REGULATION: A TIPPING POINT
Brian Williamson discusses how OTT is focusing minds on transition in telecoms markets

INTERNET OF THINGS
Part one of a comprehensive briefing on the technical and regulatory issues, by Ian Brown

EUROPE IN THE ROUND
The major communications review in Europe puts global policy trade-offs in focus

MEDIA LITERACY
Engaging children in the digital age

SPECTRUM CLASH
THE COMPETING MOBILE AGENDA
By Roland Beutler
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**KEY EVENTS IN THE YEAR COMING UP...**

- **October 2015**
  Communications Policy and Regulation Week
  Washington DC

- **December 2015**
  Telecommunications and Media Forum
  Johannesburg

- **March 2016**
  Telecommunications and Media Forum
  Brussels

- **May 2016**
  Telecommunications and Media Forum

**SHAPING THE PUBLIC POLICY AGENDA**

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This is a closed group where discussion is strictly confined to key policy issues.
This year is turning out to be one of the most eventful so far even in a sector that has a consistently high rate of change. On the regulatory front, the European Commission’s electronic communications framework review is raising a number of key policy trade-offs that will apply anywhere (and see the article by Peter Alexiadis in this issue), while national reviews in the UK, New Zealand and elsewhere are also raising questions about what type of regulatory and competition regimes will deliver digital economy goals. With networks in transition to over the top (OTT), the case may be building for separation of applications and networks, and focusing communications regulation on the latter, as Brian Williamson discusses, and we also have contributions on the need to consider economic goals and the idea of ‘industrial policy’, and to cross-fertilise with other network industries such as energy and transport. We are at a major junction between old and new, I feel.  

Fabio Colasanti, president, IIC
Where cables land: a still from an impressive animation by Business Insider on submarine cables around the world, produced from TeleGeography’s Submarine Cable Map, a free resource that allows data to be downloaded. See bit.ly/1Uruqty and submarinecablemap.com

COMMUNICATIONS REVIEWS
OFCOM LEADS IN REVIEW STAKES
This year is turning out to be pivotal in the review of communications frameworks, with the European Union review being the most prominent on the international stage (see page 3), and other major decisions on elements such as net neutrality, by the US FCC, also attracting global interest. UK regulator, Ofcom has embarked on one of the most far-reaching national reviews of the entire communications model, and the organisation has also commissioned several studies that are of wide interest. In its ongoing strategic review, taking place ten years after the previous one, Ofcom is consulting on four main areas:

● Investment and innovation – including examining how regulation can enable the development of ultrafast broadband. Ofcom has already mandated that 4G broadband will reach 98% of UK premises.

● Competition – this includes a possible big decision about the Openreach wholesale network operation, which is owned by BT. Complete separation or deregulation to promote competition are mooted.

● Empowering customers – a review of information provision and better options for switching services, including in mobile and TV bundles.

● Targeted regulation and deregulation – the review “will identify where existing regulation may be simplified, removed or replaced. For example, the rise of over the top Internet communications services, such as instant messaging, may create a case for less regulation on mobile operators, or for extending existing rules to internet-based services.”

Among research commissioned to inform debate, one that has attracted attention is the dry-sounding ‘Traffic management detection methods and tools’, which some commentators have hailed as a landmark report in the net neutrality debate (see separate news item on page 3).

Another report carried out for Ofcom is an analysis of the drivers of superfast broadband, by WIG-Consult. It finds that “although some have claimed that regulatory policies such as forbearance on access to next-generation networks may stimulate deployment, we did not find proof that this was the case. Nor did we find at the other extreme that structural separation necessarily provides better outcomes for consumers. In general, regulatory factors appear to have had less influence than market-based factors such as infrastructure competition or online video.”

DIGITAL ECONOMY
ITU AND OECD TAKE STOCK
Two reports released over the summer cover the building blocks and policies needed for the digital economy. The ITU’s Trends in Telecommunication Reform, an annual publication now in its 15th edition, is subtitled ‘Getting ready for the digital economy’ and looks at market and regulatory trends in the ICT sector, and ways to cut barriers to competition and promote broadband expansion. It also includes chapters on big data and the economic analysis of data, and ‘cross-cutting’ regulatory issues to ensure digital consumers are protected. The ITU has also developed an ICT ‘regulatory tracker’, a tool to help pinpoint the strengths and weaknesses of regulatory interventions. The OECD meanwhile has released the latest in its biennial publication, Digital Economy Outlook – see page 44 for a review.

NEW ZEALAND
COMMS AND CONTENT
New Zealand has launched consultations on both communications and content regulation, one of several countries now undergoing major reviews. The discussion paper ‘Regulating communications for the future’ continues the government’s review of the 2001 telecommunications act, and is one of the workstreams in a convergence work programme. It proposes fundamental changes to regulatory structures and a possible move to a utility-style model. Also out for discussion is ‘Content regulation in a converged world’, which highlights content classification and standards, inconsistencies in how election programmes are treated, advertising restrictions, and supporting local content. See bit.ly/1J5a1pq

AUSTRALIA
SPECTRUM REFORM IS ‘GO’
The Australian Communications and Media Authority (ACMA) expects to move to a single and more flexible approach to spectrum licencing following an announcement that the government will adopt all 11 of the recommendations proposed in a spectrum review by the Department of Communications. The main elements of the review are to replace the current legislative framework with one that permits timely allocations and greater flexibility (including sharing and trading of spectrum); incorporates the management of broadcasting spectrum and better integration of public sector agencies; and reviews spectrum pricing arrangements to support efficient use and facilitate secondary markets.
EUROPEAN UNION

COMMISSION OPENS UP CONSULTATIONS

The European Commission has opened a debate on the future of Europe’s ‘telecoms rulebook’ with two consultations – one on the broadband needs of Europeans and the other on the review of the current telecoms framework, the package last updated as recently as 2009. Both are part of the Commission’s digital single market strategy, which has so far reached agreement on ‘strong’ net neutrality rules and an end to roaming charges by June 2017.

The telecoms rules review – more accurately the review of the electronic communications framework – asks about the future of network access regulation, spectrum management, communication services, universal service and telecoms governance. It covers the evaluation of fundamental service and telecoms governance. It includes the evaluation of the 2002 framework directive, the authorisation legislation, including the 2002 directive, the universal service directive as modified in 2009 by the better regulation directive and the citizens’ rights directive, as well as the BEREC regulation, which set up the European telecoms regulators body.

In the light of the explosion in OTT and smart devices, the Commission “will examine whether the current rules, designed to liberalise former monopoly networks and services, sufficiently incentivise all market players to meet tomorrow’s high-capacity demands across the whole Union.” There is a large public survey online that has more than 200 questions and is supported by a number of background documents.

The broadband consultation is titled ‘Needs for internet speed and quality beyond 2020’ and will help define technical requirements for future digital infrastructures and will also influence investment funding. The lead page for the consultations is at bit.ly/1VRylNl.

TRAFFIC MANAGEMENT

THE TRUTH ABOUT NET NEUTRALITY?

A report commissioned by UK regulator, Ofcom, examines the use of traffic management (TM) techniques by internet service providers (ISPs) to manage network congestion, and in doing so opens up discussion about net neutrality, according to some commentators. TM can be used anti-competitively, as ISPs can make their own services more attractive by allocating a higher priority/capacity to say a video service, and a “TM detection mechanism could be a useful part of the regulatory toolkit”. According to Martin Geddes, a telecoms consultant, the report identifies the “many false technical assumptions” being made about detecting discrimination or throttling. Guy Daniels, of Telecom TV, says: “Anyone wanting to weigh into the net neutrality fight should first read this report,” which is at: bit.ly/1P6PX3W.

NET NEUTRALITY

SWISS USERS GET OMBUDSMAN

Switzerland has set up a net neutrality ombudsman’s office to mediate in disputes between customers and internet service providers in the event of breaches of a code of conduct that was drawn up last year. The code has been signed by Swisscom, Sunrise, Salt Mobile, UPC Cablecom and the cable network companies’ association, Swisscable.

Internet users who believe that their service provider (if a signatory) has breached the code of conduct can call the Network Neutrality Arbitration Board, as the office is called, if the issue is not resolved in prior discussions with the network operator. The board comprises three independent experts from media law, ICT and consumer protection. Details at www.s-nn.ch.

