

# THE MOBILE CENTURY

LIFE AND WORK IN THE DIGITAL ERA

FEBRUARY 2019

## TOWARDS A NEW DIGITAL CULTURE

### CYBERSECURITY

NAVIGATING THE NEW DIGITAL CULTURE

TRUST IS ENCRYPTION

THE VALUE OF THE PERSONAL CLOUD

WHY WE NEED NEW DEFENCES AND SKILLS

### INNOVATION

THE FUTURE OF EDUCATION

DEMOCRATISING SCIENCE

5G IN RURAL AND REMOTE COMMUNITIES

ANTHROPOLOGY AND TECHNOLOGY

GOVERNMENTS AND DIGITAL TRANSFORMATION

THE FUTURE OF CASH

### TECHNOLOGY

IOT DRIVING 5G

GENOMICS

DATA NETWORKS

VOICE RECOGNITION

SATELLITE BASED SOLUTIONS

THE FUTURE OF RETAIL

### CULTURE

YOUR DIGITAL TWIN

GUIDE TO DIGITAL CULTURE

DIGITAL LEGACY

OUR SHARED DIGITAL FUTURE

SPONSORED BY:



Women4Tech

WWW.THEMOBILECENTURY.COM

## GTWN INTERNATIONAL BOARD MEMBERS

**BRIDGET COSGRAVE**

NTTRA, Every European Digital, UKKO VERKOT OY  
GTWN Global President

**INGRID SILVER**

Partner, Reed Smith  
(Regional President, Europe)

**MICHELE MERRELL**

President  
Merrell Consulting Group  
(GTWN President USA)

**CANDACE JOHNSON**

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

**CARLA CICO**

CEO, Telemig Celular Participações S.A  
Board Member EPTA  
Allegion, World Duty Free

**LAUREEN COOK**

Executive TMT Adviser, Extelcon Consulting

**AMB. DIANA LADY DOUGAN**

Founding Member  
International Communications Center  
for Strategic & International Studies

**SUSAN DARK**

Board Director

**MARILYN ESPOSITO**

MCC Worldwide President  
(President Emeritus GTWN USA)

**ANN GLOVER**

CEO and Founder, Amadeus Capital Partners Ltd

**JANET YALE**

President & CEO,  
The Arthritis Society

**SALLYE CLARK**

Partner,  
Mintz Levin

**MOSIRI CABEZAS CEBALLOS**

Chief Digital Officer,  
IKEA Spain

**GEMA ESTEBAN GARRIDO**

ESG Investors & Reporting Director  
Telefonica

**DR. MINA-JAQUELINE SCHACHTER-RADIG**

German Telecoms Pioneer

**MARJORIE SALEM-GALVEZ**

Art and Managing Director, GTWN

**MYLA VILLANUEVA**

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

**KATE MCKENZIE**

CEO Chorus  
(President GTWN Australia/New Zealand)

**VICKI MACLEOD**

GTWN Secretary General  
Member of the Board,  
OWNSAT

**HEATHER HUDSON**

Professor and Director,  
Institute of Social and Economic Research  
(ISER) University of Alaska,  
Anchorage

**JANICE HUGHES**

Founder/Director  
Red Shift Strategy  
Founder, Spectrum Strategy Consultants

**VICTORIA HERNANDEZ**

CEO, Sequeris

**JULIE MEYER, MBE**

Chair, Founder and CEO,  
Entrepreneur Country and Viva Capital  
(Immediate Past President)

**SUSAN MAJOR**

Managing Director, Major Executive Search

**LUCY LOMBARDI**

Senior Vice President, Telecom Italia  
GSMA EMC Member

**LAINA RAVEENDRAN GREENE**

CEO and Lead Consultant, , GET-IT

**DR. JESSIE MCLEMAN**

Founding GTWN Board Member  
Former BT and Scottish Water Executive

**ELISABETH SLAPIO**

Managing Director,  
IHK Cologne Chamber of Commerce, Germany

**WALDA ROSEMAN**

CEO, Compass Rose International  
Chair, Arthur Clarke Foundation

**CRISTINA RUIZ DE VELASCO**

Vice President,  
Nextel, Mexico

**MARIE-MONIQUE STECKEL**

President, Alliance Francaise, United States

**DR. SUSANNE PAECH**

Founder and CEO, Servus-TV



Welcome to the 2019 edition of the Global Telecom Women's Network (GTWN) flagship publication, The Mobile Century: Life and Work in the Digital Era (TMC).

This year, in recognition of the continuing evolution of the digital age, we decided to explore how digital technology in all of its forms is changing every aspect of our lives: Towards a new Digital Culture.

Since its inception more than a quarter of a century ago, at the start of the internet revolution, the GTWN has focused not just on technology, but also on the impact that technology is having on the economy and society at large. We have taken a particular interest in highlighting the intersection between technology and humanity. Our members and colleagues are intensely focused on how we can apply the great advances in communications networks, media, computing, satellites, big data and social media, for example, to solve some of the most important problems facing mankind.

It is therefore no surprise that TMC has always covered a very broad range of topics where digital technologies are being applied - from healthcare, education, social sciences, law and regulation, finance, to space and development aid. And this year is no exception. The rapid advances in digital mobile and fixed technology is also a strong theme this year - ultra fast broadband networks, and the challenges of the ever-increasing data demands of consumers; the promise of 5G and IoT; artificial intelligence and machine learning

applications; virtual reality; the use of satellites in isolated communities; the promises of gene-based healthcare; and the future of digital cash. The variety and depth of these topics clearly demonstrate the knowledge and expertise of our members, colleagues and supporters, as well as their industry recognition.

Reflecting the rise of scams and cybercrime, a particular focus this year is on cybersecurity and the ways we can all seek to safeguard our privacy while fully participating in our new data driven world. Many answers are proposed - from encryption, to consumer education and awareness, to regulation. Ultimately, one suspects, a combination of all of these approaches, and perhaps even more, will be needed, while our perception of privacy may itself continue to evolve in line with technology.

A special thank you to our authors, who have given of their time and expertise to make this publication a success. Thanks, as always to our designer and sub-editor, Marge Salem for meeting tight deadlines with a smile.

We are proud to be partners with the GSMA's Women4Tech Program, without whose sponsorship this publication would not have been possible.

We would also like to acknowledge, with our sincere thanks, the support of SES-imagotag, sponsors of our Welcome Reception held at the Casa de la Seda (Silk Museum) during MWC Barcelona on 25 February 2019.

**VICKI MACLEOD**  
Editor in Chief

# THE MOBILE CENTURY



## GSMA is committed to reducing the gender gap of women in technology

Women4Tech is the global GSMA programme that focuses on addressing gender equality and reducing the persistent gender gap in the mobile industry, inspiring industry action for female leadership and workforce representation. Women4Tech offers different touchpoints for women throughout their education and career journey from early and graduate studies, to entering the workforce, and to executive leadership and board representation with focused activities and as part of the GSMA's MWC events. Women4Tech supports the United Nations Sustainable Development Goals, in particular SDG 5: "to achieve gender equality and empower all women and girls." Women4Tech has dedicated its commitment to reducing the gap of women in technology ranging from youth to executive levels.

Under the Women4Tech umbrella, the GSMA's Tech4Girls programme aims to reduce the gender gap in the tech industry by exposing young girls to technology through learning and education. Launched in March of 2018, Tech4Girls offers hands-on workshops for elementary through high school girls to inspire careers in Science, Technology, Engineering and Arts and Design and Math (STEAM) studies. In the hands-on workshops, industry professionals teach girls from local schools industry skills such as coding and programming. Workshop participants also get a chance to hear from women in STEAM careers and see live demos from the latest technologies. So far, participants, selected from underserved communities and

local schools, have developed an artificial intelligence tool such as Google Home and a Kano Computer.

The GSMA Women4Tech programme inspires and connects women with the end goal to reduce, not only the gap in female representation across the mobile industry, but also in senior leadership roles. Women4Tech activities focus on career growth by creating development and networking opportunities for senior leadership with the end goal to increase female representation on executive boards.

Women4Tech offers a robust agenda at MWC Barcelona, MWC Shanghai, MWC Los Angeles, and m360s including keynote sessions; a Women4Tech Summit; the Women4Tech Speed Coaching and Networking session; specialised MWC Tours; Women4Tech GLOMO awards for "Outstanding Achievement in Mobile Industry Leadership"; a Women4Tech panel on Mobile World Live TV; and Women4Tech activities at 4YFN.

GSMA is committed to advancing SDG 5 and will continue to grow its dedicated programmes, development and networking opportunities for women at each career level to reduce this gender gap and support gender equality in technology.

**Women4Tech**

# CYBERSECURITY

## SECURELY NAVIGATING THE NEW DIGITAL CULTURE

Edna Conway  
Chief Security Officer, Global Value Chain  
Cisco

**P. 7**

## TRUST IS ENCRYPTION

Sandrine Murcia  
CEO and Co-Founder  
Cosmian

**P. 9**

## KEEPING IT SIMPLE: THE VALUE OF THE OPERATOR PERSONAL CLOUD

Mary Patterson Clark  
Chief Product Officer & CMO  
Synchronoss

**P. 11**

## ESECURITY: WHY WE NEED NEW DEFENCES AND NEW SKILLS

Michele Merrell  
President, Merrell Consulting Group  
North America President of GTWN

**P. 13**

# TECHNOLOGY

## IOT DRIVERS OF THE 5G REVOLUTION

Laureen R Cook, Executive  
TMT Adviser  
Extelcon

**P. 15**

## SEQUENCING 100,000 GENOMES FOR PERSONALISED MEDICINE: IT TAKES A VILLAGE

Dr Lea Lahnstein  
Cross-Cutting Co-ordinator  
Genomics England Clinical Interpretation  
Partnership

**P. 17**

## MEETING THE DATA NEEDS OF THE FUTURE: THE NEW ZEALAND EXPERIENCE

Kate McKenzie  
CEO, Chorus

**P. 21**

## THE COEVOLUTION OF SPEECH TECHNOLOGY: A ROAD MAP FOR ADAPTATION

Laura Kusumoto  
Former Director, Technology Innovation  
Enablement, Disney Parks & Resorts

**P. 22**

## AWARD-WINNING SATELLITE TECHNOLOGY DRIVING SOLUTIONS TO THE DIGITAL DIVIDE

Kacific

**P. 25**

## THE FUTURE OF RETAIL: BUILDING THE WORLD'S LEADING RETAIL IOT CLOUD PLATFORM

SES-imagotag

**P. 28**

# INNOVATION

## THE FUTURE OF EDUCATION - WHEN EDUCATORS BECOME LEARNERS

Dr Michelle Zimmerman  
Microsoft Innovative Educator Expert,  
Renton Prep, Seattle USA

**P. 30**

## DEMOCRATISING SCIENCE: LEVERAGING AI FOR HUMANITY

Dr Vivian Chan  
Co-Founder and CEO  
Sparrho

**P. 34**

## 5G: CHALLENGES FOR RURAL AND DEVELOPING REGIONS

Dr Heather E. Hudson  
Professor and Director  
Institute of Social and Economic Research (ISER)  
University of Alaska, Anchorage

**P. 36**

## ANTHROPOLOGY AND TECHNOLOGY: SOLVING GLOBAL PROBLEMS WITH PRACTICAL SOLUTIONS

Juliette Neu  
CEO and Co-Founder  
Cingeto

**P. 40**

## DIGITAL TRANSFORMATION: THE CHALLENGE FOR GOVERNMENT

Carla Cico  
Member of the Board  
Allegion

**P. 43**

## LIVING IN A WORLD OF CASH

Victoria Hernandez  
Rising Tide Europe 3  
Head of the Investment Committee

**P. 45**

# CULTURE

## ARE YOU READY FOR YOUR “DIGITAL TWIN”?

Derrick de Kerckhove and Maria Pia Rossignaud  
Media Duemila

**P. 47**

## A HITCHHIKER'S GUIDE TO DIGITAL CULTURE

Vicki MacLeod  
Secretary-General  
GTWN

**P. 50**

## OUR DIGITAL LEGACY: CREATING A NEW CULTURE FOR THE NEXT GENERATION

Vicky Sleight FRSA  
Chief Perfect Officer, Perfect Ltd &  
Senior Advisor Diversity & Inclusion

**P. 52**

## OUR SHARED DIGITAL FUTURE - BUILDING AN INCLUSIVE, TRUSTWORTHY AND SUSTAINABLE DIGITAL SOCIETY

Lynn St. Amour  
Chair of the UN Internet Governance Forum  
Multistakeholder Advisory  
Group (IGF-MAG).

**P. 53**

# CYBERSECURITY

## SECURELY NAVIGATING THE NEW DIGITAL CULTURE

### EDNA CONWAY

Chief Security Officer, Global Value Chain, Cisco

We used to only imagine a world where connected “things” talk to, listen to, and observe all of us. For example, biometric data compiling real-time as we eat, sleep, and go about our lives in order to provide us with better health outcomes. Or a world where devices are able to talk to other devices at speeds beyond human comprehension to improve the performance of human transportation, factory floor production, or the human interface with our mobile devices. With today’s influx of connected devices, we are already roaring down a high velocity digital highway. Our challenge now is to understand how to reap the benefits of that connected world while also ensuring security with every connection we make.

These connected devices are sharing information and controlling operations across a spectrum we could not have imagined even five years ago. Moreover, the convergence of Information Technology (IT) and Operational Technology (OT) has been sweeping global industries, including sectors such as energy, heavy equipment, transportation and healthcare. Digital connectivity has also expanded into all aspects of daily living and government, exacerbating the need for ever more vigilance and security across and through this interconnected environment.

Today’s focus must be on who has access to the operational data generated by this hyper-connected world and how to ensure that every device in it is secure. The exponential increase in the number of connected sensors and devices creates an attack surface of unprecedented depth and breadth. Thus, the challenge is to secure these exponentially increasing connections.

What often keeps me up at night is my concern for the hidden and often overlooked reality that as we digitize, we are expanding the ecosystem of third parties who will inevitably impact us. Who will be “touching our stuff”, whether physically or digitally?

The more we connect – the more transparent and collaborative we are – the more we are allowing others to observe and possibly control us. For better, or for worse.

As participants in digital culture, whether individually or at an enterprise level, we must be aware of who and what is digitally and physically touching our information and devices. As the deployment of connected devices expands, the related third party security risk of data loss, invasion of privacy and cyberattacks will only rise.

To meaningfully address this inevitability, let’s step back and examine the problem by defining it in terms of threats and threat impacts.

### THE THREATS

**Manipulation** – The alteration of technology that allows unintended control or observation. Such an alteration of a connected device and its resultant security vulnerabilities can have a host of ramifications. Ramifications that include a failure of the device itself or control of the Information Technology (IT) systems to which it connects, including a denial of service. Ramifications can also manifest in the Operational Technology (OT) that has converged with these affected IT systems, including outright failures or reconfigured operational settings.

**Espionage** – The observation of confidential information at any point in the new ecosystem of digitally and operationally converged technology. Espionage is not just the prerogative of nation states anymore. A disgruntled co-worker or a devious neighbor can equally be an unwanted observer.

**Disruption** – From the most draconian level of a full denial of service to precise surgical alterations that allow data and operational processes to be changed. Have you ever been in an airport when a reservation system goes down?

## 8 CYBERSECURITY

### THE THREAT IMPACTS

**Tainted Solutions** – Whether hardware, software or cloud-based services, the threats identified above lead to the risk of taint—anything that no longer functions as its designer or user intended. Taint can have far-reaching consequences.

**Counterfeit Solutions** – Functional integrity and quality are compromised when deceptively “real” looking and functioning technology is put into operation. We can all fall prey to spoofed emails or a false front cloud platform.

**Intellectual Property Misuse** – The lifeblood of innovation, intellectual property (IP), when disclosed in whole or in part, can be effectively leveraged by bad actors to manipulate, falsify, and create tainted and counterfeit solutions.

Awareness of these threats and threat impacts to you, your enterprise, community or government must encompass a view throughout the entire value chain. What exactly is this “Value Chain”? The value chain is the end-to-end lifecycle for any technology used in our growing digital culture.

### RISK VS. REWARD

Connected technology should be used to serve us – humanity. To use it wisely we must examine when and how to use it, balancing the security and safety risks inherent in connectivity with its obvious benefits.

Let’s explore this essential survival tip for the digital age, because the connected world requires a rigorous risk and reward analysis.

It is important to understand a digital device before you connect it. Be aware of why and with whom you are sharing information. From a consumer perspective, consider the example of a smart refrigerator. The primary function of a refrigerator is to keep items cold. Ask yourself:

- Do you really need it to check Facebook or read email?
- Do you actually need it to count the eggs or check the expiration date of your milk?
- Will you even use all the features it provides?
- Does the refrigerator allow you certain control options?

- Can you manage who can access the refrigerator from other connected devices?
- Does the manufacturer provide software updates to address new security vulnerabilities?

Similar consideration should surround the use of any connected device. This is true for consumers, enterprises and governments alike. Inherent in all cases is the need to also address the potential third party threats. So the next time you’re chasing the latest shiny object—whether a connected refrigerator in your home, or connected industrial controls systems in the manufacturing plant—avail yourself of your human advantage, perhaps enhanced with data analysis and some artificial intelligence for good measure, and weigh benefit versus risk FIRST.

The extraordinary opportunity to reap life-altering benefits from the burgeoning growth of connected devices is ours as we roar down today’s digital highway. But to live wisely and thrive in our new digital culture, we must think through how best to take advantage of pervasive connectivity, balancing the security and safety risks inherent in every on-ramp.



**EDNA**  
**CONWAY**

Edna Conway currently serves as Cisco’s Chief Security Officer, Global Value Chain, creating clear strategies to deliver secure operating models for the digital economy. She has built new organizations delivering cyber security, compliance, risk management, sustainability and value chain transformation. She drives a comprehensive security architecture across Cisco’s third-party ecosystem.

Conway is recognized domestically (US Presidential Commissions) and globally (NATO) as the developer of architectures delivering value chain security, sustainability and resiliency. She was recently appointed to the Executive Committee of the U.S. Department of Homeland Security’s ICT Supply Chain Risk Management Task Force. Her insight is featured in a range of publications, analyst reports, and case studies, including Forbes, Fortune, Bloomberg, Washington Post, CIO Magazine and the Wall Street Journal.

Acknowledgement of her industry leadership includes membership in the Fortune Most Powerful Women community, and awards including: a Fed 100 Award, Stevie “Maverick of the Year Award,” a Connected World Magazine “Machine to Machine and IOT Trailblazer” Award, an SC Media Reboot Leadership Award, a New Hampshire TechProfessional of the Year 2018 Award, and CSO of the Year Award at RSA. Conway serves or has served on Cisco’s Cyber-Security Board, Risk and Resiliency Operating Committee, Global Compliance Governance Committee and Eco Board. She also serves as an independent advisor on the Executive Advisory Boards of many technology companies and organizations.

Prior to Cisco, Conway was a partner in an international private legal practice and served as Assistant Attorney General for the State of New Hampshire.

For more: Twitter: @Edna\_Conway; Cisco’s Global Value Chain security solutions at <https://bit.ly/2DxM20u>

### THE MOBILE CENTURY

# TRUST IS ENCRYPTION

**SANDRINE MURCIA**

CEO and Co-Founder, Cosmian<sup>1</sup>

**THE LATEST, STATE-OF-THE-ART CRYPTOGRAPHIC TECHNOLOGIES ARE POISED TO BECOME OUR NEXT BEST FRIENDS TO PROTECT OUR PERSONAL DATA. WHILE ALLOWING THE DATA ECONOMY TO THRIVE WITHOUT COMPROMISING OUR PRIVACY.**

For about a year now, there has not been a single week without news of a massive customer data theft. The recent cases of Cambridge Analytica, British Airways, Google+ or Facebook hit the headlines. No one is spared, from Internet moguls to bricks-and-mortar retailers. But above all, it is us, the individuals, who bear the maximum cost: not only are our personal data stripped from us without full consent, but they are traded, stolen, manipulated - in short, out of our control.

Every day I find myself in situations where I have to disclose personal data. And every day I'm struck by the fact that I'm somehow forced to reveal or to give access to a lot more than what is really needed. Why does my bank have to access all the details of my daily transactions: what, how much and where? My contract with the bank is about me making sure there is enough money in my account and paying debt interest if there is not. Not about giving the bank access to all these personal details. What's in it for me?

Why do I have to provide my entire tax report to rent an apartment just to prove I can actually pay the rent? Why is my online activity recorded and sold to third-parties without my consent to benefit from so called user benefits such as «targeted advertising» or «personalized services»?

Don't get me wrong. I'm not arguing the pipeline of data should be sealed with lead. I'm pointing out the extreme need for regaining control on who accesses our data and what for. Not more. The (very) good news is that this type of control, allowing for selective data osmosis with full and informed user consent, is now possible thanks to the latest cryptographic research turned into service applications.

Let me highlight the two fundamental

<sup>1</sup> <https://cosmian.com/>

**“THE NARRATIVE THAT SOME COMPANIES WILL TRY TO GET YOU TO BELIEVE IS, ‘I’VE GOT TO TAKE ALL OF YOUR DATA TO MAKE MY SERVICE BETTER.’ WE’LL DON’T BELIEVE THAT. WHOEVER IS TELLING YOU THAT - IS A BUNCH OF BUNK.”**

**- - TIM COOK, CEO, APPLE**

reasons why I believe cryptography is poised to revolutionize privacy in everyday applications.

## **Mathematics not Magic**

Cryptology is the study of techniques for «enciphering and deciphering of messages in secret code or cipher» (Merriam-Webster). The mother of all such techniques was encryption or how to convert information from a readable state to apparent nonsense. Ancient Greeks, Julius Caesar, Persians, Czars & Kings all over Europe - to name the oldest but not the least - have used encryption for diplomatic reasons, to protect war communications and intimate conversations. On a lighter note: who hasn't written with invisible ink during treasure hunts in summer camps?

The computer era changed the nature of the game, tremendously augmenting our abilities to encrypt and decrypt.

Think about WWII, Alan Turing cracking Nazis' Enigma machines. In the past 30 years, cryptographic techniques heavily transformed themselves with intensive use of mathematics. In 1976, modern cryptography was taken by storm with the revolutionary concept of «public key encryption» (Diffie-Hellman and Merkle): a pair of different but mathematically related keys, the public key to encrypt and the private key to decrypt.<sup>2</sup> Hence, if I give away my public key, anyone can use my public key to encrypt data - but I am the only one to be able to decrypt the data using my private key (as long, of course, as I don't give it away as well).

This founding principle directly led to the emergence of many public-key encryption systems - one of the most famous being the algorithm developed by Rivest-Shamir-Adleman. The RSA cryptosystem has been at the core of several applications and RSA signatures are still very much in use in SSL certificates, for instance. SSL certificates are (An SSL Certificate is a small computer file that digitally combines a cryptographic key with an organization's details). More recently, schemes such as Elliptic Curve Cryptography became very popular and most blockchain systems are built on it. In a nutshell, we are all already exposed to, or are using cryptographic technologies without knowing it. Just like your car or household equipment is powered by state-of-the-art electronics, which are invisible to the user.

In short, cryptographic technologies are the new chips of the data economy.

