A recent study by Boston Consulting Group[2] presents that if women and men around the world participated equally as entrepreneurs, global GDP could rise by approximately 3% to 6%, boosting the global economy by $2.5 trillion to $5 trillion.

Women in the workplace

Diversity programs within companies are still not achieving the desired results. An article in the Harvard Business Review, Why Diversity Programs Fail[3], states that some of the most common tactics for improving diversity -- compulsory diversity training, hiring tests and grievance systems -- can actually make diversity worse. The number of women holding senior positions in many companies are still low. In some regions around the world such as Sub Saharan Africa, female university graduates have less employment opportunities than males. We need for more effective solutions.

Future of work

We organized our first "Reimagining the Future of Work for Women"[4] Sprint from September 28 to October 2, 2020. The timing of the event coincided with the release of McKinsey & Company and Leanin.org's Women in the Workplace 2020 report, which sought to highlight the potential for women arising from the pandemic:

> *The crisis also represents an opportunity. If companies make significant investments in building a more flexible and empathetic workplace—and there are signs that this is starting to happen—they can retain the employees most affected by today's crises and nurture a culture in which women have equal opportunity to achieve their potential over the long term.*

The objective of the Sprint was to analyse the challenges around women's economic participation and create innovative solutions. The Sprint followed

the Exponential Organizations[5] and Exponential Transformation 10 weeks Sprint[6] methodology. The objective was to identify the challenges related to women's economic participation, explore the current trends and emerging technologies that are shaping the future of work, and finally come up with solutions for these challenges.

There were 16 female participants from Bahrain, Spain, Colombia, Cameroon, South Africa, the Philippines, and Tunisia and a team of 2 male and 5 female coaches from Spain, Mexico, Austria, Canada, South Africa, Malaysia, and Vietnam. In addition to location, there was diversity in the participants' career background and level of experience. Discussion focussed on technologies such as artificial intelligence, machine learning, robotics, and 3D printing, which are making many jobs obsolete, while they are also creating a need for new jobs and can be tools to improve women's economic participation. For example, a team from Spain was addressing the aging population in Spain and the fact that most women leave the workforce at some point to become caregivers for their elderly family members. Their solution to help these women was to create a wearable application that would detect falls, heart attacks, and loss of consciousness by monitoring vital signs and other data which allows the person wearing them to become more independent.

Women4Impact focuses on three main areas to find *solutions* to the challenges confronting women:
- How to upskill and reskill women who are already in the workforce
- How to assist women to enter the workforce: Innovative Recruitment models that hire women based on their skills. Solutions need to target female university graduates and women with employment gap that want to return to the workforce
- Providing support to female entrepreneurs.

Upskilling and reskilling

According to the McKinsey Future of Work Report 2020, *"Between 40 million and 160 million women globally may need to transition between occupations by 2030, often into higher-skilled roles."*

1   https://www.ilo.org/infostories/en-GB/Stories/Employment/barriers-women

2   https://www.bcg.com/publications/2019/boost-global-economy-5-trillion-dollar-support-women-entrepreneurs

3   https://hbr.org/2016/07/why-diversity-programs-fail

4   https://www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace

5   https://www.entrepreneur.com/article/341439

6   https://www.openexo.com/exponential-transformation-book

Through our work with multinationals, we know that the need for business transformation and innovation for companies is on the rise. Critical thinking and problem solving are essential skills needed for the future workforce. Moreover, according to the OECD Report in 2018, Bridging the Digital Gender Divide[7]: Include, Upskill, Innovate: The importance of innovation for economic growth and for the advancement and well-being of societies is well understood and supported. But very little is known about the role that women play in shaping innovation dynamics.

The scarce attention devoted to the role of women in innovation stems from a number of factors, including the relative "invisibility" of individual innovators, as compared to the emphasis generally put on innovations themselves, the processes that lead to them, and the companies or universities and innovation systems in which they happen (see Agnete Alsos et al., 2013). With this in mind, we believe that women play an important role in creating innovative solutions to drive business transformation. Therefore, one of our solutions aims to upskill women in STEM and business to become innovation and transformation leaders in their organizations.

New recruitment models

Many companies may want to hire women, but they may not know how to identify the best talent. Research shows that biases exist when recruiting women. Traditional recruitment methods are increasingly viewed as ineffective, with companies moving to skills-based hiring. Indeed, business school graduates may struggle to find employment, while companies are hiring talent through hackathons, datathons, and design sprints. This gives women an opportunity to be hired based on their skills.

Female Led Social Impact Start-ups

Women are more likely to start and succeed in creating a business with a social and environmental impact. Government entities are calling for more social impact start-ups. Creating funds and initiatives such as the Cartier Women's Initiative[8], is a trend we expect to see grow in the near future.

Grasp the opportunity

We cannot predict exactly what the future of work for women will be, but the opportunities and solutions mentioned above can be a path towards a more diverse and inclusive economy. The shift towards becoming purpose driven, new policies to support remote working, global employment opportunities, and hiring women based on their skills are key in driving this change. Also, the female leadership archetype is becoming more popular and we are seeing empathy and collaboration celebrated as essential leadership attributes for now and the future. I believe that the future of work for women is bright and we have an ideal opportunity to do something about it now.

7   http://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf

8   https://www.cartierwomensinitiative.com/

Sahar Albaharna is passionate about creating positive impact through problem solving. She believes in the power of abundance to achieve that. Professionally, she has over 9 years of experience in the technology industry where she managed and worked on projects in the telecom, financial services, and government sectors. Since 2009, she set up two businesses in Bahrain and was a founding member of the first tech accelerator in Bahrain in 2016. She is now working with tech entrepreneurs and organizations to solve business and social problems. Sahar holds a Computer Science degree from the University of Kent and an MBA from IE Business School.

FUTURE
ECOSYSTEM

Digital societies: are we looking for simple solutions to complex questions?

Cecilia Alvarez, EMEA Privacy Policy Director, Facebook

The digitalisation of our social exchanges, business activities and interactions with public authorities has been greatly accelerated due to COVID-19 lockdowns and social distance and mobility restrictions. We now work remotely, online; we use digital payment apps instead of cash. We are used to logging in via QR codes through our phone cameras; we send e-greetings, make short videos of our friends as birthday greetings, virtually visit museums and listen to concerts; we even attend university courses online; we register births or deaths remotely and execute legal documents with a digital signature, etc.

Digitalisation has enabled services to be tailored to an individual's actual or perceived needs.

This encompasses from personalised banking to personalised medicine, personalised education, personalised shopping or personalised travel experiences. A significant number of online business models have been based solely or partially on personalised ads, either as part of the core service or as an ancillary feature of another core service. Personalised ads have also financed the provision of certain free services, including email, videoconferencing, search engines, social media, navigation or games, to name a few.

Digitalisation has created its own neologisms that correspond to popular new digital behaviours. We google someone or have an insta moment; we zoom, skype or teams instead of meeting in person; we create a spotify playlist; while some have become an influencer or a youtuber. Our language has expanded to encompass new social norms, such as sending a message in vanish mode, unfriending or accepting someone. For those overwhelmed by all of this, there is a digital detox, which has even given rise to new labour rights, such as the French or Spanish right to be digitally disconnected. Popular culture has been changed forever, with emojis and GIFs that are (audio)visual neologisms that are particularly powerful ways to express emotions as well as gender, age and racial inclusion.

The processing of personal data is an invisible element of the design, implementation and technical maintenance of these activities, involving multiple actors in a complex ecosystem. But rather than rely on a more sophisticated approach based on our skills in history, philosophy and maths, we are tempted to reach for simplistic solutions. To understand this further, I have focused on three particular issues: (i) the unclear role of consent, (ii) the impact of an inflexible approach to data protection, and (iii) the privatisation of justice without social consensus.

The unclear role of consent

Consent is one of several mechanisms under the EU data protection regulations, the GDPR, which legally justify the processing of personal data. Under the GDPR consent is not considered more important than other legal mechanisms. However, we have created complex legislation that nobody fully understands as only 'data protection experts' can apparently understand what it means to rely on any legal basis other than consent. To read a privacy policy, and understand whether contractual necessity, vital interests, legitimate interests, or public interests, might apply, requires users to have both the legal acumen and the determination to do so. Further, the GDPR promise that individuals

are empowered to control their data, creates false expectations and distrust of organisations that rely on any legal basis other than consent, which is the only one users seem to actually understand.

Further, some data protection authorities in some EU Member States will only consider consent, but also take the view that no consent could actually be valid because there is an asymmetry of power between the service provider and consumer. This would mean the data protection regulator arrogate the right to create a "data protection consent" not governed by civil law (which is not appropriate in my opinion). Asymmetry of power obviously exists by definition in any B2C relationship or any employer-employee relationship, but the rules governing consumer terms and conditions or labour regulations acknowledge the existence of valid consent in these kinds of relationship.