IN BRIEF

INCENTIVE PLAN

The FCC has published bidding procedures for its long-awaited incentive auction for the 600 MHz band, the first auction of its kind. It has set 29 March as the start date of the auction and this autumn it will release detailed information on the application process and announce the reverse auction opening bid prices.

NEW HEAD OF GSMA

Mobile operators group, the GSMA, has appointed Mats Granryd as director general. He was CEO of Tele2 Group, and takes up his new position on 1 January 2016.

NCC HAS NEW CEO

Umaru Danbatta has been appointed CEO of the Nigerian Communications Commission, and is promising to address service quality. He is a professor of electronics engineering.

NO TO UHF SHARE

The European Broadcasting Union has put out a factsheet on whether mobile 4G can share UHF spectrum with broadcasting as ‘some mobile proponents claim’ but is ‘not supported by evidence’. See also our article on page 22 of this issue.

COPYRIGHT BLOCK?

A paper by academics in Europe suggests that innovation may be held back in the region because researchers are more restricted by copyright law in what data they can ‘mine’ from other research than in the US. See bit.ly/1L1YghK.
Regulators from more than 20 countries came together in Miami to discuss how to smooth the transition from analogue to digital and what impact the convergence of communications services is having on their regulatory remit. At the IIC’s second Regional Regulators Forum (RRF) in the city, speakers from Central and South America, and the Caribbean, discussed the issues with colleagues from Europe and the US, and shared their experiences. In particular there was much debate about developing models of regulation to reduce the digital divide to ensure that all have access to the many benefits afforded by the digital age (see page 6 for a summary of RRF issues). The RRF was followed by two days of discussion in the Telecommunications and Media Forum (TMF), as follows.

Latin American Connections

Mexico featured prominently on the first day of the TMF, which was largely dedicated to Latin America and the Caribbean, as many observers watch its bold reforms reshape a highly concentrated sector. The country is now in “an ideal position” to benefit from the greater productivity unleashed by technology, according to keynote speaker Thaddeus Arroyo (AT&T Mexico).

A great challenge still facing the country, added Jorge Espinosa Mireles (Telecomunicaciones de México), is the huge urban-rural gap: although 50% of the population is connected, the figure for the rural population is only 2%. The government has adopted three main initiatives for universal coverage: fibre optic using the network of the electricity company, common LTE infrastructure, and satellite coverage for the most remote areas.

Peru also has an enormous urban-rural gap, together with a difficult geography. Luis Andrés Montes Bazalar (ministry of communications and transport) explained that universal connectivity is a goal shared by several ministries to provide a range of basic key services, like education and health, and this helps to meet the high costs.

National connectivity has exceeded planned goals in Colombia, reported Juan Manuel Wilches (Commission for Communications Regulation), thanks to a public-private alliance where the government contributed some $170m. By the end of this year, the last 47 towns in the most hard-to-reach places will be connected using a microwave network. The next step will be to apply this technology to key sectors, such as agriculture, in order to improve individual and national productivity.

Sustainable models were the topic of the second session: Gabriel Contreas Saldivar (IFT – Federal Institute of Telecommunications, Mexico) opened with a keynote presentation reporting how Mexico is enjoying new investments, more competition and lower prices only 20 months after opening up its telecoms and broadcasting markets. Currently there is asymmetric regulation to ensure the incumbent telecoms operator opens up its wholesale network and this has greatly helped entry. There is also one new entrant in broadcasting, and digital television is already running in some areas.

Brazil is undertaking a major regulatory review, with the dual aim of providing operators with incentives to keep upgrading their networks while consumer spend is down, and expanding coverage to the most remote (and/or poorest) share of the population, explained Igor Vilas Boas de Freitas (Anatel – National Telecommunications Agency).

Sebastian Cabello (GSMA Latin America) observed that connectivity, an area where mobile operators’ contribution has been huge, is only one side of the story: there needs to be development in content and innovation to add real value at local level.

Governments can help with more digital literacy and learning, so that citizens and local companies can grasp the great opportunities. Local content is a key driver of demand: in Jamaica, the areas with strong local content tend to have greater access irrespective of the wealth level, according to Ayanna Samuels (BIIPAC, Broadband Infrastructure Inventory and Public Awareness in the Caribbean).

The Net Neutrality Debate

Congresswoman Ileana Ros-Lehtinen opened the session with a keynote speech welcoming delegates to the international technology hub that is Miami. Commissioner Ajit Pai (Federal Communications Commission, US) expressed his disappointment with the US net neutrality rules, which he said shift policy towards intrusive regulation, creating uncertainty and discouraging investments.

In the panel of experts that followed his keynote presentation, some conceded that, while there were legitimate reasons for concern regarding net neutrality, the FCC could have found less intrusive ways to deal with them (Jonathan Nadler, Squire Patton Boggs), Doug Brake (Information Technology and Innovation Foundation) added that some form
of traffic prioritisation will always be necessary, and rather than blocking it, policy should ensure there is no negative impact on the consumer or on competition. Pablo Pfost (Telefónica) related the EU’s approach to net neutrality and expressed his concern that Latin America, with its diverse regulatory regimes, may see some ‘contamination’ from the FCC rules, and thus discourage much needed investments.

INTERNET GOVERNANCE
The lack of centralisation is what makes internet unique but also very difficult to govern, according to Sebastian Bellagamba (Internet Society), but we have learned to work together and come up with solutions to issues, like IP addresses, that allow us to continue to interconnect. Not all issues are easily resolved, however, and Ambassador Daniel Sepulveda (US coordinator for international communications and information policy, State Department), reporting on the latest World Summit on the Information Society (WSIS) in Geneva, highlighted that ‘enhanced cooperation’ on internet governance means different things to different people. For the US, this is achieved through the stakeholder model, but for other countries such as Russia and China, the UN should set up an ad-hoc agency. These issues created a divide in 2012 and are likely to come to the fore again at the end of this year.

Yahoo’s Kathleen McInerney reminded delegates that all internet governance bodies should recognise and remain committed to the human rights principles central to the debate – especially freedom of expression and association. Rodrigo de la Parra (ICANN) echoed this view, stating that the governance ecosystem, which is based on those principles, should be preserved. He confirmed the move of IANA from the US to a multistakeholder representative system (although the IANA transition has now been put back a year).

POWER BREAKFAST
Informed decision making is a key part of a truly representative system: ICANN hosted a breakfast workshop, on day two, to discuss the main findings of an updated report it commissioned from the Boston Consulting Group. ‘Which wheels to grease? Reducing friction in the internet economy’ ranks 65 countries according to their ability to exploit the benefits of the internet, based on an index, which takes into account 56 variables from four categories: material and legal/governance infrastructure, users’ digital ability and internet content.

When results were discussed in open workshops around the world, other relevant variables came up in the debates – such as proficiency in the English language, literacy and rural populations. Once these new variables were taken into account, the main surprise was that GDP and urbanisation turned out to be important but not determining factors. English proficiency is relevant – unless the local language content is strong, as it is in France or Arab countries. E-government was found to make a real difference, and also literacy and ICT skills. The key lesson is that the internet works as a horizontal multiplier, and a country’s ability to benefit from it is not strictly related to its wealth.

SPECTRUM UPDATES
Ulf Pehrsson (Ericsson) gave a keynote presentation that reminded the audience that the most important development we expect in the next few years is that most people will be connected to mobile broadband, either 3G or 4G. With mobile broadband so significant, spectrum remains a key aspect of public policy.

As part of its wide-ranging reforms, Mexico issued a strategic spectrum plan that allocates different bands to different uses, reported IFT commissioner Adriana Labardini Inzunza. A consultation is underway to find the best solutions to achieve plurality and better quality in broadcasting, while the goal of providing universal access in a tough geography is pursued through a public access LTE network run by a private company.

Panel presentations showed that small countries can have very different spectrum management stories. The Dominican Republic’s spectrum auctions were contested in court and had to be re-run, while Panama worked out a new spectrum plan to align with the ITU standards and was able to free up and assign the 700 MHz band.

Costa Rica held a referendum in 2009 to decide on opening up the telecoms market, and has seen demand explode as soon as mobile operators began operating. It plans to put unused government spectrum out to tender. One common trend is that rather than just maximising revenues, countries...
are now taking into account universal service objectives, or the goal of increasing plurality in broadcasting, when pricing spectrum.