**The only bulletproof personal data protection is for data to be encrypted with the Person's public key.**

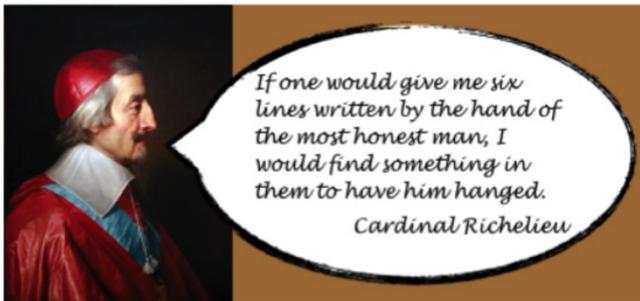
First of all, let me explain why public-

<sup>2</sup> <https://ieeexplore.ieee.org/document/1006971> - Martin E. Hellman - An overview of Public Key Cryptography

## 10 CYBERSECURITY

key encryption of your personal data protects your privacy. Since your data are encrypted with your public key, only your private key can decrypt them hence only you can read them. No one else but you. It's mathematically bulletproof.

But you may ask: Why on earth would I want to encrypt my personal data? When I browse the web, search for products, post on social networks, my activities are legitimate. I don't have anything to hide. Here is why you should always favor encryption. This is not about hiding anything.



I don't mean to be as extreme as Cardinal Richelieu (famous and feared French Foreign Secretary -1585-1642) and suspect systematic data mishandling. But the fact is that you don't know who accesses your data and what for. Conclusion: personal data should be encrypted by their owner.

Second, when personal data are encrypted, there is a significant reduction

of risks in data security and in data compliance. Very good news again, this time for companies and organizations.

When customers' personal data are encrypted with customers' public keys, organizations not only stop holding «clear text data» (subjected to European GDPR regulation<sup>3</sup>) but also the consequences of data breaches are reduced: data can still be stolen if security fails but data can't be decrypted as long as the private keys are not in the hacker's hands. Protecting private keys has hence become essential and a large number of new paradigms, hardware and companies have recently emerged to improve handling and security.

Last but not least, once properly encrypted, personal data can be stored anywhere: in the cloud, locally on devices, on premises. This flexibility also reduces compliance risks for organizations.

In summary, cryptography is a highly technical, mathematically involved, constantly evolving subject. At Cosmian

[3 https://eugdpr.org/](https://eugdpr.org/)

**“THERE ARE 2 TYPES OF COMPANIES: THOSE WHO HAVE BEEN HACKED, AND THOSE WHO DON'T YET KNOW THEY HAVE BEEN HACKED”**

**-- JOHN CHAMBERS, EX-CEO, CISCO**

we believe that some of these techniques are ready for wider application and should immediately be enabled to satisfy the need for improved privacy. We are working hard with world renowned cryptographers to make them available in easy to use packages and tools to application developers and data scientists.

Our goal is a time when privacy does not become a choice, but the default.

*(This is a shortened version of an original article published in Medium on November 15, 2018)*



# SANDRINE

## MURCIA

After 15 years in leadership positions at global corporations, Sandrine Murcia decided to answer the call of a stronger force and become an entrepreneur. Sandrine is the CEO and co-founder of Cosmian, the Private Data Intelligence platform with zero compromise on privacy. Leveraging deeptech cryptography and blockchain technologies, Cosmian powers a fair and secure private data economy. Sandrine began her career in 1995 at Procter & Gamble. In 1999, thrilled by the emerging potential of the Internet, she switched gears and joined Microsoft's MSN consumer division. In 2004, Sandrine joined Google as Southern Europe Marketing Director. In 2010, she co-created her first company, Spring Lab - a strategic consultancy in business innovation and digital transformation. Sandrine then joined Connecthings in 2015, a leading Smart City mobile engagement service company, as Managing Director. Sandrine is deeply involved in supporting women's entrepreneurship and is a strong advocate for women in tech. She holds a BS in Biotechnology from INSA Lyon and a HEC Paris Master in Entrepreneurship. Sandrine is a 2004 Kellogg School of Management MBA graduate.

# KEEPING IT SIMPLE: THE VALUE OF THE OPERATOR PERSONAL CLOUD

**MARY PATTERSON CLARK**

Chief Product Officer and CMO, Synchronoss

Consumers increasingly want the ability to access all aspects of their digital life anywhere and anytime. They also want the simple, easy-to-use experience now made ubiquitous by Facebook, Amazon, Apple, Netflix and Google (FAANG). These companies, which have grown up in a native IP world, have kept simplicity at the center of their user experience. Unfortunately, for many mobile operators and broadband providers who started way before being a “digital native” was a thing, keeping it simple may seem like an unattainable goal, given the growing complexity of the digital landscape.

The key to helping customers – both enterprises and individuals – get their digital worlds under control is to help them realize that today content is worth much more than the device. Devices are being lost, stolen and damaged at a growing rate, but the amount of personal and business-related content on them keeps accumulating. While insurance can cover the replacement cost of a phone or laptop, it cannot recover the loss of an important contract, the first draft of a novel, family photos from a recent

holiday or information-heavy messaging communications.

Many operators and broadband providers have recognized that part of their value proposition is helping businesses and individual customers to trust them to reliably store and protect their critical content through the cloud.

Convincing anyone to leverage the cloud should not be difficult once they understand that the cloud will:

- **Protect Content:** A cloud solution that backs up, syncs and restores content provides the user the ability to securely protect documents, messages, contacts, photos, videos and more in case a laptop crashes or a mobile phone is stolen.
- **Give Full Access to Content, Anytime and Anywhere:** Whether streaming music to a home entertainment system or sharing a presentation at an off-site meeting, the cloud gives customers the freedom to access their business and personal content where and when they need it.
- **Allow Easy Sharing of Content:** The cloud also makes it easy to share important files, documents, photos and videos – especially those too large to email – through cloud functionality. Just as importantly, the owner of the data has the ability to manage who has access to specific files.
- **Consolidate Contacts:** The cloud gives your customers the ability to create a single, consolidated contact list across all devices and third-party services, alleviating the worry about lost email addresses or phone numbers.

These values are now mostly recognized as consumers and businesses alike use the cloud for many aspects of daily life. The key decision that needs to be made next, especially as we consider the plight

of mobile network operators who must create new revenue while driving down costs in anticipation of 5G investments, is how to prioritize projects like cloud and how to promote them.

## TRUST IS CRITICAL

By offering a cloud solution to customers, operators and broadband providers can create a completely different value exchange. They change the conversation from a focus only on the customer’s monthly bill to an engaging interaction related to that customer’s most valuable digital assets. Moreover, being offered a cloud solution by an already trusted service provider eliminates many of the concerns end users have about storing their valuable content in the cloud.

This is especially relevant when considering the results of a 2018 survey by Sapio Research. In that survey, 62 percent of respondents stated that when it comes to protecting their data, they trust mobile operators more than over-the-top players. Moreover, 56 percent of the respondents who stated that they trusted their mobile operator more than over-the-top players also said they were more willing to share their personal data with those operators.

## AN EXISTING ECOSYSTEM

Another reason operators and broadband providers are well-positioned to serve as a cloud provider is that they already have the right ecosystem in place. Some of these key elements include:

- **Customer Service:** Existing customer service channels that have been used to onboard new customers or to help existing customers manage their services provide a familiar method of interacting with a known company – a rarity with FAANG organizations – allowing for further differentiation by the operator.



## 12 CYBERSECURITY

- **Device Buy Flow:** Because the operator controls the device buy flow that the customer goes through when obtaining service for the first time or upgrading service, the operator has an opportunity to upsell additional services, including cloud offerings. The same goes for broadband providers, as well.
- **Existing Billing Relationship:** Both pre-paid or post-paid end users have payment methods already in place for the most part; therefore, adding a new service such as cloud storage is not difficult for either that end user or the provider.

### A REVENUE OPPORTUNITY

As the amount of content that individuals consume continues to grow at exponential

rates, individual reliance on a personal cloud will soon become completely ingrained in our digital behavior, much as we rely on Wi-Fi today. If operators are going to reap the benefits, including the opportunity to generate new revenue, now is the time to launch personal cloud solutions and create a stronger long-term financially rewarding relationship with their customers.

As service providers around the world come to grips with the convergence we see in the telecommunications, media and technology sector, they continue to look for ways to expand their value. For most, buying media content companies or merging with other companies is rare and reserved for the very largest of businesses. Instead, they should focus on offering a set of solutions – one of

which is a simple, easy-to-use personal cloud offering – that will expand their value with their customers, thereby changing the dynamic from a provider of connectivity to one of true value for some of the most important things in our lives.



**MARY**  
**CLARK**

Mary Clark is the Chief Product Officer and Chief Marketing Officer of Synchronoss. In this role she is responsible for global product management, marketing and communications. Prior to joining Synchronoss, Mary served as the Chief Marketing Officer and Senior Vice President of Roaming at Syniverse. Throughout her 25 years in mobile, she has held several executive-level positions and currently serves as a Board member for The CTIA Wireless Foundation and is an industry advisor for Astra Capital Management. She has been an active industry speaker as well as a contributing writer for Global Telecoms Business and CMO.com. Mary is a champion of gender diversity and has been heavily involved in the Women4Tech program founded in 2016, the GSMA's program on promoting women leadership in mobile technology. Her recognition spans from being named to the National Diversity Council's "Top 50 Most Powerful Women in Technology" list in 2016 and 2017 to Mobile Marketer's "Mobile Women to Watch 2016" list. Most recently she was named to Capacity Magazine's 2018 20 Women to Watch 2018, a list of some of the most prominent women in telecom. Ms. Clark holds a Bachelor of Arts in communications from the University of Delaware.

# ESECURITY: WHY WE NEED NEW DEFENCES AND NEW SKILLS

**MICHELE MERRELL**

President, Merrell Consulting Group, North America President of GTWN

For all the benefits of the fourth industrial revolution, the age of the Internet and big data, most of us are faced with an inability to adequately prevent eSecurity breaches that seem to occur on a daily basis, despite an ever-increasing spend on IT security.

Many within the tech sector from twenty years or so ago, will remember that over the years, IT security was relative child's play. Most of the data (of which there was a fraction of what we have today) was largely contained within a small IT department and its infrastructure. Access to company data and applications was tightly controlled and occurred in a few well-known ways via terminals, desktops, laptops and consoles. Where data breaches occurred, it was usually seen as a bit of mischief by amateurs without any clear agenda beyond their 15 minutes of fame. In those days, many hackers were actually recruited by large tech companies and turned from "poachers" to "game keepers," as the saying goes.

Today, one of the fastest growing job specializations in the ICT sector is e-security or cybersecurity expert. Governments and businesses around the world have woken up to security threats presented by the highly complex online environment we now face - with an ever changing and evolving mix of different fixed and mobile hardware, firmware, software, BYO devices and applications. And because businesses around the globe are transforming themselves digitally and putting more and more of their data online and in the cloud, corporate or even national boundaries no longer provide the protections they once did.

Hacking has now become a central skill for organized crime gangs in places as far apart as Nigeria, Malaysia and Belarus. The armies of hackers keep growing and are dispersed around the globe, and in many cases, they use the dark web

to share data and ply their modern-day form of piracy. The motives of those who are fighting this cyberwar are also as diverse as their locations - from terrorism, to nationalism, to anarchy or just plain greed.

So how can we address this increasing risk, and turn it from threat to opportunity? How can we design new security systems that will adequately defend us against these data breaches? What are businesses proposing, and what should they do, to increase their e-security now and in the near future?

Some interesting insights into these questions was provided in the 2018 Thales Global Data Threat Report.<sup>1</sup> According to the report, "data breaches have become the new reality... For the global survey conducted by 451 Research 1,200+ senior security executives were surveyed from across the globe and included respondents from key regional markets in the U.S., U.K., Germany, Japan, Sweden, the Netherlands, Korea and India. Key segments within those countries were also included in the survey, including federal government, retail, finance and healthcare."

The key results of the survey are both astounding and sobering. According to the respondents, "67% of global enterprises have now been breached (73% in the US); 42% of enterprises breached this year have been breached in the past; and 79% increased IT spending, but the data breaches did not slow down in response".

So clearly what we are doing is not working, or it may be having some slight impact, but not enough to keep pace with the growing threat. Consumers and businesses are no longer as accepting of data breaches as they perhaps were in

the past, and the potential economic and social harm is growing. Governments are starting to give privacy regulators ever greater powers to intervene.

In response to community concern about the increasing risk to private data, data privacy regulations have either been introduced or are in planning in many countries, with the potential to substantially impact organizations of all types. Last year the most potent of these new privacy frameworks came into effect - the EU General Data Protection Regulation (GDPR). Although it applies only within the EU, it has in fact ushered in fundamental changes in the way organizations must deal with any data related to the European Union's 500 million residents. The GDPR has required online actors to disclose how and why they keep personal data and track online behaviour. This has made the whole process more transparent to online users, but also in many ways, even more concerning. The pressure is mounting on all sides to find a new solution.

We need new skills to tackle these threats. Perhaps the key to tackling these ever-increasing cyberthreats is to realize that we are all ultimately responsible for our own online security. It is no longer just the task of the IT department, or businesses with whom we do online transactions, to secure our data and make sure we do not fall victim to online hacking or cybercrime. And this exposes all of us to the reality that we are not nearly as skilled in digital world survival as we should be. Only a relatively small percentage of children study IT in any depth, even fewer at tertiary level, and an even smaller percentage go on to make a career in IT. While the so-called 'digital natives' of the millennial and Gen Z demographics are firmly wedded to their mobile devices and online gaming consoles, far too few of them are choosing to study IT, digital media and above all digital security or to progress to

<sup>1</sup> <https://dtr.thalesecurity.com/>

## 14 CYBERSECURITY

a career in these areas. As a fast-moving sector that hinges on advancements in technology, the cyber security industry is facing a skills gap.

From a slow start a few years ago with voluntary and community organizations, digital skills education is now being adopted as a priority in many countries.

In the US, the National Initiative for Cybersecurity Careers and Studies offers more than 3,000 cybersecurity-related courses, both online and in person, from more than 125 providers around the US. These providers offer education and training courses for all people interested in advancing their cybersecurity knowledge and skills. It has a particular focus on career changers seeking to forge a new path as well as US service veterans retraining for the

next phase of their lives. In addition, the Federal Government offers free online, on-demand cybersecurity training for government personnel and veterans. Topics include ethical hacking and surveillance, cyber risk management, as well as malware analysis and mitigation. Many cybersecurity initiatives in the US now focus on high schools, to identify and encourage those who have the ability to excel in cyber and to make a career in this rapidly growing field. According to some analysts, there will be up to 3.5 million job openings in cyber-related roles by 2021, but women still make up only 20% of the cybersecurity workforce.

In order to address this gender gap, both in the US and elsewhere, a special focus is being placed on the low numbers of girls participating in computing skills classes, as they generally lag behind their

male peers in this area. It was recently announced that the UK's intelligence and security agency, the GCHQ has created a new competition for girls aged 12 - 13 in codebreaking, in a bid to create the next generation of female cybersecurity professionals. This initiative, CyberFirst Girls Competition, kicked off on January 21 this year and offers female students an opportunity to learn about cybersecurity and practice skills in a simulated real-world environment. It is great to see this initiative to inspire female students to join the cybersecurity workforce.

Given the vast number of data breaches reported by organizations around the globe in 2018, and the ongoing skills shortage, it is vital that government, industry, education and the media work together to make cyber security an exciting and inviting career choice for all.



# MICHELE MERRELL

Michele M. Merrell is a senior level technology and telecommunications executive with 30 years experience in organizations ranging from start-up to mature, private, public and pre-IPO. She is the President of Merrell Consulting Group, a global marketing consulting consortium. She is an experienced practitioner in marketing, branding, advertising, social media, digital marketing, internet development, product marketing, public relations, crisis communications, public affairs, corporate communications, investor relations, and corporate social responsibility. She has worked for companies such as Tyco International, Brightstar, CSPI Technology Solutions, Thales eSecurity, Bellsouth, U.S. Cellular and others.

Michele currently serves on the Board of Directors for three international corporations, including Cable Bahamas (BISX: CBL), Aliv (Nassau, Bahamas) and Summit Broadband (Orlando, FL). She is the head of the Corporate Governance Committee for all three organizations, and also sits on the HR & Compensation Committee. She is on the international board of directors for the GTWN and is the North America President for the GTWN. In 2018, she was named to the board of the LeMieux Center for Public Policy. She is an elected official in her county of residence. Michele's achievements have earned her dozens of awards and recognition over her career for her business and leadership acumen. In 2019, she will receive the "Women of Distinction Lifetime Achievement Award from Celebrating Women International. She received the Women of the Channel Power 100 Award by CRN Magazine. Michele was the recipient of the Florida Achievement Award from the Florida Commission on the Status of Women, part of the Office of the Attorney General, State of Florida. The South Florida Business Journal also named Michele as their "Business Woman of Influence" recipient. Michele was named by the Diversity Journal as the recipient of their "Woman Worth Watching" award. She has been a featured business executive in an edition of March Magazine, a women's executive magazine. She speaks regularly both internationally and domestically on topics ranging from technology, entrepreneurship, marketing, business leadership, politics and women's issues.

# IOT DRIVERS OF THE 5G REVOLUTION

**LAUREEN R COOK**

Executive TMT Adviser, Extelcon

2G/GSM gave us digital voice on a global scale, 3G gave us additional capacity with a taste of mobile data, and 4G brought a transformation in network topology from circuit switched to IP based, allowing basic commercial IoT applications to become a reality. 5G will enable speeds of 10Gbps, 10x faster than 4G. Latency will significantly improve from 10ms in 4G, to 1ms in 5G, and will provide roughly 8x the capacity of 4G networks. As we approach the advent of ultra-high bandwidth, low latency 5G/IoT, coupled with the explosive plethora of intelligent devices in addition to that of the common mobile phone, there will be a contextual change in the relationship between the consumer, industry and the Mobile Operator as networks and use cases evolve.

## TOPOLOGY OF THE 5G MOBILE NETWORK

5G will provide enhanced Mobile Broadband (eMBB), Fixed Wireless, Massive IoT, and Mission Critical Services by utilizing spectrum in the High (24GHz - 86GHz or mmWave bands), existing LTE frequencies in the Mid (1GHz to 6 GHz) and Low (below 1GHz) bands. 5G will co-exist with 4G for many years to come and will require diverse network densification at the Macro, Indoor and Small Cell layers. 5G will provide increased coverage which will support multiple network topologies including private networks and unlicensed spectrum. Additionally, Fiber Optic Networks will need to expand both capacity and coverage in order to support the densification of Small Cells in the Mobile Network and to provide the bandwidth required to backhaul 5G networks.

5G will leverage Advanced Computer Processing, Artificial Intelligence and Edge & Cloud Services, together with Advanced Industrial Security for 4G & 5G in order to connect seamlessly with Gigabit LTE and support LTE IoT applications. In 5G the center of computing intelligence shifts to the distributed wireless edge of the network; closer to the user in order to reduce latency. 5G will use Network Slicing in order to meet application QoS requirements and will offer Ultra Reliable Low Latency Communications (URLLC), providing 99.9999% reliability, capable of supporting mission critical and time sensitive applications such as industrial

applications, autonomous vehicles, and Massive Machine Type Communications (MMTC) such as M2M sensors.

## DATA POINTS RELATED TO 5G

Today there are 8.83B global connections including IoT, and 5.109B unique mobile subscribers worldwide. 5G/IoT requires a 10X increase in current 4G network performance in order to support mission critical applications. To support IoT, mobile operators must invest in Spectrum, Radio Access Network (RAN) Infrastructure, Transmission (Backhaul), and their Core Networks. It is estimated that the global spend on 5G/IoT between 2018 to 2025 will be approximately US\$1.4T, yielding a global economic output of US\$12.3T by 2035, according to the World Economic Forum (WEF). Approximately one-third of these 5G costs will be attributed to the RAN and transmission (Capex & Opex), coupled with Small Cell Densification, according to a McKinsey study. Additionally, the GSMA forecasts that 70% of the world's population, or roughly 6B people will be using mobile internet, and 40% of the world's population will be on 5G networks, with 1.1B active connections (excluding IoT) in 2025. In order to scale the costs 5G initially, operators will begin by upgrading the capacity of their existing 4G networks and by re-farming their existing 2G and 3G spectrum, taking a prudent approach to investment as revenue generating applications and use cases emerge.

Data Collection and data privacy related to public domain use cases remain an open issue for Regulators to catch up with, requiring new legislation. Additionally, streamlined regulatory processes for the deployment of Small Cells would assist in reducing the costs and timing associated with the rollout of 5G.

## IOT APPLICATIONS DRIVE THE 5G REVOLUTION

Key industry applications and use cases for 5G/IoT will impact our daily lives and create new revenue models for Mobile Network Operators (MNO's). Many of these applications have already started to emerge in 4G including: Automotive, Industrial Manufacturing, Smart Cities, Smart Home, Healthcare, Asset & Fleet

## 16 TECHNOLOGY

Management, Digital Signage, Utilities, and Immersive Tech. As the fidelity of these applications evolves in 5G/IoT, new revenue models will emerge based on ultra-low latency and improved QoS, which will be the key differentiators for most use cases.

Automotive will entail the use of Connected Cars (CC) and Autonomous Vehicles (AV), and will include technologies such as Augmented Reality (AR) and Virtual Reality (VR) which will be implemented into the communication between vehicles, vehicle to pedestrian, vehicle to infrastructure and with autonomous driving. Application development is currently focused on safety, insurance, remote in-vehicle system updates & diagnostics, route planning, coordinated driving, and real-time GPS location updates. Safe driving, utilizing customer opt-in vehicle sensors, has already resulted in savings to the consumer with new less costly insurance models.

The Industrial Manufacturing is estimated to become among the first users of private 5G networks. Industrial segment connections are expected to grow by 4.7X between 2017 - 2025, from approximately 3.5B to 13B, according to the GSMA. Industrial Manufacturing requires a high level of QoS to the 99.9999% that 5G will provide, as well as superior network security. This will allow for the wireless replacement of Ethernet connectivity to machines within the manufacturing facility, as well as enhanced analytics. While security and encryption has evolved, there is still a great deal of work to be done regarding Cybersecurity issues in general and in relation to the manufacturing environment.

Smart Cities will utilize IoT to reduce costs, increase public safety, and increase revenues. According to Ovum, over 180 contracts for Smart Cities had been announced by the end of June 2018. IoT has the potential to save more than 50% of lighting costs to municipalities, which is significant as lighting costs make up some 40% of municipal budgets. Video streaming of surveillance cameras in public & remote locations will help monitor roadways, public transportation and pedestrian walkways in order to increase public safety, help reduce crime rates and divert traffic as required. Additionally, smart parking meters and sensors will help increase the flow of

traffic and provide additional revenue in real-time over IoT.

Smart Home applications already allow for the monitoring of almost everything from your door bell to your toothbrush. In a 5G/IoT environment we will see improved streaming video and enhanced analytics to support applications such as; home security & surveillance systems, HVAC systems, remote entry, lighting, utilities, kitchen appliances, vacuums, washer/dryers, and personal care devices. Additionally, we will see smart applications for exterior equipment such as smart lawn mowers, and intelligent pool systems.

Healthcare in both developed and developing countries can be transformed with the ability to provide high resolution, remote surgical assistance to rural hospitals and communities. Virtual Doctors can assist patients in real time via High Definition Video and VR technology to provide basic healthcare, pregnancy, neonatal care and health education. Additionally, there is a plethora of patient wearables and hospital remote monitoring equipment under development: blood pressure, heart rate, blood glucose, and seizure sensing devices from which new services are evolving. Elder care is developing, with assistance of always-on technology, allowing for seniors to remain in their homes longer with the combination of healthcare and video technology.