Other EU regulations also pivot around consent and have included very limited exceptions, which are proving to be insufficient in the digital age. After the terror attacks of September 11, 2001 and years of complex and debate on the need, guarantees and costs of retaining personal data on location and traffic, we ended up with the 2006 Data Retention Directive. This was however invalidated by the Court of Justice of the EU in 2014 for lack of proportionality[1]. Debate continues on the need to balance privacy of communications with fighting serious crime online, such as child exploitation; even celebrities such as Ashton Kutcher are taking part[2]. It is obvious that consent should not pay a role in these debates, since the fight against crime cannot be left to the bad actors' will and decision.

As opposed to data protection regulations, privacy regulations primarily focus on consent regarding cookies, which explains why we have omnipresent cookie banners. In this case, the legislative focus on consent has proven not to be the most appropriate action to provide effective privacy protection. Data protection authorities identified as early as 2012 cases where cookie consent was not required because the privacy invasion was insignificant, such as first party analytics[3]. These cases will be considered as part of the ongoing process to update

2018

Approved as part of Emoji 11.0, now on all major platforms. *Images: Apple.*

2019

Approved as part of Emoji 12.0, coming to platforms this year. *Images: Emojipedia.*

2020?

Emojipedia top requests.

Source: Top Emoji Requests 2019 (emojipedia.org)

1	https://curia.europa.eu/jcms/upload/docs/application/pdf/2014-04/cp140054en.pdf

2	https://www.politico.eu/article/ashton-kutcher-urges-eu-to-pass-interim-privacy-law/

3	https://ec.europa.eu/justice/article-29/documentation/opinion-recommendation/files/2012/wp194_en.pdf

EU e-privacy laws. The industry has identified other situations where they believe the focus should be put on safeguards to ensure minimum privacy impact, rather than on insisting on consent.

There are other examples, such as scientific research, which has gained prominence during the COVID-19 pandemic. The GDPR includes a certain number of conditions to enable scientific research that do not include consent, such as providing an exemption to the general prohibition on use of health data, focusing instead on safeguards, including the codification of data. This is the usual way data are protected in clinical trials in the EU, US and Japan. However, some legislators and data protection authorities have nonetheless continued to insist on very narrow consent mechanisms that are not viable to build and implement a national/EU research strategy or to provide legal certainty to investors in pan-European research projects.

Some of these issues are summarised in an excellent CIPL article from 2015 that is still relevant today[4]:

"(...) We do not believe that consent is the best or only way to empower individuals in this day and age for three reasons. First, consent has become overused and an over-relied-upon in practice, calling into question its function as indicator of meaningful individual choice and control. Privacy policies and notices are too numerous, long and complex to result in valid consent. (...) Second, modern information practices are on a collision course with canonical consent requirements as envisaged in many data privacy laws today. Increasingly, there are situations where consent will simply not work (...) Third, and perhaps most importantly, are other mechanisms in our ever-growing privacy toolkit and existing legal regimes that, in the appropriate contexts, are able to deliver privacy protection and meaningful control more effectively than consent. However, while these alternative mechanisms already exist, they must be better understood, further developed and more broadly accepted."

Finally, it is worth noting that we are witnessing a convergence of data protection, competition and consumer protection approaches, where individual consent seems to be a common denominator. However, we need to be very careful before borrowing concepts from other regulations, in particular, regarding consent, since its construction and the role it plays is different in each regulation is entirely different.

The impact of an inflexible approach

When I began to study data protection in 1997, I realised that personal data has a dual nature: the moral dimension of any fundamental right, linked to the protection of human dignity, and the commercial aspect linked to economic outcomes. Both aspects must be adapted to the evolution of our culture and social development.

In the EU, fundamental rights and freedoms are protected (including the right to privacy, freedom of information and expression or the freedom to establish a business) by general principles, and infringement must be proved by the affected party through civil and/or criminal court proceedings. Data protection is (as far as I know) the only fundamental right or freedom that the EU and its Member States is protected through administrative laws, with specific administrative bodies (i.e., data protection supervisory authorities) enforcing its protection. On the plus side, this has raised public awareness and created concrete tools to protect human dignity, to prevent horrific abuses of personal data, such as that we witness(ed) by totalitarian regimes. On the negative side, this has led to isolation of data protection rights from the rest of the law. The result has been an over-emphasis on fundamental rights to justify extreme measures, with negative effects on other fundamental rights and freedoms and on the commercial dimension of the data protection right. The rise of populism is impacting the way we envisage and apply our legal instruments. It is increasingly difficult to have a discussion with those who share different views, while some feel the need to adopt an inflexible, extreme approach to data protection, rather than one which is more proportionate and nuanced.

In my professional experience, data protection issues cannot be assessed in isolation - they must be balanced with other laws and interests and in a context that is full of grey areas. These include: contractual laws that determine whether a contract is valid; consumer laws that determine whether consumer terms and conditions are legal; labour laws that set the framework for the rights and duties of employer and employees and the role of trade unions; clinical trial regulations that determine ethical principles for biomedical research and the roles of the different actors in a clinical trial, etc.

Other legitimate interests must also be taken into account. For instance, there is always a balance that needs to be struck in a democratic society between the need for security and safety (e.g., to combat money laundering, terror financing and other serious crimes) and the respect for privacy and other fundamental rights. Data protection requirements must be viable and operational and be assessed considering their social, technical and economic impact. For instance, the link between international data flows and trade and economic and social progress is undeniable. As a European, I am proud that we have built, and exported beyond our borders, a concept of dignity linked to the rule of law in democratic societies. We cannot build and radiate our influence by isolating ourselves.

Privatisation of justice without social consensus

The personalisation trend means that the user is central and no longer a passive recipient of a service. Users actively demand to be listened to by service providers and the authorities. Users have direct communication channels such as personal blogs, social media or other online means to express themselves without intermediaries or editorial filters. The rating by consumers of the quality of any service is now considered of equal or more importance to any communication from the service provider. The democratisation of opinion on any topic has fundamentally changed the character of social communication (before it was limited to broadcast media - newspaper, TV and radio), which has led to a massive increase in conflict arising from user generated content.

Instead of being assessed in courts by experienced magistrates with the guarantee of a judicial due process, some of these conflicts are now being overseen by administrative bodies without such guarantees. Even more concerning is the legislative trend to privatisation of justice, with an expectation that some of these disputes are expected to be dealt with by private companies. An interesting example of this is how the 'right to be forgotten' proposal was referred for resolution by private companies, who were obliged to automate internal procedures and policies as much as possible to deal with vastly differing and complex requests on the basis of only broad criteria arising from the Costeja CJEU case[5].

Legislators and regulators are not providing the advice and frameworks necessary to deal with these disputes. Despite this, organisations that have created and enforced their own rules for a good online citizen have been criticised by users or regulators.

User empowerment has generally not been accompanied by any consideration of the user's responsibilities. Some parents use online services as a babysitter, without supervision of their children's online activities. Even worse, some parents or educators allow children under their custody/supervision to use services not designed for their age, without thought to liability for any harm. As a society, we have not yet worked out how to create digitally responsible and resilient individuals. Nor have we decided what role each stakeholder should play (service providers, users and public authorities) in setting rules to prevent online harms such as digital violence, bullying, hate speech, sexual blackmail, etc. It is encouraging to see that some Data Protection Authorities are considering holding users responsible for the use of third parties' data, when their actions harm others.

Conclusion

The digitalisation of our social and professional interactions has been accompanied by rapid change in our approach to data protection and privacy. The 'individual-centric' trend has enabled personalised services which we can no longer imagine living without. It has also encouraged an egocentric approach that has blurred our view of individual responsibility to our fellow human beings, both the current and future generations and the environment. We cannot just blame others for negative consequences but must embrace our collective responsibility for our own contribution to the problem. We need to work together collaboratively to identify the potential harms in our digital society and economy, who is responsible for them and which part we should each play in mitigating or avoiding them.

4　Centre for Information Policy Leadership (CIPL) Empowering Individuals Beyond Consent (informationpolicycentre.com)

5　https://bit.ly/3j9GYFG

There is a role for consent in redefining our social norms online, as a way to avoid the trap of focussing on personal data protection without considering other laws and the full social and economic impact. We are, after all, still only human beings, with all their problems. Technology can and will provide ways to address these problems; to choose the right way forward depends on us learning the lessons of history, protecting our dignity and the rule of law, but not being afraid to be responsibly creative and innovative.

The opinions expressed are purely personal and do not necessarily correspond to the corporate views of any organisation, past or present, for which the author has worked.