**CONVERGENCE AND DISRUPTION**

Google’s Pedro Less Andrade stressed the opportunities created by disruption, not just for new services, but also for better ways to do the same things. There are also good opportunities to forge partnerships: Google partners with telcos for billing, with manufacturers for low cost Android handsets and with mobile operators for a new 4G/WiFi service called Project Fi. Chris Libertelli (Netflix) underlined that people’s love for great stories provides an opportunity for ISPs to sell faster internet, driven by the demand for video. Netflix invests in both the content side and in content delivery services that cut ISPs’ costs by fetching content far away from the subscriber. According to Manoel Rangel (Ancine, Brazil) content providers and carriers working together will be key to resolving the main regulatory challenges such as deciding what services to regulate, ensuring tax is paid fairly by all, competition, contribution to local production, and ensuring economic models are sustainable.

**TRUST, DATA, ONLINE SECURITY**

The last session at the Miami TMF was devoted to the issue of online trust and data security. For Harvey Anderson (AVG Technologies) trust is ‘the currency of online relationships’ and context is very important. Expectations change when dealing with a bank, or a doctor, or a friend on Facebook. Most of the benefits of internet come from sharing, so the issue really is about the terms under which we do that. More contextual information from service providers, which helps consumers understand the context and the value proposition they are facing, can provide a solution that works better than the current ‘notice and consent’ framework.

The inadequacy of the current system is also an issue for Intel: David Hoffman, the company’s global privacy officer, reported on a project which is rethinking privacy and which aims to identify new solutions to the problem of online trust. Nelson MacQuhae (Microsoft) advanced five principles that should be followed to foster online trust: security, privacy, transparency, reliability and compliance.

Finally, Rytis Rainys (Kazimieras Simonavicius University) focused on the impact of cyber-attacks on infrastructures. Critical infrastructures that were previously designed with closed systems are today vulnerable because they are connected to IP networks. Attacks are constant and the real issue becomes one of fast response and minimising the damage from attacks by treating the data in the best way. The first line of defence is having a strategy, which most countries do not have. Then there is identification of the critical infrastructures and the importance of public-private partnerships in this defence.

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**REGULATOR FORUM REPORT**

The RRF at Miami focused on convergence, access and broadcasting with reports from several Latin American and Caribbean countries, and context also provided from the European Union and the US. Universal access to broadband is a critical issue for many countries in the region, with difficult geographies often an obstacle, although wireless 4G and microwave networks are becoming key enablers. Connecting schools and providing public access points such as kiosks are spreading internet access, while ICT plans that include favourable tax treatment and government funding of equipment are fuelling efforts for countries to reach ‘developed country’ status.

Freeing more spectrum for mobile broadband is a priority, although some have already allocated more to mobile operators and are enjoying healthy competition. There was discussion about measuring consumer broadband speeds, which is more challenging in wireless than in fixed line. Broadcasting was highlighted from several aspects. First, there is a choice of at least four technical standards for digital TV, and momentum in Latin America is with the Japanese–Brazilian standard, ISDB-T, which has the advantage, said one telecoms regulator, of being able to alert people during disasters and also having mobility features. But there are countries yet to select one system and that are currently trialling or using two or more standards.

Broadcast content and over the top (OTT) convergence is high on the agendas of media regulators. A particular concern is promoting plurality and diversity given that certain countries have significant indigenous populations. As one media head said: “We also have to promote our constitutional values: democracy, peace, pluralism, regional development, the environment, children’s development, gender equality etc. We want the media to develop social and human capital.” Community radio had a mention, but free to air TV is the most significant medium in these aims.

A big challenge is regulating content, as consumers become more involved in shaping programmes across platforms and as convergence takes hold. There is now a body for Latin American broadcasters, Plataforma Iberoamericana de Reguladores de Televisión, where such issues are also being discussed.

And OTT players are providing innovation with little regulation compared with telcos. As one regulator said of OTT: “It is a complex relationship and the debate leaves more questions than answers, but it is all the more important to make sure the right questions are posed.”

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**CRISTINA MURRONI** is a telecoms and media analyst.
ECONOMIC CATALYST

JERRY POWER says regulation must change to promote digital ecosystems

Most regulatory policies were established during a time when monopolies were needed to build the communications infrastructure necessary to support a nation’s needs. Regulators served as a counterpoint to the self-serving agendas of monopoly companies by acting as a consumer advocate. In a competitive environment, competition acts as that counterpoint, allowing the role of the regulator to change from being an adversary to becoming an advocate working with industry to ensure their region will be able to fully participate in the digital ecosystem of tomorrow.

Around the world many regulatory authorities actively built on the natural rivalries between communications industry players in an effort to minimise prices for a least common denominator level of service. Several regulators have solidly demonstrated that regulatory policy can be structured to encourage market behaviours that serve to drive down both prices and – unintentionally – service quality.

However, in a networked world where the internet is working to eliminate economic borders, any effort that ultimately works to handicap a country’s ability to compete in the knowledge economy on the global stage will drive information services to other countries that provide a more favourable forward-looking environment. These economies are seldom based on low-cost service structures.

Equally unappealing is the laissez-faire approach that allows the ‘invisible hand’ to guide the evolution of a critical infrastructure component. Under such a philosophy, investments may be prioritised to maximise established business structures to the possible detriment of future needs that societies will require in an increasingly networked environment. These types of policies tend to favour consolidation of market power and increase the digital and economic divides that are often associated with short-term gains and long-term losses.

Regulatory policy has a direct impact on the economic value of communications infrastructure. If regulators are tasked with oversight of legislative mandates, the legislature has effectively taken on the responsibility for an infrastructure that defines future economic potential. Legislative processes are slow and deliberative, making them ill equipped to respond to a fast paced economy. As an alternative approach, a knowledge-based economy may be better served by a process where regulatory agencies are directly driven by economic objectives.

In a competitive world, the role of the regulator must change from being a consumer watchdog to becoming an economic catalyst that encourages economic growth for the public good. Regulators will always have the choice to encourage rural over urban growth, consumer over business needs, or serverside market development over infrastructure growth. These choices will determine the level and direction of investments and so regulatory agencies are making significant economic decisions for each country.

So it is increasingly crucial that regulators have a clear vision of the changing needs of citizens and the role the network plays in enabling their country to compete on the global stage of a knowledge-based economy. Once that vision is established, the regulatory agencies can begin to work as partners with industry to create a climate where that vision becomes reality. A lack of vision or trust between the authority and industry will hobble the effort and open the door for competing countries.

But regulatory agencies formed with the tactical mission of overseeing domestic communications issues are finding that as industry becomes increasingly complicated their energies are absorbed in lengthy debate over policy that hopes to maintain order over a dynamic and changing process. These debates distract from the fact that the knowledge industry knows no geographic borders and countries have to compete on a global level to attract economic activity to their domain.

I believe that regulatory agencies need a new form of governance, something that won’t be mired in politics but instead is tasked with overseeing and maximising a strategic industry that is instrumental to economic progress. I would suggest a break from legacy approaches that task agencies with implementation details and instead provide economic targets that require them to work with their industry partners to maximise our potential.

JERRY POWER is head of the Institute for Communications Technology Management at the University of Southern California. He is co-author of Transforming Business (Wiley 2012) and is a member of the Global Agenda Council on the Future of Digital Communications. Email: jerry.power@marshall.usc.edu
Q: HOW HAS BNETZA BECOME SUCH A LARGE MULTISECTOR REGULATOR?
A: BNetzA originally started just as the regulatory authority for telecoms and post, when in fact it was called RegTP. In 2005 and 2006 it was given responsibility for energy and rail because of our experience in opening up telecoms markets. Energy in particular is in major transition in Germany – we have a strong environmental policy, and are investing heavily in renewable resources and phasing out nuclear power. Rail networks too are being modernised to cope with more traffic.