Asset & Fleet Management utilizing GPS tracking sensors allows companies to track vehicles, such as rental car or shipping companies, resulting in loss prevention of company assets. It allows shipping companies the ability to receive real-time data related to freight deliveries, food deliveries and just in time supply chains for manufacturing, which will improve the bottom line. For the consumer it allows deliveries to be pinpointed, in order to reduce theft. Dashcams mounted in company vehicles, trucks and public service vehicles provides additional asset management in case of accidents or emergencies.

The electronic billboard, or Digital Signage, is used to provide advertising on the large screen and as a data information source at bus stops on small panels. These large screen panels will offer high resolution in 5G and become interactive with speech and sound capabilities. Additionally, these panels yield new

revenue models by allowing for timeshare advertising at the push of a button. These panels are also capable of providing real-time information regarding public safety and emergency service information.

Cisco predicts that there will 933 million Low Powered Wide Area (LPWA) modules operational by the end of 2019 for use in monitoring utilities such as electric, water, and gas. These sensors are battery operated and are expected to last about 10 years. They allow utility companies and their collection agents to monitor usage, collect payments and provide analysis on usage patterns in developed and developing countries. They will allow for Pay-As-You-Go utility services to be administered via mobile for those is developing countries, creating a significant societal impact.

The customer experience in 5G will become highly personalized by leveraging AR and VR technologies. The personalized applications available for retail shopping, offering the ability for the virtual try on of clothing will increase the mobile spending of eRetail applications. Additionally, the immersive experience for inter-active gaming will propel increased penetration of Mobile Gaming, Immersive TV and Video Consumption. These applications and use cases are ranked at the top of multiple research studies associated with 5G/IoT revenue creation. Revenues for the mobile industry are projected to be \$1.1T US in 2019, with approximately 64% of revenues coming from developed economies such as the US, Japan, and South Korea. China and India are the key drivers of growth in developing economies, as demand for data and increased subscriber penetration help to accelerate growth.

Looking forward, while there is a huge appetite for new 5G/IoT services, the GSMA projects a slowdown in global revenue growth year-on-year in Developed Markets from 3.8% in 2017 to 2.3% in 2020, primarily due to unlimited price plans and increased competition in the US. Developing Market growth year-on-year is also predicted to slow from 2.8% in 2017 to 0.07% in 2020 due to increased competition, regulatory intervention, reduced mobile termination rates in India & Malaysia, protracted revenue growth in Africa and a slowing of China's economy.



# LAUREEN

# COOK

Having concluded her long tenure with the IFC (World Bank), as Principal TMT Advisor, in the Global Telecoms, Media & Technology Investment Sector, Laureen has resumed the helm of Extelcon as Executive Adviser to the TMT industry; providing consulting services to the private sector and investment communities regarding the technical & commercial bankability of Telecoms & Satellite projects on a globally basis. As a senior member at the IFC (World Bank's) TMT Team, she was responsible for business development, due diligence and the financial evaluation of companies for investment in Emerging Markets; providing guidance on new projects and oversight to portfolio companies including deal structure & operational improvements, from concept through to exit. Prior to joining the IFC, Laureen was with Alcatel-Lucent, as Vice President 4G/LTE Strategy. She is a founding Director of the GTWN, and is a BOD member of Rising Tides III, a European based Angel Investment Fund, providing financing to female led start-ups in the tech industry. She is a founding Director of several joint venture European and Asian wireless companies; Debitel GmbH (Germany), Teletet (now Wind Hellas, Greece), and PT Satelindo (now Indosat) of Indonesia. In June 2017, Laureen was named to the Top 50 Women to Watch in the Telecoms Industry by Global Telecoms Business.

## SEQUENCING 100,000 GENOMES FOR PERSONALISED MEDICINE: IT TAKES A VILLAGE

**DR LEA LAHNSTEIN**

Cross-Cutting Co-ordinator, Genomics England Clinical Interpretation Partnership

- **THE UK HAS SEQUENCED 100,000 WHOLE GENOMES IN THE NATIONAL HEALTH SERVICE**
- **COLLECTIVELY REVOLUTIONISING MEDICAL PRACTICE AND RESEARCH, WHOLE GENOME SEQUENCES ARE A RESOURCE THAT KEEPS ON GIVING. INITIALLY COLLECTED FOR PATIENTS AND THEIR CLINICAL CARE, THEIR DIGITAL NATURE MAKES THEM AN ONGOING RESOURCE FOR BOTH RESEARCH AND THE PATIENTS**
- **THEY ARE AN EXAMPLE OF THE INTRICATE RELATIONSHIP BETWEEN TECHNOLOGY AND PEOPLE**
- **GENOMICS IS MORE FUNDAMENTALLY ROUTED IN THE PHYSICAL THAN OTHER, MORE NATIVELY DIGITAL, REALMS OF BIG DATA. THIS CREATES A UNIQUE SET OF REQUIREMENTS AND INFRASTRUCTURE FOR GENOMICS**

The ability of healthcare systems to deliver high-quality and efficient care will increasingly depend on our ability to harness a growing wealth of data. We are all different from one another and the increasing accessibility of DNA sequencing is helping us characterise these differences. As in other fields, we are also increasingly connected to information, analytics and data collection, all powered

by astounding leaps in computing power and data storage. Processes that used to take weeks now take hours on a single machine, which applies equally to DNA sequencing and deep machine learning. The general advent of the digital in healthcare is broad ranging, spanning machine learning algorithms for clinical decision-making, mobile apps, portals and patient monitoring.

Genomic medicine uses individuals' genomic information as part of their clinical care. Unlike specific genetic tests, the field of genomics focuses on the whole genome and how it works, including how it is to be interpreted and the technologies that have been developed to help do this. Genomics underpins the development of precision diagnostics, treatment and prevention strategies, helping to reduce

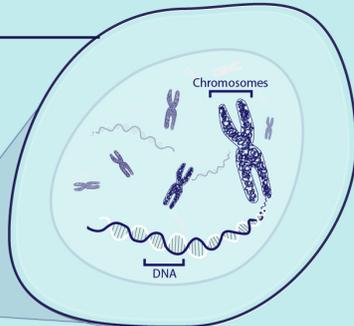
# The 100,000 Genomes Project



## What is a genome?

### Human cell

Most cells in the human body have a **complete** set of genes



Your **genome** is one whole set of all your genes plus all the DNA between your genes.

There are around **20,000** genes in your **genome**

## What is genomics?

Genomics is the study of the whole genome and how it works, but has also come to have a broader meaning to include the way that the genome is interpreted and the technologies that have been developed because of it.

### Why?



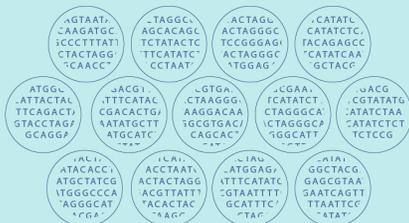
Looking at the whole genome will help us understand how disease develops and which treatments will be most effective.

**80%** of rare diseases are genomic



Around **40,000** people with cancer and rare diseases will take part in the project

over **330,000** new cases of cancer reported every year and growing



We compare books (that is, other patients' genomes) and try and find letter relationships that match to better understand gene activity.

## Sequencing

This means reading the human genome letter by letter (all 3 billion pairs of letters)

In the past it has taken

**13 years & £2 billion**

to read every letter of our genetic code

Today it only takes **2 days & £1k** to read every letter

### Before



Your **genome**

with

**3 Billion**

pairs of letters in the human genome

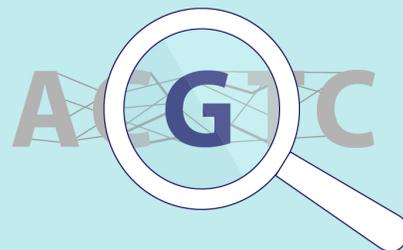
**5%** were analysed  
Only the active genes were looked at

```
AAGTAATATGC
TTCTAGGCGTC
TCAAGATGCAT
CTAGCACAGC
GCCCTTTATTA
TCTCTATACTCA
ACTACTAGGGC
TATTTTCATATCT
AAATACGCTCG
AGGCTACTGAC
TTATGCTATCG
ATCTCGAGCGC
TDCCGTAATTT
TCGCGAATCAG
AAGTAATATGC
TTCTAGGCGTC
TCAAGATGCAT
CTAGCACAGC
GCCCTTTATTA
```

**95%**

were unused  
All the non-gene sections that we didn't understand were disregarded as useless

### Now



We know that the non-gene (non-coding) parts of your genome may have a role to play so we look at the whole thing, every single letter, and how the different parts work together.

Think of it as reading a book, **every letter counts.**

side effects of drugs; target specific molecular changes through treatment; or predict how a disease will develop or how a drug might work.

For rare diseases, this means that, where clinicians might have difficulty telling symptoms apart and interpreting them based on observable characteristics alone, genomic testing can show up commonalities between seemingly different clinical pictures, or correct misdiagnoses based on superficially similar ones. For cancer, genomic and other biological research shows that no two tumours are the same. Cancer begins because of mutations in a normal cell's DNA, developing mutations or changes that make it develop further; yet traditional cancer treatment is based mainly on statistical efficacy without being sure that there is a biological target in an individual patient's cancer to act on.

New digital frontiers in genomics are increasingly allowing researchers and clinicians to spot the proverbial needle in the haystack of biological heterogeneity and compare what can work and what has worked in similar cases. They are also a learning curve for researchers, clinicians and patients alike and will shape – and be shaped by – their behaviours. In the UK, the 100,000 Genomes Project is employing digital technologies to harness the potential of genomic medicine<sup>1</sup>. Recently completed, this largest national sequencing project of its kind has (as of December 2018) sequenced an unprecedented 100,000 whole genomes<sup>2</sup> from around 85,000 participants, who are National Health Service (NHS) patients with rare diseases, plus their families, and cancer patients.

Clinically, the effort is to find new diagnoses, treatment or disease management options for long-suffering rare disease<sup>3</sup> patients and to find personalised treatment or clinical trial options for cancer<sup>4</sup> patients. As well as

being kept on file, genome sequences are analysed to compare patients' genes against ones that are known to be associated with certain conditions and this analysis is beginning to include other variants in further parts of the genomes. The project has also transformed medicine and healthcare services forever and ushered in practices and lessons along the way. A new, consent-based, NHS Genomic Medicine Service is being created, transforming the way that patients are being cared for by offering new diagnoses and paving the way for more personalised, effective treatment options.

This is supported by further analysis of the genomes and their clinical interpretation by scientists, to generate new results and insights. Approved researchers can access<sup>5</sup> the de-identified data generated by the project in a secure virtual and globally accessible Research Environment, where the combined genomes and rich clinical and health data held by the NHS for 85,000 people is a ground-breaking resource for new medical research. Commercial researchers are also able to join in the effort, kickstarting a UK genomics industry along the way.

This makes whole genome sequencing fundamentally different from other diagnostic tests, because we can keep looking for new answers in a participant's genome, based on results coming in from other participants and based on new technology and algorithms becoming available. It is this process of opening up sequences for analysis and to researchers in order to “keep looking” that is almost entirely digital and based on the field of Bioinformatics, the interdisciplinary field concerned with collecting and analysing large sets of complex biological data, such as genomic data, through specialised software tools and other methods. In order to enable this, the Research Environment, too, provides access in a digital space via secure log in.

The development and application of bioinformatic and genomic tools and

technologies has long since become a field in its own right. It ranges from correctly assembling sequencing and comparing against reference data to find and evaluate tiny changes in them, to determining statistical evidence levels for new genomic tests. Crucially, however, the success of harnessing “the digital” to address genomic medicine for new diagnoses and insight is underpinned and even constituted by its relationship with everyone who comes into contact with it. In other clinical spaces, such as radiology, we see the importance of behavioural and social questions in the debates around machine learning, artificial intelligence and clinical decision-making. In this case, the clinical, technical, social and economic interpretation and utilisation of 100,000 whole genome sequences is unavoidably synonymous with certain principles and behaviours (this, too, is supported by designated research).

For those accessing the data (and for those governing that access), genomic research has to “think big”, speaking figuratively as well as literally. Research on the data from the 100,000 Genomes Project is organised through the Genomics England Clinical Interpretation Partnership (GeCIP)<sup>7</sup> for team science. GeCIP promotes collaboration in order to: avoid duplication of efforts and therefore computational and data storage requirements; bring together researchers across clinical and functional disciplines; cover the vast amount of ground required to analyse the huge amount of data needing to be integrated, harmonised for analysis and interpreted (1.6 billion clinical data points, millions of variants per genome and 21 Petabytes of data); and to create feedback loops between researchers and clinicians.

Participants' privacy and anonymity is protected by sealing off the Research Environment<sup>8</sup>, strictly controlling what can come in or out. A key part of the consent obtained from participants who donate their data is that no participant-level genomic or clinical data, or any other data that might identify them, can be removed from the environment. This means that all relevant resources

1 <https://www.genomicsengland.co.uk/about-genomics-england/the-100000-genomes-project/>

2 <https://www.genomicsengland.co.uk/the-journey-to-100000-genomes/>

3 <https://www.genomicsengland.co.uk/understanding-genomics/jessicas-story/>

4 <https://www.genomicsengland.co.uk/understanding-genomics/8335-2/>

5 <https://dtr.thalesecurity.com/>

6 Details on how Genomics England works with industry partners and the strict framework for doing so can be found in <https://www.genomicsengland.co.uk/working-with-industry/working-with-industry-faqs/>

7 <https://www.genomicsengland.co.uk/about-gecip/for-gecip-members/data-and-data-access/>

8 <https://www.genomicsengland.co.uk/about-genomics-england/research-environment/>

## 20 TECHNOLOGY

and tools must be provided within the Research Environment and money, time and effort must be continually invested to keep the space fit for purpose and efficiently shared. Finally, genomic research, and the GeCIP in particular, allows for bolder research funding applications and landscape publications, again based on jointly staking out and tackling the unprecedented amount of data analysis opportunities afforded across the types of data and angles for analysing it. As with publicly funded storage and computing power, research dollars and publication inches are also likely to be allocated to collaborative and thus impactful efforts.

More fundamentally, genomic technologies are intertwined with the interests and behaviours of patients who stand to benefit from their application but who also allow for their data to be accessed for analysis and research. They underpin everything through their informed consent<sup>9</sup> to take part in genomic medicine and donate their data to genomic research. Whole genome sequences differ from other diagnostic tests because the results they generate may emerge over a long time, as new technologies

---

9 <https://www.genomicsengland.co.uk/about-genomics-england/the-100000-genomes-project/information-for-gmc-staff/consent/>

and further genomes analysed yield new insights, and some findings might apply to other conditions than the one that sequencing was commissioned for. This is particularly the case for the 100,000 Genomes Project, which is ground breaking in that it is a hybrid clinical and research project. Furthermore, since patterns and clues are continuously looked for across genomes to classify individual variation, genomic data are more likely to be useful to individuals the more information is available to be drawn on from others. Genomic technology binds us all together in contract, as the significance of a genetic variant for a particular condition or disease can only be evaluated in comparison with other genomes.

Ultimately, as impressive as genomic technology is, this space isn't all digital but also very physical and visceral. To avoid the old "garbage in, garbage out" adage, this effort relies on setting up and following correct pathways for obtaining and handling tissue samples and clinical data. Most importantly, this is about real NHS patients with serious illnesses and about people living with conditions that impact their lives and influence their identity. They have been at the heart<sup>10</sup> of the undertaking, supported it and ask for answers to their questions. They have to be physically present and they need physical access to genomic services.

This makes it so exciting that the 100,000 Genomes Project is being expanded so that at least one million genomes<sup>11</sup> will now be sequenced and patients will continue to be given the option of donating their data to the research dataset. The future is now as the NHS Genomic Medicine Service<sup>12</sup> will continue to embed genome sequencing in routine medical care and revolutionise healthcare by making it more digital, efficient and personalised.

---

10 <https://www.genomicsengland.co.uk/about-genomics-england/how-we-work/patient-and-public-involvement/>

11 <https://www.genomicsengland.co.uk/matt-hancock-announces-5-million-genomes-within-five-years/>

12 <https://www.england.nhs.uk/genomics/nhs-genomic-med-service/>



# DR LEA-REBECCA

## LAHNSTEIN

Lea currently oversees the cross-cutting research strands for the Genomics England Clinical Interpretation Partnership (GeCIP) around the dataset of the 100,000 Genomes Project at Genomics England. She is responsible for constructing the framework for research in these areas, for conceiving and enacting the necessary governance and for ensuring that the necessary resources are available for researchers to fulfill their ambitions. Lea holds a longstanding interest in the intersection between biotechnology, bioscience and society, as well as in translating knowledge and expertise across multidisciplinary boundaries. After a PhD on the practices of biobanking and the exchange of biological samples and data, she was responsible at a cancer research and diagnostics company for projects encouraging the uptake of precision diagnostics through stakeholder management and information strategy, before working in Technology and Medical Innovation at GE Healthcare prior to her current role.

# MEETING THE DATA NEEDS OF THE FUTURE: THE NEW ZEALAND EXPERIENCE

**KATE MCKENZIE**

CEO, Chorus

Fixed and mobile network operators around the world are facing an ever-increasing demand by their customers for more data. This growth is largely due to a changing digital culture and a switch from voice to video, the growth in online video gaming, as well as the increasing adoption of many business applications which rely on the acquisition and analysis of large amounts of data.

Faced with this exponential growth in demand, how are network providers to respond, especially at a time when traditional revenue sources, especially those based on voice are stagnant or in decline? And how can we predict future demand for data and the required network investment, where the industry is split amongst a number of different actors, including broadband providers, ISPs and third-party content providers?

The experience of New Zealand may be worthwhile to consider for others who are facing similar challenges. The New Zealand Government decided back in 2008 to launch an infrastructure project to take the country into the digital age. The ultra-fast fibre broadband (UFB) project had an original target of building out fibre to 75% of the country, but we are now scheduled to reach 87% by 2022.

A key enabler of this project was the decision to structurally separate the former Telecom New Zealand into two: Spark – the retail arm and the mobile network operator; and Chorus – whose goal was to build and operate the fibre network.

Chorus became a publicly listed company in 2011 and now eight years later we are already two-thirds of the way through the build. The Chorus network now passes a million New Zealand homes, and take up is now at 51% against a target of 19% at this point in time. The decision makers of the time can congratulate themselves on their foresight. At the time no-one would have predicted the rate of take up of fibre

or the rate of increase in the consumption of capacity.

The rapid growth of broadband data use in New Zealand shows no sign of slowing, with our latest figures showing a massive increase in demand. Our latest figures continue to show that fast, reliable broadband is now an essential part of many Kiwis' day-to-day lives. Nationally, the average New Zealand home uses about 234GB of broadband data as at November 2018 compared to 172GB in 2017, showing more than a 35 percent increase. 234GB is the equivalent of watching nearly 80 hours of content on Netflix each month.

Porirua (close to the New Zealand capital Wellington) consumed the most internet data at an average of 274GB per household, while Waitomo, a north island tourist hot spot due to its extensive underground cave system, saw a data increase of over 60 percent per household over the previous twelve months. Most homes across the country now have several connected devices going at any one time. With voice activated smart devices such as Google Home and Amazon's Alexa now becoming commonplace, New Zealanders are using far more data and requiring faster, more dependable broadband speeds.

The changing digital culture in New Zealand is evident in people's viewing habits, which have shifted online and it's no longer just down to Netflix. The Government broadcaster TVNZ now also have online only, OnDemand content, while Freeview has launched an industry-first device for New Zealand that brings free-to-air content onto a streaming platform. Freeview's new streaming device integrates the offline and online worlds into one simple to use, tidy device that attaches magnetically to the back of the TV and removes the need for ugly aerials, coax cables and satellite dishes. And, of course, the online video gaming industry has also been driving

demand for data. In July 2018 Chorus experienced the biggest ever data spike on our network due to New Zealanders downloading the latest version of Fortnite.

New Zealand has already seen dramatic improvements in broadband thanks to the Ultra-Fast Broadband (UFB) fibre rollout and the Rural Broadband Initiative. Improvements have also been seen with updates to the broadband electronics across our copper network. While fibre is the fastest form of broadband technology, for areas where it's not yet available or isn't a viable option now or in the future, VDSL on our copper network provides a faster, more reliable service with less buffering than regular ADSL. VDSL often enables a customer's service to be upgraded without a technician visit, reducing the cost of the upgrade.

In the last few years many European countries have turned their minds to how to get fibre to bigger proportions of their population, beyond the urban areas where it makes commercial sense. Spain and Portugal are two countries which have done very well in tackling this challenge, but other countries are lagging behind. The shared infrastructure, wholesale only model adopted in NZ is definitely worth others considering, especially in an environment where telco's around the world are struggling with the justification for investing in new networks when revenues are generally stable or in decline and growth is hard to find.



# KATE

# MCKENZIE

Kate McKenzie brings her extensive communications infrastructure and leadership experience to Chorus' top job. Before becoming Chorus' Chief Executive, Kate was Chief Operating Officer of Telstra, Australia's largest telecommunications company. She joined Telstra in 2004 holding a range of senior executive roles in strategy, marketing, products, regulatory and wholesale. Prior to joining Telstra, Kate was a CEO in the NSW Government of the Departments of Commerce, Industrial Relations and the Workcover Authority. She worked in the Cabinet Office on the development and implementation of competition policy, energy reform, privatisation and a range of complex Commonwealth/State negotiations. Kate also has significant corporate governance experience and is currently on the board of Allianz, having previously been on the boards of Foxtel, Sydney Water, Reach, CSL and Workcover. Kate is a qualified lawyer with a strong track record in understanding government and regulatory environments. Kate also has a passion for innovation and technology and for customer centricity. She is also a member of Chief Executive Women, has served on the Telstra Foundation, Telstra's philanthropic arm and has had a long history of involvement in promoting the interests of indigenous communities.

---

## THE COEVOLUTION OF SPEECH TECHNOLOGY: A ROAD MAP FOR ADAPTATION

**LAURA KUSUMOTO**

Former Director Technology Innovation Enablement, Disney Parks & Resorts

Not long ago, the sight of someone out in public speaking aloud - to no one in particular - aroused concerns that the person was delusional, talking to an imaginary friend or foe. Today it is common for phone users to converse with distant friends while strolling, blurting private details into the air as if no one around them could hear. There was a moment in time when our perception flipped, from not wanting to look foolish chatting with the invisible friends, to accepting this behavior as the norm.

With further advancements in conversational technologies and the data streams and knowledge bases they tap into, a few years from now, chances are that we will also be chatting in public with our digital assistants. These AI voice bots will not only take verbal commands to navigate, buy tickets, or play music, as Alexa, Google Assistant and Siri do today, but they may also be keeping a digital journal, providing reminders, diverting our attention with personalized advertising, and possibly, providing

advice and support.

As these advancements are absorbed into consumer products and grab the headlines, we might also take note of their impact on our behavior - and ultimately, our welfare. Indelibly, a coevolution is taking place, between AI voice enabled systems and the behaviors of people who use them.

As a biological phenomenon, coevolution was first identified by Charles Darwin in the *On the Origin of Species*, when he observed that certain flowers and insects could not have evolved into existence without one another. Their relationship is symbiotic, in that each needs the other for ongoing survival.