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Lessons from the pandemic: towards connectivity for all

by Heather E. Hudson, Ph.D., J.D. [1]

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The pandemic which began in 2020 will be remembered for decades to come. What did we learn from it about the future of connectivity? Among its major impacts were *acceleration* of adoption and *innovation* by both users and providers. But significant gaps remain.

Acceleration of adoption has taken many forms. Older people who had never used a smart device or computer have learned how to interact with children and grandchildren. Teachers scrambled to learn how to use videoconferencing platforms when their schools closed down to prevent transmission of the virus. Doctors who had shunned technology figured out how to consult with their patients via telehealth systems when patients could not visit clinics. Employers have realized that their workforce should be allowed, and encouraged, to work from home wherever possible. Consumers who had rarely shopped online order everything from food to face masks to avoid visits to grocery stores and pharmacies.

Pandemic-forced lockdowns have also created incentives to innovate. Families have used video chats to communicate with sick relatives quarantined in hospital rooms and nursing homes. Educational institutions from kindergartens to graduate schools have developed online curricula for students forced to stay home, and hybrid distance learning with in-class labs and seminars for those who can safely meet together. In-person conferences have moved to virtual sessions; community organizations and local governments now meet online rather than in person.

Restaurateurs have pivoted to online ordering for take-out services where they could not stay open to serve their clientele. Small and local businesses have learned to market their products online to survive. Instructors offer online yoga and music lessons. Musicians play in virtual concerts, compensating for latency in linking musicians in several countries and even continents.

Residents of remote Indigenous communities have also turned to online services while isolated during the pandemic. In an Alaskan Yupik village, a woman described her 86 year-old grandmother's suffering from COVID-19: "I have never known anything to be too much for my grandmother. She was a fighter. We teleconferenced with immediate family to pray that God come take her sooner than later, so that her suffering may end." When she died, only the immediate family could take her coffin to the graveyard. "The pastor did the burial on speaker phone." [1]

1   Cynthia Ivan. "The death and burial of our dearest mother and grandmother." Anchorage Daily News, November 19, 2020.

In northern Canada, nurses in remote communities have requested more bandwidth to support telehealth consultations while travel has been difficult or impossible. Telecom providers in these regions have also reported increased demand for high reliability for emergency communications and first responders.

The pandemic has also exposed disparities in access to communications technologies and services. Some households in the US and Canada do not have broadband or have insufficient bandwidth for students to participate in online courses. Some cable and mobile companies have offered discounted connections for low income families, but it is unclear whether these discounts or relief from penalties for data overages will be continued after the pandemic.

In cities, students without broadband at home cluster around fast food outlets to share Wi-Fi. Others spend hours in parking lots to use Wi-Fi from town halls or libraries. Schools have scrambled to obtain tablets or Chrome books for their students; many have requested donations from tech companies. And the school bus has taken on new roles while students are stuck at home. In Anchorage, Alaska, the school bus driver delivered donated computers to grateful students. But where students lack broadband, as a community activist in Washington, DC, pointed out "a free laptop becomes about as useful as a 1940 Smith Corona typewriter." Urging national leaders to take action, he emphasized that without real access to broadband, kids across the country are effectively "logged out of school."[2]

School buses equipped with Wi-Fi have also become stationary hotspots. Students gather around the parked buses or sit in cars to participate in online classes. Some download assignments and return to upload their homework. The school district in Austin, Texas, has been deploying 261 Wi-Fi-equipped buses across 40 neighborhoods with little or no home Internet access. While innovative, this stopgap solution demonstrates the ongoing urban digital divide in a city that is also the state capital and home to the University of Texas at Austin.[3]

Students in remote and Indigenous communities

2   Petula Dvorak. "When 'back to school' means a parking lot and the hunt for a WiFi signal." Washington Post, August 27, 2020.

3   Stacy Fernandez. "Wi-Fi buses were a quick solution for student internet access, but as schools reopen they need their buses back." Texas Tribune, Oct. 8, 2020.

Source: The Washington Post

face even greater challenges to continue schooling online. The Yupik region of Alaska includes 29 schools in remote communities, in which only about 15 percent of households have Internet access. Some teachers put lessons on USB sticks, but find that lack of interaction with students can make learning difficult.[4] One provider is setting up local intranets in villages so that students and teachers can share online lessons and coursework without connecting to distant Internet hosts. In other communities, residents have basic broadband access but cannot afford to stay online for classes and assignments that exceeded their data caps. In crowded Arctic households, several children and adults try to share a single connection.

In the developing world, many students lack broadband access or the tools to take advantage of it. In rural India, three young sisters share one 2G phone with no Wi-Fi. The girls ration their class time, selecting only lessons they think are most important. The phone doesn't allow streaming video, so they just listen to audio. The signal is erratic, forcing them to run around the house to get the best reception, which is usually on the roof. "It's going to be really cold," said the oldest. "But do I have a choice?" [5]

In the future, we hope she will have a choice! The pandemic has demonstrated dramatically that broadband is not a luxury but an essential service for all. In the US, Canada, and other countries, governments are making more funds available for extending broadband infrastructure in unserved and underserved regions. But there is less attention to affordability for low income families who cannot pay for broadband plans with sufficient bandwidth or with unlimited data caps. However, prices should decline as more bandwidth becomes available, and competition among technologies such as fiber, terrestrial wireless and satellite, as well as among providers, creates incentives to lower prices. Yet should does not mean will. Regulators will need to be vigilant to ensure that bandwidth, quality of service and affordability targets are achieved and maintained.

Broadband as defined today will eventually be ubiquitous, connecting almost everyone, including those living and working in isolated and developing regions. Children will take connectivity for granted. But gaps will remain, as new generations of mobile and fixed services and smarter devices are introduced.

Connectivity is always likely to be a moving target. When I first worked in remote regions, our goal was to get two-way high frequency radios into isolated communities. Then the goal became reliable telephone service, then Internet access, and now broadband, but the goal will continue to evolve.

In the 1990s, national governments and the ITU were calling for "information superhighways." At a conference about information infrastructure in Washington, DC, a young woman reporting on the meeting asked me when I thought the goal of universal broadband would be achieved, and the effort would be finished.

"It will never be finished!" I replied. The connectivity target has moved enormously in the 25 years since that conference. It hasn't stopped now.

4   "For Alaska's rural children, distance learning exposes gaps in internet equity." See https://www.youtube.com/watch?v=L_Z4Hm3JRX4&feature=youtu.be

5   Vibhuti Agarwal and Eric Bellman. "In the Himalayan foothills, Mehak Bisht and her sisters have to go to the roof of their house to get mobile phone reception." Wall Street Journal, Nov. 24, 2020.

Dr. Heather E. Hudson is Professor Emerita at the University of San Francisco where she was founding Director of the Telecommunications Management and Policy Program in the Business School. She is also Affiliate Professor of Communication Policy and former Director of the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage. Her work focuses on applications of information and communication technologies (ICTs) for socio-economic development, impacts of access to ICTs, and policies and strategies to extend affordable access to broadband, particularly in rural, remote and Indigenous regions. She was awarded the 2021 Richard J. Barber PTC Distinguished Service Award for her forty years of dedicated service to the Pacific Telecommunications Council community.

Professor Hudson has planned and evaluated communication projects in Alaska and the Canadian North and more than 50 developing countries and emerging economies in Africa, Asia, the Middle East, the Caribbean, and the Pacific. She has also been an expert witness for consumer and Indigenous organizations in regulatory proceedings. She is the author of many articles and several books.

Imagining and designing the future together

Andrew Bullen and Janine Huizenga, Co-founders: Creative Cooperative FR/NL

Our vision of the future is shaped by our aspirations, our ideals and our past experience. And more than ever, our present experience of the pandemic, and its impact on almost every aspect of daily life, have brought into sharp focus exactly what really matters to us, whether as individuals or as a community. Such humanistic imperatives as healthcare, security, freedom, family, friends, work, education, democracy, availability of food and information, fair distribution of wealth, and the health, beauty and diversity of our shared environment not only reflect our values, but also represent essentials for the future prosperity and wellbeing of humankind.

In many respects, the pandemic, with its daunting challenge to humanity, has brought the world closer together in the realization of how important our shared core values are. This has acted both as a trigger to 'rethink our socio-economic'[1] model on the basis of shared economic and social fragilities and also as a motivator for collaboration in adversity[2].

1   Nasser Kamel, Secretary General of the Union for the Mediterranen, Méditerranée du Futur, 01.12.2020

2   "Believing that fellow citizens share one's values has been found to elicit a sense of connectedness that may be crucial in promoting collective efforts to contain the pandemic. The abstract nature of values, and cross cultural agreement on their importance, suggests that they are ideally suited to developing and tailoring effective, global interventions to combat this pandemic." British Psychological Society, 23. June 2020

In this light, it is not difficult to understand our real values, what matters and what's at stake for our future. However, life in a global and digitalized environment is far from simple. Indeed, it is becoming increasingly complex, whether in a business organization, an urban agglomeration or a rural community. Consequently, when we imagine the future, and design solutions to realize our values for the future, we must also grasp the implications of the interaction of multiple, inter-related factors. We must focus on the promotion and sustainability of valuable but vulnerable eco-systems to maintain the balance between human and non-human factors. To achieve this end, we believe that it is essential to complement human-centered technological design principles, involving the use and understanding of technology in a participatory creative process, with the broad vision and insight provided by systems thinking.

