ITU TELECOM WORLD '14

Doha 7-10 December

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ITU Telecom World 2014

# The Outcomes

## Future in focus

ITU Telecom World 2014

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# Foreword

By Mr Houlin Zhao, Secretary-General

It is my great pleasure to introduce this Outcomes Report, the result of in-depth analysis of more than 45 panel sessions, keynote speeches, roundtables and exhibitor workshops held at ITU Telecom World 2014 in Doha, Qatar, last December. These debates brought together the best of international ICT leadership from public and private sectors, from academia, non-governmental organizations and consultancies, to focus on the future of our businesses, industry and societies as radical transformation continues to reshape the ICT ecosystem.

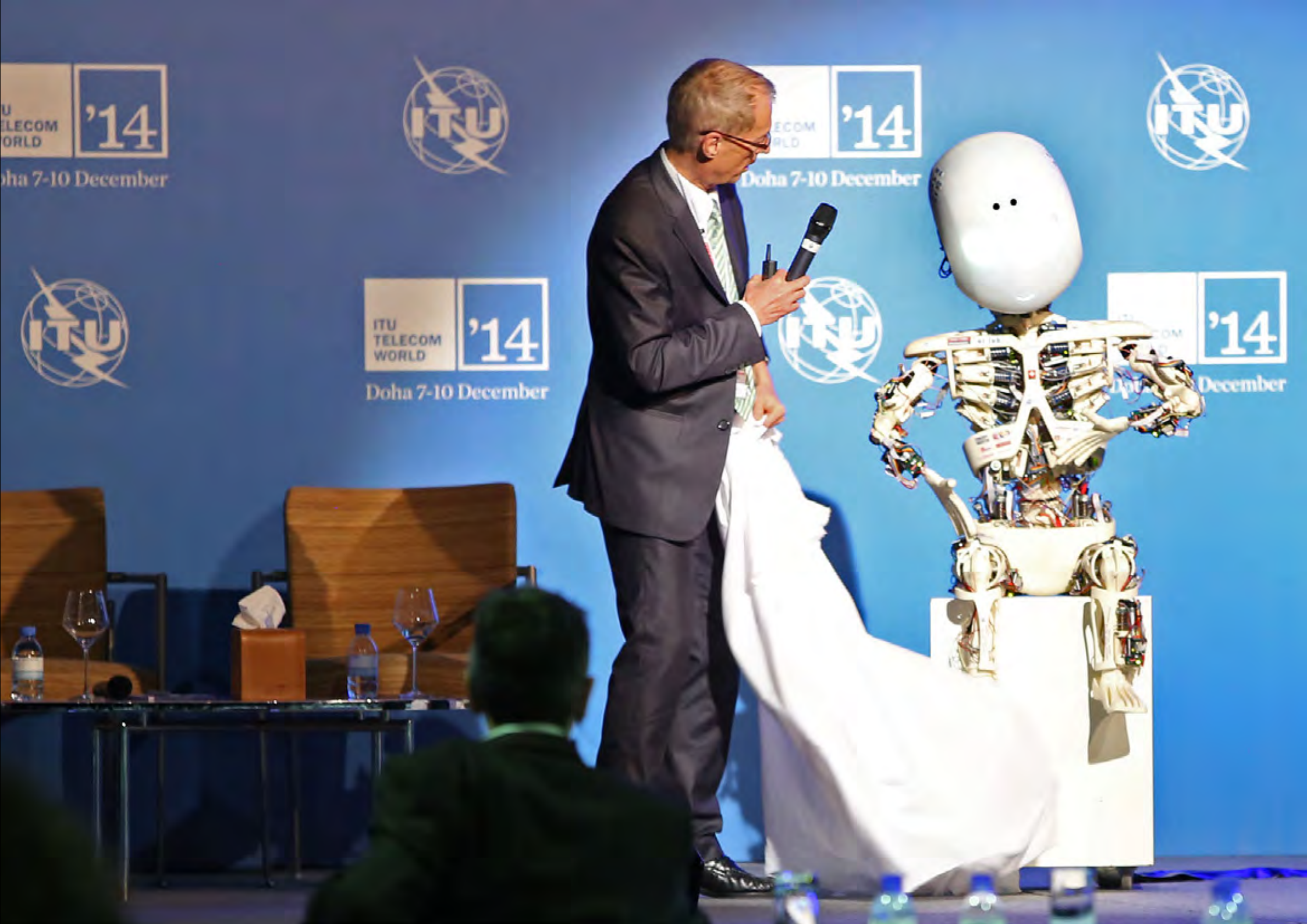
That future promises to be an exponential one, where the arrival of so many new technologies, business models and trends at the same time, from artificial intelligence to nano-, neuro- and bio-applications, will have an utterly unprecedented economic, social and human impact. The opportunities for growth and development are tremendous, in particular in emerging markets- but call for informed and committed leadership in government and industry. It is critical to understand and prepare for new technological developments; balance innovative business models, big data benefits, new delivery platforms, players and sectors against security, privacy and regulatory concerns; and work to ensure universal access to broadband connectivity and smarter, more sustainable societies.

Two key findings emerged from these discussions: the need for innovative business models, solutions, applications and mindsets to embrace fully the opportunities of the exponential age; and the vital importance of collaboration, cooperation and co-creation across international, industry, ministerial and sector boundaries in order to realize this potential better and sooner. It is micro, small and medium enterprises, entrepreneurs, innovators and the hubs, accelerators and incubator programmes that serve them, that are at the forefront of industry innovation. And it is only by coming together, exchanging ideas, engaging in new partnerships and collaborations, that we can accelerate change.

ITU Telecom World is a platform for the international ICT community, not a one-off event. The focus of the exhibition and forum programme each year is not created in a vacuum, but builds on the ideas, messages and conclusions of each earlier event. This Outcomes Report summarizes the findings of ITU Telecom World 2014, offers relevant and interesting background reading – and provides a direction for the debates and exhibition at ITU Telecom World 2015 in Budapest this October.

> We should put our innovators, our small, start-up companies as the focal point of our event. These small, medium-sized companies, these entrepreneurs, they represent the future of ITU Telecom development.

Houlin Zhao
ITU Secretary-General,
Forum Closing Conversation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# 1.

# The exponential age

New technologies, business models and trends are arriving at a fast and furious pace. Change is no longer linear: all of a sudden it has become exponential. It is essential that governments and organizations alike stay as near to the curve as possible, understanding both the massive impact of these disruptions and the potential challenges they create. Only by exploring now what is coming round the corner in five to ten years is it possible to plan strategies and policies, prepare for radical societal change, inform and educate customers, citizens and society as a whole.

The criticality of broadband networks in the digital economy is established. An era of total connectivity is approaching, powered by the dramatic drop in cost of production and materials throughout the ICT ecosystem, alongside equally dramatic increases in technological capacity, processing power, data storage facilities and end-user demand.  It is the convergence of these various factors that is behind the pace of change; it is the convergence of so many new technologies and developments at the same time that makes that change exponential.

Many developments and technologies that have been discussed, planned or initiated over many years are now coming both to fruition and to the market, moving beyond the realm of science fiction or the reach of only the very wealthy. The Internet of Things, cloud computing, social media, driverless cars, big data, predictive analysis, artificial intelligence, augmented humanity, virtual reality, immersive experiences, robotics, deep learning, wearable technology, embedded technology, 3D and 4D printing, solar power, digital currencies, nano-, neuro- and bio-technology – these things are happening now, at the same time, with very quick developmental cycles and with huge economic and social impact. This is exponential change.

> Connectivity is becoming truly like water, like air. The total connectivity that we're looking at in 2020 will change everything.

Gerd Leonhard
Futurist and CEO, The Futures Agency,
Leadership Summit on the Future

# Future users

Consumers turned producers, empowered end-users, the sharing economy, the open source, crowd-sourcing and crowd-funding communities, micro, small and start-up businesses: these are the loci of innovation. Future growth will be powered by the digital natives and younger generations, emerging markets and local content, language and demand. Disintermediation at every level is flattening traditional hierarchies of information, production and manufacturing. The trends may be the same globally, but their impact and the future they shape varies greatly from country to country, market to market.