Q: SO IT’S ALL ABOUT NETWORKS?
A: Yes – in energy we gained responsibility for authorising electricity grids and national transmission lines as there are a number of synergies in the regulation of network industries, where competition can only really be achieved with strict ex-ante regulation of access and price controls. There is also convergence between electricity and telecoms networks with smart grids, and other infrastructure synergies. A lot of knowledge transfer takes place here as we can draw on experiences across the sectors. For example, our telecoms and energy experts have substantially contributed to the determination of adequate capital costs in the railways sector. We have even introduced a rotation scheme for new staff members to move them between different sectors.

We believe there is no other major country that has a regulator converged on this multisector networks approach. Meanwhile competition law, including merger control, is managed by the Bundeskartellamt, our national competition authority. We are responsible for the retail obligations of service providers, just not for competition law intervention. It is notable that other countries such as the Netherlands and Spain have merged their telecoms regulatory and competition authorities, but we have a clear line between the agencies in Germany although with legal provision for information exchange. But it is a trend that we are watching.

Q: DID OPERATORS PAY TOO MUCH FOR THE RECENT SPECTRUM AUCTION, WHICH INCLUDED 700 MHZ?
A: Actually it was only slightly more than expected and seems like a fair outcome. We used the same auction mechanism (SMRA) as in previous auctions, and it has proven its value. We are also confident that the societal aims such as wide coverage will be fulfilled as they were with the first digital dividend auction in 2010 where we asked operators to start network rollout in less densely populated areas.

Q: WHAT IS BNETZA AND WHAT DO YOU DO?
A: BNetzA is short for Bundesnetzagentur. It is Germany’s federal network agency for electricity, gas, telecoms, post and railways. I am one of two vice presidents and am responsible for telecoms and rail, and we are based in Bonn.

Q: WHAT IS YOUR BACKGROUND?
A: I started a civil service career in the ministry for post and telecoms in the minister’s office, and also earlier studied law before working for a long spell in the ministry for economic affairs and energy on international telecoms and postal policy. Then for seven years from 2007 until 2014 I was head of the unit for European ICT policy at the ministry and I was closely involved in the negotiations that led to the 2009 framework for electronic communications, which among other things established BEREC, the European communication regulators body, and which I will be chair of next year. During my time in the economics ministry I was always connected to the regulatory issues of BNetzA and was then invited to take up my current vice president’s post.

Q: WHAT IS THE TELECOMS SCOPE OF BNETZA?
A: BNetzA is responsible for all regulatory tasks in telecoms, including spectrum, unlike some other regulators such as in Spain, where the regulator is not responsible for spectrum. But responsibility for broadcasting and media lies with the media authorities of the 16 federal states for constitutional reasons. Meanwhile competition law, including merger control, is managed by the Bundeskartellamt, our national competition authority. We are responsible for the retail obligations of service providers, just not for competition law intervention. It is notable that other countries such as the Netherlands and Spain have merged their telecoms regulatory and competition authorities, but we have a clear line between the agencies in Germany although with legal provision for information exchange. But it is a trend that we are watching.
We want to make sure that the principles of the pro-competitive regulatory approach are kept.

Wilhelm Eschweiler, vice-president of BNetzA

before major cities. The other big recent decision has been the reduction of mobile operators from four to three through the Telefónica–E-Plus merger, which was allowed by the European Commission. It’s too early to say what the full impact will be but again we are confident that the conditions attached will maintain competition.

Q WHAT ABOUT THE GERMAN BROADBAND MARKET?
A The government’s broadband strategy of 2009 set a target of access for all households by 2010, which was achieved, and for 75% to have 50 Mbps by 2014 – this has now been updated for all to have 50 Mbps by 2018. We have a lot of regulatory activity in next-generation broadband and it’s complicated here by the fact that our larger cities have city carriers such as NetCologne that compete with the national incumbent, Deutsche Telekom (DT), which we ruled has significant market power outside of the cities. We have made regulatory decisions concerning co-location in street cabinets, and access to ducts and dark fibre, including DT’s FTTH infrastructures in the bitstream and local loop markets. Two years ago we allowed vectoring – the upgrade technology for VDSL – at the street cabinet level for both DT and its competitors, to create a level playing field, and currently we are consulting on an application by DT to implement vectoring at the distribution frame. It’s all part of the broader picture of a likely transition from local loop unbundling towards a wholesale bitstream market and is rather complex.

Q YOU WILL BE BEREC CHAIR NEXT YEAR, AND ALREADY HAVE EXTENSIVE EUROPEAN EXPERIENCE FROM THE GERMAN PERSPECTIVE...
A When I was head of the unit for European ICT policy it was also during the German presidency of the European Council, and I worked intensively on the draft of the first roaming regulation and was closely involved in the negotiations that led to the 2009 framework for electronic communications. Our position then was that the European Commission was aiming to get more powers and to have a veto over remedies, and we were in coalition with other member states to stop this veto, which we did. We also achieved a similar result for spectrum policy, which again the Commission wanted more responsibility for. Today, we have to look into the current framework and make sure that the principles of the pro-competitive regulatory approach, which has worked successfully since 2009, are kept and that the rules are adapted where necessary to ensure continuation of its success, given that Germany like all countries has to react to new technologies and business models, such as over the top (OTT) offers, market consolidation, and fixed–mobile convergence.

Q WHAT ARE YOU BRINGING TO BEREC?
A I am already bringing my experiences to the negotiations of the proposed telecoms single market (TSM) as vice-chair, and I want to help strengthen the role of BEREC and give it a clear voice in the process as an independent body of regulators. So far we have welcomed the publication of the Commission’s digital single market strategy in May 2015, and feel it has a holistic approach that reflects well the changes in the market for electronic communications and related markets. We have set out the strategic priorities of BEREC and are busy with benchmarks, reports and consultations, and are working on input to the new roaming and net neutrality provisions of the TSM regulation agreed by the European Council and Parliament. Incidentally, there has been comment that Germany’s Angela Merkel is not in favour of the net neutrality proposals, but speaking personally I can say the German government’s position is very close to the European aim to preserve the open internet. And as for the electronic communications framework, overall we feel the review should be evolutionary not revolutionary.

Q YOU SEEM TO BE FAVOURING LESS BUREAUCRACY...
A Yes, that’s partly what I mean by evolution – ideally we want to make things less complicated with improvements, stick to what is working well and not introduce more bureaucracy. For example, there are still rumours in Brussels that the Commission would like an EU agency for telecoms, as mooted in the last review, but there has been no majority among member states for changing the institutional design. The national regulatory model works well to balance the needs of the internal market and national circumstances – the latter can’t be ignored and in my view should be the key focus of regulation.

Q BUT COLLABORATION IS CRITICAL...
A Indeed, which is why BNetzA is active in all sorts of international networking meetings, and we also have a scientific board made up of academics who publish opinions on our website. We also hold our own meetings, such as one this autumn on OTT. What’s important is that we learn from each other and don’t make the same mistakes twice.
Q WHAT IS YOUR BACKGROUND?
A I was a litigation lawyer practising civil and criminal law, and then moved to a corporate law firm, before joining Reliance, currently India’s fourth biggest telecoms operator, as senior legal counsel. That was an interesting time as it was then the first CDMA mobile player in India and was buying a lot of telecoms equipment amid a global meltdown in the market – everyone was knocking on our door. I then moved to be head of legal at eBay where I also did some advocacy on the regulatory side for Paypal and Skype, which eBay acquired before it went to Microsoft. As an over the top (OTT) service, Skype’s status still isn’t resolved in India, although there is currently a new consultation paper on OTT. I then went to Star in 2008.

Q WHY THE MOVE TO STAR?
A I thought it was natural progression given the blurring of lines between the telecoms, IT and commerce, and the content and entertainment sectors. I thought it was all going to converge at some point. I came in as head of legal, was promoted to general counsel two years later, and I’m also now looking after regulatory and government relations. I have about 60 lawyers in my team.

Q THAT’S A BIG TEAM...
A Yes, most of my group is in India but the breadth of Star is huge here. It’s approaching a $2 billion business and we do entertainment, sports, digital services and distribution. We are primarily a content company but with a digital play now as we are getting into the ‘edge provider’ space. Our main distribution is through cable and satellite platforms owned by other independent companies and this is where the scale becomes apparent – there are about 5,000 multisystem cable platforms around the country, six DTH (direct to home) satellite operators and two HITS – headend in the sky – satellite multiplex services that go to cable firms. We don’t own any infrastructure and the Indian regulatory position is very clear – a broadcaster’s role is content creation and providing access to content; the distribution platforms are entirely different licensed entities, whose only job is distributing the channels provided by the broadcasters. By the way, Star is a wholly owned subsidiary of 21st Century Fox.