In the early 2000s, our company Creative Cooperative started to create urban design challenges around what Jane Jacobs called "problems of organised complexity"[3]. We brought together policy makers, innovators, architects, designers and communities to create innovative urban solutions through the use of open and collaborative methodologies and technologies. On this basis, we initiated the European Street Design Challenge in Paris to co-create scenarios for the future city, based on a systems thinking approach to inspire alternative design scenarios from a broad future vision, based on systemic trends, driving forces, parameters and values.

The results of such an approach provided a new design paradigm for the digital city of the future, based on the tension between conflicting driving forces: trust and security as against change, creativity and risk on the one hand and competitiveness set against broader ethical/social considerations on the other hand. This approach gave rise to urban designs focused on shared and open knowledge facilities, the fusion of physical structure and digital information, and new forms of technology-driven sensory presence in the city. Knowledge exchange was considered as a new future form of "value-transaction"[4].

However, understanding the system, its components and driving forces is not enough. Further challenges in the Parisian banlieues, Amsterdam, St. Petersburg, Cairo and China, and the design of urgent solutions for the UNDP in Egypt and Georgia, saw us move towards a more participative design-thinking approach to place the 'empowering human' at the centre of the design process.

Particularly, our United Nations work with the disadvantaged and disabled in Cairo and Alexandria, and our projects with locals in such 'sensitive' areas of the Parisian banlieue as St. Denis, Bondy, Bagnolet and Montreuil, brought home the value of co-creating and co-designing with locals. They are not generally included in application or system specification and design, but they really understand the issues and can be inspirational and instrumental in addressing and solving those issues together through their own 'real-life' experience and expertise. Who else could be more equipped to co-design a new disabled-friendly pedestrian system to traverse the intimidating Cairo traffic than the disabled who must face that daunting challenge very day? To be effective, this participative creative work needs the careful development of one critical factor: trust, both in the leadership and the technology. And not only when working with disaffected groups communities in Egypt, France or rural China. The pandemic has shown that governments across the world which have inspired trust among the population have been more successful and credible in their application of science and technology[5].

However, the limitations of design thinking methodology, when not informed by broad perspective and future vision, led us to the development of a new, hybrid approach, reintroducing systems thinking to complement the 'human centred' element. This complementary approach aims to achieve the most effective design of services and solutions to meet often urgent human needs and aspirations while embracing complexity with a longer-term systemic approach.

We have been successful with this approach, for example, in the United Nations "Loud and Clear" project in Tbilisi, where we worked closely with deaf participants to design a new 112 emergency alarm and response system for their urgent need across Georgia. Their personal trust, empathy, experience and expertise were all critical for the in-depth understanding and effective co-design of the service on a human level; as was a complete and thorough understanding of the complex technology and interconnected processes within the future-oriented system.

What does our experience tell us when we imagine and design applications with technology for the future? First, we must carefully examine the forces affecting complex systems, building scenarios for the future, and particularly designing resilience into those systems: the ability and flexibility within a community to anticipate and adapt to the challenges of the future, for example. This systemic approach is clearly applicable to such threats as climate change, ecological and environmental destruction, the decrease in biodiversity and the loss of essential material and natural resources. It will promote circular systems, a diverse and balanced eco-system, food security, environmentally friendly transport, renewable energy, and the use of locally available, often traditional skill sets and materials.

To complement this approach, we must normalise broader participation within the development of the systems of the future. As we have learnt, participation goes along with trust and transparency. Our shared technologies and data are too important to be placed in a 'black box' in the hands of a few powerful institutions or individuals. On the contrary, we must break open that 'black box', deconstruct complexity, and ensure that our technology and data use are transparent and understandable. Indeed, at a time of rapid development of AI, big data and high-speed computing, transparency around the use and impact of technology and the ownership of our data should become a civil and democratic right.

With all these factors in mind when imagining our design for the future, we are now embarking on the QuantIA project, which holds the potential to realize the ideals and values described above. The QantIA project aims to use the latest AI and high-speed internet, together with satellite technology, to better evaluate the ecological system, locating environmental degradation, and bringing together residents, experts and artists in understanding, communicating and mitigating its impact.

Whatever our hierarchy of values, we share a common responsibility as entrepreneurs and designers of technology solutions to ensure the prosperity of our world in a spirit of solidarity and fairness. Our vulnerabilities exposed during the pandemic have only served to highlight how we can, and should, work together with our users to understand complex social systems and design technologies and applications for an enlightened and dignified future.
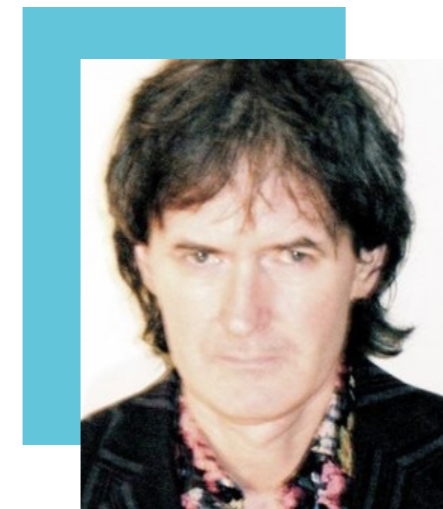
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3   Jacobs, J., 1961 The Death and Life of Great American Cities, New York: Random House

4   In this context, it is worth noting that the pandemic, particularly the life-saving role of low-paid emergency workers, has also brought into focus future-oriented reflections on 'value', from a social and economic perspective, as witnessed in ex-Bank of England Governor Mark Carney's December 2020 BBC Reith Lectures "How We Get What We Value", and inspired by economist and Professor Mariana Mazzucato's highly influential work "The Value of Everything' Penguin, 2019.

5   OECD: Transparency, communication and Trust: The role of public communication in responsing to the wave of disinformation about the new Coronavirus. July 2020.

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AI and digital transformation: rebuilding a better world

Derrick de Kerckhove and Maria Pia Rossignaud

On October 10 2020, TED and Future Stewards brought to YouTube the results of a global transgenerational consulting operation aimed at a global audience from all socio-economic levels. The 50 participants included celebrities such as Al Gore, Ursula von der Leyen, Richard Attenborough and Jane Fonda, along with other lesser known professionals, architects, artists, renewable energy experts and innovators of all kinds. During this "Countdown to a better, greener, healthier, thriving, resilient, fairer, cooler, creative future" they shared suggestions about how to rebuild a better post-COVID world.[1] Their discussion gave a glimpse,

founded on hope and enthusiasm, of "the world we all hopefully want". The pre-condition for achieving this goal was to take advantage as soon as possible of the detailed, positive and soundly applicable advice proposed.

"The world to come", however, is something else entirely. It seems presumptuous in these times of political and environmental uncertainty to make overly optimistic predictions about such an anxious future. We can hope that the future will arrive more or less in the general direction proposed in the Countdown. However, to believe this we need to make compatible two scenarios that seem to be irreconcilable. On the one hand, we strive for the dignified survival of all human beings – and

other forms of life too – in all conditions and in all latitudes (as expressly stated in the SDG program of the United Nations). On the other, we promote an unbridled economy that thrives remorselessly on exploiting the planet. In addition, there is a current social breakdown caused in part by the exponential growth of fake news, of extremist groups such as deniers and conspirators, which is provoking a global crisis in the search for meaning. In this crisis the underlying problem is that digital transformation, through social media, gives voice to multitudes of people without knowledge but with often wrong and dangerous opinions. Elections won by populists who seem to lack ethics have thrown their own nations into chaos in relation to actions to combat the threat of COVID-19, or to protect the environment. In this *infodemic* the precious value of 'objectivity' is lost, and fact is seamlessly confused with subjective opinions and echo chambers. This is the unfortunate downside of digital transformation, but also an unavoidable price to pay for the benefits of such a massive economic and social transition.

Digital transformation brings with it a change that goes far beyond a new way to do business. It is not just about management or a new communications system, it is about all of us, and it affects the daily life of every human being. Digital culture is not simply added to our former alphabetical culture; rather, it overturns all of its assumptions. For example, the alphabet allowed the western individual to take personal control of language and gave one a kind of privacy that was enhanced in the silence of reading. This opportunity constituted the private and inviolable consciousness of each one. Instead, the digital invades the mind, outsources cognitive functions such as memory and judgment to various portable screens and networks and tracks all our mental and physical movements. Moreover, algorithmic assistantship moves the decision-making center from the intimacy of the person to the machine in order to suggest or anticipate decisions. We are thus facing a historical, anthropological, psychological, personal and social upheaval.