> This conference is for the telecom industry. I'll argue that that is risky. Today what we are meeting in is an arena, a space that has resource and that you might be contesting with players from other industries.

Rita McGrath
Professor, Colombia Business School,
Leadership Summit on the Future

# Exponential challenges

Immense economic potential, trillion-dollar new markets and life-enhancing, sustainable socio-economic development beyond anything yet imagined are the glittering prizes proffered by these exponential developments. But the challenges are equally immense, in particular for regulatory bodies and governments charged with establishing relevant ethical frameworks. Regulating the human-machine interface involves, for example, ensuring safe and comfortable interaction with service robots as they increasingly move out of the factory floor and into our living rooms; or seeking to control the augmentation of humanity as technology moves inside us. There is a very real danger of not only deepening the existing digital divide between developed and emerging economies, but of introducing new categories of technology have and have-nots throughout all societies.

Big data and its applications calls for assurances on data protection, personal privacy and anonymity; breaches of cybersecurity, the use of data and artificial intelligence in the military, or a data large-scale meltdown similar to that of a nuclear reactor have the potential to devastate economies, societies and even world peace. Advanced robotics, machine learning and deep learning herald a new wave of automation that will change the world irredeemably as machines or software take over from human employees in ever more areas. Embedded devices, physical enhancements and gene technologies will extend average life expectancy. Fast-paced change, rather than stability, is the new norm. The old, established, linear world and the new, digital, exponential one are colliding.

Governments must study the industries and developments which are coming, look deeper at the underlying technologies, focus research and funding accordingly- and start the debate on the wider implications, even if the basic connectivity and technologies are not yet present. There is a significant opportunity for emerging markets to pole vault beyond developed nations, avoiding costly and complicated transitions and updates to establish themselves as global leaders.

> We are moving into a world in which technology has created an environment of abundance instead of scarcity.

Yuri van Geest
Managing Director, the Singularity University Summit Europe (SUSE), Leadership Summit on the Future

> The real challenge is how we work together as different agencies to respond to the future and what is coming next.

Rohit Talwar
CEO, Fast Future Research, Leadership Summit on the Future

# Collaboration, innovation, education

For private and public sectors alike, education, innovation and collaboration across silos are key. Education involves building awareness of the changes amongst consumers, employees, peers and society at large; encouraging life-long learning; equipping citizens with future-relevant skills; managing the complexity within education curricula; building local knowledge to create the necessary skill base and open up new insights into the economy; and enabling innovative research.

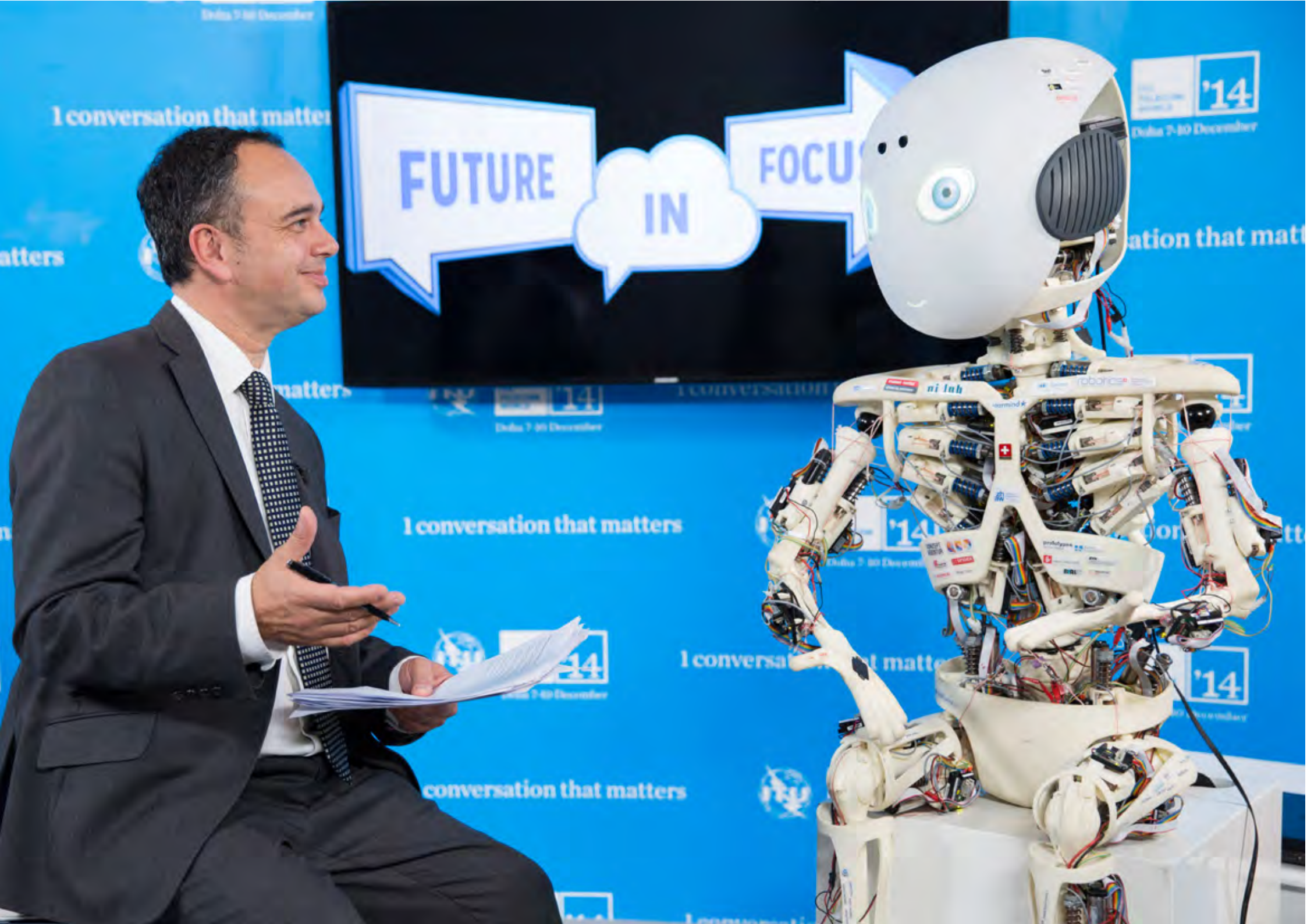
Active facilitation of innovation is critical, moving away from "nostalgia as business strategy" through grass-roots programmes such as accelerators and collaborative hub initiatives to offer knowledge-transfer, financing, mentoring and practical skills to start-ups. Innovation should be a core efficiency, rather than an episodic activity.

Cooperation and collaboration will and must develop across sectors, silos, government departments and national boundaries. New partnerships will lead to entirely new industries and markets, not least those engaging the crowd, creating and channeling demand. Governments have a critical role to play in facilitating cross-sector partnerships, revisiting and rebalancing competition rules, exploiting pre-competitive research.

Access – to people, resources, platforms and social networks – is more important than ownership, enabling the exponential organization to be agile, responsive and flexible, working with a smaller core team and outsourcing or crowd sourcing as necessary. The exponential age demands an ongoing exploration of how technology flows are changing business and societal models – and of what is coming next.

> Today, the answer to every single question, whether you can do engineering or climate control, is usually going to be yes, sooner or later you can. So we have to think about the question of why. And we have to reset our brain to think exponentially.

Gerd Leonhard
Futurist and CEO, The Futures Agency,
Leadership Summit on the Future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# 2.

# New partnerships

Digital transformation in an age of exponential change is leading to new interconnected ecosystems, new cultures and new environments, where ICT players are only one of many stakeholders. The potential for new commercial markets, for economic growth and social good, is unprecedented: but realizing that potential, creating value for consumers, citizens and businesses, and assuming a position in the new value chain means forming new partnerships and collaborations across sector, industry and technology as well as geographic boundaries. Doing so effectively calls for a dramatic and challenging change in culture, from protecting vested interests and patches of traditional telco turf to a creative, flexible openness in the face of new possibilities.

> The reluctance of vested players, in any field, whether in broadband, telecom, or anywhere, is always going to be, I don't want to embrace this new technological order or change because I have something to protect.