Q WHAT ABOUT TERRESTRIAL TELEVISION?
A This is still only government owned in India, by a statutory body (Prasar Bharati) with Doordarshan being the only terrestrial TV network. There is also a DTH satellite service that is free to viewers but which private broadcasters can use for a charge. However, of late it has been struggling owing to competition from private players. Public broadcasting in India is a politically sensitive issue and entirely financed by the taxpaycer. We do need a proper debate about public broadcasting models and how to build a robust public-private partnership model.

Q YOU HAVE ISSUES WITH YOUR PREMIUM CONTENT AND WITH REGULATION GENERALLY...
A Under Indian law, valuable sports content has to be given free to the public broadcaster for its own terrestrial and DTH viewers. However this has led to unintended consequences – as terrestrial television is still analogue and unencrypted, all the private cable and DTH operators in India are able to download the content for free, so they have no incentive to negotiate with the actual rights owners. While they can charge subscribers, they do not have to make any payments to the rights owners. This isn’t about public interest and is a disincentive for investments in such sports. So unfortunately, piracy is rampant here and we have to spend a lot of time combating it. Also, we have to supply all our content at a regulated rate to all distribution platforms on a non-exclusive and non-discriminatory basis, so we lose the ability to effectively monetise our content. So the industry has been reduced to commoditising content and driving down ARPU. Consumers in India get about 300 channels for $5 a month, one of the lowest ARPUs globally. Network profitability is a huge challenge and many firms have had to make a hasty retreat, which does not bode well for investments in content and technology.

Q DO YOU PROVIDE BROAD PUBLIC INTEREST CONTENT?
A We’ve got four English channels but we used to do more. Now the rest of our 30 channels are regional language channels, and also in Hindi of course. We reflect the aspirations of nearly all the states that make up our nation through the kind of
programming that we do and we have taken a lead in addressing key social issues. In particular, we have broadcast ‘Satyamev Jayate’, which translates as ‘The Truth Shall Prevail’, a discussion programme that has covered everything from female foeticide, child sexual abuse, rape, honour killings, domestic violence and untouchability. This has generated huge debate and is not something we do for profit. Recently, we have also broadcast ‘Girl Rising’, about empowering women – 40% of girls here don’t make it into secondary school. We have about 50 million women who watch our flagship Star Plus channel and we need to do more for them.

**Q:** **SO SOME OF YOUR PROGRAMMES HAVE BEEN VERY CONTROVERSIAL – HOW IS CONTENT REGULATED?**

**A:** We have a self-regulatory model, the Broadcast Consumer Complaints Council (BCCC), that I have had the opportunity to set up, working with colleagues in the industry, after much hue and cry was raised on a particular programme where litigation and heavy handed government intervention seemed imminent. The industry entrusted me with the task of poring over several models from abroad and to come up with a proposition that would work with Indian conditions. The BCCC comes under the Indian Broadcasting Foundation and has a 13 member committee headed by a chief justice, representatives from various commissions such as child rights, eminent people from the creative community, and broadcasters – I am thankful to be retained on the committee. What we now want is for our code to be recognised in our cable television act on a statutory basis. I’ve shared insights with other countries and some regulators have expressed appreciation of our model – but I think content is something which governments don’t let go of easily.

**Q:** **WHY IS REGULATION INCONSISTENT IN INDIA?**

**A:** Essentially we have had a purely telecoms regulator [TRAI] that was saddled with the responsibility of regulating broadcasting services, despite the fact that broadcasting was excluded by parliament from the definition of telecoms services. This is why we have got terms like ‘interconnect regulations’ and ‘tariff orders’ that are prevalent in the telecoms sector being applied thoughtlessly in the broadcasting narrative to govern our prices and services. We also have a challenge in that the broadcasting industry has been kept away from the application of the copyright act. Given our inherent functions – broadcasters in India are actually nothing but networks providing content and are not distributors of TV signals – we should be governed by copyright law instead of telecoms regulations, more so as India is a signatory to the Bern Convention. Our copyright act allows content owners and licencees to monetise their creative outputs at rates and terms as they deem fit – but the telecoms style sectoral regulation has taken precedence and suppressed the principal legislation of copyright. The new chair of TRAI, Ram Sewak Sharma, comes from an IT background so I’m hopeful we’ll see more understanding of content and copyright on the part of the regulator in future.

**Q:** **WHAT ABOUT THE INTERNET AND DIGITAL SERVICES?**

**A:** Fixed line internet is very slow in India and mobile data is still very expensive. Earlier this year we launched our ‘edge provider’ app, Hotstar, but it is yet to attain critical mass in the mobile space owing to broadband constraints. There is a discussion paper from TRAI about net neutrality that surprisingly focuses more on protecting the text messaging revenues of incumbent telecoms operators rather than enabling consumers or engaging innovators in the space. Our position is that we support net neutrality but we see no need for regulation on rates or any reason for government interference through statutory or regulatory formulations. Meanwhile the government’s Digital India programme to lay fibre with last mile wireless is way behind schedule. We as pure play content providers would love broadband to pick up as we are platform agnostic.

**Q:** **THE DIGITAL EMPHASIS IS ON TV…**

**A:** Yes, where we have made rapid progress is in digitising cable television – the operators have already digitised 65 million homes with digital set-top boxes and will complete another 35 million by the end of this year and 40 million in 2016. This scale of project would normally take a lot longer, and is only a little behind schedule. It is a success of regulation as we amended the cable television networks act to mandate digitisation in phases. I’m one of the members of the task force set up by the ministry of information and broadcasting that is implementing this digitisation roadmap. But the TV network is not doubling as an internet platform here.

**Q:** **ARE YOU WORRIED ABOUT COMPETITION WHEN INDIA FINALLY GETS DECENT INTERNET BROADBAND?**

**A:** We’ve got a strong proposition with Hotstar. We have 60,000 hours of library content, and create about 150-200 hours of content every month. I’m not saying I wouldn’t be worried about Netflix – it would be a serious competitor. But it will take them an awfully long time to get the kind of library content that we have, and to create content at the pace we do.
Sector specific telecoms regulation evolved when the market was comparatively static and applications were comparatively homogenous. For around a century, telecoms equalled voice, and slow progress was made towards universality, typically under state ownership. Now, markets are in transition to broadband access, including fibre, and applications – including over the top (OTT) messaging applications – are proliferating, fostered by smart mobile devices and ‘apps marketplaces’.

In less developed regions a transition is also underway, but from no service or voice only to mobile broadband access. Globally, mobile access already dominates and its dominance is growing.

Regulatory norms and principles including cost orientation, unbundling and the ladder of investment concept were developed in a comparatively static era. It was also an era in which services equalled switched voice and basic broadband, rather than an increasingly heterogeneous mix of connectivity and applications.

This article considers the implications of this more dynamic and heterogeneous market for regulation, policy and business strategy.

Objectives differ
Policymakers may have comparatively common high-level goals, but nevertheless have different objectives and approaches. For example:

- The US National Broadband Plan of 2010 focused primarily on mobile and the demand side, and did not pursue fibre to the premises or very high-speed broadband targets. In the US, investment has been left to commercial players, with limited regulation.

- In Europe, the objective is universal availability of 30 Mbps broadband by 2020, delivered on a technology neutral basis, and primarily by vertically integrated commercial entities. Regulation was in a state of flux during the period 2010 to 2013, and is under review yet again, in recognition of concern that sufficient private investment to meet the targets may not be forthcoming.

- In Australasia, governments adopted fibre to the premises strategies with substantial state involvement and separation of networks from service provision. In Australia, in response to limited progress, high costs and a review which found little evidence of benefits from deploying fibre to the premises as opposed to copper-fibre hybrid systems, a mixed technology strategy has now been adopted.

It is only possible, therefore, to understand policy differences in the light of consideration of objectives. For example, separation of networks from applications tends to follow a belief in the benefits of investing in near universal fibre to the premises. Substantial investment by the state tends to then ‘cause’ separation, rather than separation causing investment (one might expect separation to weaken commercial investment incentives).