That said, the solution could be found at the heart of this transformation, by pushing rather than slowing the progress of AI. An increasing amount of human judgment is already, in some way, entrusted to AI in terms of critical decision-making processes in medical, legal, military, administrative and many

other sectors. It is therefore conceivable that our trust in the principle of objectivity will in future be vested in the algorithm itself, so that it does not disappear forever from our social consciousness.

However, even algorithms cannot always be trusted. Children are falling victim to algorithmic traps, as described in the *The Social Dilemma*[2], a documentary that analyzes the insidious manipulation of children by social media algorithms, controlling their choices and moves that, if not totally involuntary, originate in largely unconscious processes. We need to prioritise education - rather than the economy or the military – to truly defend the future of nations and their prosperity.

Today we need to realize that the collaboration between man and machine has become indispensable. This is a key concept of the "Symbiotic Autonomous Systems (SAS)" Initiative of the IEEE, an ongoing research project that takes as its basis the first examples of symbiosis already present in a number of areas that influence our economic system and our way of life. This initiative started 5 years ago and now proposes a 360º vision incorporating technology and standardization, which is the main IEEE's focus, but combining this with complementary points of view, including economic, regulatory, ethical and socio-cultural perspectives. Derrick de Kerckhove is involved in the latter, because the transformation resulting from technological evolution in all walks of life requires awareness, planning and dissemination by current and future actors.[3]

The technologies that support datacracy, or algorithmic governance, could also usher in the emergence of a networked direct democracy as well as a post-scarcity/post-capital ecosystem
(...)
While post-scarcity and post-capital ecosystems are often seen as synonymic, this is not necessarily the case. In a post-scarcity ecosystem, resources are no longer

1   Countdown is a global initiative to accelerate solutions to the climate crisis. The goal: to build a better future by cutting greenhouse gas emissions in half by 2030. https://www.ted.com/series/countdown

2   The Social Dilemma is a 2020 American docudrama film directed by Jeff Orlowski and written by Orlowski, Davis Coombe, and Vickie Curtis about the role of social media in influencing behaviour of people young and old, mostly unknown to them. https://www.netflix.com/it-en/title/81254224

3   The IEEE Digital Reality Initiative was launched by Roberto Saracco under the auspices of the IEEE to identify trends and existing digital technologies to forecast developments to 2030 for the first two years (2017 and 2018), and later extending the vision to 2050. To date four White papers have been published, one a year to 2020 and Derrick de Kerckhove has participated in all of them.

scarce due to adoption of renewable clean energy; fusion power, which uses water

for fuel, cannot lead to a meltdown, and powers itself by generating more energy than it takes to operate the fusion reactor itself; and ubiquitous molecular- and atomic scale raw material used by future 3D printers to transform what are referred to as blueprints into a wide portfolio of objects, including foods, biological tissue and organs, mechanical and electronic products, tools and components, and other outputs – all at minimal cost. Moreover, natural resources are handled by a global algorithmic network (comprising advanced automation, Artificial Intelligence and robotics) that will perform all steps in the resource location-acquisition-processing-manufacturing-maintenance-distribution sequence.

A fully automated SAS post-capital ecosystem (in which goods, services and information are universally accessible at no monetary costs) could then theoretically emerge when the above human labor-free system generates global economies of scale and algorithmic optimization to minimize costs to the point of making capital unnecessary, thereby transforming values and ethics that then prioritize societal well-being and global preservation. A post-capital supply-and-demand system could thereby leverage global crowdsourcing protocols and local/personal molecular manufacturing to operate automatically and perpetually optimize ecosystem operations, security and environmental issues addressed by datacracy-like intelligent algorithmic systems. (WHITE PAPER I, 2017).[4]

Among our predictions in the first two SAS White Papers (2017 and 2018), energy issues were given top priority.
"Our reflection has also led to new renewable energies including artificial photosynthesis —a biomimetic (that is, mimicking biology) chemical process that that replicates

the natural process of photosynthesis by converting sunlight, water, and carbon dioxide into carbohydrates and oxygen—

generally refers to any system that captures and stores energy from sunlight in the chemical bonds of the resulting solar fuel. Related technologies involve engineering photoautotrophic microorganisms and enzymes to generate microbial biofuel and sunlight-based biohydrogen production and converting CO_2 directly from air into biomass and fuels. Another example is a recent hybrid water splitting–biosynthetic system that when combined with solar photovoltaic cells promises solar-to-chemical conversion rates roughly a 10- fold increase in efficiency compared with natural photosynthesis, and moreover avoids toxicity associated with previous attempts. Cost-effective artificial photosynthesis technologies well-suited to housing installations in urban and densely-populated suburban areas are inkjet-printable solar panels, artificial leaves and (even for woven polyester cotton fabrics) spray-on solar cells—an important focus given the interaction between continued population growth, increasing urbanization and rising energy demand.[5]

Research reveals that so-called "renewable" energy sources are much more abundant and ubiquitous than fossil fuels and absolutely less polluting. This means that a healthy future cannot only be imagined, it can also be built. Dismantling and converting all fossil energy, although complex and painful as it is already installed everywhere as the main energy source, will eventually become essential to production and use of the energy of the future. Resistance to this fundamental change by growing throngs of 5G tower destroyers and QAnon-like conspiracy theorists fearful of the motives of a delusional 'Deep State', will simply prolong the transition.

A world, however, similar to the one we want is still possible and will be much more livable than the present. The technological conditions are there, along with clean material resources, and especially

those of the most precious of all: energy. But it requires vision, will and more than anything else, courage from all of us. It is a matter of changing attitudes, something that may look simple but is very difficult in practice. Neither the evidence of climate disasters nor political persuasion will be enough; although a system of restrictive laws could work, we certainly want to avoid a fascist solution. To change people, we do not need strength or prayer, but we do need to change the ground itself, that is the basic context in which people live. It is still just possible to imagine a world where we could close all

of the world's city centers to automobiles, or where we could combine the budgets of the ministries of defense and education to make it clear that the real basis of defense in the information economy lies in increasing intelligence and creativity, rather than armaments. This is a world we would like to share.

Maria Pia Rossignaud is Director of Media Duemila, Italy's first digital culture magazine which was founded in 1983. She is also one of 25 digital media experts chosen by the Italian delegation to the European Commission to advise on digital culture and digital transformation of the media. She is a frequent contributor to The Mobile Century and a long term supporter of the work of the GTWN.

Derrick de Kerckhove is a journalist at Media Duemila. He has spent many years as a professor and cultural researcher in digital media and digital transformation of society in both Canada and Italy. He is a former long-term Director of the McLuhan Program of Culture and Technology at the University of Toronto.

4   Symbiotic Autonomous Systems White Paper I
IEEE Symbiotic Autonomous Systems - November 2017 (by Roberto Saracco, Raj Madhavan, S. Mason Dambrot, Derrick de Kerckhove, and Tom Coughlin) https://digitalreality.ieee.org/images/files/pdf/sas-white-paper-final-nov12-2017.pdf

5   IEEE Symbiotic Autonomous Systems White Paper II (By S. Mason Dambrot, Derrick de Kerckhove, Francesco Flammini, Witold Kinsner, Linda MacDonald Glenn, Roberto Saracco - Edited by Theresa Cavrak). https://digitalreality.ieee.org/images/files/pdf/SAS-WP-II-2018-Finalv3.2.pdf

Reimagining the future of policy making

Vicki MacLeod, Secretary-General, GTWN and Editor-in-Chief, The Mobile Century

In August 2020 the southern Australian State of Victoria was firmly in the grip of a rapidly spreading second wave of CoVID-19. Daily infection numbers were running in the 700s with no sign of slowing down. Daily death rates, almost exclusively of aged care residents, were running in the low forties. While these numbers may be small in comparison to the impact of COVID-19 in many other countries, this situation came as a shock in Australia, where most areas of the country had been successful in containing or eliminating community transmission altogether.

After a second wave of the virus broke out in Melbourne as a result of a mismanaged hotel quarantine system, 5 million residents of the city found themselves pariahs in their own country, with all State and Territory borders closed to them. Faced with an economic and social crisis, the Victorian State Government began looking for a roadmap out of lockdown, hoping they could bring the State back to a 'new normal' by Christmas 2020. At the time, this goal seemed beyond reach.

Faced with an unprecedented set of circumstances and a public health crisis, the Victorian Department of Health and Human Services turned to the work being done by a team of expert scenario modellers.[1] They were asked to develop a model to address a seemingly intractable public policy challenge – bringing a city of 5 million diverse inhabitants out of a pandemic lockdown safely.