Shiv Bakhshi
Vice-President Industry Relations, Group Function Technology Strategy, Ericsson,
Convergence of Broadband and Broadcasting



# Arenas, not industries

Developments and trends in technology, business and society have changed the competitive landscape. From the Internet of Things to smart solutions, cities and societies; from vertical sectors to the convergence of media, broadcasting and broadband; from web companies and content developers competing over operator networks to the softwarization of those networks; and from artificial intelligence to new areas such as nano- and bio-technology, the ICT industry has varied and sometimes unexpected company.

Moving beyond basic connectivity and its role as a critical national and global infrastructure means competing within an arena of activities, rather than a specific industry, with different players, cultures and dynamics jostling for position. The aggressive growth of web companies running services and applications over operator networks is a prime example of a new form of competition, long regarded as a threat. But going head-to-head with web companies over issues such as network investment, content, and connection rights is destroying value; and is perhaps the wrong way to view the relationship.

# Partnering with webcos

Web companies and network operators are, after all, mutually dependent upon one another to deliver ever-greater volumes of content, more and more of which is audiovisual, with better quality and at higher speed to more customers. Operator infrastructure is an expensively empty road without the content and applications that consumers demand and webcos provide. Changing mindsets to create mutually beneficial partnerships can open up the latent capabilities of the network: guaranteed quality, relative security, customer relationships, billing systems, data centres, cloud capacity. Customer call data in particular can be leveraged in partnership with webcos, as well as governments and development agencies, to create innovative and lucrative apps and solutions.

> We are not collaborating enough within the telecom industry. There is huge value destruction caused by the operators themselves.

Ahmad Abdulkarim Julfar
Group CEO, Emirates Telecommunication Corporation – Etisalat,
Essential Case for Hybrid Solutions


## Cross-sector partnerships

Partnerships with key vertical sectors such as health, education, transport, energy, manufacturing and logistics involve an often complex mesh of multiple stakeholders, content providers, regulators, government sectors – but are critical to improving life, bringing value to consumers, citizens, industries, economies and societies. The benefits of e-services and smart cities are not exaggerated, but are contingent on the ability of telcos to work closely with government, regulators and private sector entities in creating a new ecosystem. The nature of the partnership, the role of the telco on the value chain from complete service provider to enabling platform or utility pipe, its position as a hub or a central spoke in a hub, will depend on market dynamics, individual operator appetite for risk, and the complexity of each vertical.

## Massive data

The volume of data is a leading game changer driving cross-sector collaboration, along with major shifts in technology and consumer behaviour. Demand for video data over mobile networks, in particular, is the fastest-growing segment of any technology; content is driving consumption over a greater range of end-devices than ever before; consumer choice on delivery channels, streamed or linear content, live or time-delayed, wired or wireless platforms, big or small screens, has set terrestrial, satellite and mobile broadcasting networks on a path of collision or convergence.

No individual technology can hope to meet consumer demands, support the increase in data traffic or invest adequately in networks alone. Serving the end customers' perhaps unreasonable expectations of ubiquity, quality and serendipity, of any device anywhere anytime, calls for increased collaboration between networks and technologies, optimizing network deployment to reach underserved areas, sharing resources and making clear business sense.

> The biggest challenge is how you change culture, how you get capability inside of the organization that is learning and moving as fast as the market outside. Otherwise you'll be always behind the game in your ability to respond.

Rohit Talwar
CEO, Fast Future Research,
Leadership Summit

# Hybrid models

A new cross-silo, hybrid model, specifically one involving broadcasting, satellite and telco industries, would ensure delivery, better satisfy end user experience and evolve business models and propositions; adding web and advertising partners would bring content and monetization options. An integrated system may offer the best of all worlds: satellite coverage at an efficient cost, the personalized interactivity of broadband, and broadcasting's majority content. It would provide flexibility in meeting demand in different territories, geographies, demographics and markets, working for the shared goal of improved customer experience and affordability – and circumventing, perhaps, the zero end game of lobbying for spectrum. Bringing device manufacturers into the mix may lead to automatic switching between platforms via a single landing spot or end user device; any new hybrid model would also enable a new approach to embedding structured security and privacy frameworks.

# Barriers

Any partnership or collaboration needs ongoing dialogue to establish clearly defined roles, transparent processes and internal organization. Standardization is necessary to ensure interoperability across different interfaces, parts of the network and value-added services; without regulatory pressure, progress may be simply bilateral. Combining regulatory authorities, approaches and spheres of influence across sectors is challenging, but essential to establishing security, consumer protection and scale. Bringing together two worlds, whether satellite and mobile technologies, network operators and software engineers, or telcos and financial institutions, brings two world views into conflict. The instinct to protect vested interests, individual shareholder objectives, cultures and values is strong; establishing formal contracts is time-consuming and often fraught with mutual suspicion.

> We should not take a view that we live in separate worlds. It is true that historically that was the case. We are seeing more and more that we are incentivized to get closer to the telcos. And we are seeing clients and partners sort of proactively moving to that particular world.

Karim Michel Sabbagh
Member of the Board, ESOA & President & CEO, SES,
Essential Case for Hybrid Solutions

# Changing mindsets - now

Easy to say, difficult to execute: the most critical factor in successfully establishing meaningful cross-sector partnerships is changing traditional mindsets. Mutual understanding and cooperation must be established at an individual, human level as well as across company and industry cultures; across verticals in particular, this means overcoming the resistance of professionals, learning to speak a different language, educating all parties. Working with governments, with new sectors, with other technologies and with competitors from within the telco industry to form partnerships calls for creating value through dialogue, through roadmaps, test cases and best practices.

The exponential age demands exponential organizations with the flexibility, speed and efficiency to innovate and scale quickly and responsively, collaborating with new partners and forming new relationships – including drawing on end users for crucial input in innovation and marketing through community and crowdsourcing. The underlying pace of technological change is accelerating so fast that it may already be too late to adapt, to let go of existing power dynamics, understand what can be achieved by and with other parties, be open to innovation, have the audacity to go beyond thinking it is possible to do it alone. It is now or never; in the world of abundance created by technology, standing still is simply not an option.


> Either we'll go and compete heads on and destroy value for the next five years, or we'll do partnerships with OTTs and by creating value, go into the new industry connectiveness.

Joseph Ged
Chief Executive Officer, Ooredoo Algeria,
Cross Sector Partnerships

# 3.

# Broadband enlightenment

Broadband networks are the enabling infrastructure of the internet, the most transformative technology of our generation. The direct correlation between access to broadband and increased GDP, social and economic development is widely accepted; the unconnected are dramatically disempowered and increasingly disadvantaged. Extending broadband connectivity and the benefits it brings involves driving down core access costs, engaging in dialogue and partnerships between policy makers, regulators, different industry players, financial institutions and civic groups, championing open access, targeting local community needs and content. The single greatest barrier to development, however, remains the need to change and enlighten government culture and mindsets on the importance, implications and implementation of broadband.

## Government leadership

Committed, informed leadership is critical. Governments must prioritize broadband as the essential infrastructure for economic growth across all vertical industries, developing a comprehensive, cross-ministerial ICT policy – and working towards long-term, wider value rather than the short-term gains of taxing operators, increasing spectrum fees or charging high local access rates. Developing and deploying services and applications in e-government, and in key verticals with maximum social impact such as health and education, brings the value of connectivity directly to citizens, increasing demand, economic growth and revenue. This is dependent upon government's active involvement in coordinating different internal departments, industry sectors and stakeholders; facilitating infrastructure investment and roll-out through open competition, rather than complicating with bureaucracy; and building awareness and capacity.

> Being relevant and helping out the communities means understanding what they need. That becomes a self serving, positive circle. So I mean, it is that philosophy for doing business, I think.

Ross Cormack
CEO, Ooredoo Myanmar
Revenue Generation through Community Driven Social and Economic Partnership


## Enabling environment

Creating an enabling environment is critical, through a range of means that will vary in nature and extent in the context of individual administrations but should follow a clear sequence: transparent, stable policies and regulations, a coordinating, multi-stakeholder framework, facilitating demand, financial support, and direct intervention only in the last resort of market failure.

A policy of open access makes proven commercial sense: it increases quality, grows market size, enables the market to self-regulate in terms of capacity, stimulates wider economic growth as availability, consumption and revenue rise. Open access is an important regulatory tool, but it is an organic process requiring political vision and leadership rather than a quick-fix pill. In some economies, opening up markets may have negative implications for citizens who are also employees, for example; the political dynamic calls for an alternative, staggered approach to structuring competition, perhaps enabling internet exchange points as a first step.