History matters
Markets differ for historical reasons. In some, fixed access is mostly absent. The primary means of delivering connectivity in such markets will then be mobile. The extent of parallel fixed network development also differs with cable, now able to compete with fixed broadband access, in some locations and not in others. Network topography and the quality and availability of duct and pole access also differ, shaping the investment case for fibre to the cabinet versus fibre to the premises.

From an economic perspective the costs and benefits of different incremental investment options will therefore differ for historical reasons. Expecting the same approaches to work, and expecting the same outcomes, in different regions may not therefore be a realistic goal (or it may be a goal whose pursuit would involve substantial costs).
**Networks**

**Changes in Available Technology Are a Common Strand**

What is common globally is technology. At a high level, the payoff from information and communications technology has varied significantly, contributing substantially to growth in some regions and much less so in others (including within Europe). This is a hint that policy matters. Turning to communications markets I focus on two things – the transition underway in access networks and the development of OTT.

**Networks Are Increasingly Local**

In the recent past, networks and applications were tightly coupled, and tended to be thought of as national in actual, or desired, extent. The economics of access network investment and its dependence on history is now making access increasingly local.

Some locations may have fibre, cable and mobile, while others may have mobile or mobile and copper line only. Competition and network performance are therefore heterogeneous and local, and increasingly so. Further, economies of scale at the network level appear limited, with networks servicing small markets faring well on a comparative basis.

**Applications Are Increasingly Global and No Longer Tied to Networks**

OTT applications are not tied to networks, and have global economies of scale. Applications such as WhatsApp, Slack, iMessage, Skype and FaceTime scale globally. This also means that, at a stroke, OTT applications have broken down barriers to cross-border communication and created a single global market. The benefits of this for consumers, businesses and nations individually and collectively are substantial. It is also worth noting that the providers of these applications are minor beneficiaries compared with users.

Content markets have proved more resistant to the rise of OTT than messaging. However, OTT content providers, Netflix and Amazon, have now achieved sufficient scale to commission original content including House of Cards (Netflix) and win rights in competition, including signing the previous Top Gear car programme trio (Amazon). This may prove to be a tipping point.

OTT is therefore separating applications and networks, and also acting to unbundle telecoms bundles that include access, voice and content (the possibility of bundling fixed and mobile access remains, irrespective of OTT).

Some network operators, particularly those that have not adapted their pricing models away from applications and towards access, have found these developments challenging. Here, history also matters with, for example, operators in Asia and Europe more dependent on voice and messaging revenues than operators in the US. Nevertheless, there are signs of progress in adapting network business models. For example, the chief executive of UK mobile operator EE has said the growth of mobile-messaging services like WhatsApp isn’t a threat as the sector’s growth is driven by data-hungry consumers.1

Some have also sought extension of existing regulation to slow the advance of OTT – a protectionist response with little if any basis in terms of the protection of competition and consumers, as opposed to existing competitors. Others, however, have sought the relaxation of specific regulation that is no longer appropriate, and sought to benefit from the increased demand for network access flowing from OTT.

In Europe, the removal of fixed voice origination from the list of relevant markets susceptible to ex-ante regulation was, in part, a response to competition from OTT. Other areas of regulation should also be examined to assess their continued relevance. However, there is a distinction between access and applications, with OTT increasing competition in services but not in access.

**OTT Is Driving Network Demand**

Growth in OTT services has been rapid not just because such services are cheap or free, but because they include new features valued by consumers, such as the ability to work over WiFi, device interoperability, presence, photo and video sharing, and ways of contacting people without the need for a phone number.

The growth in value to consumers from OTT is fuelling increased demand for network access – ubiquitous access to high quality fixed and mobile connectivity. The challenge for operators is turning this demand into revenues – both by adapting their business models and by seeking a reduction in no longer justified regulation.

Some in Europe have in effect argued that demand is bad, as it imposes costs without corresponding payment from OTT providers to networks operators. However, increased demand can be monetised via the consumer market, from those purchasing network access and higher data or speed tiers as their demand grows.2

In India it has been argued that OTT will harm operators, investment and broadband adoption goals since the revenues from the data required by voice and messaging OTT services that replicate existing services will be small in comparison with existing revenues.

However, OTT is not simply a substitute for existing voice and messaging services, but grows overall data demand. Consumers increase their level of communication and they increase the amount of data demanded via, for example, use of video and photo sharing. In the absence of OTT, market growth would be more limited, as would broadband adoption and network investment.

Indeed, without rapid demand growth, network operators would see their revenues shrink. For fixed operators, traffic growth and growth in demand for higher speeds are necessary to forestall substitution by mobile. For mobile operators, traffic growth is necessary to offset the impact of declining unit

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1. Hungry consumers.1

2. Some have also sought extension of existing regulation to slow the advance of OTT – a protectionist response with little if any basis in terms of the protection of competition and consumers, as opposed to existing competitors.
costs – due to increased spectrum availability and more efficient technology (4G and, in future, 5G).\(^3\) Without growth in demand, network access revenues will decline.

To paraphrase the Red Queen in Through the Looking Glass, the industry has to run to stand still, and OTT is the key to doing just that.

**Transition Requires a Different Policy Approach**

Regulators have learned their craft during a period that was comparatively static, at least in relation to fixed networks. Copper access, for the privileged few who have fixed access (globally, only around 20\% of consumer access will be via fixed lines in the near future), was already in place. Adding broadband capability, while ingenious, was not a major undertaking in investment terms.

Now networks and services are in transition, regulation must adapt to facilitate rather than impede the process. Copper is in transition to fibre, and fibre itself is transition to more capable standards (Verizon is exploring PON2, for example). Mobile networks are also in transition from 2G and 3G to 4G, which will be followed by 5G.

Transition involves up-front commitment of capital, and requires flexibility – the opportunity to differentiate price-service, experiment, and earn a return that aligns investor and customer interests,\(^4\) coupled with commitment that the government and/or regulator will not engage in ex-post appropriation once investment is sunk.

The relative price of legacy and new services is important for transition, and it is challenging for regulation to get this right. One option is to relax the constraint on the price of the legacy or new service, with the price that is controlled acting as an ‘anchor’ on the service price.\(^5\) Another – potentially complementary option – would be to rely on long-term contracts rather than ex-ante price controls.\(^6\) These approaches offer consumers protection during transition while leaving the investor to determine the margin between legacy and new services, and to differentiate service prices. First, Ofcom, the UK regulator, and subsequently the European Commission (in its 2013 recommendation on costing and non-discrimination), have supported the anchor product approach for the copper-fibre transition.

**Europe Asks a Question...**

The European Commission has now floated the possibility that regulatory relief would be targeted only at the most advanced next generation access, excluding fibre to the cabinet (see also news item, page 3). This would remove one of the virtues of pricing flexibility – that it promotes efficient technology choice based on an assessment of the anticipated costs and willingness to pay for alternatives. It may also reduce rather than increase investment, because the possibility of a reversal of policy regarding pricing freedom for fibre to the cabinet immediately attracts the attractiveness of investing in it, while the investment case for fibre to the home may not in any case stack up, even with the proposed freedoms.

Transition not only involves new investment, but retirement of legacy network elements and services. Copper may be retired to the premises or cabinet in favour of fibre. However, a high level of adoption is a likely prerequisite and this requires not only network investment but the installation of customer premises equipment in the case of a fibre to the premises deployment.

To facilitate network rationalisation, constraints on notice of closure and relative pricing – instruments that can be used to promote transition – should be the minimum consistent with customer protection. One approach is simply to specify that customers can receive the old service level over the new technology at the prior price – leaving the investor free to determine the price of the legacy service and all other service-price offers on the new technology. This is the approach proposed by the FCC.\(^7\)

Any universal service or other obligations should also be expressed in technology neutral terms so as not to impede migration.

Similar considerations apply to the transition to all-IP service provision in the voice and business services market. In addition to notice requirements there is a risk that price constraints on legacy services may reflect depreciated asset values, thereby lowering the price of legacy services relative to new services and discouraging customer migration.\(^8\) In commercial settings, such as the end of support for Windows XP, continued support for legacy service is a private matter for negotiation between provider and consumer.\(^9\) The same principles should apply in telecoms markets.