### THEORY OF COEVOLUTION

While not biological, our relationship with conversational systems is becoming symbiotic. For our own survival, then, we might ask, where are the AI voices taking us? Who benefits from them and how,

and what are we losing in the process? What or who is driving progress, and is there a road map that we can use to encourage beneficial results?

Fueled by competition to win the favour of consumers, conversational technologies are being designed to adapt to our preferences. The holy grail of the digital consumer product is to provide "frictionless" interactions with the most profitable actions in the system. These impose no impedance to the behaviours that the sponsor most wants to encourage, such as making a purchase, favouriting an item, lingering in a shopping area, or sharing a product with friends. Reducing friction also entails minimizing time-to-satisfaction; for example, the use of the Alexa for Hospitality product at Marriott hotels enables guests to speak their wishes in room, and obtain amenities and information such as room service and checkout times, without waiting for a human receptionist or concierge to acknowledge them. For consumers, instant gratification is one allure of the



frictionless interface, and it is influencing our behavior.

A key attribute of this experience is that it doesn't require us to learn how to operate it. Natural speech – learned by nearly all human beings in childhood – is the ultimate frictionless experience. It requires minimal effort to express our preferences and sentiments, as it has for millennia.

As with many technologies that mimic human capabilities, though, our expectations outpace the progress of conversational technologies. Anyone who converses with an AI voice-enabled call center or device quickly learns that these assistants still don't handle natural speech all that well. Speech is a hallmark of human intelligence, and we expect that which is speaking intelligently to be intelligent - and it can be funny or highly frustrating when it's not.

Although they are improving, speech recognition technologies cannot yet handle speech that is fluid, run-on, raspy, off-topic, heavily accented, or in a very noisy environment. They still require users to speak a limited, coded language – as when the home devices require a “wake word” and all of the assistants require highly structured speech – to enjoy the benefits of playing music, hearing the news, or turning off the lights. When processing a command they don't understand, or when listening when they shouldn't, digital assistants go off course. Only when in their designated domains can they recognize and declare what they don't understand.

Significantly, AI voice assistants are largely transactional today. They do not

store context nor personal information, in part due to privacy concerns of passing that data across corporate and cloud boundaries. Goal-directed AI assistants can be constructed to follow a dialog flowchart to answer a pre-determined line of questioning, say, with the goal of determining a travel booking. However, artificial intelligence does not yet exist to sustain an open-ended or in-depth conversation.

The benefits of speech technologies derive in part from their connection to back-end knowledge bases and data. Some of their current limitations derive from knowledge sources that are siloed for reliability and security as well as proprietary or commercial reasons. Hence at present, the Domino's Pizza assistant can't find a gas station nor play a song, while Siri can't access your bank account to pay your bills.

The design criteria for various assistants is differentiated as well. A digital assistant

to serve the public on behalf of a large enterprise must be held accountable for the information it provides, and it must uphold brand values in the words it chooses and in the voice it uses. An assistant providing vehicle navigation instructions must be reliable and precise, whereas an assistant asked to play a song can be forgiven for picking the wrong tune.

The consumer digital assistant and call center uses of speech technologies are only the first of many future applications. There are multiple opportunities to deploy them to improve social welfare and increase economic engagement outside the current digital consumer demographics. They represent significant research and development opportunities. Examples of possible applications include:

- **Listening to the elderly.** While conversational devices cannot replace the attention and physical care that elders need, they can help to fill gaps in time for those who are no longer mobile, or suffering from dementia, much the way that a television does, but in a more personal and engaging way. The Gerijoy device and service provides an example of this concept, while at the same time, however, refuting the current readiness of speech technologies to serve this purpose. Gerijoy employs human operators in the Philippines to speak with elderly clients at home alone or in assisted living facilities. The system includes a tablet for the user to speak to while operators appear as animated animals on the screen. While this type of service is in its early stages of development, there are many opportunities to provide

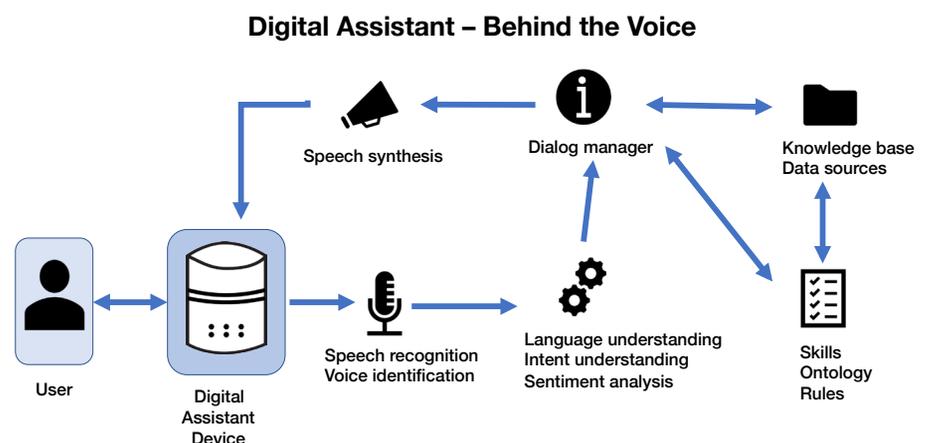


Diagram I: Behind the Voice

## 24 TECHNOLOGY

targeted services for the elderly and disabled, provided that users' needs are carefully targeted.

- **Accessing entitlements.** Voice-enabled systems could be deployed to reduce the tedium and frustration of accessing information and services and entitlements from insurance or government programs. In the US, the Medicare bureaucracy is tasked both with warding off fraud and servicing elderly and disabled insureds. For these populations, filling out complicated forms can be extremely difficult if not impossible, making them further dependent on others. A voice-enabled system could help both with deterring fraud by using a voiceprint for biometric identification, and by enabling a more conversational dialog that provides the data needed to fill out forms. The technology provider, Interactions, developed a system for Humana that enabled Medicare insurance applicants to fill out a detailed, lengthy form entirely with voice input over the phone. The Interactions system, however, used human listeners to fill in gaps that the automated system could not reliably hear or understand. Future innovations could make systems like these more conversational and more useful.
- **Aids for the hearing impaired.** Ironically, speech technologies are well positioned to help the those who cannot hear well, because the technology can hear, transcribe and display words, effectively providing "closed captioning" for the real world. Transcription apps could help a hearing-impaired person function almost normally in social situations if they were ever-present and accessible. The World Health Organization estimates that 25% of people over the age of 65 are affected by disabling hearing loss, as are 5% of the overall population (466 million people). The potential market is large, but consumer products in this arena are still sparse.
- **No more typing.** For first-world users, conversational technologies hold the promise of freeing us finally from the need for typing. Typing is learned later in life than speaking and engages different parts of the brain. Having to type creates a



communication barrier for those who don't have their hands free, who didn't learn to type, who have hands too large for the device, or are arthritic. For third-world users in the near-future, they may be able to access all of the computing applications available to the developed world, but without ever having to learn to type or thumb the keyboards on their mobiles. As with many technological innovations, it is now becoming possible for developing countries to leap frog developmental stages and gain the benefits of the latest advances even before many people in developed economies.

Future systems must take into account the privacy needs and rights of their users, and the security of the information vocalized. As one example of a clear bug that was quickly resolved, a user of Amazon Echo Dots in Oregon found that they were recording her conversations and sending them in email to one of her husband's employees! More often, the issues that arise are not due to bugs or design flaws in the device, but rather unforeseen circumstances in connection with private speech. In 2016 Amazon was asked by investigators in Arkansas to share the Alexa recordings from a household where a man was found dead in the hot tub. Evidence like this is often sought from mobile phones and email, but the introduction of more speech-enabled devices in homes and hotel rooms invites added capture of private and intimate speech, that most users would never consider sharing via a phone.

An intrinsic design flaw with all voice applications is that they lack privacy when the user is within earshot of other people. The well-designed, AI voice-enabled call center may be a delight to use

even in a room full of people, until it asks for your birth date or credit card number. This issue may extend the use of typing for the foreseeable future, at least until room features such as "phone booths" can be provided for private conversations in public places.

### THE FUTURE OF SPEECH TECHNOLOGIES

The coevolution of speech technologies and human beings is probably most important for the children who are adopting AI voice devices. In the near term, our concerns may be focused on their security, on shielding them from predators, and protecting them from self-harm (or from harming parents' bank accounts by ordering expensive products). Educators may muse about the educational impact of knowledge on-demand that is provided merely for asking, to little ones who don't even know how to spell and type the question. Little research has yet been done about children's perceptions of digital assistants; even less is known about the impact on their cognitive development.

But children are the ones who will be most affected by these advances, and who will be most able to coevolve with them. One thing is certain: whatever emerges, we will probably be amazed by the impact on both sides of the coevolution.



# LAURA KUSUMOTO

Laura Kusumoto is an experienced pathfinder for technology innovation in the development and commercialization of new digital products and services. As an innovation leader with Kaiser Permanente and then Walt Disney Parks and Resorts, she promoted a portfolio of innovations that take advantage of emerging technologies such as internet of things (IoT), artificial intelligence (AI) and conversational platforms, gamification and avatars, by engaging business stakeholders and technology partners in understanding and adopting them. Earlier in her career, Laura served in executive management and software product development roles in multiple startup and established companies, including LEGO, Intuit, and Price Waterhouse (now PwC).

## AWARD-WINNING SATELLITE TECHNOLOGY DRIVING SOLUTIONS TO THE DIGITAL DIVIDE

### KACIFIC

Six years ago, a number of GTWN International Board Members including Bridget Cosgrave, Candace Johnson, Vicki MacLeod, Sallye Clark, and Walda Roseman came together with Women Executives in the Pacific Islands, amongst others Ellen Strickland, the then President of the Pacific Internet Society and Anne Matson from New Zealand, to create OWNSAT - Oceania Women's Network Satellite, which then became one of the first and largest shareholders in Kacific. We were extremely pleased that Kacific received the "Better Satellite World" Award on 03 December 2018 in London, very much confirming our desires and hopes of bringing indeed a "better world" to the inhabitants of the Pacific Islands with high-throughput satellite Internet.



Jacques-Samuel Prolon from Kacific with children in Naviso Village, Maewo Island

The Space and Satellite Professionals International (SSPI) established the Better World Satellite Awards in 2015 to honour companies whose technology and activities have had positive impacts on the world around them. From visual image sensors that produce images for resource, disaster and ocean monitoring, to volunteer-based organisations that reconnect disconnected communication links in disaster zones, winners of the Better World Satellite Awards are fantastic, real-world examples of the positive impact of satellites.

At the 2019 Better World Satellite Awards dinner, one satellite company toasted the socially-minded award with a murky brown liquid. The drink was kava; a traditional brew shared ceremoniously throughout the Pacific Islands and made from the root of a locally grown crop. And the company; Kacific Broadband



Villagers carrying the VSAT terminal across Maweo Island

Satellites, an HTS satellite operator that brings affordable high-speed broadband to communities across the Pacific and South East Asia.

### FOCUSED ON ASIA PACIFIC

Led by founder and CEO Christian Patouraux, Kacific has introduced Ku-band broadband satellite service into Fiji, East Timor, Papua New Guinea, Indonesia, the Solomon Islands, Kiribati, Vanuatu, Tonga, Niue, Samoa, American Samoa and Tuvalu. Working with local partners, these proof-of-concept services connect hospitals, health clinics, schools, libraries, post offices, police stations and many other public institutions in rural areas where terrestrial broadband infrastructure is not an option.

The company's first Ka-band HTS, Kacific1, will launch into orbit later this year and existing connections will be upgraded to Kacific1, delivering even higher speeds. Currently under construction at Boeing, Kacific1 will deliver bandwidth via 56 spot beams which have been placed over 25+ markets

### THE MOBILE CENTURY

in Asia Pacific including the populous regions of Indonesia and Philippines, as well as small island nations such as Tonga, Niue and Vanuatu.

Kacific enables the profitable connectivity of markets that larger operators, which are deterred by the geographical remoteness, under-developed ICT infrastructure and small population sizes, often overlook. Kacific offers inexpensive, small and easy-to-maintain ground equipment and high-speed internet at wholesale prices to local service providers throughout the region, making such providers into partners and stakeholders in their areas' futures. The VSAT terminals that end-users access the service through start at 90cm in diameter – making them transportable to rural areas and remote islands by boat, car or even on foot. The terminals run on low power and can easily be solar-powered. Such robust, compact terminals are crucial to making the service accessible to local businesses and communities.

The value of Kacific's flexible deployment and rapid response in time of emergency was demonstrated on 20 January this

year, when Tonga Cable suffered an outage in the submarine cable network that connects the island nation to the outside world, plunging the whole country into digital isolation. Tonga Cable System is an 827 kilometre long submarine cable system, funded by the Asian Development Bank and the World Bank. It has cable landing points at Sopo in Tonga and Suva in Fiji.

Despite the serious impact of the outage, there was no clear timeframe to restore Tonga Cable's service, meaning that 110,000 residents, businesses and importantly government services, were facing an extended period without connection to the outside world. The sole international service available was provided via a Ku-band satellite network, operated by Kacific, and supplied in-country by ISP, EziNET. Kacific's satellite service provided essential connectivity while Tonga Cable carried out repairs.

### CONNECTING REMOTE VILLAGERS

The flagship project in Kacific's proof-of-concept service connects the Vanuatu Interisland Telemedicine and Learning (VITAL) Network. Located in the South Pacific, Vanuatu is made up of around 80 islands that stretch 1,300 kilometers. With a population of just 263,800, Vanuatu places 125th of 187 countries on the Human Development Index, with high maternal and infant mortality rates. Travel between its islands is expensive and difficult due to weather and infrequent travel options.

The VITAL Network began when a remote village of Naviso on Maewo Island, a community with no cellular network, successfully campaigned for internet access to communicate with doctors at a provincial hospital on a larger island. The island is home to around 3,570 people. Utilising Kacific's satellite services, primary healthcare workers in the VITAL Network can chat message or video conference main island doctors quickly to treat and transport patients in life threatening circumstances. They can also contact specialist doctors for diagnosis and advice and use the internet for learning and up-skilling remotely.

Shortly after the introduction of services, the Telecommunications and Radiocommunications Regulator (TRR), Dalsie Baniala, spoke with the community, imploring them to show leadership in how they used the internet connection

for positive social outcomes. “The internet broadband network will bring in all sorts of rubbish among the good and it is for you to manage yourselves because bad choices will spoil the community,” she said. The Maewo sites were the first connected in the VITAL Network and provided the blueprint for the Government to replicate the service in other islands. “It is important that we on Maewo provide the leadership on how to use the facility in the right way,” commented Ms Baniala.

### IMPACTING THE LIVES OF MANY

In the first six months, two village clinics on Maewo Island engaged with doctors over 1,250 times and helped 32 patients. This included six life-threatening cases involving mothers and children, and ten patients who would have been permanently disabled without intervention. A breakdown of the communications revealed that 44 percent of the communications were about patient care, 26 percent for relationship building, 21 percent administrative, 6 percent public health, and 3 percent education. The majority of communication (96.7 percent) was through chat message.

The Network is also used by local teachers and students to access information, and tertiary students who can complete online study through the University of the South Pacific Emalus Campus in Port Vila. Kacific’s network data reveals a strong and continuous demand for internet. In 2018, the primary schools and clinics on Maewo island were using between 200 Gbytes – 500 Gbytes per month.

The VITAL Network was a result of multi-stakeholder engagement including local government organisations; international development agencies; the Maewo community; and network suppliers Telsat, a local telecommunications company, and Kacific Broadband Satellites.

This flagship project is opening doors for other villages in Vanuatu to follow suit and join the Network. Through collaboration and digital education, villagers living in outer islands are making good use of satellite connectivity to receive the same level of healthcare and education opportunities as those in Vanuatu’s main provinces.

### References:

Dr. B. Leodoro and S. Leo. (12 September 2018). *Vanuatu’s VITAL network to save lives. Presented at Asia Pacific Network Information Centre (APNIC) 46 Conference in Nouméa, New Caledonia. Retrieved from <https://www.slideshare.net/apnic/rural-community-wifi-in-png-114162207>* J Cullwick. (04 August 2016). *Regulator calls on Maewo community to use telemedicine network wisely. The Daily Post Vanuatu. Retrieved from [http://dailypost.vu/news/regulator-calls-on-maewo-community-to-use-telemedicine-network-wisely/article\\_fe7fe294-8cc7-5f52-b818-26174c875393.html](http://dailypost.vu/news/regulator-calls-on-maewo-community-to-use-telemedicine-network-wisely/article_fe7fe294-8cc7-5f52-b818-26174c875393.html)* Kacific Broadband Satellites. (January 2019) *Monthly data usage from Maewo Island sites.*

Space & Satellite Professionals International. (2019) *The Better Satellite World Awards. Retrieved from <https://www.sspi.org/cpages/better-satellite-world-awards-dinner-demo>.* Vanuatu Interisland Telemedicine and Learning (VITAL) Network. *One World Connected. (2019) Case Study. Retrieved from <http://1world-connected.org/case-study/vanuatu-inter-island-telemedicine-learning-network/>*



Candace Johnson represented OWNSAT at the “Better Satellite World” Award Ceremony where its investee company Kacific won the top prize. The Ambassador of Vanuatu, the President of Boeing, and the President of NewTec joined Kacific Board Members and CEO Christian Patouraux on this prestigious occasion.

# THE FUTURE OF RETAIL: BUILDING THE WORLD'S LEADING RETAIL IOT CLOUD PLATFORM

## SES-IMAGOTAG

Thierry Gadou, Chairman and CEO of SES-imagotag



Source: SES-imagotag

SES-imagotag<sup>1</sup> is creating a digital future for retail thanks to the application of Cloud and IoT technologies. The global leader in electronic labelling and digital solutions for physical commerce has recently entered into a partnership with Microsoft with the objective of developing an IoT Cloud platform for retail on the Azure cloud.

Founded in 1992, SES-imagotag equipped its first store with electronic labels just one year later and reached its target of its first one million label deployments

in 2000. Since then the company has installed more than 160 million electronic labels in 17,000 retail outlets in over 60 countries, which means that it is the absolute leader in this field.

Electronic labelling is the spearhead of the products and services offered by SES-imagotag. Cloud-connected digital labels offer retailers the possibility to automate prices and low-value-added tasks. This is an obvious advantage in a fast-moving competitive environment and enables a seamless synchronisation with e-Commerce platforms. It also prevents discrepancies between the shelf price and the checkout price.

But SES-imagotag's ambition is to go beyond this horizon and to digitalise shopping, to create a seamless blend of the physical and the digital - because the customer experience cannot be either purely digital, nor purely physical. It has to be a 360° experience. The physical retail experience engages all 5 senses. A consumer must be able to touch, look, feel, discover a product, before purchase." This blend of all consumer experiences - both online and offline - is the future of retail.

SES-imagotag also operates a digital IoT platform that allows stores to: connect and digitally integrate their points of sale; to automate their procedures for

<sup>1</sup> <https://www.ses-imagotag.com>

little additional cost; to better understand and serve shoppers; to optimize on-shelf availability; avoid shortages and wastage; and create an omnichannel environment adapted to the current expectations of consumers.

It is this platform, which has been developed by SES-imagotag's own R&D, which is now deployed in the Cloud, providing the necessary flexibility for both current and future applications. This new platform will notably offer an application, based on artificial intelligence, which simultaneously relies on the data from the labels and computer vision based on in-store cameras, in order to avoid empty shelves, poor placement of products in the shelves, or even items being out of stock. SES-imagotag's vision is an AI solution for all retail - for all stores, so that they can become much more efficient and more automated, but also for consumers, to provide them with better information and enjoy an enhanced shopping experience.

As IoT continues to revolutionise physical stores, retailers will need partners who can provide always on, ultra-connected spaces that promote ultra-powerful omnichannel retail services. SES-imagotag's comprehensive IoT and digital platform will deliver this array of services to retailers.

The new retail environment will also provide multiple business opportunities for mobile operators. Retail stores will need mobile industry partners to provide in-store infrastructure for WIFI



Source: SES-imagotag

connectivity. As soon as customers enter the store, they will become connected into the interactive retail environment that will better identify, know, serve and interact with shoppers. For example, wireless interactive graphical displays are able to speak directly to the consumer at the shelf, at the precise moment of purchase. They can display a logo, a message, a QR code, etc, and there are no limits on content they can communicate to consumers' smartphones via simple NFC tap or QR code scan. And because shoppers are identified, it is also easy to contact them again after they visit the store. In addition, sign-up free mobile pay systems can be integrated into this retail

solution to ensure fast check-outs and avoid long waiting lines. The platform developed by SES-imagotag and adopted by top retailers all around the world proves that the future of retail is truly mobile and in the Cloud.



# THIERRY GADOU

Thierry Gadou holds the position of Chairman & Chief Executive Officer for SES-imagotag SA. In the past Mr. Gadou held the position of Chairman at Amalto Technologies SA, Investment Committee Member at NexTFund Capital Partners SAS and Director-Investor Relations of Hubwoo SA.

Mr. Gadou received an undergraduate degree from École Nationale Supérieure des Mines de Paris.

# THE FUTURE OF EDUCATION - WHEN EDUCATORS BECOME LEARNERS

**DR MICHELLE ZIMMERMAN**

Microsoft Innovative Educator Expert, Renton Prep, Seattle USA

## **CULTURE: WHAT IT CREATES**

There is something beautiful at the intersection of culture, tradition, creativity and humanity that some fear will be lost as AI becomes more prominent. There are parents and educators who are concerned about the rise of mobile technologies and the thought of losing the core of what makes us uniquely human. There is reason for people to be concerned when they see young people disconnecting from face-to-face interactions with peers and appearing to lose touch with the real world around them. We see on social media people falling into fountains as they are so engaged in the content on their mobile devices that they not only miss the aesthetics of the fountain, but they also miss that tripping over and falling in could be hazardous to their physical wellbeing. We see cyberbullying. We see destructive behaviors.

But we do not have to choose between either humanity or technology. Both can exist

together. Technology can support humanity in powerful ways. But it does require some creativity and a willingness to step out of domains that have been considered traditional subjects in school. This requires educators to continuously become learners and to be willing to challenge long-held ideas of how to approach learning and assessment.

Education as we know it now has become an incredibly inertial system. It tends to stay in its current state unless something acts upon it. Although there are many people who have been working on education change, it feels like once there is some movement for shift in thinking, the fear of failure, the resistance to change, how to assess learning, or the feeling of being inadequate lead people to return to that inertial state. Nothing seems to change enough to make a big enough impact in a scalable way, leading to substantial change. As much of education stands, the fears and challenges are more similar across the globe

# INNOVATION



Metal ivy on the door of La Sagrada Familia, Barcelona

than many educators are aware. This is because human nature transcends geographical boundaries and languages. Without a shift in the way we think about education, we will continue to train young people to look at content in isolation, work only with same-age peers, resist seeking multiple perspectives and alternate paths to elegant solutions, while these learnings are removed from context and application in life.

## MODELING SHIFT FOR EDUCATION

To model creative, cross-cutting divergent and convergent thinking, and reflective processes, educators need to be willing to go beyond feeling most accomplished as specialists in a specific, singular subject domain. There needs to be a willingness to learn about other domains, intersections of subject matter and approaches that they may have never considered in the past. This requires a willingness to acknowledge: "I don't know it all, and I need to leverage the expertise of others" In other words, teachers need to model collaboration as well as humility, understanding that we cannot humanly know everything in one subject domain, nor can we be the sources of all the knowledge our students will need.