## International connectivity

Lack of terrestrial networks is a limiting factor in many emerging markets in Asia and Africa in particular, where submarine cables bring affordable transit to coastal regions but the commercial cost of connecting further inland is prohibitive. IP transit hubs tend overwhelmingly to co-exist with established trade and transport legacy hubs from the pre-digital era, embedding the bias against more difficult geographies. Better connection to the global internet may involve opening up not just markets, but historical political and physical boundaries; models for improving international connectivity cannot be imported wholesale from other regions or countries, but must be adjusted to fit specific market realities.

> Very often companies only look at the issue of financial sustainability. In fact, from a community perspective, the issues of social sustainability, that is the degree to which the community is engaged with, is committed to, ultimately owns the project, may be as important in the long term viability and health and success of the project as being able to eke out a relatively small amount of revenue.

Michael Gurstein
Executive Director, Centre for Community Informatics Research, Development and Training (CCIRDT),
Revenue Generation through Community Driven Social and Economic Partnership

# Sharing technologies, sharing infrastructure

Creating a resilient, sustainable, affordable broadband infrastructure in accordance with local markets calls for a mix of delivery platforms, from submarine cables and terrestrial fibre to microwave, satellite, mobile technologies, even drones and balloons. Putting multiple access technologies together in an affordable platform may solve latency, increase capacity and reduce reliance on international connections, balancing out the inherent fragility of internet infrastructure and enabling the development of local content and local growth.

Sharing infrastructure with other utilities by piggybacking on projects such as road-building or electricity build-out reduces redundancy and capex costs. The principle works both ways: value can be added to submarine cables by incorporating environmental sensors or tsunami warning systems. Auditing and streamlining existing broadband assets across ministries and other government bodies may enable savings through a holistic approach to maintenance costs, spectrum and infrastructure roll-out; and may form the basis of a national broadband plan based on current connectivity, usage patterns, populations, economic zones and social and economic objectives.

# Investment and funding

Open and stable regulatory frameworks, combined with realistic expectations of ROI timescales and established international best practices, may encourage development banks, private entities and other investors to justify risk and fund infrastructure projects alone or in partnership with governments. Revenue sharing with vendors and operators can help to meet huge demand for connectivity; disruptive technologies may be the only financially and practically viable option in some terrains or pockets of low-income. Government policies could also favour investment, offering spectrum for free, access to unlicensed spectrum on a regional basis or at a lower price dependent on coverage commitments; or offering tax incentives to encourage local manufacture and tax breaks for investors at municipal, regional and national levels.

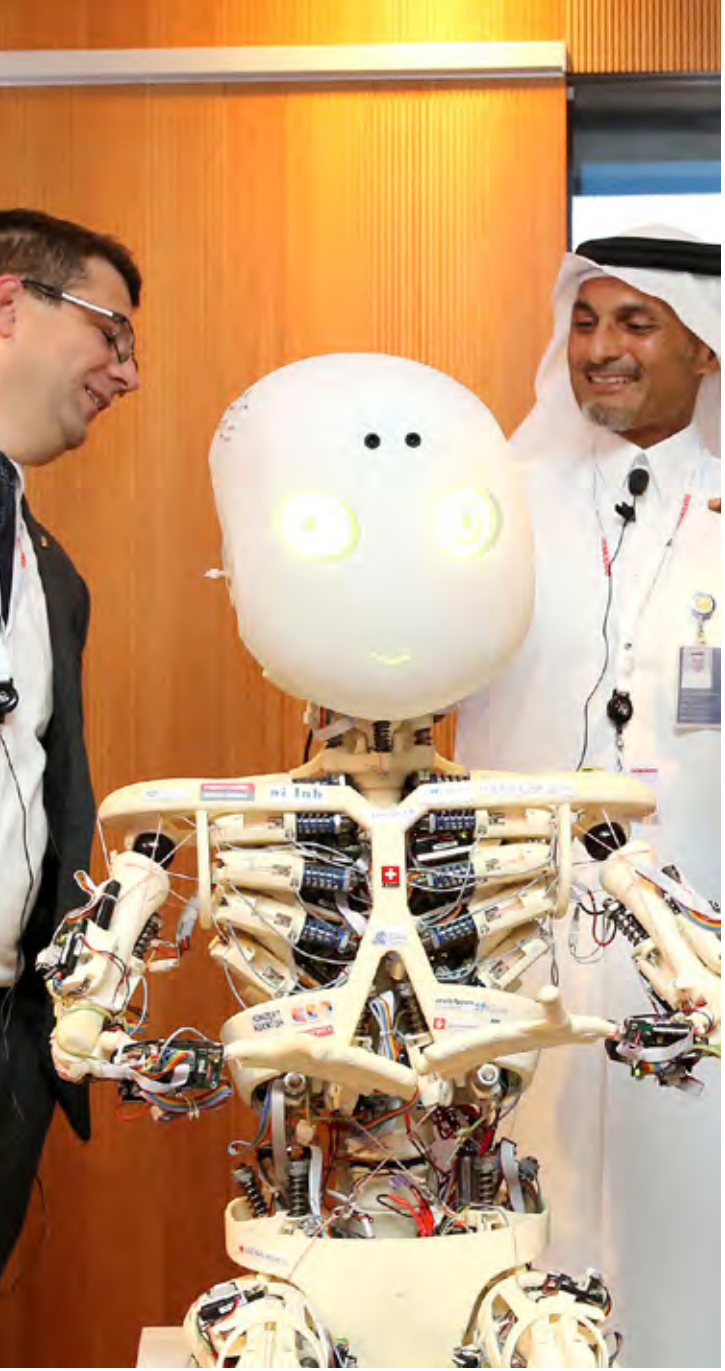
Making devices affordable for end users may involve using public funding, such as universal service funds, to purchase broadband devices at scale and distribute at low cost; establishing more local community telecentres; and offering smart phone rental, or financing plans in affordable instalments.

# Keeping it local

Social and financial sustainability can only be achieved by understanding and meeting long-term needs and practices at the local level, evolving in line with technology and service requirements. If a project is vital to local communities, such as emergency services, or produces clear growth, such as ecotourism or agricultural applications, it will be supported and sustainable, generating revenue to participate in the wider economy. Generating a sense of value often implies charging a nominal fee for the use of the platform or services; local language digital content is a critical element in including citizens and potential consumers disadvantaged by remote or rural location, illiteracy, gender and age. It is imperative for operators to be close to local communities, understand what is needed and offer appropriate applications and services, in order to grow a business case in a virtuous circle of supply and demand.


> If there is anything that will change the equation, it is enabling the private sector to come and invest. It is not the enemy

Khaled Naguib Sedrak
CEO and Founder, NxtVn,
Affordable International Backhaul



## Creating demand

Stimulating that demand in local communities involves demonstrating directly relevant use cases and the breadth and depth of available content, from the power of global giants such as Facebook and Skype to connect families separated in remittance economies, to often unprecedented access to government, health and education services, and highly-local applications with clear commercial and social value. Educating consumers in the benefits of broadband connectivity is an important part of digital literacy programmes and capacity building amongst end users, community leaders and policy makers. Once value is established, demand tends to grow all but insatiably; availability of low cost devices is key to supporting growth.

Grassroots initiatives and local entrepreneurs can prove very effective in building last (or first) mile access from a central point in a village or rural community, in developed as well as emerging markets. This may take the form of assembling mesh WiFi networks, connecting houses through open source projects and small community networks, or delegating power to local and municipal governments within a central enabling regulatory framework. Technology must also be sustainable at the local level in terms of access to spare parts, support, training, updates and available power supplies. Making cities smart is easily financed by private sector interest in wealthy urban clusters; making villages smart is often a less attractive commercial prospect, needing government support and community engagement, but may prevent the sometimes disastrous impact of rapid urbanization.