**OtT – Levelling Up versus Levelling Down**

As a general rule, regulation should be removed from legacy services rather than extended to OTT. Voice should no longer be price controlled, and coverage obligations for voice should arguably be removed now that broadband access is the basic service building block (emergency calls may constitute a special case). Where social obligations remain, for example in respect of coverage, they should be tax funded rather than industry funded since input taxes are inefficient (the Diamond and Mirrlees result).\(^10\)

Other considerations such as interoperability requirements should arguably differ between legacy communications services and OTT. This is because consumers can use multiple OTT services on a single device and because the costs and benefits of interoperability regulation can be expected to differ between standardised legacy services and an open and evolving ecosystem of applications.

OTT is also more interoperable than legacy communications services in a number of key respects such as cross-network (including WiFi) and cross-device. This raises the question of whether application of a ‘level playing field’ concept would...
see requirements for cross-network and cross-device interoperability imposed on legacy services.

**OTT and an Institutional Fork in the Telecoms Policy Road**

An underlying institutional question is whether the scope of coverage of sector-specific ex-ante telecoms regulation should be extended to OTT, limited to broadband access bottlenecks or eliminated entirely, with ex-post competition law applying to both telecoms and OTT. Given that regulators are finding it challenging to adapt their frameworks to network transition, extending their remit to the even more dynamic domain of applications would arguably be misplaced.

While removal of all ex-ante regulation is a possibility, it is unlikely (at least in Europe), and where it was tried in New Zealand the result, ultimately, was the re-imposition of regulation (in a form involving a disconnect between copper and fibre regulation). Network access bottlenecks are likely to be the focus of continued sector-specific regulation in most jurisdictions.

This leaves as a high-level option a narrowing of the focus of ex-ante sector-specific regulation to access bottlenecks, as and where they occur. In Europe, this could be achieved by changing the scope of the regulatory framework from electronic communications services to network access. This option deserves consideration.

**More Change Coming – Two Technology Wildcards**

The options for providing network access may soon expand from terrestrial fixed and wireless networks to include high altitude platforms – including balloons,12 solar powered planes12 and low earth orbit satellite constellations13 – linked by free space laser links. These possibilities may change the economics of connecting the next few billion internet users – predominantly in less developed countries but also in low density areas throughout the world. Free space optical links may also have terrestrial applications such as mobile backhaul.

Another wildcard with potentially wide ranging implications is artificial intelligence, which is now, after long being disappointing, making rapid progress. Image recognition and translation are now feasible, using neural networks, and many other applications are under development that will impact the telecoms market and wider value chain.

Artificial intelligence will be both a complement to and substitute for connectivity. Applications such as Skype Translate require connectivity to the cloud, while the Google Translate app performs real-time visual translation without an internet connection.14

The growing power of artificial intelligence to ‘understand’ what it sees may also see some internet of things (IoT) applications using video links rather than sensors using very low data rate connections.

Finally, artificial intelligence using neural networks and learning may behave in a manner that is inherently non-transparent. Commenting on Skype Translate, Microsoft CEO Satya Nadella noted that as it learned an additional language it got better at the ones it already knew and that no one knew why.15 In a world of artificial intelligence the concept of neutrality may be difficult to define and apply.

**In Conclusion**

- Key problems for regulation include supporting network transition and how to respond to OTT applications.
- Flexibility is needed on the closure of legacy network elements and services, and over the margin between new and legacy product prices, to promote efficient transition and network retirement.
- In relation to OTT, applying existing ex-ante regulatory approaches to this new and evolving dynamic market would likely prove counter-productive, not only in foregone benefits from OTT but also in foregone demand for enhanced network access.

**Brian Williamson** is a partner at Plum Consulting in London. His broad focus is the transformation of the economy and society via the effective use of ICT, and the strategy, policy and regulatory challenges of convergence.

Email: brian.williamson@plumconsulting.co.uk

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MODERN TIMES

How can children gain vital literacy skills in today’s internet, mobile phone and video game era? AVIVA SILVER says it’s about storytelling.

It was MIT’s Nicolas Negroponte who said way back in 1998: “Face it – the digital revolution is over. Yes, we are now in a digital age, to whatever degree our culture, infrastructure, and economy (in that order) allow us. But the really surprising changes will be elsewhere, in our lifestyle and how we collectively manage ourselves on this planet.”

We live in a world that has changed radically as a result of the rollout of digital technologies. Nowhere is this more apparent than in the development of the media and their permeation of our lives. Their impact is felt most strongly by new generations, whose outlook is shaped by the different media, including social networks, to a greater extent than ever before. Policymakers have become obsessed by ‘digital’ and national, European and international policies are peppered with ‘forward looking’ and technology informed approaches, advocating the teaching of coding in schools and warning of the dangers of being left behind in the digital race.

In this article I refocus the debate on ‘content’ and education. I argue that the general approach to education should be technology neutral. Education should be future proof – it must be based on methods, processes and qualities that will engender curiosity, creativity and the ability to adapt to changing environments and, most importantly, to create new environments. Digital skills are important but are one of many issues pertaining to education – content is the essential element and we need the ability to appreciate, evaluate, criticise, enjoy and demystify it. This should be independent from the media or technology that are used to distribute it. The genuine novelty of digital technologies is enabling users to be creators, reducing the barriers to access and of course facilitating distribution of content.

So any approach should be open and create the necessary conditions for the development of future societal and technological revolutions. I will look at two separate but linked aspects of media literacy and how they are affected by digital technologies:

• The concept of media literacy (defined by the European Commission as the ability of people to access, understand, create and critically evaluate different types of media, i.e. an extension of the classic concept of literacy)

• The concept of education through media (media as a tool for learning and more specifically the use of opportunities flowing from digital developments to enrich formal and informal education).

Media literacy is not a new concept. Organisations such as UNESCO have worked in this field for many years, funding research and promoting concepts. UNESCO issued the Grünwald Declaration of 1982, which recognised the need for political and educational systems to promote citizens’ critical understanding of ‘the phenomena of communication’. UNESCO updated the declaration in 2007: “In the light of globalisation and the explosion of ICTs, the Grünwald Declaration was reaffirmed at the international level by experts (information, communication and media), education policymakers, teachers and researchers, NGO representatives and media professionals from all the regions of the world.”

DEMOCRACY AND HUMAN RIGHTS

UNESCO is also working with UNAOC (United Nations Alliance of Civilizations), an organisation that was created in 2005. One of its projects is the Media and Information Literacy Clearinghouse, which considers that: “Empowerment of people through information and media literacy is an important prerequisite for fostering equitable access to information and knowledge, and building inclusive knowledge societies.”

UNAOC sees media literacy as building on an understanding of the role of media in society as well as essential skills of inquiry and self-expression necessary for citizens of a democracy.

The importance of media literacy in maintaining democracy and human rights is also an element of European policy. The European Commission launched a European policy debate on this in 2006 and put in place a group of experts who drew on experience worldwide and highlighted best practice. This group included members from public bodies and education but also from media industries, and was a starting point.

The EC also enlisted research into various aspects of media literacy: later studies focused on the different levels of media literacy across Europe and the development of tools to assess media literacy levels across a range of ages, education levels, income levels, access levels, and geographic locations. The first EC policy document set out a number of areas where media literacy could be important (commercial communications, audiovisual and ICT).1 This expanded to include the concept of media literacy in legislation (the Audiovisual Media Services Directive).2

One of the more thorny issues is the inclusion of...
considering pilots. Each is developing their own model but centred on a curated catalogue of films. The results demonstrate the impact of film literacy and how such initiatives can achieve wider objectives in public policy.

The education landscape is littered with failed initiatives and schools are filled with pupils disengaged from learning. All teachers and pupils know that trying to bring a text or an idea to life in a classroom, several times a day, five days a week can be a challenge. Sometimes, even the best strategies become tired and ineffective. Exceptions appear to be drama, music, art and a great story which, more often than not, engage most pupils most of the time. It’s not surprising then that a well-chosen film that embodies all of these art forms can almost always immediately engage young people.

Stories have always been the foundation on which learning is built. Film is perfect for storytelling, since it deepens the viewer’s immersion and promotes memorable learning. Film encompasses a huge range of stories across humanity, history, geography and language, so why wouldn’t we want this great educational resource available in schools?