Artificial Intelligence will continue to make this reality more evident as AI based searches, such as Wolfram Alpha, (which powers Siri), become increasingly sophisticated and much quicker at accessing a wide range of content. This doesn't make human educators obsolete, by any means. However, if all an educator is doing is just what an AI based search engine can do, and students can find a rote response to a question quickly, then the machine should replace the teacher. It will be more efficient and probably faster at providing an answer and has the ability to quickly present more than one perspective on a topic. We, rather, need to focus on what machines are not good at. We need to help young people look for multiple approaches to solutions and draw on inspiration from those who have gone before us. We need to train them to receive and apply critique – and more – learn how to ask for it. We need young people to respect other people's perspectives that are different from their own, develop empathy and compassion and let those inspire defining problems that need solutions and need answers. So, how to harness all of what technology has to offer us to help solve

those challenges in unexpected ways?

We have seen the power of technology. We know the good it can do. We have also seen the power of humanity. GTWN at Mobile World Congress in Barcelona, Spain, in 2019 is once again evidence of the power of human connection in an era where technology allows us to communicate across distance and time. There is something uniquely human about meeting in person and watching the serendipity of new ideas emerge, new connections, transferring learning, and being inspired by beauty, architecture, strength, grace, emotion, tradition, and culture that surrounds us. From traveling, listening to people, and presenting around the world I continue to become more aware of how different the experience is to research online about a place and a culture than it is to be immersed in it and talk with the people who live there.

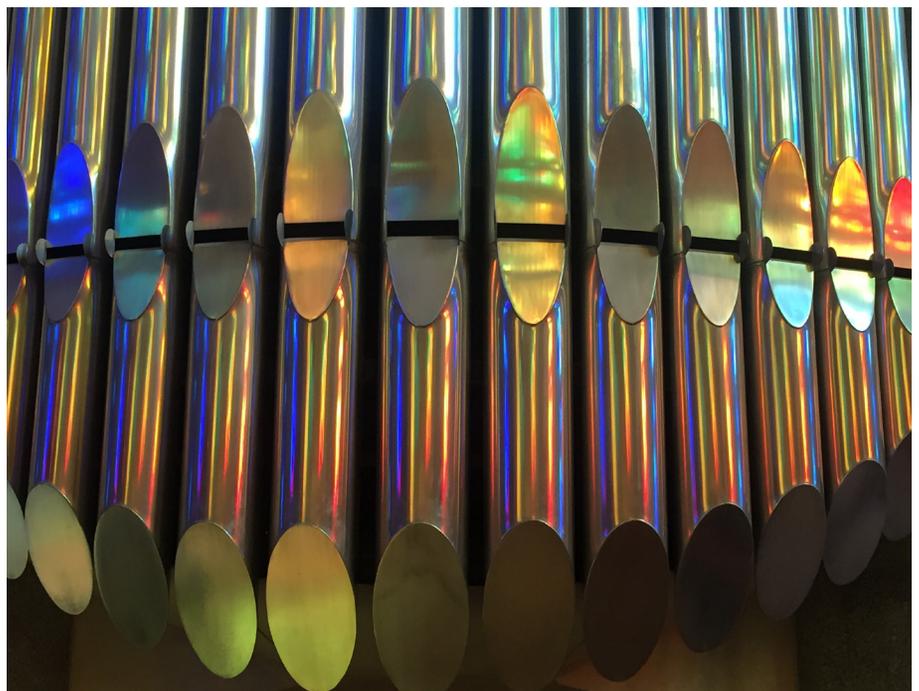
## BARCELONA INSPIRATION

When I visited Barcelona for the first time in July 13, 2015, I wondered how in my entire school career, I never knew about Gaudi. I didn't recall hearing about La Sagrada Familia until someone recommended that I make sure to visit while I was there. I had visited many cathedrals in Europe and thought I had an idea of what I may walk into. The experience was nothing like I expected. The intentionality with the way the light played across different surfaces to bring rhythm and music to cold metal organ pipes and play across the stone, the structure of the support systems

replicating shapes found in nature, like trees and branches. It was a striking statement with the absence of traditional iconography, but a choice to tell the story by demonstrating the glory of God through His creation through abstractions of creation in all of its strength, beauty, balance, and precision. It was mathematical, scientific, engineering marvel, and had an aesthetic that I didn't anticipate. It was intentional design. Not an accident. Not a replication experiment of something that had been done before and tweaked, and yet, a replication of what already exists in nature, reimagined.

I walked away thinking how La Sagrada Familia was an extraordinary example of the intersection of Science, Technology, Engineering, Arts, and Mathematics (STEAM), an ongoing, transdisciplinary, project-based learning (PBL) that was history and was becoming history, simultaneously. It was merging the past and the future, the vision of someone who may have been far ahead of his time and the emerging technology now that was helping to make his vision a reality for future generations to marvel.<sup>1</sup> I wanted my students to see. I wanted them to know what STEAM looked like across generations, in real life. I decided to turn it into a hub for learning and modeling a process of thinking, researching, practising, reporting, documenting, and sharing failures and successes. I wanted the learning to span subject domains, across different media – tangible and

<sup>1</sup> <https://youtu.be/sWA-eqiNQT8>





digital. I wanted there to be storytelling and student voice. I wanted them to experience challenge that may not succeed at first, persist, and model that for younger students and for educators to see what was possible. I wanted them to be the center of their learning and set goals as they collaboratively produced a final product.

Humans and machines both have the ability to learn from mistakes—but only humans can glean wisdom from them. Our imperfections are worth observing. The flaws in each of us can propel us to become better, and the scars we have received though hurts can guide our choices when failure occurs. It takes

courage to model this for our students—to encourage them to highlight their mistakes in their STEAM, design thinking, and PBL work so they can reflect on their failures, ask the right questions, and move forward with resilience to find a solution. Their documentation becomes a model for others to build upon, creating the type of culture necessary for innovation to persist. (see Teaching AI<sup>2</sup>, p. 151)<sup>3</sup>

### LA SAGRADA FAMILIA: STUDENT WORK AS A MODEL FOR LEARNING

I told my students that their goal was to document their learning in a way that someone who was never in our

classroom could see their thought process, their learning, understand how they relied on a range of subjects, tools, perspectives, and collaboration. Their goal was to create a five-minute video. This is what they showed me as their draft: <https://www.youtube.com/watch?v=yPd8lDhPxQo&t=50s> in addition, we explored how current day artists and engineers are still inspired by math, science and nature to create a different kind of art – digital animation. Pixar Animation Studios has created a series in collaboration with Khan Academy called Pixar in a Box. The goal is to give young people hands-on experience with the ways of thinking, the multiple disciplines as STEAM domains interact and seeing real people in real jobs as role models. One of the examples was demonstrating how animators solved the problem of making blades of grass in the movie, Brave, look realistic. They demonstrated how they used the concept of the approximation of a parabola <https://www.khanacademy.org/partner-content/pixar/environment-modeling-2>

I wanted my students to see the parallels between the way Gaudi used parabolas

<sup>2</sup> <http://www.iste.org/TeachAI>

<sup>3</sup> See January 9, 2019 article about Michelle and her students Teaching AI: Exploring New Frontiers for Learning on Forbes. <https://www.forbes.com/sites/tom-vanderark/2019/01/09/teaching-ai-exploring-new-frontiers-for-learning/#4881d5a01c5b>



and catenary arches with the type of work Pixar Animation Studios did to create blades of grass for an animated movie. Both drew on nature and represented nature. Both used some form of technology. Both approached the challenges in unexpected ways to produce the desired result and end product.

**AI AND CULTURE**

In the future, we know that machines will become more capable of automating tasks, including basic level code. However, humans have the ability to create in ways that are inspired by emotion, tradition, culture, empathy and even from implicit information in ways that machines currently cannot. As educators, mentors, influencers, and developers, we have the opportunity to help young people understand who they are as people; why societies, cultures, and traditions are important to people; how to treat others with respect; and how to become stronger in areas where machines do not excel, while learning about machines' ability to augment our own human capacity. Students need to know how to learn, unlearn, and relearn to remain relevant in a constantly shifting job market. Training in design thinking, STEAM, and PBL can assist with developing this mindset early.

The cultural implications of AI make it vital that culture remains a part of the process as schools lay the foundation for students to effectively interact with new technologies while engaging in project-based learning, STEM, and design thinking. The key to retaining the uniqueness of schools around the world is to not abandon each school's rich heritage for the sake of modern technology. We should maintain a mission within our individual schools around the world and the communities they serve to ensure they have a clearly defined culture, allowing history to be restored, renewed, and maintained in order to not forget the past. By adapting our vision for the future, we can demonstrate a synthesis of existing culture and machine learning (Teaching AI, p. 57-58). Creating rich projects like the Paper Tree Project will help students practice deep level processing, collaboration, knowledge creation, and communication as they work across multiple domains and transfer learning to multiple settings outside of the classroom walls.

Mobile enabled technologies are making learning out in the field more efficient and purposeful. There are apps that are

3 <http://www.iste.org/TeachAI>

supported by AI to help students capture video and photo data, edit that data, and create new representations of learning. Choosing the tools that match the end goals for learning<sup>4</sup> will help us to prepare students for the future. If we don't take the challenge to engage in modeling these behaviors and showing educators and families what is possible, who will? When will we expect young people to learn it? But in the process of helping create a vision, build the scaffolding, model with technology, we can document the progress to show future generations that change didn't happen overnight. It was the hard work of passionate and dedicated individuals who helped make the future of education and learning a reality though policy, collaborations, innovations, and technologies that allowed them to communicate globally in ways we cannot yet even imagine.

4 <https://educationblog.microsoft.com/2018/10/double-exposure-learning-unbounded-by-time-or-place/>





# MICHELLE

# ZIMMERMAN

Michelle Zimmerman received her Ph.D. in Learning Sciences and Human Development from University of Washington, College of Education. As a Microsoft Innovative Educator Expert, she is a third year Microsoft MVP for global impact. With 18 years in the classroom (PreK-10th), her students gained international recognition through global school visits hosting Ministries of Education and Delegates at Renton Prep from over 16 countries including China, Pakistan, Serbia, UK, Japan, and South Africa. She co-designed Renton Prep and is part of the leadership team. Renton Prep has won multiple awards including FETC STEM Excellence and was selected as 1 of 17 Global schools to be part of the Microsoft Flagship Schools Program, and the first and only K-12 school in the United States. She and her students have been presented at educational technology conferences nationally and internationally, such as Macmillan and Scientific American STEM Summit at New York Academy of Medicine and New York Academy of Sciences, SXSWedu, ISTE, FETC, NCCE, TCEA, iNACOL, American Education Research Association, CARNET in Croatia and BETT in London. She is published in Springer's International Human-Computer Interaction Series and press such as VentureBeat and Vecernji list in Croatia. For more about the future of education in a world with artificial intelligence, see her new book Teaching AI: Exploring New Frontiers for Learning. [www.iste.org/TeachAI](http://www.iste.org/TeachAI)

---

## DEMOCRATISING SCIENCE: LEVERAGING AI FOR HUMANITY

### DR VIVIAN CHAN

Co-Founder and CEO, Sparrho

Scientific discovery is central to our everyday lives; it engineered the crops used to make our morning breakfast and created the technology on which you're reading this. Science, at its core, is simple: it's about exploring the world and understanding how it works. But the British Science Association recently found that over a quarter of the UK population feel that 'science is not for them'. For one reason or another, we've stopped seeing science as integral to society – it is merely the realm of 'scientists' – occurring in high-tech labs and secret basements.

If we can re-engage with this vital scientific process, though, it could be the key to us connecting with each other in more meaningful, intelligent ways and thereby driving innovation forward. But, ironically, the means of this reconnection is perhaps the very thing that has fostered our disassociation in the first place: technology.

As the founder of a tech company focused on democratising science, Sparrho, I have witnessed first-hand just how well these two disciplines can go together to foster intelligent communication and connectivity. At Sparrho, we use AI algorithms and machine learning to massively cut down on research times for scientists, which average over 195 hours per year, and leveraging their efforts, we are able to provide users with three-minute digests on key topics and cutting-edge research. Drawing on a database of over 60 million research papers and patents, we are remedying the fact that 50% of doctors use Wikipedia as their primary source of information on specific conditions – a worrying development found in a 2014 report.

With tech facilitating new research, it can then be used in the development phase to create a fairer and more engaged society. And this is already happening as I write – it is shaping our futures in ways

that will reach us sooner than we think.

So how did we get here? What was the spark that ignited our passion for democratising science? What is our vision and what does this tell us about the place of artificial intelligence in our future, and indeed the place of humans as co-inventors of that future?

Sparrho was born of frustration – about the inaccessibility of much of the data generated by the more than 2% of GDP spent on R&D each year, and the nearly 2 million scientific publications per year. Even those engaged as professionals in science struggle to stay across the material that is directly relevant to their speciality, not to mention all of the other material that might be of relevance, or even ground breaking, if they only knew about it.

As a young venture capitalist, armed with my undergraduate science degree,

I soon found myself challenged when trying to get across all of the R&D and scientific publications and filtering out the relevant data. It soon became apparent to me that the volumes of data now available had become unmanageable from an individual perspective. I also soon realised that we would need new “unit values of science”, in other words, new content types relevant to different user groups, as a path to democratisation.

Curation and summarisation of the vast amounts of scientific data became key pillars as part of this journey. Leveraging cutting edge technology, we developed a hybrid augmented approach, as the best way to solve this problem: - using AI to do the aggregation and recommendation, to reduce time and maximise output from the human experts. Using this hybrid approach, we have been able to massively cut down on research time for scientists, providing users with three-minute digests on key topics and cutting-edge research.

The key to the Sparrho platform is that the strengths of both AI and human beings are combined into one innovative package. The AI is best at filtering vast amounts of data according to key words, which our 400k+ active users pin onto what we call “pinboards”. Human scientists are still better than machines at making the non-linear connections that we refer to as insights. And as we capture how humans think and relate different pieces of information together, the AI learns and becomes ever more useful as a curator and mentor<sup>1</sup>.

Of course, the aim of Sparrho is not just to create a large database of scientific knowledge. It is to stimulate creativity and innovation by bringing the latest cross-cutting research and understanding to both scientists and the broader community. With tech facilitating new research, it can then be used in the development phase to create a fairer and more engaged society. Science is not just for scientists in the traditional sense. It is of enormous importance to every one of us in our everyday lives and in many jobs that need to understand the latest technology and its implications. How many business angels and venture capitalists, for example, would like to

have the latest, curated research at their fingertips, in simple and ready to use form, when they are making investment decisions about ‘the next big thing’. And how many individuals would love to have access to the latest thinking on cancer or arthritis treatments, for example?

In our digital age, connecting with one another seems easier than ever. Just reach into your pocket, pull out your smartphone and another person – or their social media profile – is only a few taps away. But despite this instant access, paradoxically we’re also living in an era of massive societal division and cynicism towards the truth and facts.

In order to fully democratise science, we need to ensure that it is seen as an integral part of our society and the way we go about things. Everyone is aware of the latest health tech advances, personal wearable devices, 3D printed artificial organs, etc. Crucially, the increasing challenge and increasing pace of climate change means that we all need to work together, using the best tools we have – human and artificial – to find science based global solutions.

In a recent study by the Pew Research Centre, only 26% of over 5,000 adults surveyed could identify five factual statements compared to statements of opinion presented to them and only 32% showed an interest in the news. So, we can reach our friends and even strangers across the globe easily, but we don’t seem to be hearing messages other than our own. Stuck in our echo chambers, this lack of engagement with facts and others’ perspectives means not just fear-mongering percentages but it has worrying consequences for all aspects of society, especially science.

However, in order to fully engage society as a whole, science needs to reflect that society too. There is an alarming global gender gap in science. With the UN announcing their International Day of Women and Girls in Science, they are remedying the fact that in 2017 only 24% of STEM graduates in the UK were women. I am proud to say that at Sparrho we are a globally representative company; we are 50% female, we collectively hold 14 passports and speak over 10 languages, and we are one of the about 210 companies that have signed up to the Tech Talent Charter in the UK to drive diversity into all parts of the sector, drawing in big name employers such as

Microsoft, the BBC and Cancer Research.

Most importantly, the role of science and tech in society moves beyond concrete advancements and affects our capacity for imagination also. If we can re-engage with the science that forms the fabric of our lives, we will not only help humanity in the years to come but also inspire future generations to imagine a better world; one that is fairer, meaningfully connected and that doesn’t merely accept the status quo.

1 For more information on the Sparrho platform and how it works see <https://www.youtube.com/watch?v=GZuZKBkIYUA>



# DR VIVIAN CHAN

Dr Vivian Chan is founder & CEO of Sparrho, the only platform in the world that democratizes science by aggregating, curating, and summarising cutting-edge research using augmented intelligence - the convergence of AI and human expertise. Dr Chan founded Sparrho as a tool to help rectify the inherent barriers that exist within the scientific ecosystem.

Since founding the industry-leading start-up, Dr Chan has had the opportunity to address the EU Ministers of Research and Innovation about Open Science, discussing the pressing need for scientific information to be accessible to all. She currently sits on the UK Department for Digital, Culture, Media and Sport's Digital Economy Advisory Group.

In the Autumn of 2018, Dr Chan was named one of the UK's Top 100 BAME leaders in Technology by the FT and Inclusive Boards. She has also had the honour of being named in the MIT Tech Review's 35 Under 35 Innovators in 2017, and the Top 5 Asian Stars in UK Tech in 2018.

## 5G: CHALLENGES FOR RURAL AND DEVELOPING REGIONS

### DR HEATHER E. HUDSON

Professor Emerita at the University of San Francisco and Affiliate Professor and former Director of the Institute of Social and Economic Research (ISER), University of Alaska Anchorage

### THE PROMISE OF 5G

Fifth generation (5G) mobile wireless is being touted not only as the next stage of mobile communications but as a technological paradigm shift. Mobile operators and equipment vendors point to fiber-like connectivity as well as new flexible and dynamic techniques for managing spectrum that will offer enormous potential. Qualcomm states that 5G is not just a network, but that it "will become the underlying fabric of an entire ecosystem of fully connected intelligent sensors and devices, capable of overhauling economic and business policies, and further blurring geographical and cultural borders. It will be capable of delivering at every rung of the ecosystem's ladder, and will provide

1 Qualcomm. (2017) "The 5G Economy: How 5G will Impact Global Industries, The Economy, and You," MIT Technology Review, March 2 "Ericsson Mobility Report." (2018) June. <https://www.ericsson.com/assets/local/mobility-report/documents/2018/ericsson-mobility-report-june-2018.pdf>.

### THE MOBILE CENTURY



Heather at the Pacific Telecommunications Council (PTC) in Hawaii, January 2019, where she presented on the implications of 5G for rural and remote communities. Pictured (from L to R): Sharon Nakama, PTC; Heather Hudson; Lynn Smullen, CenturyLink; Candace Moreno, Teliax; Tara Giunta, Paul Hastings.

seamless, continuous connectivity for business applications."<sup>1</sup> Ericsson predicts enormous demand in terms of both users and data traffic: "5G will kick off with

enhanced mobile broadband as its first use case. By the end of 2023, there will be 1 billion 5G subscriptions, accounting for around 20 percent of mobile data traffic."<sup>2</sup>

## CONSIDERATIONS FOR NORTHERN CANADA

The Canadian North encompasses an enormous land area with a very small population, typically clustered in communities with a few hundred to a few thousand residents. Most have no road access, except, in some cases, winter roads that traverse frozen lakes and rivers for a few months a year. The total population of the three northern territories (Yukon, Northwest Territories and Nunavut) is less than 115,000 scattered over 3.5 million square kilometers. The majority of the population in much of this region is indigenous. Conditions are similar in the northern parts of the provinces.

While small in absolute numbers, these populations are also young and growing rapidly; in Nunavut, 51 percent of residents are under the age of 25. Household incomes in these regions are typically lower than the Canadian average, and often seasonal, while the cost of living is considerably higher. Mobile wireless coverage in the North is lower than in any of the provinces, and the penetration rate is also lower (subscribers as a percentage of the covered population). The number of subscribers with a data plan in the North in 2016 was less than 1 percent of the Canadian total, and the growth from the previous year was only 5.6 percent, the lowest of any Canadian region.<sup>7</sup> Canadian Northerners are clearly not able to participate fully in the digital economy.

### THE CANADIAN POLICY CONTEXT

One of the objectives cited in Canada's Telecommunications Act is "to promote the availability of reliable and affordable services to all regions of Canada<sup>8</sup>." (italics added) In a recent decision, the Canadian Radio-television and Telecommunications Commission (CRTC) determined that broadband is to be considered a basic service available to all Canadians, and established targets of 50 Mbps download and 10 Mbps upload.<sup>9</sup>

Like the U.S. and European countries that want to facilitate rollout of 5G, the

7 CRTC. (2017) Communications Monitoring Report 2017. Ottawa, CRTC, 2017.

8 Canada. Telecommunications Act. (1993) S.C. 1993, c. 38, 1993.

9 Telecom Regulatory Policy CRTC 2016-496, Ottawa, December 21.

Such forecasts have prodded policy makers to propose plans for 5G introduction and spectrum policies to allocate the necessary bandwidth in order to gain early advantage as well as early benefits. The EC has adopted a Digital Agenda for Europe (DAE) and a specific 5G Action Plan.<sup>3</sup> The U.S. Federal Communications Commission (FCC) justified acting quickly in its September 2018 Declaratory Ruling on 5G: "These new services can unleash a new wave of entrepreneurship, innovation, and economic opportunity for communities across the country .... Moving quickly to enable this transition is important, as a new report forecasts that speeding 5G infrastructure deployment by even one year would unleash an additional \$100 billion to the U.S. economy."<sup>4</sup>

Implementation of 5G, like other wireless services, depends on availability of suitable spectrum. The history of spectrum regulation has been marked repeatedly by the need to accommodate various new requirements for spectrum, and to balance the trade-offs, with efforts to share spectrum for various uses, and to move new applicants to as-yet unused parts of the spectrum ranging from "white spaces" between TV channels to extremely high frequencies (EHF) or millimeter waves (mmW). For 5G services, lower frequencies such as 700 MHz can cover significant distances, but their bandwidth capacity is limited. Higher frequencies, such as 3500 MHz and higher, have much greater capacity but much shorter range.

Key issues include ensuring access to 5G technology and services and affordable connectivity for rural users. Spectrum plays several roles in addressing these issues. Some spectrum suitable for network densification and higher data rates needed for 5G may already be in

use. Will frequencies currently used for satellite services and fixed wireless (such as 3500 MHz and above) be appropriated for 5G terrestrial mobile services? Will the rural market be sufficient to entice providers? Will the characteristics of these bands (high bandwidth, limited range) render them uneconomical for rural regions, and/or enable local entrants to serve their communities?

### RURAL CHALLENGES

A recent UK study highlights the financial challenges of universal 5G coverage. Using a business-as-usual scenario, the study estimates that 90 percent of the population is covered with 5G by 2027, but coverage is unlikely to reach the final 10 percent due to exponentially increasing costs "making this proportion unlikely to be served by the market." The authors point out that this coverage is unlikely to occur as "...as investing an additional £12 billion to cover the final 10%, while the first 90% only required £6 billion, may not be an attractive prospect for industry or government." The authors note that integrating spectrum including 700, 800, 2600 and 3500 MHz into existing sites could lower costs to achieve 10 Mbps in rural areas, but would still leave a major rural divide, as data rates would be much lower than in urban areas.<sup>5</sup>

In the U.S., the FCC's proposals to cap costs outside major urban markets by setting maximum fees for locating antennas and towers have been criticized by some state and local officials who argue that lower fees will make little difference in bridging the digital divide unless there is adequate market demand. They also note that the FCC's ruling lacks any requirements for telecommunication companies to provide service to unserved and underserved areas.<sup>6</sup>

A recent (and continuing) Canadian government consultation on 5G spectrum policy study highlights many of the challenges – and potential contradictions – facing policy makers who want to extend the benefits of 5G throughout rural regions.