## Psychological barriers

Broadband connectivity enables communities to become sustainable ICT users contributing directly to the economy, empowers and enriches lives, provides vital new revenue streams for telcos, and offers immense long term benefits in terms of health, education and other social metrics. Providing electricity and internet access is often enough for creativity to blossom in surprising and highly productive ways amongst those for whom innovation is a form of survival. Governments must invest to provide stability, international connectivity, access to data and global knowledge in local languages; develop an integrated, joined-up ICT policy; and support a multi-stakeholder approach led by local communities. It is psychology, not technology, that is the greatest barrier to broadband adoption. Governments must move beyond entrenched views on national security, national assets and misplaced patriotism to spin the enormous social and economic benefits of broadband through engaging with new and local partners, developing innovative solutions and applications, open markets, open borders – and open minds.

# 4.

# Internet of All Things

The Internet of Things (IoT) is moving from the periphery to large scale deployment at explosive speed – bringing with it all the issues of the wider ICT industry in microcosm. Its enormous potential for economic growth, social development and human well-being is framed by the ongoing challenges of spectrum availability; establishing security and privacy; ensuring basic connectivity; enabling innovation; implementing new software-based technologies; dealing with big data analytics; creating viable business models; relevant regulatory approaches; and the critical importance of cross-sector partnerships, collaboration and cooperation.

> We're at the point where the dream of engineers to be able to measure everything and process everything is almost there.

Francois Rancy
Director of the Radiocommunication Bureau, International Telecommunication Union, The Intelligent Future

> Relationships are at the heart of the notion of being smarter or having the smarter society.

Bashir Patel
Regional Director, Global Government For Central Asia, Middle East And North Africa (Camena), Inmarsat, Strategies For A Smart Society



# Unimaginable potential, unintendedconsequences

A mobile network of interconnected objects is in itself nothing new. It is the availability of massive computing power at low cost that is now making it commercially viable to interlink human to human, human to machine and machine to machine in physical connections of switches, routers, sensors and computers across all everyday environments at scale. Tens of millions of interoperable objects can be measured in digital form, measurements which can then be transmitted, processed, regulated, analyzed and interpreted. It is both a huge evolution in the history of humankind – and the opening of a digital Pandora's Box of unintended consequences, a prospective nuclear winter in the networks.

As the IoT expands, so does the potential for abuse of data, loss of privacy and the threat of cybersecurity attacks. Securing millions of embedded minute devices with long life cycles calls for careful design and long-term planning; the number of devices and connected points coming together means end-to-end security throughout the system cannot be guaranteed; and even if individual sensors with very low processing power are of little interest in themselves, their actuating power is enormous. A malicious tweak in one temperature or timer reading could impact millions of connected things or bring down critical infrastructure. Actuation is cause for paranoia.

> What we are seeing here is certainly the evolution of the Internet of Things with artificial intelligence. How do we keep humans in control of such things? So this is a really important philosophical change in the way we change this technology. It's not just about the data but it's about what these things can do.

David Rogers
Chief Executive Officer, Copper Horse Solutions Ltd,
The Internet of Things: a Force for Good or Evil?

## Security is human

The cat and mouse game with cyber criminals, the difficulty in tracing perpetrators and the lack of international legal redress will continue. Standardized security protocols, encrypted data, and the correct configuration on security settings are important; establishing closed-model networks with trusted APIs, limited architecture and single-function devices without access to the wider internet may offer an interesting middle-of-the-road approach to securer IoT deployments. Data privacy is a global problem with local solutions. Whilst public debate and awareness are vital everywhere, different privacy characteristics and standards will reflect different values, cultures, contexts and legal systems. Ultimately, security protocols are designed and developed by humans, meaning that M2M communications are subject to the same vulnerabilities as human communication. Machines themselves do not care about security – a critical implication for the design of future artificial intelligence applications.

## Smart cities

Smart cities of the future are dependent upon IoT to deliver the collaborative use of technology and data which will improve urban living. The IoT is the enabling framework, brokering and interpreting that data to provide solutions to the pressures of rapid urbanization currently straining existing infrastructure, processes and environment. One step further is investment in smart villages, bringing connectivity, services, work and improved quality of life to rural areas, counteracting the urbanization dynamic. Committed leadership within government is critical, bringing together all relevant stakeholders in a hub of connected things, scaling up viable projects rather than sponsoring endless pilots. Regulatory stability, digital capacity in government and civil society, overcoming the resistance of incumbent professionals in vertical sectors, and cross-silo collaboration within and across government are prerequisites to smarter societies, starting at local level.


> A large part of the Internet of Things is coming from what's called the do-it-yourself, the huge community of people that are artisans. They have technology and that's enabling them to do a lot of things. My perspective is that as soon as these people have access to the internet, they will provide services.

Roberto Minerva
Chairman, IEEE IoT Initiative,
The Intelligent Future

## Multiple stakeholders, services and platforms

Collaboration is paramount: it is not just devices that are coming together, communicating and perhaps conflicting, but ultimately people, with competing areas of influence and loss of privacy. Multi-party, open dialogue should include civic groups, governments, corporations, enforcement agencies, manufacturers, academics, designers and different end user interest groups to ensure balance and accountability. Breaking down silos within and across government and industry sectors will lead to a new ecosystem – and multiple platforms with multiple stakeholders delivering multiple IoT service provisions. The commercial complexity of alliances, and the integration of equipment and connectivity across different industry segments, will herald a lively jostle for standards, partners and winning share in an often undefined market. Identifying one part of the puzzle, where value can be added most effectively, is key.

## Where are the business models?

Monetizing this explosion of data will lead to new business models as diverse and complex as the IoT itself. Start-ups and industry behemoths alike are entering uncharted territory. Heterogeneous devices using licensed or unlicensed spectrum, covering short or long distances, continuous streams of data or one-off triggers, in long-term sunk applications or high churn consumer applications, using different combinations of sensors, wired or wireless networks and software, at different scales and of different natures, create multiple possibilities. The enormous productivity gains and cost savings of industrial applications make commercialization easy; on the consumer side, models are less clear-cut, in particular for IoT applications in the home, which need to move beyond the wow factor to show real added value and concrete benefits in terms of reduced costs, energy savings and greater convenience.

# Regulatory dragnet

Policy, legal and regulatory issues threaten to act as a major dragnet slowing down the fantastic potential of the IoT. Additional spectrum is needed for the communication of tens of billions of sensors, machines and buildings coming on line. Harmonizing spectrum is essential for economy of scale and affordability; standardization in IoT data in the cloud must include specifications, architecture, user and provider interfaces; the growing use of low frequency and narrow band frequency addresses the low-cost, small-device universal connectivity required by many IoT and M2M applications.

The IoT needs to be higher up the public and government debate and national agenda, stimulating the public private civic collaboration. Education on the core elements, benefits and risks of smart solutions is essential for decision makers and end users alike, both of which are still often digitally illiterate. Networks need to be of good enough quality, rather than merely fast, to enable end users to benefit as consumers, citizens and taxpayers. The opportunities for emerging markets to pole vault into the future, unencumbered by legacy systems or spectrum, are enormous – but presuppose basic connectivity to a far greater degree than is currently often the case. The fault line between technology and humanity, the Internet of Things brokers and interprets data, providing the key framework to smart cities; the source of the meaningful, competitive knowledge which is the future.


> We need to buy into machine to machine because there's too much money upon the table not to do it, but then we have to find techniques to mitigate the security risk. We cannot arrest cyber criminals, because cybercrime is really an issue not with technology, it's an issue with international law.

Barry Greene
Chief of Strategy, Niometrics,
The Internet of Things: A Force for Good or Evil?

# 5.

# Big data: opportunity and fear

Big data is reality, not hype. Data is generated on an increasingly vast scale, from the millions of call detail records produced daily by mobile phones, to the whole range of smart devices, wearables, embedded technologies, machine to machine communication and physical objects in the Internet of Things. Initially regarded as a liability, a byproduct of transactions taking up expensive storage space, data is now seen as having enormous commercial value and potential for social and public good.

The power of big data lies in its actuation, using analytics, algorithms, prediction and virtualization tools, to analyse what has happened in the past, calculate what is likely to happen in the future, and suggest how that can be altered or improved, such as diverting traffic to avoid dangerous congestion or halting the spread of infectious diseases. But the opportunities of hyper connectivity are balanced by the fear of hyper surveillance, of loss of privacy and security, of data abuse for commercial or political gain. Resolving this tension through transparency, policy and education is critical to improving the quality of life of citizens and consumers.