Their expertise ranged across urban and population

planning, biometric modelling and public health and epidemiology. Dynamic policy modelling – based on a range of complex assumptions about the way humans will behave given a particular set of circumstances and restrictions – became the 'secret weapon' of the team trying to contain the virus.

The Dynamic Policy Model

Public policy is more often than not developed on the run and is based more on the achievement of political objectives of the group or party in power at the time, rather than a scientific approach based on verifiable fact. It is therefore remarkable to have witnessed first-hand the impact that an evidenced based scientific approach could have on public health planning and implementation, in what became a live experiment about the impact of dynamic public policy modelling.

Despite many misgivings about the level of restriction on their movement and activities, the Victorian public accepted the unusual and, in comparison to other countries, extreme control measures that the model predicted would succeed. These included: a night time curfew; the mandatory wearing of face masks; closing down the international airport to all incoming arrivals, even returning Australians; confinement to within 5k of your home except for work, exercise, medical appointments and care-giving; closure of all retail premises; and a virtual shut down of the normally vibrant city centre. The success of the scheme relied on general public acceptance of these extreme measures, which was an achievement in itself.

The model predicted various stages, and a tiered loosening of restrictions, to get to the desired less than 5 community transmission daily figure. This benchmark was achieved precisely as the model predicted – on 26 October 2020. Melbourne continued to record 0 community transmission and 0 deaths, gradually easing restrictions in a strictly controlled manner, applying assumptions about the human reactions to these changes that the DPM enabled them to make with a high level of precision. The predictions from the model had been achieved right on target.

A hope for the future

Although the approach of the DPM and reliance on it by public health officials, were frequently questioned by the public and in the media, its success in achieving its stated objective was irrefutable. The DPM demonstrated in real time the value of a multi-disciplinary approach involving experts from different backgrounds, using diverse skills, applying technical knowledge to achieve a clear public policy objective.

On the other hand, the use of the DPM approach could also be seen as a one-off exception to the rule in public policy, given that it was used during a public health emergency with no precedent in living memory. But for those who promote the important role of STEM and encourage the younger generation to seek a career in science and engineering, it provides a ray of hope from the darkness of 2020. Perhaps we can imagine a future where a renewed interest in a scientific approach to policy development may become an enduring legacy of the crisis, and that it is viewed more broadly as a valuable approach to address other major public policy challenges.

Dynamic simulation models are virtual representations of the real world where individuals and communities act and react in the same way as people do in real life. *Melbourne University's Dynamic Policy Model (DPM)* resulted from an extensive international collaboration among a multi-disciplinary team from Australia and New Zealand over many months. The primary contributors were:

- Dr Jason Thompson (PhD, Medicine), a computational social scientist from Melbourne University's Transport, Health and Urban Design Research Lab
- Professor Rod McClure, emergency physician and Dean of Faculty of Medicine and Health from University of New England
- Professor Mark Stevenson, epidemiologist and Professor of Urban Transport and Public Health at the University of Melbourne
- Professor Tony Blakely, Professorial Fellow In Epidemiology from the Population Interventions Unit at Melbourne University's School of Population and Global Health.

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1   See the end of the article for the details of the team and the DPM they used.

The model looked at how people move around in the community. To do this, they simplify how people interact and spread coronavirus (COVID-19). The purpose of the model is to help understand the likely outcomes of possible policy actions taken by Governments in response to the SARS-CoV-2 outbreak over time. It works as a decision support tool, to enable development of evidenced-based policy.

The model used for the roadmap assumed that from the time a person becomes infectious, there is a 25 per cent chance that within 24 hours they will be tested and identified as having coronavirus. This assumption was based on how long it would take people to get tested and therefore how quickly they are detected as a case. Some people might only get tested after they have had symptoms for a few days, and others might isolate before they became infectious thanks to contact tracing.

The chance that someone will be identified as having coronavirus (COVID-19) increases with each day, so the more days you are infectious, the more likely it is that you will be identified. When someone is identified and they isolate, they stop spreading the virus in the community.

In the models, each person has individual characteristics that reflect Victoria's demographics. Examples of some of the assumptions built in are:

· Some people are older, some are younger, some go to work, and some go to school. Everyone moves around according to their characteristics and the current restriction levels.

· A few people are super spreaders, and the chance of someone being a super spreader grows as case numbers grow. A super spreader is someone who infects more people than the average person with coronavirus (COVID-19) would.

· Wearing a mask and keeping at least 1.5 metres away from others reduces each person's chance of catching the virus.

· Not everyone who interacts with someone who has coronavirus (COVID-19) will become infected. The chance of catching coronavirus changes if you interact with someone inside or outside, if you are both wearing masks, if you wash your hands, and depending on how long you spend with that person.

For further detail see https://pursuit.unimelb.edu.au/articles/modelling-victoria-s-escape-from-COVID-19

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The GTWN: building the future on strong foundations

Bridget Cosgrave, GTWN Global President and Candace Johnson, GTWN Founding President and Member of the Board

GTWN

Looking towards the future of digital technology, it is timely for the Global Telecom Women's Network (GTWN) to reflect on the contribution of our members to increasing the leadership of women in the sector.

Founded in 1992, by a group of women leaders, the GTWN is something unique, pushing the boundaries for women. The GTWN has followed the trajectory of the industry expanding from telecommunications to everything digital, which is now pervasive in society. When we reflect on the role of women leaders in this journey it is amazing to see how far we have come.

The GTWN inaugural meeting was at the 1992 CeBIT fair in Hanover, Germany with Elke Geising, Dr. Susanne Paech, Janice Hughes, Dr Jessie McLeman, Lillemor Larsson, Susan Dark, Laureen Cook and Candace Johnson. These women were drawn together by a common career in telecommunications where they enabled and witnessed the power of this developing technology to change the world. GTWN founding members were united in a belief that women can achieve great things and wrote their motto up on a blackboard: "The Changing Culture of Communications". Numerous meetings followed, typically on the occasion of industry trade events, in Washington DC, London, Munich and Cologne, with the founding members growing the movement around the world. In 1995, the GTWN was officially registered as a non-profit association at the Cologne Chamber of Commerce and Industry, in Germany. In the same year, we held our first GTWN "Power Breakfast" based on similar events at ITU meetings, organized by one of our early Board members, Walda Roseman.

The inspiration

In the beginning we were inspired by amazing women such as *Ambassador Diana Lady Dougan*. Ambassador Lady Dougan was a trailblazer as the first woman appointed to many senior industry roles, notably as US Ambassador to the World Administration Radio Conference, head of the U.S. Federal Communications Commission International division, Director of the Corporation for Public Broadcasting, and Non-Executive Director of Qualcomm. Today, Diana devotes her considerable energies to documentary film making about women facing challenges, with tremendous results. In 2018, she shared the Peabody Award as co-producer for the documentary, "The Judge".

Another key figure who helped establish the GTWN was *Marie-Monique Steckel*, then President of France Telecom USA. Marie-Monique was a pioneer in data-transaction networks and joint ventures amongst industry leaders. Today Marie-Monique continues to embrace cultural exchange between nations as the President of the Alliance Française in the US.

Janice Hughes demonstrated the same qualities in co-founding the GTWN as she did in her world leading strategy companies. Janice brought the newest technologies to the GTWN Board meetings, such as in 1997 when she demonstrated

her new mobile phone. Janice was awarded a CBE for her services to UK technology exports, charitable healthcare abroad, and her work with the GTWN. Janice continues to find solutions to new challenges, combining technology with the environment, art and design. She has continued to mentor younger entrepreneurs; for example, the founders of lastminute.com began their careers with Janice before starting their own company.

Walda Roseman, currently Chair of the Arthur C. Clarke Foundation, inspired us - women and men - to go *boldy forth* and change the world through the power of telecommunications. Walda led the first international communicatons office of the Federal Communications Commission. She held executive positions with Intelsat and served in many senior executive positions, including as: Director of Public Information and Government Affairs with the former White House Office of Telecommunications Policy; and Chief Operating Officer and Chief Strategic Communication Officer of the Internet Society. Walda created the concept of Women's Breakfasts at the ITU, even before the GTWN's Power Breakfasts. She helped the ITU to rejuvenate its leadership through the International Youth Forum with countries sending one female and one male participant.

As Director of the Cologne Chamber of Commerce and Industry, *Elisabeth Slapio* has been the GTWN's "rock" for more than 25 years. She helped

to officially incorporate the GTWN and provided a corporate base. She has led our engagement with the Worldwide Chambers of Commerce and their role in the digital transformation of SMEs. Today, Elisabeth continues as Managing Director of the Cologne Chamber of Commerce to lead the innovation and environment divisions.