### 5G SPECTRUM POLICY:

6 Maciag, Mike. (2018) "FCC Sets Rules for 5G Infrastructure, Limiting State and Local Control." <http://www.governing.com/topics/transportation-infrastructure/gov-fcc-5g-telecom-smartphone-states-cities.html>. September 28.

3 (EC 2010 and 2016). European Commission. (2010) Digital Agenda for Europe (DAE). Brussels; European Commission. (2016) 5G for Europe: An Action Plan. Brussels, September. 4 Federal Communications Commission. (2018) "Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment." Declaratory Ruling and Third Report and Order WT Docket No. 17-79; WC Docket No. 17-84. September 5.

5 Oughton, Edward J. and Frias, Zoraida. (2018) "The cost, coverage and rollout implications of 5G infrastructure in Britain." *Telecommunications Policy*, vol 42, no 8, 636-652.

Canadian government has concluded that it “needs to repurpose the spectrum to quickly and efficiently support the introduction of the 5G ecosystem.”<sup>10</sup> In 2018, it initiated a consultation on “Revisions to the 3500 MHz Band to accommodate flexible use and preliminary consultation on changes to the 3800 MHz Band” primarily to make these bands available for 5G services. Its stated objectives are to:

- “foster innovation, investment and the evolution of wireless networks by enabling the development and adoption of 5G technologies;
- support sustained competition, so that consumers and businesses benefit from greater choice; and
- facilitate the deployment and timely availability of services across the country, *including rural areas.*”<sup>11</sup> (italics added)

The government’s general spectrum policy framework established in 2007 enumerates several policy guidelines, including:

1. Market forces should be relied upon to the maximum extent feasible.
2. Notwithstanding (a), spectrum should be made available for a range of services that are in the public interest<sup>12</sup>.

These two guidelines which specify both market forces and the public interest, plus the objectives for the 5G spectrum consultation, highlight the policy challenges facing 5G implementation in rural and remote areas of Canada.

## SPECTRUM USE IN NORTHERN REGIONS

The government consultation document noted: “... given Canada’s geography and widely dispersed population, it can be

---

10 The CRTC regulates telecommunications, but is not responsible for spectrum, which is managed by a government department -- Innovation, Science and Economic Development Canada (ISED), formerly Industry Canada.

11 ISED (Innovation, Science and Economic Development Canada). (2018) Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band, June.

12 Industry Canada. (2007) Spectrum Policy Framework for Canada. Ottawa, June. 14 Quotations in this section are from Comments and Reply Comments in ISED, Consultation on Revisions to the 3500 MHz Band, 2018.

difficult to make a business case for the deployment of new innovative services in some rural and remote areas of the country. Consequently, some rural areas may continue to rely on fixed wireless access in the 3500 MHz band over a longer period of time than urban areas....”<sup>13</sup>

Northern and remote communities rely on some of these frequencies (3700 to 4200 MHz) for telephony and Internet services provided by the Fixed Satellite Service (FSS) and in some regions by fixed terrestrial wireless systems. These frequencies are also used in remote regions to transmit television signals for local over-the-air and cable distribution. There are currently 927 licenses issued to 281 licensees for services in this band.

The Canadian government proposes to accommodate 5G and existing services using these frequencies through a transition plan “that will allow for the timely deployment of mobile services in urban areas while providing rural providers of fixed services with more time to transition to [a] new flexible use system.” Incumbent licensees that would interfere with planned deployment of new licensees in urban areas would be protected for six months, in surrounding regions for two years, while those in rural areas (population less than 30,000) would be protected for three years. Yet such protection does not guarantee that broadband services meeting the CRTC’s speed targets of 50 Mbps down and 10 Mbps up would be available in these rural regions.

## CHALLENGES TO GOVERNMENT PROPOSALS

Small ISPs, satellite providers and representatives of rural areas challenged various elements of the government’s proposals. Small providers emphasized their need for spectrum and role in rural connectivity: “The single most effective measure that the Government of Canada can take to promote rural broadband connectivity is to make spectrum available to small, regional, and rural service providers.... Making spectrum accessible to small companies in rural Canada will promote investment, innovation, employment, and economic development in rural Canada.”<sup>14</sup> Others

---

13 ISED, 2018.

14 Quotations in this section are from Comments and Reply Comments in ISED, Consultation on Revisions to the 3500 MHz

pointed to the need for rural broadband, but also the challenges of small markets and high costs of extending 5G: “...demand exists for the 5G potential, but it is market failure that may delay its rollout to rural areas.”

Mobile equipment vendors participating in the consultation pointed to the advantages of these frequencies for 5G and to comments in U.S. FCC proceedings alleging decline of C-band utilization and demand in the U.S., concluding that “... this decline in use, and the availability of alternative transmission options for FSS systems, make the band a great candidate for re-allocation for terrestrial 5G use” and that “the entire 3700-4200 MHz [should be] cleared for licensed flexible mobile 5G service as early as possible.” Bell Canada, one of the country’s largest mobile operators, which also leases C-band satellite capacity to serve the North, recommended: “Ultimately ... the Department should plan to require FSS systems to relocate and be compressed into a smaller portion of the band with the objective of eventually vacating the band altogether.”

However, the importance of C-band satellite facilities for remote and northern regions was noted by several satellite service providers as well as the Canadian Broadcasting Corporation (CBC) which distributes radio and television programming via satellite in the North. Telesat noted that “demand for C-band satellite services is strong and growing, driven by the explosion in broadband demand and the characteristics of the spectrum, and is supported by a huge investment in space and ground infrastructure.” Another satellite-based operator in the North stated that “for the foreseeable future any sharing [the government] could consider in this frequency band must make certain to protect existing FSS users.”

Several participants endorsed flexible use of 3500 MHz spectrum including innovative strategies to make efficient use of spectrum such as a dynamic spectrum allocation model that would allow multiple operators to share spectrum on an ‘as needed’ or ‘spectrum as a service’ basis. Several small providers

---

15 First Mile Connectivity Consortium (FMCC). (2018) Reply Comments in ISED Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary

noted that in many small rural markets, spectrum held by incumbent national providers is underutilized or unused, and that policies should not reward “spectrum warehousing.” Spectrum should be assigned to persons willing and able to use it; spectrum should then be used or, failing that, reclaimed and reassigned.

Large Canadian operators endorsed auctions as a means of awarding spectrum for 5G networks. While the U.S. has chosen to auction spectrum, small providers argued that this model does not appear appropriate for Canada. Small and community providers may not be able to compete in auctions for 5G spectrum or to provide 5G services in the timeframe proposed by large operators. As one association of small providers noted: “By discouraging competitors in small regional markets, auctions have served urban Canadians at the expense of rural communities.”

The First Mile Connectivity Consortium (FMCC), whose members are indigenous internet service providers, stated that the issue is not timelines, but available and affordable alternatives to provide high quality broadband service in these regions and communities. “Therefore, services and frequencies for internet

and broadband in the 3500 MHz band using fixed wireless and satellites should not be withdrawn in rural, remote and Indigenous regions and communities until reliable and affordable wireless broadband of at least 50 Mbps download and 10 Mbps upload [as mandated by the CRTC] is available using alternative technologies.”<sup>15</sup>

**CONCLUSIONS AND RELEVANCE FOR OTHER RURAL AND REMOTE REGIONS**

Economic benefits, social benefits, market forces, public interest, global competitiveness, universal access to reliable and affordable services – these are challenges facing regulators and policy makers not only in Canada but in other countries as well. The following conclusions from the above experience suggest how these challenges may be addressed for 5G, in order to further the goal of universal access to broadband:

1. Licenses for services and frequencies used for fixed wireless and satellite services should not be withdrawn in rural, remote and indigenous regions and communities until reliable and affordable broadband is available

2. The allocation of spectrum for new services such as 5G should be governed by a framework that enables small, rural, and regional operators to invest in networks that support broadband in rural communities.
3. New entrants and small providers should be eligible to use spectrum for 5G services through spectrum sharing, micro licenses, or other means.
4. Any policy to allocate additional spectrum for mobile wireless should require that the spectrum be used within a specified period or forfeited.
5. Techniques for flexible use of spectrum may be appropriate as long as there is recognition of, and accommodation for, conditions in remote and indigenous regions including technologies currently deployed that are likely to remain in use for broadband services in these regions.



**DR HEATHER**  
**HUDSON**

Heather E. Hudson is Professor Emerita at the University of San Francisco and Affiliate Professor and former Director of the Institute of Social and Economic Research (ISER), University of Alaska Anchorage. Her research focuses on applications of information and communication technologies for socio-economic development, regulatory issues, and policies and strategies to extend affordable access to communications, particularly in rural and developing regions. She has planned and evaluated communication projects in Alaska and northern Canada and more than 50 developing countries and emerging economies, and has consulted for the ITU, the World Bank, UNDP, IDRC, and other international organizations. Dr. Hudson is the author of numerous articles and several books. She is a member of the Board of Governors of the Pacific Telecommunications Council and the International Board of the GTWN. She has held a Fulbright Policy Research Chair in Canada and Fulbright Distinguished Lectureship in the Asia-Pacific. She has been a Sloan Foundation Industry Fellow at Columbia University Business School and Sproul Fellow at the University of California, Berkeley, and Senior Fellow at the East-West Center in Hawaii and the University of Hong Kong. She is a dual Canadian and U.S. citizen, and received her PhD from Stanford University and JD from the University of Texas at Austin.

# ANTHROPOLOGY AND TECHNOLOGY: SOLVING GLOBAL PROBLEMS WITH PRACTICAL SOLUTIONS

**JULIETTE NEU**

CEO and Co-Founder, Cingeto

I am an anthropologist with a background in both applied cultural anthropology and anthropological archaeology and I work in the space, aerospace, and innovative tech sectors. On the face of it, anthropology and technology seem to be two disparate fields. Yet, when combined, anthropology and technology could not be more complementary. Anthropology teaches us to be curious, genuinely interested in others and in understanding their point of view. As Nancy Scheper-Hughes of UC Berkeley beautifully puts it, anthropologists are trained to free themselves from the fear of difference. They see people as precious repositories of knowledge.<sup>[1]</sup> In turn, applied anthropologists use anthropological methods to solve concrete human problems. Anthropology has never been more relevant to addressing today's business problems and informing technology ventures.

Why? Anthropology provides profound insight into people, their unspoken rules of engagement, their likes and dislikes, and their concrete needs and wants. Anthropologists are experts at finding answers to human-centered questions, challenging assumptions, and redefining problems. This is what I do at an organizational level. My training in anthropology has enabled me to gain insight into employee relationships, power structures, unspoken norms, modes of communication, and overall inner-workings. This has allowed me to provide management with effective roadmaps for their talent strategy. I use these skills to help organizations build diverse teams who enjoy working together, own their vision and values, and deliver on goals. Anthropological methods, which rely on holism and a systemic approach to understanding people, make it uniquely valuable to organizations that wish to retain and

engage their members. Anthropology serves as a tool to weave diversity into the group's fabric. Diversity is vital to creativity, which in turn is essential to innovation.

We often forget that technology is created by people. Talent is frequently under-prioritized, yet it is key to the success of a business. In fact, innovative organizations are often hindered by a shortage of skilled professionals, poor team dynamics, and an unclear talent strategy. My team and I are working to change that. However, in the past few years we have noted a marked shortage of talent in certain Science Technology Engineering and Math (STEM) and Science Technology Engineering Art and Math (STEAM) specialties, most notably in the digital technology fields. Overall, there seems to be a general awakening in the market place regarding this shortage. But a number of private and public initiatives designed to remedy low student enrollment in STEM/STEAM fields have shown mixed results. So how can we address that shortage using an anthropological approach? The demand is there but where do we find the supply and what are the mechanisms of empowerment that might be used to bring this about? You do not need to be an anthropologist to know that the future lies with our children. And while digital technology needs more children to pursue STEM/STEAM-focused careers, it also represents both a means to reach more potential budding talent and a medium of empowerment.

A recent report by the United Nations Children's Fund (UNICEF) entitled "Children in a Digital World"<sup>[2]</sup> highlights that out of the over 2.2 billion children living in the world today,<sup>[3]</sup> 346 million of them are not connected to the internet. About 63 million children do not attend

school and World Bank data show that children are also the most vulnerable to poverty as half of the world's poorest population is children.<sup>[4]</sup> The UNICEF report highlights that "connectivity can be a game changer for some of the world's most marginalized children, helping them fulfil their potential and break intergenerational cycles of poverty" (pp9). In sum, there is a global need for talent in digital technology-related STEM and STEAM fields; not enough children are aiming for these fields and a statistically significant portion of the world's children do not have access to digital technology at all. At the same time, digital technology, and most specifically, connectivity, constitutes what UNICEF calls a turning point for some of the world's most marginalized children.

Anthropology is a profoundly humane vocation that opens one's eyes to a multitude of ways of thinking and apprehending the world. It equips you with a unique aptitude to think unconventionally. Anthropologists never stop learning, studying, observing, and taking in what is around them. People working on the project share the collective hope that by marrying technology, anthropology and the desire to solve a global problem with concrete business-oriented solutions, we can contribute to the advancement of technology and society that ultimately benefits all of us.

The best way to illustrate what we do as applied anthropologists is to present a concrete project that I am currently working on with partners in the satellite industry.

The project sits at the intersect of business, digital technology, education, mentorship, and poverty reduction.

## USING DIGITAL TECHNOLOGY TO ADDRESS POVERTY

The issue of poverty and access to digital technology is complex and multilayered. By focusing on connectivity, our goal is to show that poverty can be addressed using the same technology that can also cause it to worsen. The expanding availability of communications technology and connectivity exacerbates poverty because poor people often do not have equal access to the physical devices that allow access and connection to a network<sup>[5]</sup> due to low income and the resulting inability to pay for them. Consequently, poor people also do not have equal access to digital information leading to less exposure to data, educational material, and support networks, which in turn further deepens disadvantage and poverty. Scholars of anthropology recognize information as a major source of power. As the old adage states, knowledge is power. So, while digital technology has rendered information omnipresent, and theoretically available to all, reality shows a growing gap between those able and unable to access connectivity and its associated access to information.

Looking specifically at the United States, in 2018, 17.5% of all children (12.8 million kids) lived in poverty<sup>[6]</sup>. Today, approximately 1 in 6 children faces hunger in the United States.<sup>[7]</sup> Helen Ladd has produced noteworthy data that show causality between family income and educational outcomes for children.<sup>[8]</sup> Recent studies in the US have also shown that schools in disadvantaged areas need more funding, which they do not get. In fact, a 2018 report by the Education Trust shows that schools in disadvantaged areas suffer from a chronic shortage of services, classroom supplies and technology due to lack of funding.<sup>[9]</sup> Because the families of kids in poverty-ridden areas cannot afford computers or access to the internet, and their schools lack additional resources, their ability to use modern tools and technology that would allow the sharing of teaching resources through the cloud or other connectivity solutions is negatively impacted. Children in low-income school districts do not benefit from the same access to educational tools and information as other children, which in turn fosters unfavorable educational achievement. Poverty is directly linked to achievement gaps, which strongly influences employability and the attainment of higher paying jobs. This entrenches people in a cycle of poverty

that is hard to break.

Data show that children of poverty start school less equipped to succeed than other children.<sup>[10]</sup> Poverty is a complicated, multifaceted beast. There are many forces at work that need addressing to annihilate it. Early childhood education is one key to breaking the cycle of poverty. Studies have revealed that early intervention in school settings can provide a platform to success.<sup>[11]</sup> Family settings and care-givers strongly impact a child's development but educators and other adults in the child's surroundings also play a major role in counter-balancing circumstantial influences.<sup>[12]</sup> Throughout my career, I have met remarkable people meaningfully contributing to the science and technology sectors. Of those who come from difficult beginnings and raised themselves out of poverty, each has had access to an inspiring figure who guided and/or motivated them. This individual gave the young child the necessary foundation for success: confidence in their ability, a sense of self-worth and the understanding that they were needed and could achieve their goals. This individual thus opened avenues for the child that might not otherwise have been considered and provided the necessary foundation for her/him to spring from, learn and succeed.

Human beings all share similar basic needs: to feel loved, valued, wanted, and important. Poor children are especially vulnerable because they are surrounded by struggles, stress, uncertainty, and their caregivers are often not available to offer adequate support. I am not suggesting that poor kids are not loved, but the fact that they lack necessities (food, electricity, and the presence of a caregiver), predictability, and a reliable positive influence in their life, negatively impacts their chance at succeeding in school. Academic achievements represent a passport out of poverty. A mentor can provide a guiding light to a young child and radically change their trajectory.

Poverty is exacerbated by unequal access to communications technology and connectivity. Equally, the quality of education - a formidable weapon against poverty - is affected by the socioeconomic circumstances of its pupils. No matter how advanced our technology is; human interactions and simple encouragements are still essential to shifting the fortune of a child living in poverty. Let us imagine that we could use cost-effective

communications technology, including satellites, to connect mentors and mentees anywhere in the world. In addition, search engines, cloud-based applications, virtual reality experiences, artificial intelligence, all can be used to enrich a child's ability to learn and augment the school experience. The tools are there, but they are currently expensive. However, in the last decade, the cost of satellite capacity has significantly reduced. In the next decade, another order of magnitude decrease will allow satellite capacity to approach or even be less than terrestrial connectivity costs. This is key to improving connectivity in schools globally and to providing the technological platform for all the opportunities mentioned. It will also allow educators the freedom to explore new ways of teaching students who might not respond to typical teaching methods. The push needs to be focused on STEM/STEAM specialties related to digital technology because we want to address the growing shortage of incoming talent, but the model can work for education as a whole.

Let us allow our imagination to run a bit more. Picture yourself in a destitute part of the US. You are 5 years old. Your caregiver is scarcely home because they work three jobs to keep a roof above your head. Sometimes there has to be a choice between keeping the lights on or eating. No one has time to help you with homework or to encourage you. In fact, all you see and know around you is people struggling to make ends meet. All the kids around you share a similar situation. Thanks to digital technology, your school gets connected to a mentors' network. A network made of STEM/STEAM professionals who want to be agents of change and who understand that you, at 5 years old, represent the great potential that this new era so desperately needs. That network is linked to other schools like yours in other areas of the world. Each mentoring session is attended by a small group of children from the four corners of the planet. They, you, can be inspired by the mentor. They, you, can ask questions to each other and thus be exposed to a totally different, or surprisingly similar, way of seeing the world. You are no longer stuck in that destitute part of the US and you too can let your imagination run, toward a better future. Digital technology represents a formidable tool to better education and address poverty. The increasingly affordable modern communications

technology, including satellite technology, combined with the proper use of the internet, cloud applications, and “good old” human connections, offer an incredible opportunity to reach more kids and disrupt current socioeconomic schemes. There are hurdles to overcome of course but the fact remains that a healthy mix between what digital technology offers and human interactions is a winning recipe.

This project was born from my experience applying anthropology to crafting talent in the technology sector. It is expanding thanks to the distinctive ability anthropology offers. Its practitioners to bring communities together, be it internally to a business or externally in the public space. I was inspired by direct feedback from the marketplace on the shortage of STEM and STEAM talent and sought to find a way to address that deficit. At the same time, I wanted to create an inclusive approach in order to give all children access to the world of innovative technology. Last, but not least, the project also came to be thanks to the keen sense of purpose and willingness to change the current status quo from partners in the satellite industry. This demonstrates how relevant anthropology is to tackling current challenges in the technical world through bringing novel ideas and people together.

#### References:

1. Scheper-Hughes, Nancy. “Can Anthropology Save the World?” *Perspectives.americananthro.org*, [perspectives.americananthro.org/](http://perspectives.americananthro.org/).
2. “The State of the World’s Children 2017: Children in a Digital World.” UNICEF, [www.unicef.org/publications/files/SOWC\\_2017\\_ENG\\_WEB.pdf](http://www.unicef.org/publications/files/SOWC_2017_ENG_WEB.pdf).
3. “World Population Prospects - Population Division.” United Nations, United Nations, [population.un.org/wpp](http://population.un.org/wpp).
4. “9 World Poverty Statistics That Everyone Should Know.” *Lifewater*, 21 Dec. 2018, [lifewater.org/blog/9-world-poverty-statistics-to-know-today/](http://lifewater.org/blog/9-world-poverty-statistics-to-know-today/).
5. Warschauer, Mark. *Technology and Social Inclusion: Rethinking the Digital Divide*. MIT, 2004.
6. US Census Bureau. “Library.” *Census Bureau QuickFacts, United States Census Bureau*, 12 Sept. 2018, [www.census.gov/library/publications/2018/demo/p60-263.html](http://www.census.gov/library/publications/2018/demo/p60-263.html).
7. No Kid Hungry, [www.nokidhungry.org/who-we-are/hunger-facts](http://www.nokidhungry.org/who-we-are/hunger-facts).
8. Ladd, Helen F. “Education and Poverty: Confronting the Evidence.” *Journal of Policy Analysis and Management*, vol. 31, no. 2, 2012, pp. 203–227.
9. Amerikaner, Ary, and Ivy Morgan. “Funding Gaps: an Analysis of School Funding Equity across the U.S. and within Each State.” *The Education Trust*, [edtrust.org/wp-content/uploads/2014/09/FundingGapReport\\_2018\\_FINAL.pdf](http://edtrust.org/wp-content/uploads/2014/09/FundingGapReport_2018_FINAL.pdf).
10. “Poverty’s Long-Lasting Effects on Students’ Education and Success.” *INSIGHT Into Diversity*, 26 June 2017, [www.insightintodiversity.com/povertys-long-lasting-effects-on-students-education-and-success/](http://www.insightintodiversity.com/povertys-long-lasting-effects-on-students-education-and-success/).
11. [mwilliams@newsleader.com](mailto:mwilliams@newsleader.com). “The Complicated Correlation between Poverty and Lower Test Scores.” *The News Leader*, 26 July 2015, [www.newsleader.com/story/news/local/2015/07/26/complicated-correlation-poverty-lower-test-scores/30683627/](http://www.newsleader.com/story/news/local/2015/07/26/complicated-correlation-poverty-lower-test-scores/30683627/).
12. Ferguson, Hb, et al. “The Impact of Poverty on Educational Outcomes for Children.” *Paediatrics & Child Health*, vol. 12, no. 8, 2007, pp. 701–706.



# JULIETTE

# NEU

Juliette Neu is an anthropologist and enthusiastic explorer with the ability to apply anthropological methods to talent strategy. She is a result-driven multilingual and multicultural consultant with twenty years of international experience advising the leadership of space, aerospace and innovative technology companies. Juliette started her career in talent management in 1998 while based in South Korea, assisting international organizations focused on industrial innovation across East Asia. Juliette founded Cingeto in 2016 after a client asked her to design and lead its talent scale-up in North America and Europe for the first-ever mass-production of satellites in the world. Prior to launching Cingeto, Juliette served as partner for the industrial practice of a large firm with a focus on aerospace and innovative technologies covering global accounts in the Americas, Europe and Asia. She has lived and worked in Europe, West Africa, East Asia, and North America and speaks four languages (English, French, Korean, and Spanish). Juliette holds a MA in Applied Anthropology from American University and began doctoral research in 2012 in Anthropological Archaeology at the University of Pittsburgh. Juliette is passionate about anthropology, advanced technology and space. She is currently working on an initiative where early education, mentorship, space sciences, and cutting-edge technology intersect to address the shortage of STEAM talent and curtail the devastating consequences of poverty on young generations.