## Mobile phone data for public good

Beyond more efficient markets and businesses, better customer relationships and service offerings, big data also promises better governance, public administration and support for citizens as a powerful tool for common good. Combining mobile phone and satellite data can provide critical information for improved policy-making, urban planning and the provision of social services, with a far higher degree of accuracy than more traditional tools such as national censuses. For emerging markets in particular, the opportunities for accelerated development are tremendous.

Mobile phone data can be used as a fundamental population mapping tool to measure where hotspots of people are concentrated, patterns of travel, residential or commercial use of land and how these factors change over time. It can be used to channel relief and support by tracking the movement of people affected by disasters or emergencies; to monitor and control the spread of infectious diseases, preventing epidemics, and targeting humanitarian aid and resources; and to analyze socio-economic patterns to highlight untapped pockets of poverty to improve social policy – or of wealth, to uncover new market possibilities.

# Open government for public good

Much of the power of mobile phone records relies on its combination with existing or more traditional datasets, including surveys, satellite information, censuses or other government statistics. It is therefore incumbent upon operators, internet access providers, and government to make that data open and available for research and analysis to change real social and economic policies. Government policy facilitating investment in next generation networks and technologies is a basic prerequisite to enabling data collection. Integrating the work of economists and statisticians at a central level with data scientists and industry players will enable effective monitoring and use of data, efficient allocation of resources and maximum benefits for all stakeholders in a smarter society. Increasing open access to government data will check abuse and fear of misuse through transparency, enable innovation and progress to transform society, and empower citizens through shared ownership – but must be tempered with regulation to protect against discrimination, ensure privacy and security, and  be responsive to unforeseen consequences.


> I think the focus should be much more on the purpose and the data security than not letting the data be analyzed at all because of fear of privacy.

Linus Bengtsson
Co-Founder, Flowminder,
Big Data for Development


## Privacy concerns

Releasing the benefits of big data, whether for business, social development or public purposes, depends on being able to analyze free-flowing, global data at scale. Fears over the abuse of privacy or misuse of personal data, whether through big brother government surveillance or commercial exploitation, may inhibit data flow. The exponential rate at which data is created, the highly personal nature of new data sources such as video and genetic information, and the growth of artificial intelligence applying complex algorithms in a form of digital justice, increase concerns.

Current legal and regulatory systems are inadequate given the international, cross-jurisdictional nature of data generation, storage, transmission and analysis; as the volume of data grows, so does the impossibility of enforcing meaningful sanctions against cyber-criminals and infractions of privacy, whether malicious or unintentional; existing consumer-oriented privacy agreements are largely meaningless, offering no real alternative to surrendering personal data for convenience, and engendering a wearying form of terms and conditions fatigue.

## Privacy options

Depersonalizing data, moving packets anonymously, encryption and peer-to-peer alternative platforms may provide greater protection. Data analysts can add noise to mobile phone data, distort the timestamp slightly or use aggregated, anonymous data to generate synthetic models; or remotely access records kept within the operator system under the strict terms of non-disclosure agreements. Offering the option to opt in to services to a greater or lesser extent, or classifying data as highly personal or more general, may provide an important degree of granularity that is currently missing; a form of graceful degradation would enable monetization and support emergency services whilst accommodating user choices in design of apps and services. Greater transparency and openness on the part of operators and governments may reestablish trust and responsibility; a trust mark or internationally recognized standard may enable operators to build a role as trusted guardians leveraging the value of data, supporting innovation for commercial and public good securely over their networks.

> It is only on a need basis that the governments and authorities should act to protect society and put in the right laws and frameworks. The fact that they have access doesn't mean they should help themselves all the time. Any democratic society, even security agencies, needs to be accountable and work within the framework of the law. The law has to be proportional, transparent, and clear to everyone.

Getachew Engida
Deputy Director General, United Nations Educational, Scientific and Cultural Organization,
Strategies for a Smarter Society

# Purpose is all

Informed consent and permission from end-users in clear local language provides a pragmatic approach to data analysis, proven effective in other research disciplines such as medical trials. Collective privacy has already been compromised by often unauthorized, unilateral commercial use, by established government data collection practices and by de facto differentiation in allocation of resources based on socio-economic status. Focusing on the purpose to which data is put is key; in the context of a major disaster, for example, not supplying information could be considered downright unethical.

Privacy is contextual and relative, varying over cultures and evolving over time, but confidentiality and trust are essential. Regulation must take the form of established global norms or consensus-based conventions, working to regulate data ambiguity, criminalize spurious correlation and enshrine basic rights and responsibilities. The law alone is not enough; a wider conversation is needed involving all sectors of society, industry and government on the purpose of big data analytics – and transparency and accountability in its use. Being able to access data does not mean being able to use it at will.

# A culture of data analytics

A new culture of data analytics and data science education across industry and government might enable consumers to have the right tools and knowledge to protect their own privacy, changing traditional notions of privacy in line with the digital reality and unleashing the developmental power of big data. New business models may also include data banks or enterprises inspired by data philanthropy. Collaboration at intergovernmental and inter-ministerial levels, continuous education on future technologies, developments and complex issues of data management, and open communication with industry and citizens will ensure data policies are not made in a vacuum, balancing consumer and citizen rights, fear and opportunity.

Big data is not just a matter of human beings, personal privacy, social and body metrics; it is also the massive market potential of the Internet of Things, machine to machine communication, efficiency, productivity and economic growth. Creating a new framework for analytics and privacy to deliver maximum benefits to all involves the participation of all stakeholders, from operators establishing transparent, consent-based data policies to governments opening up data, partnering with private sector, civic and research groups, and promoting awareness and responsibility to citizens. Big data is increasingly neither created nor analyzed or actuated by humans alone – but it is humans who control its enormous potential impact, for better or worse.

# 6.

# Spectrum

Spectrum is a critical natural resource for communication and a source of major contention within the ICT industry. Without sufficient spectrum, the mobile industry will be unable to expand broadband coverage and services to meet the ever-growing demands for data transmission, deliver socio-economic benefits at scale or bridge the digital divide. Without sufficient spectrum, the multi-trillion dollar new markets of the Internet of Things will not come to fruition. Planning for near-future success demands an urgent reassessment of spectrum allocation throughout the ICT ecosystem.


> We're not in a separate box each from the other. All of the technologies, base stations, mobile communication, satellite communications, they exist in the ecosystem where a service or an application is delivered to a customer. We have a certain dependability on each other. We need to take into account individual, local, regional requirements to ensure that those communication needs are satisfied.

Gonzalo de Dios
Assistant General Counsel, Intelsat,
Scarce Resource or Shared Resource

> From our point of view it's very difficult to build a business model. It's very difficult to get the investment, to launch a network in spectrum where we can't control the quality of service. At the end of the day, operators need exclusive spectrum that they use that they can guarantee the quality of service and control.

Roberto Ercole
Senior Director of Long-Term Spectrum, GSM Association,
Dynamic Spectrum Access Opportunities and Challenges

# Sharing with other users

The mobile industry is lobbying extensively for reallocation or sharing of blocks of spectrum currently held by other users, in the broadcasting and satellite sectors in particular, in order to meet the demand for mobile broadband – a move naturally resisted by those incumbents.

Satellite operators arguing against ongoing pressure to share the C band with mobile broadband point out the criticality of satellite services over that band in many regions of the world where climate, topography, population and lack of terrestrial infrastructure allow for no reliable alternatives. There is doubt as to how the needs of such communities, as well as of users at the periphery, could be met if parts of the C band were to be reallocated. Sharing spectrum raises serious concerns on interference, particularly where receiver stations cannot be accurately mapped. Innovative regulatory approaches may introduce shared access, where satellite in rural areas is free with geographical separation, but the band is segmented in large urban centres desperate for capacity.

Similar issues arise with the broadcasting industry, where moving from analogue to digital terrestrial services opens up a digital dividend of spectrum widely claimed by the mobile industry. Broadcasters urge for caution and the need to establish digital terrestrial broadcasting services of a minimum guaranteed quality before allocating further. Latency, culture, social cohesion and the broader needs of consumers and citizens must be balanced against the undisputed benefits of extending mobile broadband services. LTE and eMBMS allow digital broadcasting over advanced mobile networks but there will remain a long term need for both broadcasting services to meet the needs of the wider population.