Anne Glover co-founded Amadeus Capital Partners in 1997 with Hermann Hauser and has been a venture capitalist for other thirty years. She has been our guide to understanding innovation and its connection to the world of investment. Anne was appointed as a Non-Executive Director of the Court of the Bank of England in 2018 and in 2019 became a member of the Investment Committee of Yale Corporation, which is responsible for oversight of the Yale University Endowment. Anne was awarded a CBE in 2006 for services to business and is an honorary fellow of the Royal Academy of Engineering. She has recently been appointed NED of CDC's Investment Committee.

A GTWN Board Member for two decades, *Heather Hudson* has recently been awarded the prestigious "Pacific Telecommunications Council Richard Barber Award" in recognition of her forty years' service to the PTC. Heather is Professor Emerita at the University of San Francisco and Affiliate Professor of Communications Policy and former Director of the Institute of Social and Economic Research (ISER), University of Alaska Anchorage. Heather has

L to R: Laureen Cook, former VP of the European Commission Viviane Reding, and GTWN Global President Bridget Cosgrave during the GTWN's 20th Anniversary Gala Dinner at Circulo Equestre on 27 February 2012

planned and evaluated communication projects in more than 50 developing economies, including the Pacific Island nations. She is the author of numerous articles and several books. Her latest book is Connecting Alaskans: Telecommunications in Alaska from Telegraph to Broadband.

Our GTWN Emeriti Board: We also applaud the significant contribution of our many founding members, including Susan Dark, Dr. Jessie McLeman, Dr. Suzanne Paech, Dr. Mina Schachter-Radig, and Elke Geising. Although they have gone on to pursue activities in other sectors, be they energy, water conservation, private equity, the arts, politics or media, they contributed mightily to laying the pillars of our organisation.

Building our network

Carla Cico was introduced to the GTWN by Janice Hughes. As President of Brazil Telecom, Carla was named by Forbes as one of the 50 Most Powerful Women in Business in 2002 and 2003. Carla has credited being an athlete with helping her promote a corporate culture of discipline, preparation, focus, and teamwork. She went on to become a member of the Board of Alcatel Lucent, Allegion, and to head one of Italy's largest holdings in China. Throughout it all, Carla has continued to be a leader within the GTWN and to show us the way in Governance, Ethics and Sustainability.

Sallye Clark is a space and satellite attorney and partner at Mintz & Levin and is highly regarded for her ability to negotiate market access around the world and is well known for securing host nation authorizations for US military and government satellite ground networks and unmanned aerial

vehicles (UAVs). When the US President boards Air Force One, his communications to the world are possible thanks in no small part to Sallye's ground-breaking work.

Laureen Cook was a Director of Satelindo in 1992, bringing telecommunications to the islands of the Pacific, when she joined the GTWN. She became Vice President 4G/LTE Strategy for Alcatel-Lucent, a critical role for that ground-breaking technology. Later, as a senior member at the World Bank IFC Global TMT Team, she was responsible for technical, commercial and financial due diligence of emerging market TMT & satellite investment. Laureen has recently resumed the helm of Extelcon Consulting and is also a BOD member of Rising Tide III, a European Angel Investment Fund, providing financing to female led start-ups.

Victoria Hernandez has been a C-Level executive of major telcos such as BT, Orange and Proximus, as well as a Business Angel, Board Member and most recently a Member of the Board of Caixa Bank. Catalonian of origin, resident of France and a global citizen, Victoria pushes the boundaries of the cross-sections of telecoms, investment, fintech and payments. Victoria will always be "Our Woman in Barcelona", calling on her extensive network of high-level contacts, both in her native Spain, in France and abroad, to secure exclusive venues for the GTWN's events.

Sue Major is a global leader in executive search. As an entrepreneur with her epynomous firm Sue finds the best talent for telecommunication companies, Sue is a relentless supporter of women in technology, having two wireless technology patents herself and a prior star-studded career at Motorola. Sue regularly co-sponsors the annual Women in Wireless event at CTIA and GTWN events at Mobile World Congress.

Australia and New Zealand have a champion of broadband and connectivity in *Kate McKenzie*, our GTWN regional president. Kate has been instrumental in helping to create the commercial and policy frameworks to accelerate broadband network rollouts in both countries as COO of Telstra in Australia and then CEO of Chorus in New Zealand. Today she is a Non-Executive Director of Australia's National Broadband Network (NBN). Kate has been a steadfast supporter of the GTWN and sponsored our 20th Anniversary, our 25th Anniversary

GTWN Board members and guests at the Circulo Liceu on 23 February 2013
(L-R) Candace Johnson, Sarah Crampsie, Laureen Cook, Lori Gonnu, Victoria Hernandez, Vicki MacLeod, Janice Hughes

and numerous other events together with other colleagues.

Ingrid Silver (shown here on the right with GTWN Secretary-General Vicki MacLeod at the launch of our 20th Anniversary publication at the Circulo Equestre on 27 February 2012), has been our legal and moral conscience for the last 20 years and our GTWN Regional President Europe for almost as long. She has also been publisher and sponsor of many editions of our GTWN Newsletter, which preceded The Mobile Century, as well as our 20th Anniversary book. A fervent advocate of mentoring the next generation, it was Ingrid who added to our GTWN slogan originally coined by Janice Hughes the words and emphasis "….from Generation to Generation." A native Australian and trilingual in English, French and German, she has been our perfect GTWN President Europe, at home on the continent and in the world. Ingrid is a highly-regarded Partner in the Global Entertainment and Media Group at Reed Smith, providing commercial and regulatory advice to the media and entertainment sector. Ingrid is the only lawyer elected to the global board of the Mobile Ecosystem Forum, the leading industry body. She has been voted by the industry as one of the top 50 women in the mobile sector.

It is no wonder that numerous Asian publications have named the GTWN's Regional President for the Asia Pacific. *Myla Vilanueva*, amongst Asia's most influential women. As Chair of MDI Group, and through her many companies and start-up investments in the Philippines, Myla has been a driver of disruptive technological transformation and entrepreneurship. She introduced one of the country's earliest broadband wireless companies targeting educational institutions and developed software to enable low-cost access to online content on mobile devices, both start-up ventures that were eventually acquired by telecommunications giant Smart Communications. Myla has hosted numerous GTWN events in Asia Myla is the epitome of what the GTWN aims to achieve - bring about global impact via telecommunications to change the world.

It is thanks to Myla Villanueva that *Marge Salem* joined us at the GTWN more than 20 years ago. A young team member at the MDI Group, Marge came to support the GTWN. Over the years, Marge has become a sought-after 'Digital Manager' in the Philippines and Asia. Marge has supported all our online and offline publications and to ensure

the image of the GTWN remains fresh and always conforming to our core values.

Vicki MacLeod was Executive Director of the International Institute of Communications when she joined the GTWN and became our Secretary General in 1998, a role she continues to this day. She has edited all the GTWN's major publications and is now Editor-in-Chief of The Mobile Century. Vicki is a specialist in innovation and digital transformation with extensive industry and government experience in Australia and internationally. She combines her industry knowledge with her linguistic abilities in German and French, to help the GTWN to be international and globally relevant.

The journey continues

Mosiri Cabezas and *Gema Estaban Garrido* first began their association with the GTWN in 2014 as colleagues at Telefonica.

Mosiri showed early her passion for using digital technology to transform society in a sustainable way. Mosiri left Telefonica to join IKEA as their Chief Digital Officer, where she is helping the company through the digital transformation of its business. Mosiri has continued her education, at the Harvard Kennedy School of Management and the IE Business School, etc. to always keep ahead of the curve and bring real value to her customers and colleagues.

L to R: At the Opera Liceu on 26 February 2018- Sue Major, Myla Villanueva, Ingrid Silver, Mosiri Cabezas, Janice Hughes, Candace Johnson, Vicki MacLeod, Laureen Cook, Lucy Lombardi, Victoria Hernandez, Michele Merrell and Vicky Sleight.

All of us at the GTWN like to claim that we mentored Gema. Following our meeting in 2014, both she and Mosiri worked hard to enable Telefonica to sponsor the GTWN Welcome Reception at the 2015 GSMA Mobile World Congress. Gema rose quickly through Telefonica, and in 2017 was selected as the Environment, Social and Corporate Governance (ESG) Investor Director for the company. Within three years, Telefonica issued a 1 Bio USD "Green" Bond, establishing them as a global ESG leader. Gema has transitioned from a 'traditional' telecoms executive to a global ESG expert. In doing so, she carries on the GTWN tradition of using communications technology to transform the economy and society.

Lucy Lombardi is a technological and innovation guru. For almost 20 years, Lucy has been leading technological innovation for Telecom Italia and has also been an Executive Management Committee Member of the GSMA, together with our President for Asia, Myla Vilanueva. Lucy is now heading up the Subsidiaries Technical Governance in the Telecom Italia CTIO Office. Lucy has always been a firm supporter the GTWN, including hosting events in Rome.