# DIGITAL TRANSFORMATION: THE CHALLENGE FOR GOVERNMENT

**CARLA CICO**

Member of the Board, Allegion

The digital revolution has hit many companies hard and has forced them, regardless of the industry or the location, to make the changes necessary to learn not only how to survive in the new environment, riding the digital wave, but also to take advantage of the new opportunities created in this new environment.

Governments are equally facing the digital revolution, and while their existence may not be threatened by digital competitors, they have an obligation to surf the digital wave as well, in order to meet the growing expectations of citizens. The interaction between citizen and government is no longer determined by the traditional hierarchical power structure. Governments and all Public Administrations must now focus on the “customer experience”, just like any private corporation.

With one click you can find online many articles and studies that describe the steps that any Government/Public Administration should take in order to digitalize their processes and services and to be able to serve citizens faster and more efficiently. Topics covered include Smart cities, digital government platforms, security and protection of data, improving mobility and automation, among many others. When reading these articles, just as for the corporate world, you could believe that the only challenge to be overcome is the acquisition of technology, as if the results will follow automatically in due course.

But this is not the case. Just as in the case of the corporate world, for governments the key to digital transformation is not the technology itself, but the creation of a vision, the correct and faithful implementation of this vision, implemented by the correct individuals, and at the correct time, in order to achieve the desired cultural change.

In the case of governments, the change of culture is even more challenging due to the traditional hierarchical rules-based system that has been built up over time. This system is rapidly becoming obsolete. Governments need a new way to interact with their stakeholders: citizens, constituents and communities, as well as the various arms of the administration and the business community. The expectation of these stakeholders has grown considerably in light of technological change, and they will no longer be satisfied with such an obsolete and inefficient system.

When governments worldwide have budget problems, they usually turn to the easiest solution: increasing taxation, but this can have a determinantal impact on the economy. Lack of public funds due to budget mismanagement drastically affects how quickly governments and public administrations can achieve digital transformation, but it is not the only reason why most governments are lagging behind. The development and implementation of online systems that reduce the delays and waiting times involved in any bureaucratic process only scratches the surface of what governments could do if they placed digital transformation at the top of their list of priorities. Above all, to achieve the best digital outcome for everyone, governments need to focus on how

to rethink their relationship with the private sector in a mutually beneficial way.

Governments should create an ecosystem where all the stakeholders involved (the citizens, the private sector, private agencies, etc) are able co-create, co-design and co-deliver new services. This will drive economic growth, and fundamentally transform the role of Government. The new roles the Government will be required to play are the provision of the necessary physical and cyber-infrastructure, along with the introduction of few and well-defined regulations with the aim of facilitating audits and making businesses accountable. This would result in a win-win situation where the citizen benefits both directly from better services and indirectly from the growing economy.

Another factor that is slowing down digital transformation in the public sector is that many decision-makers in the bureaucracy are operating in an environment without an overall vision driving the process. They may have no direct business experience and may not be required to consider the impact of their decisions on the business community or the wider economy and society.

One example of this problem is the introduction of a digital invoicing



#### 44 INNOVATION

system in Italy. Effective 1 January 2019 Italy introduced mandatory electronic invoicing for private businesses. The requirement applies to all transactions performed between business who are resident or established in Italy.

This obligation, which arises from an EU Directive, has forced most companies to update their IT systems as well as their internal processes, in order to comply with these new regulations. It is too early to say whether this change will be beneficial or not, but my educated guess is that the Government will not receive the desired outcome of higher tax receipts, as this requirement will most probably only increase the already large proportion of businesses in Italy that avoid paying taxes.

Why this is happening? Because the core motivation behind the introduction of this new system was not to introduce a service that could benefit business as well as the government. It was driven by the Government's desire to acquire direct control over the invoicing of businesses, thinking that this would automatically result in higher amounts of collected taxes.

Another example of where digital transformation is going wrong is the implementation of the EU's General Data Protection Regulation, the GDPR. One of the most important aspects of the digital revolution is the sheer quantity and depth of data which it is now possible

to amass. The amount of data being concentrated in the hands of a few large tech companies is enormous. Not only does this data concentration represent an insurmountable barrier for new entrants into the market, which creates a de facto oligopoly, or in some cases, an effective monopoly, but it also represents a grave threat to individual privacy.

The best way to ensure data and individual privacy are protected is to regulate the big tech companies, in order to balance the concentration of market power they now have, which arises directly from the volumes of data they have collected. These companies are now so big and so influential that the only response by regulators should be a direct and targeted market intervention, as has already been done in the past.

When faced with this problem, however, the EU took a blanket approach, requiring the GDPR to be implemented in all EU member states and by all businesses, regardless of their size. They did not take into consideration the timing and necessary implementation and training costs incurred by the business community.

Both the digital invoicing system and the GDPR are examples of potential opportunities where the public sector could have worked co-operatively with the business community to co-develop standards and regulations, as well as a road map to follow for the

implementation of these systems. What the Government failed to understand is that when it comes to small and middle size businesses in particular, every euro counts, and the implementation of such processes like the two above are a burden that small and middle size companies cannot sustain, unless they move capital away from their core business with consequences for their financial results and for the overall economy.

Digital transformation represents an opportunity for governments and the public sector which should be embraced as a way to downsize and to become more agile. An example would be the reduction in personnel costs that digital transformation will bring, the channeling of savings into infrastructure upgrades, or the reduction of utility costs.

Digital transformation has presented the government and public sector with a unique opportunity to transform their culture for the best, to be nearer to their citizens, communities and business in a way that has never been possible. But this can only happen if governments listen to the concerns of those governed, if they cooperate with their community and, above all, if they put their need for control and power in beneath the well-being and development of society and the business community.



**CARLA**  
**CICO**

Carla Cico, who was born in Verona, Italy, earned her MBA at London Business School. She is the former CEO of Brasil Telecom, S.A., the third largest Brazilian fixed-line operator and of Ambrosetti (Beijing), China, part of the Ambrosetti Group, an international strategic consultancy company, whose headquarters are in Milan, Italy; as well as Rivoli S.p.A., an infrastructure Company, based in Verona. She was the first female CEO in the Telecom sector in South America. Carla has strong M&A experience and listed Brasil Telecom on the New York Stock Exchange. Brasil Telecom was the first and is even today still the only Brazilian Telco Company listed abroad. A multilingual global leader with far-reaching expertise in all the aspects of international business within multicultural environments, Carla has furthered her career abroad, including in China, India and Brazil. She was ranked 25th in Fortune Magazine's "The World 50 powerful Women in International Business" (October 2004) and 32nd in Forbes Magazine's "The World's 100 Most Powerful Women" (August 2005). In 2003 she was elected best CEO in the Latin America Telecommunications Sector (Reuters Institutional Investor Research). Independent Director in Boards of both listed and non-listed companies. Carla is a sought after speaker for many industry summits, with a focus mainly on Telecommunications, Management, Strategy and Developing Countries.

# LIVING IN A WORLD OF CASH

**VICTORIA HERNANDEZ**

Rising Tide Europe 3, Head of the Investment Committee

There is a growing trend to believe that the future of cash is limited, with a number of developed countries stating their intention to become fully cashless within a few years. This seems like an inevitable consequence of digitalisation of the financial services sector, but is this the whole picture of our digital future, and if so, what implications will that have for society as a whole?

According to the European Banking Federation, almost 50,000 bank branches have been closed across the EU over the past decade (21%). Banks are under pressure to transform their business model in line with the new financial services market and have been investing heavily in digital transformation of payment infrastructure and services. These figures reflect a broad trend in Europe towards restructuring and consolidation across the branch networks of banks, as digital and mobile delivery channels prove increasingly popular with customers<sup>1</sup>. The large scale of bank branch closures in recent decades has left millions of people struggling to access the vital financial services and cash that they need. Bank branches are essential business supports for small business owners whose customers prefer to pay cash or in areas where internet services are insufficient, or indeed where the elderly or those with disabilities may not have either the skills or the confidence to use internet banking.

Despite a general perception to the contrary, the use of cash is widespread in most European countries. According to the European Central Bank, in 2016 cash was the dominant payment instrument in the 19 countries of the Euro area. In that year, Euro area consumers made more than €1,870 billion worth of transactions by means of cash, which represents 79% of all transactions or 54% of the total value of all payments. Most of these payments were made in shops for day-to-day items, restaurants and petrol stations, as well as at street merchants and shops for durable

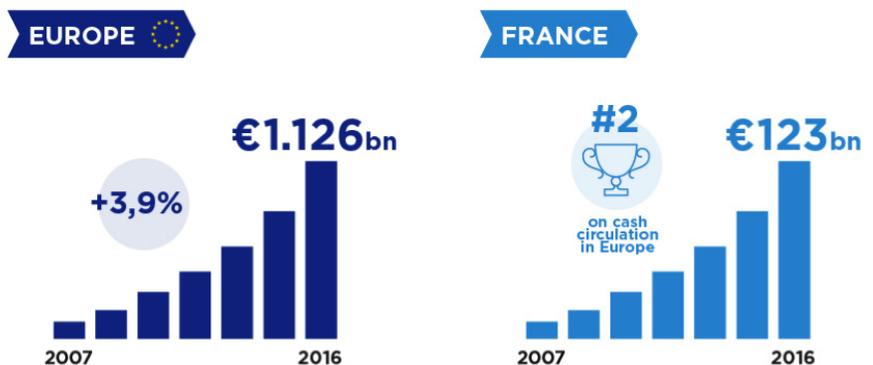


Table 1. Cash circulation in Europe (Source : Banque de France)

goods.<sup>2</sup> The chart on previous page shows how paper money (cash) in circulation has been consistently growing year over year in Europe. (The same bank note can be used again in multiple payments, which explains the difference between €1,870 billion cash payments and €1,126 billion cash in circulation.)

While larger retailers have embraced digital transactions, small family-based retailers and SMEs who rely on cash payments from their customers, are increasingly being left with difficulties in handling and managing their cash. In addition, these trends are acting together to increase the financial and social marginalisation of large sectors of the European community. In 2016, there were 118 million people in the EU-28 who lived in households at risk of poverty or social exclusion<sup>3</sup>, equivalent to 23.5 % of the entire population<sup>4</sup>. In times of economic hardship, many consumers rely on cash to manage their budgets more carefully and bank services are too costly for them.

It is important to keep in mind that a cashless society relies on three things to work: networks, electricity and security. In times of natural or man-made disasters, where digital currency is not available, cash is often the only fall-back solution. The US Government's disaster management agency, FEMA , for example, advises those preparing for hurricanes to make sure they have plenty of cash in large and small bills for when

there is a power blackout and online payment systems or automatic cash dispensers are offline.<sup>5</sup>

**MARKET TRENDS**

Historically, banks with the best branch footprint have dominated their markets, gaining outsized share. In few years, all banks will be direct banks, and branch banking will be changing fast. Leaders will offer an anytime, anywhere service, fully utilising all banking channels in an integrated fashion. They will be re-imagining their physical footprints, introducing new branch formats, expanding physical points of presence through third-party partnerships, driving sales and cutting costs. Where branch networks are thinner, physical distribution will continue to evolve, and banks are more likely to partner with new-entrants to create alternative distribution channels.<sup>6</sup>

Banking the unbanked (urban and rural) will become a primary policy objective in both developed and emerging markets, as governments seek to reap the economic benefits of broader access to financial services for their populace. This push will drive new products and business models and will become the primary focus of governmental or state-sponsored institutions, particularly where the private sector is unable to fulfil the need.

Paper money or cash is issued and backed by Central Banks. It is an instant mode of payment with no transactional cost for the end-user. The disappearance of cash will represent to leave the whole payment system in private hands: the

1 Source: European Banking Federation – Sept. 2017 Facts and figures

2 Source: ECB - The use of cash by households in the euro area. Nov. 2017

banks. With time, Central Banks might issue digital cash of legal tender (i. e. digital euros) but this represents a major change in the Banking regulatory system and to implement a radically different technology, new processes and skills in place which might take many years.

In summary, the closure of Bank branches is a European-wide trend, which is having many negative consequences for SMEs, the rural and isolated as well as the poorer in our communities. The digital transformation of the Banking industry, while having many positive effects in terms of efficiency and business stimulation, is also creating a digital divide and excluding some of the most vulnerable.

### THE FUTURE OF CASH

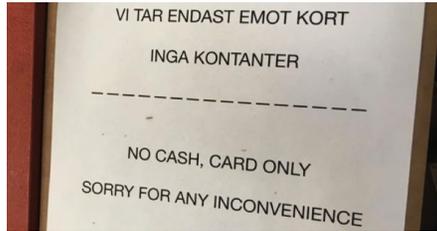
So what is the future of the digital transformation of cash, and the seemingly inexorable rise of cashless digital banking? Countries which are far advanced in the transition towards a cashless society are experiencing a backlash from the very communities which rely on cash on a day to day basis.

3 Source: AROPE

4 Source: <https://ec.europa.eu/eurostat>

5 <https://www.fema.gov/disaster/4339/hurricane-preparedness>

6 PWC - Retail Banking 2020 Evolution or Revolution



Many Swedish shops and restaurants now only accept card or mobile payment systems. Source: BBC online news (<https://www.bbc.com/news/business-43645676>)

Sweden is often touted as the example of the world's first completely cashless society. However, there is growing concern amongst those representing vulnerable groups, who believe that the move to getting rid of physical cash is going too fast for many to keep up.

Most high street stores, cafes and public transport in Stockholm no longer accept cash, while most Swedish banks have stopped dealing in cash over the counter, having phased out cheques long ago. At the same time, fees for in-bank transactions have steadily increased.

Similarly, in Australia it has now become unusual, especially for younger people, to use cash, many now using 'tap and pay' for most day to day purchases. Australia's central bank also recently declared<sup>7</sup> that

7 <https://www.smh.com.au/politics/federal/cashless-future-australia-swish-notes-sweden-20181129-p50j21.html>

8 <https://www.cashway.fr/home/>

currency was likely to become a "niche payment" used only in emergencies, while cheques would be phased out altogether.

### THE CASE FOR REAL DIGITAL CASH

So if the banks and governments in many countries are heading towards a cashless future, what can be done to help small business and vulnerable groups to cope with the transition? Will they be left without the means to undertake many of their daily tasks? The key to the transition from a fully cash to a digital society lies in implementing a solution which combines the best of both worlds – the efficiency and immediacy of digital payments systems with the convenience and perceived security of physical cash. This type of solution is being offered by start-ups like CashWay<sup>8</sup> which offers an SaaS-based solution for financial institutions and consumers. CashWay enables virtual retail banking, thus solving the problems mentioned above: banks can deploy a virtual network of branches quickly and at marginal cost where SMEs can make cash deposits, while consumers can make online purchases and pay for them with cash.

By ensuring that the benefits of physical cash are preserved, we can support the vulnerable and less digitally literate in our digital society, without leaving them behind. This should be the goal for all of us involved in digital transformation.



# VICTORIA HERNANDEZ

Victoria Hernandez is a highly recognized senior executive with more than 25 years' experience in building, launching and managing multinational enterprises in the EU and globally, primarily in the TMT and the Fintech services sector. She is Former Alliance's Director BT Europe, Executive Chairman Orange Spain and SVP international Proximus.

Victoria is an entrepreneur, speaker at international conferences and Business Angel. She is currently Head of the investment committee of Rising Tide Europe, an investment program run in cooperation between EBAN, GO-Beyond Investing and the Next Wave Foundation, part of a global movement to increase women's participation in angel investing as an asset class. She is a Horizon2020 EIC Instrument Judge Expert at the European Commission, evaluating EU proposals for H2020 funding, a Judge member of MIT review under 35 and Non-Executive Director of several organizations and companies.

She is also a member of the Board of the Global Telecommunications Women's Network (gtwn.org) the international forum for executive women in technology to contribute to the evolving global information society in a positive manner. A Computer Engineer, with an EMBA from INSEAD and a Masters in Digital Marketing from Columbia Business School. Victoria lives in Paris and speaks 6 languages fluently.

### THE MOBILE CENTURY

# ARE YOU READY FOR YOUR “DIGITAL TWIN”?

DERRICK DE KERCKHOVE AND MARIA PIA ROSSIGNAUD

Media Duemila

Among daily news about innovations in our non-stop collective creativity, two groundbreaking engineering concepts herald the new digital transformation.

The first is called **Symbiotic Autonomous Systems (SAS)**, a general category as well as a new evolutionary drive that brings together rapid advances in AI and Machine Learning applied to the worldwide accumulation of Big Data on everything. It will be the result of the concurrent evolution of machine augmentation and human augmentation converging on a symbiosis, that is, an intimate interpenetration between humans and machines or programs, a physical and mental co-existence in cyberspace. These engineering innovations will affect our bodies, our minds and the whole environment. Intelligent prosthetics, sophisticated robotics, decision-making algorithms, affective and sensitive digital assistants, and intelligent environments, well beyond today's idea of smart city, all this points to the formation of an entirely new way to occupy space and time<sup>1</sup>.

According to J.P. Morgan's top AI expert, Manuela Veloso:

*Systems already communicate wirelessly, drawing on data in the cloud, or [are] helped by remote teams. You can think of AI systems in constant symbiosis with everything else, with other information on the web, with other AI systems, with humans next to them, with remote humans. It becomes not a problem of developing self-contained AI systems, but an AI system that can recognize when it does not know, or when it needs more information, or when it thinks something with some probability but it's not sure. It's not that it can solve all the problems up front, but it can rely on all these other sources around.*<sup>2</sup>

1 To contribute sociological insights to the topic, I was invited on an IEEE six person team to examine social, cultural and ethical issues attending SAS.

Two White Papers (2017 and 20018) are now available on line (<https://symbiotic-autonomous-systems.ieee.org/images/files/pdf/sas-white-paper-final-nov12-2017.pdf> AND <https://symbiotic-autonomous-systems.ieee.org/white-paper/white-paper-ii>)

2 <https://www.theverge.com/a/verge-2021/humanity-and-ai-will-be-inseparable>

Included among the considerations about SAS is the other life-changing innovation - the concept of a “**Digital Twin**”. It was conceived a few decades ago as an engineering instrument that would augment machines with a digital double to monitor complex and expensive motors, turbines, and also robots. A machine's Digital Twin includes not only real-time reporting as it functions, but also the history of its maintenance, perhaps the occasional breakdowns and, more importantly the source and coordinates of all parts suppliers and records of delivery and efficiency. In many cases, the digital twin enables automatic repairs just as it regulates normal functions. The twinning concept is of interest not only to engineers, but also to town planners, military strategists, security systems operators, educators, trainers and a host of other complex operations managers. Planning is on course to extend and apply the concept to businesses, cities, regions and, why not, to whole countries. The concept of the Digital Twin made it to the top of Gartner's hype cycle in 2018 and is still flavour of the month<sup>3</sup> because it is also destined to be applied to you and me. How come?

The idea of twinning you and me online crowns thirty years of sketchy development that started in 1987 with Apple's purely conceptual “Knowledge Navigator” and matured over that time until today it is represented in Apple's Siri, Microsoft's Cortana, Samsung's Bixby, Google's Assistant, and particularly Amazon's Alexa. Alexa is by far the most sophisticated one, in part because it integrates machine learning to learn about you as it manages, responds, sorts and stores your queries. All these are great tools to help us in our daily lives, and the ambition of these companies and others is to make them your companions for life.

The Digital Twin, however, is much more ambitious than a digital companion. It aims to capture and represent you in every way and at all times - past, present and even future - as it will be able to predict or propose moves on the basis of what it (he? she?) knows about you.

3 <https://www.gartner.com/smarterwithgartner/how-digital-twins-simplify-the-iot/>

**“IF KINDLE WAS TO BE UPGRADED WITH FACE RECOGNITION SOFTWARE AND BIOMETRIC SENSORS, IT WOULD KNOW HOW EACH SENTENCE INFLUENCED YOUR HEART RATE AND BLOOD PRESSURE. IT WOULD KNOW WHAT MADE YOU LAUGH, WHAT MADE YOU SAD, WHAT MADE YOU ANGRY. SOON, BOOKS WILL READ YOU WHILE YOU ARE READING THEM.” --YUVAL NOAH HARARI**

The truth is, we already have digital twins because we keep accumulating tons of data about ourselves, some deliberately on Facebook, Twitter and LinkedIn, for example, and others not quite so consciously in every move we take. Even mind-reading is now possible. Eventually, as we read our novels on Kindle or Kobo, even our thoughts and our feelings will become data that will be grist to the mill for our digital twin.

The problem however is that we do not have just one, but myriad little twins scattered in the world's databases. Most of these micro profiles, tailored by government and institutions such as PRISM or Google, are fragmented by the uses they are intended for. The government doesn't need to know about your diet generally, but only if you represent a threat to the community or if you are not paying your taxes. Google wants to know what you read and builds your profile based on your search pattern and also on the kind of company you keep, since it insists that your Gmail activities be coordinated with the other services the mammoth search engine

gives you. In fact, since we generally do not know how, or how much or in what way these micro-profiles are constructed and used, I have grouped the lot of them under the general banner of the “digital unconscious”, everything that is known about that you don't know and that has more effect on your choices and motivations than whatever Freud told you about your mom and dad.

So what can your DT do for you? Markus Steer, advisor with SAP, writing for Digitalist Magazine puts the emphasis on medical health as well as the workplace:

*The representation of an individual person, including personal data like weight, health data, activity tracking data, and medical treatment data can help to establish predictive alerts and guide people to healthier lifestyles. It will give better insights and transparency on the individual's health situation by offering more data points. Data shared with doctors will help define better preventive strategies and recovery plans and shrink health care costs.....In the business world, employee training plays an important role in time to market. Workers can be trained in the digital world first, leading to tremendous resource optimization for on-site training<sup>4</sup>.*

There is a lot more to speculate about digital twins, as it will become everyone's interface to navigate and negotiate in our relationships with the Internet and the whole digital universe. It will have access to current and integrated information about anything and everything. But there is one urgent question about our twin that brings us back to SAS. In fact, how autonomous will it actually be?

Indeed, one major issue about the rapid development of ever more sophisticated technologies is that they are becoming autonomous. In fact, the more autonomy we yield to our machines, the less we can keep for ourselves. The IEEE research team, which is working on the implications of SAS, identified many legal and security, as well as ethical issues emerging from the rapid development of new generation expert systems. SAS are already replacing human skills in labor and professional competence in law,

medicine, business and arbitration. So where does that leave us humans in the future digital culture? It is ultimately up to human beings to determine.<sup>5</sup>

<sup>4</sup> Markus Steer (<https://www.digitalistmag.com/iot/2018/05/23/will-there-be-digital-twin-for-everything-everyone-06169041>)

<sup>5</sup> See the Digital Twin Manifesto developed by a student at Politecnico di Milano [http://www.digitaltwinmanifesto.space/files/full\\_manifesto.pdf](http://www.digitaltwinmanifesto.space/files/full_manifesto.pdf)



# **DERRICK**

# **DE KERCKHOVE**

Derrick de Kerckhove is former Director of the McLuhan Program in Culture & Technology at the University of Toronto, where he is professor emeritus at the Department of French. He subsequently joined the Faculty of Sociology of the University Federico II in Naples from 2004 to 2014. Presently, scientific director of the Rome based monthly Media Duemila, and of the Osservatorio TuttiMedia. he is author of more than a dozen books translated in over ten languages. A Visiting Professor at the Polytechnic Institute of Milan, he is also Research Director at the Interdisciplinary Internet Institute (IN3) at l'Universitat Oberta de Catalunya in Barcelona. His fields of research include Technopsychology, Psychotechnology, Neuro-cultural research, Art and communication technologies, Media Theory, Collaborative Educative Software, and Connected Intelligence.