Ultimately, delivering near-universal connectivity will only be possible through a hybrid model of cross-border, cross-technology coordination, where satellite, mobile, fibre, broadcasting and web company sectors move from pure competition to mutually-beneficial collaboration.

> As a regulator, we are led by three things: national policy objectives, managing the interference, and making sure that there is broadband access for everybody where possible.

Godfrey Mutabazi
Executive Director, Uganda Communications Commission (UCC),
Dynamic spectrum access opportunities and challenges

# LTE for public safety

Work on standardizing LTE for public safety use has started. Ideally, the spectrum allocated to such critical communications should be harmonized regionally or globally. Each administration must choose how spectrum should best be allocated, whether over private networks, commercial networks or a hybrid solution; but a flexible approach for public safety working across different countries must be found.

> If we don't address the IoT challenge coming up, I can tell you within the next three to five years, two things are going to happen. Telecom operators will be jobless; number two, we will face a nuclear winter in our networks.

BOCAR BA
Chief Executive Officer, SAMENA Telecommunications Council, Digital Dividend and IoT


## Dynamic spectrum access

Dynamic spectrum access may offer a technological solution by allowing secondary users of spectrum access at varying times and locations to the abundant gaps or white spaces in licensed bands without interference to the primary user. Presently at the trial stage, questions remain over its accuracy and implementation, in particular given its dependence on successful and accurate database management, and the availability of multi-band devices at scale. As current database models cannot guarantee that all existing band usage is picked up, fears of interference lead to highly-conservative estimates and limited new spectrum released. Many countries lack the context or capacity to study white spaces and implement databases without detrimental effects on primary services; who owns the databases, and how cross-border coordination is implemented, remains unclear.

Successful trials of the technology, and of multi-band devices, have taken place at local levels; important differences in local market, geography and development contexts demand caution in translating this wholesale to emerging markets. It is difficult to build a business model that facilitates investment in the network when the ability to control services and guarantee quality remains open to doubt; this is also a key factor in the drive to license any identified white spaces. But, given further studies and extensive trials, dynamic spectrum allocation may provide a real alternative to the broadband spectrum crunch in certain areas, such as densely populated urban clusters.

## Regulation

Greater spectrum efficiency may be achieved through a rigorous audit of current allocations, examining actual usage in the mobile industry or in many emerging markets. Regulators may be able to release spectrum from other holders beyond the digital dividend through working closely across government ministries such as military and civil defence. Informed regulatory decisions rely on ongoing testing, sharing good practices, needs assessment, cost benefit analysis, considering the concerns of user groups and competing lobbies, examining assumptions on the existing use of spectrum - and above all, a holistic approach involving the entire ICT ecosystem, its technologies, users, stakeholders and beneficiaries.

It is down to each individual national administration to work out the best use of spectrum to the greatest benefit of its citizens, consumers, industry growth and economic success. Spectrum has an important social value beyond its commercial exploitation. Securing coverage and quality in both urban and remote, rural areas means weighing up social versus market needs, in particular the harmonization across bands and devices that drives economies of scale and scope.

Spectrum allocation is informed by a complex mix of social needs, business models, strategies for economic growth, industry lobbying and very human power politics. No incumbent is ever happy to lose spectrum to a competitor; concerns on interference and quality of service must be taken seriously. It is a multi-stakeholder balancing act too important to be simply a telecom issue. It requires committed leadership and understanding at the highest governmental levels.

# 7.

# The softwarization transformation

Softwarisation of the telecommunications ecosystem, whether cloud computing, software-defined networks (SDN) or network functions virtualization (NFV), is not in itself a new phenomenon. What is new is the scale at which it is now beginning to happen, driven by the growing availability and affordability of software solutions, advances in IT enabling new technologies to outperform legacy networks, and the market demand for evolved network architecture to cope with rapid growth in mobile data in particular. Virtualizing most, if not all, network functions and elements allows for fully dynamic management and capacity optimization – enabling new services, new ecosystems and increased competitiveness crunch in certain areas, such as densely populated urban clusters.

> The key problem is how do you manage the performance hazards and create the insurance, and our industry is quite immature at the moment for dealing with that. We still have lots of medieval craftsman, very, very skilled, but we're trying to build skyscrapers and that requires a different level of science and engineering technology.

Martin Geddes
Founder, Martin Geddes Consulting,
The IT-isation of Telecom Networks

# Flexibility, not cost

The flexibility and speed of service provision which virtualization offers will accelerate adoption more than the prospect of cost savings, as the initial opex costs incurred by integration and workforce training effectively balance out capital expenditure savings. Longer term, the lower operating costs in the primary core network produced by automation and shared resources will move competition from capex-based models to opex-based, with potentially significant changes in business roles and models.

Softwarization enables operators to meet the needs of a demand-led model in a highly competitive environment, creating, testing, killing or deploying applications and services in line with changing consumer and market behaviour- with a vastly reduced time to market, a strategic imperative in the internet economy. The ability to constantly reallocate resources to match unpredictable and varying demand enables operators to address changes in traffic patterns and provide for niche, under-served and new markets, releasing new value for the end-user, new revenue and new business models, such as revenue sharing. Disintermediating the core network with the cloud brings the end-user closer, reducing the threshold for new competitors and innovative solutions to enter the arena.

# Network control

Deciding which functions or elements to virtualize first is fundamental to network resource management, continuity of customer experience and end-to-end provisioning. Clearly defining deployment, migration and convergence of new and legacy layers calls for long-term planning and human capacity development. Control or orchestration of the network through a central platform managing virtualized functions, layers, applications and services is critical to internal operating efficiency and quality assurance.

Several factors may affect the speed with which network elements are virtualized. Softwarization brings together IT and telecommunications, two industries with differing cultures, ways of working and regulatory approaches, such as the telco role within emergency systems, principle of lawful intercept and solid tradition of carrier-grade quality of call. Collaboration between various international bodies, the industry and the market is necessary to establish standards for inter-cloud management and international interoperability in infrastructure for public networks. As network operation moves towards a form of distributed computing, established national regulation may become increasingly irrelevant or unenforceable.


## Guaranteeing quality

Resource sharing and a reduction in investment-heavy physical ownership comes at a price: it creates variability in performance and reliability, reducing assurance of the same high level of quality of service and safety as in the traditional circuit world. As end users increasingly programme on top of network functions in the cloud virtualized environment, controlling or defining applications, creating and configuring supply chains with end-to-end integrated quality becomes more complex. Large-scale roll out of virtualization may be held back if operators find this risk to their service offering too acute.

## Security issues

Sharing resources and data in the cloud brings greater security and privacy challenges than current physical systems. Ensuring end-to-end security over a number of virtual layers, each with its own security mechanisms, is further complicated by a lack of clearly-defined responsibilities or centralized overview. Public clouds in particular are subject to higher risks of power outages, hacking or data abuse; even in private or operator-owned clouds with networking functions, it is unclear who is responsible for protecting whom, be it the users, the data itself, the network or the network owners. Regulating the cloud at a supranational level is notoriously difficult, given the cross-jurisdictional storage and flow of data; protecting the end-user calls for greater transparency and granularity in use of data, with explicit consent rather than unilateral manipulation the key to regaining trust and developing services of benefit to operator and end-user alike. If security in virtualized networks is as much about design as technology, a high-ranking chief design officer may be a solution to preserving privacy, regulation, data value and the trust in network operators that is potentially so promising.


# Vertical potential

For network operators, the urgent need to improve time to market, service offering and competitiveness must be balanced against guaranteed customer experience, end-to-end provisioning, integrated legacy services and network resource management. But virtualization, however complete or nuanced, and in whatever form of cloud, is too much of a market imperative not to happen at scale. It will create new monetization and service models, enabling disruptive start-ups, new market entrants and smaller, local players to radically alter the ecosystem in many industries, not just telecommunications and ICT. The possibility of networks tailored to different industries will impact a range of vertical sectors, including automotive, agriculture and government services, creating virtual private networks, optimizing resources, digitalizing and automating processes. Combined with major industry developments in the Internet of Things and artificial intelligence, the softwarization of telecommunications networks will lead to dramatic changes in existing business models and value chains as well as the emergence of new competitors in the next five to ten years.