Michele Merrell is our North America President and is active in various regional and global telecommunications companies as a Board Member, an executive, and an advisor. She is a tireless supporter of the GTWN and women's programs at the GSMA. Michele is a true telecommunications professional with broad experience from wholesale and back-bone networks to mobile and satellite. She is a renowned expert on the power of branding, public relations, digital marketing, and influencer engagement.

Julie Meyer burst on to the European scene in 2000 with Ariadne Capital, bringing the "Entrepreneurs Backing Entrepreneurs" model from her native California to Europe. In her various positions at First Tuesday, Entrepreneur Country, and recently Viva Capital, Julie has built global leading technology-enabled firms, financed entrepreneurship and helped founders build and define their industries. She has advised ground-breaking companies including Monitise, a global leader in mobile money, and has backed many explosive growth companies. Julie was awarded an MBE for her services to entrepreneurship in 2012, a rare UK

honour for an American citizen.

Laina Raveendran Greene understood the potential for technology to change lives for the better during her extensive travels and looked for innovative business and financing models to enable remote and poor communities to access technology. When Laina started an e-learning company in 1997, she was one of the very first female techpreneurs in Singapore. In 2000, she founded Silicon Valley-

based consultancy GETIT Inc, focused on greening the IT and telecom industry, GHG reduction overall. She has since co-founded Angels of Impact, a tech platform which connects women-led social enterprises working on alleviating poverty with consumers, funders and corporates.

As Vice President and General Manager of AT&T Mexico, *Cristina Ruiz De Velasco* is a true telecoms professional. Cristina was instrumental in facilitating AT&T Mexico's sponsorship of our Welcome Reception at the Mobile World Congress in Barcelona in 2012. Thanks to this generous sponsorship, we were able to hold a memorable event at the world famous Circulo Liceu. Cristina has successfully transitioned from a paging network executive to a senior telecoms executive and General Manager of AT & T Mexico. In so doing she has demonstrated her talent and determination, as a next generation GTWN Board Member, to bring enhanced broadband connectivity and services to her fellow citizens in Mexico.

Ellen Strickland was first introduced to Candace Johnson and the work of the GTWN at an ITU Women's Breakfast organized by Walda Roseman. Ellen was then based in New Zealand working

with the Pacific Internet Society. From that chance encounter "OWNSAT - Oceania Women's Network Satellite" was born. OWNSAT is an early stage investor in Kacific, "the Heart of Broadband" bringing High Through-Put Internet to more than 25 Asian Pacific islands. Ellen has also played a leading role in "The Christchurch Call", a response to the two terrorist attacks on the mosques in that city. Travelling with NZ Prime Minister Jacinda Ardern, Ellen joined a senior governmental and industry meeting in France to secure public private cooperation to combat violent extremist online content.

Ana Tavares Lattibeaudiere (shown here third from left with GTWN Board Members Michele Merrell, Laureen Cook and Myla Vilanueva and GSMA Director General Mats Granryd), was inducted in 2019 as a 'next generation' Member of the GTWN Board at our annual GTWN Mobile World Congress Welcome Reception at the famous House of Silk. Ana was at the time GSMA Head of North America. What better way to honour Ana and her tireless work at the GSMA and for women in the telecoms world, and to herald the start of Ana's new career advising companies on digital transformation.

Our colleagues and supporters

The work of the GTWN in promoting and furthering the role of women in the digital technology sector has been made possible over the years by many organizations and individuals who share our desire to bring about positive change. We are profoundly thankful for the support and encouragement of many women and men at the helms of the world's largest TMT companies and industry organizations, who have supported us in terms of sponsorship, collaboration, and indeed encouragement.

L to R: Candace Johnson, Mats Granryd and Bridget Cosgrave during the 25th Anniversary of GTWN at the Circulo Equestre on 27 February 2017

In particular we appreciate the close cooperation we have enjoyed with the GSMA, through the regular participation of the GSMA Board, executive and senior managers in our annual Welcome Reception at the Mobile World Congress in Barcelona. The Director General of the GSMA, Mats Granryd, has been a keynote speaker at many of our events, continuing a tradition which began with his predecessor Anne Bouverot (shown above) addressing the 20th Anniversary celebration at the Circulo Ecuestre in Barcelona on 27 February 2012). It has been a two-way collaboration, as we have

supported the GSMA in its initiatives aimed at furthering the take up of mobile technology in the developing world, including the mWomen program. We have also worked closely with the Connected Women program, developed by then GSMA Senior Memberships Director Vicky Sleight, to encourage more women to develop a career in mobile technology. We continue to support the GSMA in its aims to reduce the gender gap in the mobile industry through the Women4Tech program.

Over the past year, we have been particularly thankful for the support of CMS, who have sponsored the production of this edition of The Mobile Century and helped us to adapt to the changing circumstances by hosting associated online events.

In summary, we can say that the founding and growth of the GTWN has closely tracked the growth and rise of the telecommunications sector to become the backbone of our digital economy and society. From humble beginnings, the GTWN has continued to expand and evolve and has pursued the aim of promoting the role of women in this industry. We can indeed look back on the past three decades with pride and look forward with immense hope for the future.

Bridget Cosgrave is a former Founder Chairman & CEO of BICS, Deputy Director of ETSI (European Telecommunications Standards Institute) and Director General of Digital Europe. Bridget is a pioneer in gender diversity in corporate governance serving as non-executive director for numerous for public and private TMT companies. She is currently on the board of Sinch AB, the world leader CPaas provider for customer engagement. Bridget is a co-founder of the Global Board Ready Women, a founding member of Rising Tide Europe angel investment fund, and Oceania Women's Network Satellite (OWNSAT). Bridget has been a frequent host and sponsor of GTWN events and has mentored many young women throughout her career.

Candace Johnson is a global infrastructure, network and innovation expert and entrepreneur. Currently, she is Vice Chair of NorthStar Earth and Space, the world's first private satellite constellation dedicated to solving two of the most important issues of our time — space debris and climate change. She is also Chair of the Advisory Board of Seraphim Space Capital, the world's largest venture capital fund dedicated to space and space-related ventures. She is co-initiator of SES/ASTRA for which she was named an Officer of the Luxembourg Oak Leaf Crown and architect of SES Global, one of the world's largest satellite systems for which she was named Commander of the Luxembourg Order of Merit.

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CMS believes in facing the future and driving change for our people and communities, for the legal sector and the wider business world. As a top 10 global law firm with a presence in over 40 countries and with colleagues from around the world, we are committed to an inclusive and innovative workplace for our diverse community. Globally, 29% of our Partners and 55% of other lawyers identify as female. Our UK board is 45% female, putting us well ahead of our industry cohort. CMS is committed to making our firm a fair and rewarding place to work. It makes us a more sustainable business, representative of our clients and the inclusive world of technology. We cannot do this alone. We collaborate with all our stakeholders – clients, community organisations, schools, suppliers and other businesses – to make the greatest impact.

Businesses have been challenged as never before by the dual impact of digital transformation and the COVID-19 pandemic. Organisations are confronted by a multitude of legal and people challenges as they respond to fast moving events. Though a significant proportion of our clients are multinationals, we are also acutely aware of the needs of the burgeoning start-up ecosystem. Having strong foundations is crucial. That is why we developed CMS equIP – a unique programme supporting start-ups who demonstrate strong growth and are approaching a Series A round. With over 100 current members, and many successes already, the programme gives access to discounted legal advice, training, networking, and exposure to investors. We are particularly focussed on achieving gender balance in the equIP programme – and the wider start-up world – and our #LeadHers campaign specifically identifies and supports female founders.

We are delighted to have partnered with the GTWN, to support their global work in highlighting the important contribution of women to the technology sector, and to be part of the discussion of "reimagining the future" for us all.

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Selected CMS Technology, Media and Communications specialists

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Ingrid Silver
Partner, Reed Smith
(Regional President, Europe)

Michele Merrell
President
Merrell Consulting Group
(GTWN President North America)

Myla Villanueva
CEO, Novare Technologies/MDi
(Regional President, Asia-Pacific)

Kate McKenzie
Member of the Board, NBN Australia
(President GTWN, Australia and New Zealand)

Candace Johnson
Founder/Co Founder,
SES, Loral-Teleport Europe,
Europe Online, Success Europe
(GTWN Founding Global President)

Vicki MacLeod
Member of the Board,
OWNSAT
(GTWN Secretary General)

Mosiri Cabezas Ceballos
Chief Digital Officer,
IKEA Spain

Carla Cico
Member of the Board
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World Duty Free
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Sallye Clark
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Walda Roseman
CEO, Compass Rose International
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Dr. Ellen Strickland
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