# **MARIA PIA**

# **ROSSIGNAUD**

Maria Pia Rossignaud is Editor in Chief of the digital culture magazine Media Duemila. She is also Vice President of the Observatory TuttiMedia, a cultural association created in 1996, where companies in various sectors (publishing, advertising, television, telecommunications) sit together to imagine the future and propose useful solutions to all with respect to the problems related to the advent of new media. She has been coordinator of Digital Lab Training Coordinator @fieg, and is a former professor of Sapienza University and LUISS. She organizes meetings and conferences on subjects of current importance. The most recent: "Public Mind: construction of public opinion in the era of the algorithm (September 24th, Frederick II Naples); "Program the world". (September 28 Prix Italia Milan); "Is there a past in our future? Information between Liberty / Rules / Post Truth and Lies ". (9 March FNSI Rome).

# A HITCHHIKER'S GUIDE TO DIGITAL CULTURE

**VICKI MACLEOD**

Secretary-General, GTWN

Digital culture is the interface between human beings, societies and digital technology. It can be seen as the natural progression of human cultures as every aspect of society and economy is transformed and reinvented by the integration of a digital platform.<sup>1</sup>



From: Martin Lister, The Photographic Image in Digital Culture

Be it health, education, the arts, music, science, financial services, architecture, the law, government and social services or even the philanthropic sector – it is difficult to find one area of human endeavour which is not being profoundly influenced and changed by digital technology. This includes increasingly higher speed mobile services, ever more intrusive and ubiquitous social media and of course the shift away from the written word to video streaming and the impact this is having on communication networks worldwide.

Digital culture encompasses all the new and evolving applications of digital technology. Artificial intelligence, big data and video streaming, both individually and in combination, are changing the landscape of what we as humans understand as the essence of being human, and what we have always considered separates us from the animal kingdom on one side, and machines on the other.

We are at the cusp of a new challenge in human evolution. As artificial intelligence (AI) strives ever closer to what has been called the 'singularity' – where AI overtakes human intelligence

1 With acknowledgement of the brilliant insights into the challenges of our future digital culture by Douglas Adams in *The Hitchhiker's Guide to the Galaxy*, first published 1979.



Source: <http://www.bbc.co.uk/cult/hitchhikers/gallery/tv2/marvin.shtml>

issues about the potential future rights and obligations which should attach to intelligent machines, as they are increasingly given human-like physique and genuine people personalities (which already has its own acronym, (GPP)). Many now believe that science fiction writer Isaac Asimov's Three Laws of Robotics<sup>2</sup> are far too simplistic and obsolete as they are centred on the responsibility of robots towards humans, and do not offer robots any legal status or protections. This is becoming a serious issue as robots increasingly take over work previously done by humans.

Until relatively recently, learning was streamed into two main areas – the humanities or sciences. Those of us who did not naturally gravitate to science and maths were steered towards the humanities – languages, the arts, philosophy and history. And in most cases these streams remained separate. Science and maths experts naturally became the first adopters of IT and data analytics, while those of us who were streamed towards languages, philosophy and the arts, were not pressured, and in some cases, were actively discouraged from, further study of STEM subjects. The result was a largely balkanised education system, where IT experts hardly ever challenged to grapple with

2 <https://atelier.bnpparibas/en/smart-city/article/rights-robots-have>

the social implications of computer science or AI, while humanities experts were often left woefully unprepared to face the challenges of the impact of digital technology on their own field of endeavour. Thankfully there are a number of organisations now focussing on the ethical issues arising from the application of AI to many areas including motor transport, medicine, the justice and court system and insurance, to name but a few.

In education, I am glad to say that many things are starting to change in this regard. The integration of science and technology into the arts curriculum into what is now called STEAM is a great example. While some are calling for a return to the old days of the "3Rs" of education – reading, writing and arithmetic – others are seeing the enormous potential for future generations that incorporation of digital technology has for a broader, deeper and much more rewarding education experience. And armed with access to the modern equivalent of Adams' Encyclopaedia Galactica (aka Wikipedia), everyone can have access to a vast array of factual information, but also the full range of human opinion on every subject.

In medicine, the traditional doctor/patient relationship, which relied on the absolute

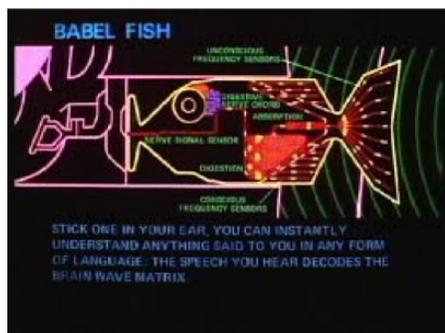


authority of the medical practitioner and his or her exclusive knowledge, has quickly changed to include a third party – "Dr Google". Patients are often taking a much more active interest in their illnesses and also their treatments, being prepared to challenge the doctor's diagnosis or treatment options<sup>3</sup>. It is now quite usual for patients to present to their doctors armed with printouts from Google or Wikipedia or other online medical

advice sites. Initial resistance from some doctors is giving way to a realisation that internet searches can help patients talk to their doctors and describe their symptoms more precisely, especially for patients with greater e-health literacy.

On the other hand, there is also the problem that gathering information from the internet without medical knowledge to help filter the vast amount of information available online can lead patients to greater anxiety and unnecessary worry. This demonstrates the importance of a new role for doctors in the future, who will play the role of a trusted guide, mentor, counsellor and digital intermediary. Further, the new genomic era of medicine with personalised drugs designed for each person's genetic profile will require a much closer personal relationship and deeper understanding between patient and health care advisor.

Language is seen as the most obvious indicator of human culture and what



Source: hitchhikers.fandom.com

sets us apart from other beings. When I was a student of linguistics, we were

assured that machine translation would be impossible, because no translation machine would ever be able to understand and apply the intricacies of different languages. These ideas were largely based on the now controversial theories of Noam Chomsky, that language ability is innate. Others have since challenged this view, believing that language acquisition is achieved by children via their general cognitive abilities and the reading of other people's intentions.

The questions around the importance of language to human culture and what computerisation would mean to our human future were satirised by Adams as the Babel Fish, which you could put in your ear and which would give you automatic simultaneous interpretation of any known language. (This effect can now be almost replicated with the use of Google Translate, a smartphone and a pair of Bluetooth earbuds.) But Adams at the same time asked us to question whether this technology would in fact be so benign, or whether we should watch out for potential cultural and social impacts of such technology, which could so easily strip away subtleties of social context and culture down to the bare bones of words and their literal meanings. The Babel fish, he warns, has on one hand enabled much greater understanding between peoples, but this greater understanding has also led to more, not fewer, disputes and wars.

And what about the reduction of human culture to a set of big data? Anyone involved in the quest for more and more data and the application of big data

analytics in order to understand and predict human behaviour, should keep in mind that this could also lead to a loss of cultural and social context and human meaning. As Douglas Adams brilliantly demonstrated with his fictional super computer creation Deep Thought, the answer to the ultimate meaning of life may be 42, but social context is equally important as the data. Without it, by the time the numerical data is available, no-one may be able to interpret it or even remember what the original purpose was.

[3 https://blog.rendia.com/embrace-dr-google/](https://blog.rendia.com/embrace-dr-google/).  
Image of Dr Google from Rendia



# VICKI MACLEOD

Vicki MacLeod is Secretary-General of the Global Telecom Women's Network (GTWN) and Editor in Chief of the GTWN flagship publication, *The Mobile Century: Life and Work in the Digital Era*. She is a specialist in innovation and digital transformation with extensive industry and government experience in Australia and internationally. Her interests include: innovation and digital transformation; culture change and addressing the digital skills gap; start-up culture; new space industries; and women's entrepreneurship. She has more than 25 years' experience in the telecommunications and broader TMT sector, in policy and strategy roles in government, industry and global organisations. She has lived and studied in Australia, the UK, France and Germany and speaks French and German as well as English (and Australian). She holds a BA(Hons) and MA in modern languages from Monash University, Melbourne.

# OUR DIGITAL LEGACY: CREATING A NEW CULTURE FOR THE NEXT GENERATION

**VICKY SLEIGHT FRSA**

Chief Perfect Officer, Perfect Ltd & Senior Advisor Diversity & Inclusion<sup>1</sup>

It's a fact that we are in the midst of a new industrial revolution and indeed a societal shift. Now more than ever, leaders are under increasing pressure to come up with innovative solutions to an array of business and societal challenges, while navigating an increasingly complex world.

Whilst the digital revolution put technology in our hands, digital transformation is about changing our lives in ways we could never have imagined. It is not just a technological transformation, but a cultural shift. As McLuhan predicted, technology is no longer just a tool we use to achieve something, we are actually becoming tools/technology ourselves. Futurists like to call this transhumanism. As Gerd Leonhard, futurist, refers to in his book, *Technology vs Humanity*<sup>1</sup>: "we should embrace technology but not become it, because technology is not what we seek, it's how we seek!"

As trillions of dollars are invested in making our world smarter through digital technology, we need to ask ourselves whether we as humans are also investing enough of our effort in getting ready for this new world. Machines will continue to get smarter, whilst if we do not make a conscious effort to evolve, we may in effect become less smart through our increasing reliance on automation. Our digital legacy is too important to leave either to chance or to what Melinda Gates has called "white guys in hoodies". Our digital legacy needs to reflect the diversity of human knowledge, experience and culture, and it needs to provide a clear pathway for the next generation to create a future of promise for all.

This challenge becomes clearer when we think about the future of work, and what type of job prospects we are passing on to the next generation, the so-called millennials. In our fast changing, globalised and digital tech driven world, we need to develop a work environment that reflects our diverse human intelligence, as it is our greatest asset. We need to become adept at connecting global teams across generations and geographies. And we will need systems that are smart enough to enable critical human thinking at scale.

Of course, all repeatable work will be automated, but critical roles will be the ones that require human creativity, innovation and thinking, flexibility and resilience. In future, people will need to understand their individual and shared purpose and know how their contribution will impact that common purpose, and how the world of the machine and the world of humans can co-exist harmoniously and to the benefit of both. To achieve this goal, we need to understand the tools available, and how to energise the teams and workplaces of the future to reflect the needs of a diverse society that we are trying to serve.

Well, imagine if we had a tool that removed any bias, conscious or unconscious and one that enabled us to measure everyone's individual impact and contribution to the team. A method that helps us align personal energies with business requirements. This tool is already available: it is **The GC Index®** [www.thegcindex.com](http://www.thegcindex.com). After seeing how well this proven method measures impact for all people, and gives them unique insights into their future, I became an accredited GCologist and have now incorporated it into my own management and consulting work.

Thinking about how we can help the next generation navigate this new digital world, I am very pleased to have seen the development of a targeted form of The

GC Index® for young people. The Young People Index® is a revolutionary online instrument that is helping to transform young people's lives by enabling educationalists to identify and nurture the key talents of young people, who are the leaders of the future. Developed by The GC Index® and Helen Rivero, Director and Founder and a fellow GCologist and her team of dedicated educationalists, **The Young People Index®**<sup>3</sup> has been applied very successfully in schools, to help students identify their core strengths and leadership styles, and to prepare them to face the future of study and work with confidence.

As James Wilder from St Peters School in Bournemouth, UK says: "The YPI programme... has allowed students to explore the transferrable skills and qualities needed in the workplace. The programme 'opens the eyes' of the students to the needs for all types of team players and has highlighted the contribution that as individuals they can make to a group or organisation... if targeted and aimed at certain students, it can give them a real feeling of worth and empowerment."

The digital culture we develop and hand on to the next generation needs to preserve the values we have developed as well as the hard-won gains we have made, in terms of diversity and social inclusion. We need to resist the narrowing of perspectives to a technology-driven approach and teach young people to think critically about how technology is being applied, and whether it is actually what we as human beings really need and want. For example, facial recognition technology will make it possible to have continuous surveillance of everyone all the time, so that future generations may lose the concept of privacy. In some schools around the world, (including the US and Australia) facial recognition

<sup>1</sup> [www.theperfectlimited.com](http://www.theperfectlimited.com)

<sup>2</sup> [https://www.amazon.com/Technology-vs-Humanity-between-FutureScapes-eb-book/dp/B01IUJZBHA/ref=asap\\_bc?ie=UTF8](https://www.amazon.com/Technology-vs-Humanity-between-FutureScapes-eb-book/dp/B01IUJZBHA/ref=asap_bc?ie=UTF8)

<sup>3</sup> <https://www.youngpeopleindex.com/>

software and tracking technologies are being introduced to scan for anyone not allowed on school grounds, and to replace the school roll call. But is this really the type of model that we want to hand on to the next generation? Or should we think more carefully about how best to balance the competing goals of security and privacy?



# VICKY SLEIGHT

As we continue to grapple with these issues and others into the future, we need to step back occasionally and think carefully about the cultural framework of our digital lives. At a time when the importance of diversity, equality and inclusion are becoming fully recognised, we need to redouble our efforts to ensure that these lessons are not lost. Diversity and inclusion cannot just be an afterthought. Aspirational goals must be set and achieved. Our digital legacy depends on it.

Vicky Sleight has 18 years' experience in Technology and Telecoms including Product Marketing, Operations, Events, creating new initiatives and sales and revenue growth. A proven thought leader and expert in diversity and inclusion within Tech through her development of successful initiatives such as GSMA Connected Women, Vicky has formed her own successful boutique consulting company - Perfect Ltd. Through this she is continuing her work within the industry to further business development and diversity and inclusion strategies. Her focus is also the diversity of impact and the formation of game changing teams through The GC Index® [www.theGCindex.com](http://www.theGCindex.com) - a radical re-think of how organisations will identify and nurture key talent in the future and a commitment to identify and unleash Game Changers everywhere regardless of level and demographic. With a keen interest in the future of work she is currently enabling collaboration on a Perfect initiative to promote the need for diversity in AI technologies.

## OUR SHARED DIGITAL FUTURE - BUILDING AN INCLUSIVE, TRUSTWORTHY AND SUSTAINABLE DIGITAL SOCIETY<sup>1</sup>

**LYNN ST.AMOUR**

Chair of the UN Internet Governance Forum Multistakeholder Advisory Group (IGF-MAG)

**A CONTRIBUTION OF THE WORLD ECONOMIC FORUM'S SYSTEM INITIATIVE ON DIGITAL ECONOMY AND SOCIETY, INTRODUCED BY LYNN ST AMOUR, CHAIR, UN INTERNET GOVERNANCE FORUM MULTISTAKEHOLDER GROUP AND CO-CHAIR OF THE WORLD ECONOMIC FORUM'S SYSTEM INITIATIVE ON DIGITAL ECONOMY AND SOCIETY.**

### AN INTRODUCTION

In December 2018, we reached a milestone: 50% of the world's population are now connected to the internet, fifty years after it was created and thirty years after the invention of the World Wide Web. Growth in internet access for users is slowing, while the number of devices connected through the internet of things is expected to explode to 50 billion in the next few years. There is growing

realization that digital divides are increasingly economic and social divides. Amongst those already connected, a crisis of trust is brewing. By 2022, it is expected that 60% of global GDP will be digitized - yet recent data shows that only 45% of people believe that technology will make their lives better.

Digital technologies provide us with the potential to greatly enhance economic, social and environmental outcomes

for humanity. However, if the risks outweigh the benefits or if we cannot overcome common barriers, the power of technology will at best be wasted, and at

<sup>1</sup> This is the Executive Summary of a report first published by the World Economic Forum (WEF) on 10 December 2018. See <https://www.weforum.org/reports/our-shared-digital-future-building-an-inclusive-trustworthy-and-sustainable-digital-society>

54 CULTURE

worst could further exacerbate exclusion, concentration of power and wealth and the stability of our societies. Tackling these common barriers requires common goals and coordinated multistakeholder action – to create a digital future that is inclusive, trustworthy and sustainable.

**AN INCLUSIVE, TRUSTWORTHY AND SUSTAINABLE DIGITAL FUTURE**

The global nature of the digital environment brings with it a rich cultural and normative diversity, with different types of stakeholders having different, often competing, interests. Nevertheless, through our dialogues, all parties agreed on three core and interdependent concepts about what we want our future digital environment to look like.

First, our digital future must be **inclusive**. Inclusion does not just refer to internet access and accessibility, but also includes participating in the social and economic benefits (outputs) and in opportunities to shape how technologies impact our lives. The benefits accruing from technology are exponential and closing the digital divide will become increasingly difficult. We risk embedding structural inequality into our social and economic systems, condemning many to intergenerational exclusion.

Second, **trust** is the foundation for any and all interactions. Without trust, we will not provide our information,

exchange goods or services or act upon the information given. In a digital context, trust is created through effective and enforceable privacy, security, accountability, transparency and participatory practices. Increasingly, as more business and government activity is mediated online, online trust and societal trust levels correlate ever more strongly.

Finally, we need our digital world to be **sustainable** – in societal, economic and environmental terms. This entails not just business models that are economically viable, but business practices that are socially sustainable. We need viable investment models for innovation and shared infrastructure. If returns on capital continue to systematically outstrip returns on labour and other factors, the increasing concentration of wealth and subsequent wealth divide is not socially sustainable. Further, while we are used to thinking of cyberspace as entirely virtual, the energy requirements and material/waste management of the physical infrastructure are subject to planetary boundaries.

**(THE FIRST) SIX SHARED GOALS**

In order to realize this vision, there are a number of shared capabilities where, as a global community, we will succeed or fail together. Expressing these as shared goals allows us to encourage, align and accelerate a wide range of distributed activities. Shared goals provide strategic direction and common purpose that

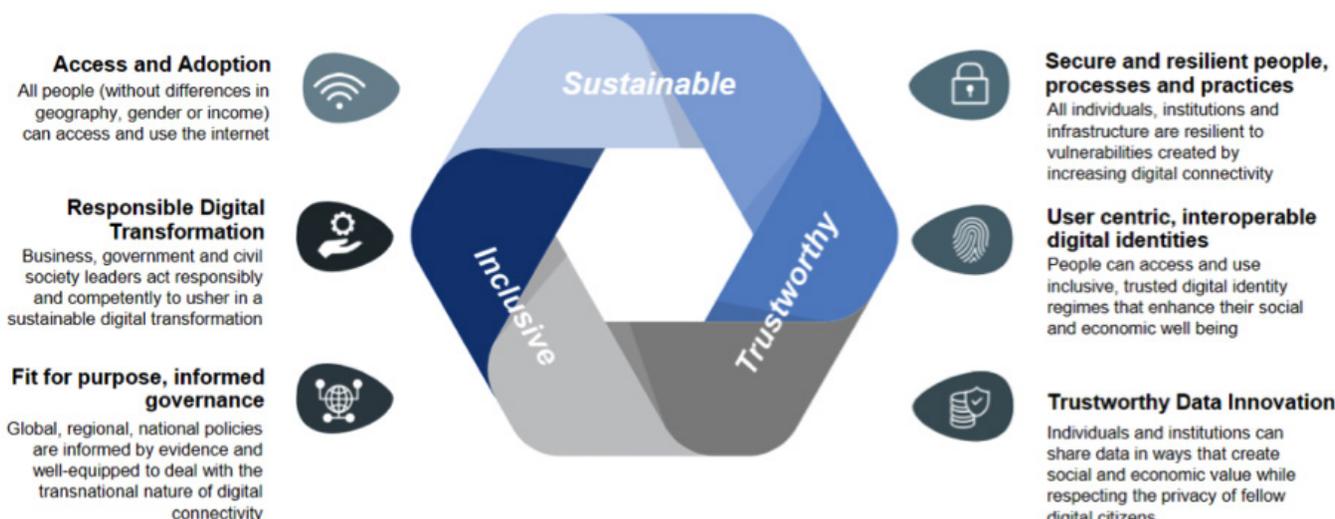
can channel the tremendous amounts of energy, investments, innovation and collaboration already taking place.

Today, some of these capabilities are easier to articulate in terms of quantifiable goals than others – for example, Internet access. However, defining more precisely what “good” looks like and what metrics would be relevant are part of the common work agenda in topics such as digital identity.

Our discussions revealed six initial areas where shared goals would be beneficial to ensure an inclusive, trusted and sustainable digital future. The six areas provide a structure for this document and create a framework for future dialogue and collaboration on shaping the digital economy and society. There are significant opportunities and major risks: much of the debate is too one-sided – either over-optimistic or over-pessimistic – and lacks precision on time frames. A core premise behind this document is the need for a narrative that explains digital opportunities and risks for stakeholders and citizens.

1. Leave no person behind: ensuring high-quality internet access and adoption for all.
2. Empower users through good digital identities: ensuring that everyone can participate in the digital society through identity and access mechanisms that enable the user.
3. Make business work for people: helping companies navigate digital disruption and evolve to new,

**Six Shared Global Outcomes to Achieve a Sustainable, Inclusive and Trustworthy Digital World**



- responsible business models and practices.
4. Keep everyone safe and secure: shaping norms and practices that enable a technology-dependent environment that is secure and resilient.
  5. Build new rules for a new game: developing new, flexible, outcome-based and participatory governance mechanisms to complement traditional policy and regulation.
  6. Break through the data barrier:

developing innovations that allow us to benefit from data while protecting the legitimate interests of all stakeholders.

The paper calls for widespread collaboration to advance progress against these goals. All the authors recommend organizations make inclusive, trustworthy, sustainable digitalization an overarching goal, beyond individual technology or innovation teams/ministries.

Furthermore, some of the leading initiatives that are underway against each of the six goals are highlighted, in the hope that these initiatives could be further supported or emulated to advance our collective progress, as well as some useful informational assets of toolkits to share understanding and support informed decision-making and dialogue.



**LYNN**

**ST. AMOUR**

Ms. Lynn St. Amour is the Chair of the UN Internet Governance Forum Multistakeholder Advisory Group (IGF-MAG). The IGF is a forum for multi-stakeholder dialogue on international public policy issues related to the Internet. Ms. St. Amour is currently President and CEO of Internet-Matters, an Internet consulting Company, active in matters of Internet development and governance. She served from 2001 to 2014 as President and CEO of the Internet Society (ISOC), a global non-profit dedicated to the open development, evolution and use of the Internet. Prior to that, she held senior positions in Europe and the United States with AT&T and Digital Equipment Corp. (DEC). She also serves as Co-Chair of the Stewardship Board of the World Economic Forum's System Initiative on Shaping the Future of Digital Economy and Society and is a Board member of the High-level Advisory Council (HAC) for the World Internet Conference (WIC) Organizing Committee (Wuzhen Summit).

THE MOBILE CENTURY IS A PUBLICATION OF



WITH SPECIAL THANKS TO OUR 2019 SPONSOR



AND TO OUR MWC 2019 WELCOME RECEPTION SPONSOR