> If you make the network flexible and simple enough to be able to quickly innovate new capabilities, you don't have to spend a year to do the simplest of things, then you encourage further innovation and encourage business relationships between content providers and operators to create capabilities that may provide new value to the user.

Hassan Ahmed
Chairman and Chief Executive Officer, Affirmed Networks,
Networks in the Cloud

# 8.

# Regulators: the best of times, the worst of times

Perhaps no other industry calls upon its regulators to balance economic productivity against social and cultural imperatives as much as the ICT sector. Effective and relevant regulation is central to ensuring the unprecedented growth of economies, industries, societies and human development in the digital convergence era – an era where the very notions of privacy and security are under threat.


> So we have to make sure that we regulate in a way that doesn't stop the creativity and innovation and growth of this market. So again it's balancing that need to allow operators the freedom to operate where they want to, but also ensuring that we have to have infrastructure and access all over the country.

Omobola Johnson
Honourable Minister,
Federal Ministry of Communication Technology, Nigeria,
A Regulator's Nightmare

# New realities, new challenges

Beyond the traditional core areas of protecting consumer interests, enabling fair competition and working towards universal access, regulators must now urgently address the challenges of the new industry realities. These include content in a converged market, innovation at services rather than infrastructure level, the threat of too much data concentrated in too few hands, the growth of non-traditional communicators, administrating the digital dividend, all-encompassing security and privacy concerns, and the need to move beyond the established silos within government, within industry sectors and between public and private players, towards cooperation and collaboration. And further beyond this lie the ethical, legal and regulatory concerns of the near future, from bio-, neuro-and nano-technology to augmented humanity and artificial intelligence.

# Staying closer to the curve

Technology has always moved faster than legal and government processes. The exponential pace of change transforming the industry threatens now to overwhelm current regulatory policies, either stifling innovation and growth in a tangle of outdated regulations, or exposing consumers and operators alike to an uncontrolled gold rush beyond any ethical, competitive, quality, security or privacy controls. Developing standards and policies at traditional speeds is woefully inadequate: by the time regulations on wearables, for example, have appeared, embedded technology will already be in widespread use. It is crucial for regulators to stay closer to the curve of technology and industry development, if not ahead of it, addressing changes and potential impact in a much timelier, more forward-thinking manner.

> This is not a land grab, this is the ability to adapt to the future. Effectively we have to be more efficient. Not necessarily faster, but more efficient in the way we approach this developing and emerging world we're about to move into.

Noel Kirkaldy
Head of Sales Dev. TD-LTE AMEA, Nokia Networks,
Call to Arms for Regulators, Consortia and Governments


# Balancing act

The essential balancing act of regulation remains – looking after both consumer and business interests through spectrum allocation and harmonization, standardization, ensuring choice and competition on networks as well as new services such as cloud, data analytics, M2M or IoT applications. More widely, the economic agenda must be balanced against social, political and cultural issues; innovation and opportunity in the market against the needs of established voice or data user communities; current consumers against those of the near future. This is often a geographical balance between the needs of robustly competitive, densely populated urban areas and those of less economically viable, rural and remote regions.

Enabling innovation is critical to empower new services in e-health, e-education, e-government and the whole host of smart applications, products and services. New players, whether web companies or from vertical sectors, users, developers or IoT enterprises, demand a new approach to regulation, letting innovative business models decide rather than blocking with bureaucracy. Facilitating rather than inhibiting may involve prohibiting nothing unless it is explicitly negative in its impact (as opposed to only allowing what is explicitly permitted); being more receptive to innovation, to the industry, to the whole arena of regulated and unregulated activities in which telcos now compete.

## Driving collaboration

Regulators are key to creating the multi-stakeholder platforms necessary to take smart societies to scale. Enabling successful cross-sector partnerships and collaborations between new and old industry players, civil society and government means balancing competing interests, treading on established toes, making sense of a mess of overlapping, parallel or contradictory regulations, standards and authorities.  Establishing a clear path for critical investment in the underlying infrastructure involves harmonization, standardization, predictable, stable and open regulation. Regulatory bodies themselves must be prepared to merge and consolidate across sectors as traditional barriers melt away, and new business models, delivery platforms, technologies and stakeholders emerge; and across jurisdictions as unregulated, non-traditional players act globally. The pace of change brings risks, uncertainties and benefits; the regulator, positioned somewhere between government, private sector and end users, is the natural point of consensus, needing power, awareness and leadership to bring all parties together for greater common social and economic good.

## Regulating data

Regulating the use and abuse of data may fall eventually to specialized data regulators; for the moment, it remains one of the most challenging aspects of telecom regulation portfolios. Data flows and is stored across borders and jurisdictions, making universal regulation and redress all but impossible; the social, ethical, political, technical and commercial aspects of privacy and security which must be taken into account vary greatly across cultures, regions, time and generations. It may therefore be impossible to establish a major international body responsible for data; agreeing a global protocol or convention such as that on nuclear non-proliferation is more feasible.

As technology evolves from current devices to embedded technologies and artificial intelligence, ever-greater amounts of data of an ever-more personal nature are generated. Relying on laws alone will not be enough to monitor and prevent loss of privacy, abuse and misuse of data or discrimination based on new digital applications such as DNA profiles, medical or financial records. A wider conversation in society and government is needed, at local, regional and international level, to establish forward-looking norms of handling data, focusing more on the purpose for which data is used rather than unenforceable concepts of ownership.



## Closing the skills gap

There is an urgent need for increased regulatory capacity, skills and resources, in particular in emerging markets, to protect consumers, monitor the market and move forward towards universal access effectively. Support and education are essential to understand the extent and ramifications of exponential change, to inform and empower end users, and to create an enabling environment for innovation. Increasing understanding and digital literacy is a priority amongst regulators, consumers and government alike, in particular given the often swift turnover and wider political distractions of ministers in both emerging and developed nations.

## ITU roles

In addition to its core areas of frequencies, satellites and facilitating connectivity in areas not addressed by the market, ITU is well positioned to make a difference in breaking down silos, facilitating communication and partnerships between policy makers and regulators across territories, offering a holistic view of the whole ecosystem. It can support regulators at an interregional and international level with education, knowledge transfer, awareness and best practices, as well as offering practical guidance and a multi-stakeholder platform to overcome roadblocks to connecting the bottom billion best tackled at international level, such as the cost and vulnerability of submarine cables. There is also scope for new data sets relevant to the new realities, measuring competitive indicators such as digital literacy or providing accessible common definitions.

# Cooperation for the future

Regulators must be more proactive in engaging with future technologies, establishing effective collaboration with the entire industry ecosystem, including web companies, research and development units, innovation incubators and futurists. The sheer scale of change calls for robust and humble dialogue within and across government departments, taking into account multiple jurisdictions, industries, regulatory bodies and cultures. Regulators are no longer at or near the top of a single food chain, but part of a still-developing, increasingly complex ecosystem. Regulation remains a vital part of achieving industry success, economic growth and human development- but enabling the future in the new multi-faceted regulatory reality means new mindsets, processes and education. The market is moving so fast, and the regulatory and policy lag is so great, that only cooperation and collaboration can move us forward successfully.


## Further information and sources

All the content and quotes within this report are drawn entirely from the interactive panel debates and discussions that took place at ITU Telecom World 2014 in Doha, Qatar. It is available as a download from the ITU Telecom World 2015 website at telecomworld.itu.int/outcomes-2014. All the sessions can be viewed as video on demand at telecomworld.itu.int.

Our sincere thanks are due to the government of the State of Qatar and leading international communications company Ooredoo, the hosts of ITU Telecom World 2014, and to all our event participants for their valuable, expert and insightful contributions to the debate before, during and after the event. We look forward to continuing the conversation as we head towards ITU Telecom World 2015, which takes place from 12-15 October in Budapest, Hungary.

ITU Telecom is part of the International Telecommunication Union (ITU), the lead United Nations agency for information and communication technology. ITU Telecom organizes the annual ITU Telecom World event, bringing together key players from across the global ICT community to accelerate innovation for social and economic development through exhibiting solutions, sharing knowledge and networking at the highest level.

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