Film clubs go further, creating a shared experience that immediately leads to discussion following the screening. Teacher feedback shows that children who don’t normally speak up in class, an increasing and worrying trend among teenagers, find themselves naturally offering their opinions on the film and its subject matter unselfconsciously.

media literacy in the school curriculum, which has met with resistance from the member states, which want to shape their own education policies. A second group of member state experts was created to look at the issue of media in education.

Media literacy policy is generally based on the notions of empowerment and protection, from identifying propaganda to avoiding cyber-bullying etc. If we look at the research findings, to quote a senior EU official, “Media literacy is like apple pie and motherhood, but it won’t win any votes.” What should we do and why? Cynics might say that rhetoric in member states about the importance of media literacy is not reflected in curriculum policy. Does this matter? I believe it does.

The internet and social media are omnipresent and at the same time ephemeral. The sheer volume of content requires critical evaluation and appreciation. Children need roots and benchmarks to navigate and arrive (safely) at their destinations. How to achieve this? At the same time, the power of images is undisputed. Young children can decipher complex emotions and situations beyond their ability to read. Harnessing this force to empower children is surely a positive step forward.

**GETTING INTO FILM**

There are many projects relating to media or film literacy, working with different ages of children to achieve different aims. One I have followed with great interest is Into Film (formerly Filmclub) in the UK, which now reaches over 430,000 children every week through 12,500 free film clubs in schools, colleges and youth groups. This is a project based on a particular type of content – film. As Beeban Kidron, a co-founder and trustee of Into Film, has said: “I think that stories and the telling of stories is the foundation of human communication and understanding and I think that if kids are watching films and asking questions, then the world will eventually be a better place.”

Film clubs are springing up in many countries. Denmark has long had film clubs and Sweden is trialling them. Film Literacy Europe and its partners are coordinating pilots this year in Romania, Spain and Cyprus, funded by the EC. The Netherlands, Ireland, Poland, Belgium, Lithuania and Greece are...
As Mark Higham, programme director of Film Literacy Europe and former CEO of Into Film, comments: “Watching such a wide range of films coupled with this interplay between pupils attending weekly film clubs, builds confidence, critical thinking and communication skills that filter back into their other subjects and classes, augmenting what they’ve learnt from the films themselves.”

The shared experience and the range of content are what pupils most frequently report they most enjoy – a healthy counterpart to the increasingly atomised and sometimes isolating experience that technology in the home and school can mean. It helps pupils become empowered young people, engaged with learning and their own community with an increased understanding of the world around them. In this case, new technologies enable the delivery of a tailored, low cost service for cultural learning on a large scale to millions of young people. This will still require the support of the film industry and licences for schools but means projects could become large-scale networks bringing curated content to millions of young people.

Film clubs are an excellent example of the value of media literacy and indeed many consider that they should be part of formal education. What about the other side of media education – using media for education? I noted that schools are filled with pupils disengaged from learning, and the power of images and stories. They have never known a world without video games, mobile phones and the internet. Have developments in technology changed the way media can be used for education to reengage pupils and foster creativity?

The rollout of digital technologies has multiplied the content available (leaving to one side questions of concentration). Media consumption, and viewing and user habits, have adapted to this new environment. Increasing power of smartphones and tablets have also had an impact (more than 50% of UK and US households now have a tablet).

ENTER GAME-BASED LEARNING

The meteoric rise of video games in all of their incarnations is a key component for media businesses (and YouTube launched a new app and gaming channel this year to compete with services like Twitch). Video games generated more than $23bn in Europe in 2014. Game-based learning is also growing, at 21%, and will reach $4.8bn in 2019.

Game-based learning is a term now used in preference to ‘serious games’, moving on from the idea that learning should only be serious and not entertaining. Games that promote learning through experience and discovery also applies to adults as well as children.

This is one aspect of how education through media can alter the way in which we teach basic skills such as literacy and numeracy. The idea of interactivity in education is not new – a Chinese proverb states: “Tell me and I will forget; show me and I may remember; involve me and I’ll understand.” The author James Paul Gee, author of a book on video games and their impact on learning and literacy, begins with: “I want to talk about video games – yes, even violent video games – and say some positive things about them.”

The author, who is an American professor of education, looks seriously at the positive outcome (from an educational point of view) of playing video games.

Take ‘Professor S.’, one of the first of a new generation of learning games focused on storytelling, from German firm LudInc. Third and fourth graders explore schoolwork through an interactive time travel web series. The game unfolds over the course of up to two school years, transforming each class into one big adventure. The series contextualises learning content, combining the story of Professor S. with children’s real life experiences. Pupils are immersed in an entertaining and mind-enriching narrative, giving a lasting learning experience.

One reason for picking this example is that the game features a media library in which each piece of content is handpicked by experts specifically for the target age group. Films, games, books and merchandise all serve a single purpose: intelligent entertainment. This is a key point – there is so much content that selecting (curating) and transforming it into educational use is arduous.

But the online explosion of media has created a massive demand for age appropriate and high quality, curated content, both from education (schools and teachers) and also from parents and families. This ties in with the film club concept and the need for shared experiences to create memorable learning.

And this brings me to a firm conclusion about content and technology. Content is at the heart of shared experiences be it film, games or education. New technologies can and should be used to serve public policy and indeed for entertainment but without the stories and the shared experiences technology has no meaning and no purpose.

Keep telling stories!

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Over the past three years, hundreds of experienced and knowledgeable radio spectrum experts have met on a regular basis under the auspices of the International Telecommunications Union (ITU) and expended thousands of hours of effort discussing and debating material that will inform attendees at this year’s World Radiocommunications Conference (WRC-15). The WRC is the culmination of this effort and takes place for four weeks this November at the ITU headquarters in Geneva, at which attendees from the world’s national spectrum regulatory agencies will together expend many more thousands of hours of effort to consider and agree revisions to the ITU Radio Regulations (RR). The RR set out, for the whole planet, which particular radio frequencies should be used for which purposes.

In addition to national regulatory authorities whose views and votes are the only ones that count when deciding on changes, many organisations that use radio spectrum will also attend and try to ensure that any decisions that are taken are to their liking. While many people might feel that spending such a large amount of effort on such a seemingly obscure document may appear to be a waste of time and money, the RR are of crucial importance in determining how wireless services across the world will develop. The situation is not the same for the whole planet, however, as the ITU divides the world into three regions:

- Region 1 comprises Europe, Africa and the Middle East
- Region 2 comprises North, Central and South America and the Caribbean
- Region 3 comprises Asia and the Pacific.

But as radio signals do not stop at international borders, there is need both for coordination between neighbouring countries, and between the neighbouring ITU regions, hence the need for all three regions to meet at the same time. In addition, having the same piece of spectrum harmonised for use by the same service across the globe offers both enormous economies of scale, and reduces the potential for cross-border interference.

Notwithstanding this desire for a harmonised approach, according to Article 4.4 of the RR any country can use any piece of radio spectrum for any type of service that it chooses, but it can only do so as long as it does not cause interference to neighbouring countries and equally, it must accept any interference that is caused by any services in neighbouring countries that are operating in accordance with the RR. So in the majority of...
AGENDA FOR WRC-15

The topics under discussion at this year’s WRC were agreed at the previous WRC in 2012, and are defined by a series of agenda items. Some of the topics on the agenda are relatively non-contentious insofar as most countries support similar outcomes. For example, agenda item 1.5 is aiming to get agreement that certain satellite spectrum can also be used for controlling unmanned aircraft systems (UAS), better known as drones; and agenda item 1.11 is seeking more spectrum for earth observation satellites. While it is true to say that no changes in spectrum use are non-contentious, some matters are easier to agree than others if the majority of countries and spectrum users recognise the overall benefits of change.

Three of the agenda items, however, appear to have generated the vast majority of pre-conference activity and are likely to spawn most discussion during the conference itself. In particular:

- Agenda item 1.1 is seeking to identify more spectrum for mobile broadband services (known at the ITU as International Mobile Telecommunications or IMT)
- Agenda item 1.2 is seeking to ratify the allocation to IMT of spectrum between 694 and 790 MHz, which used to be allocated to broadcast television services
- Agenda item 10, which sets the agenda for the next WRC (expected in 2019), will discuss even more spectrum for IMT.

PATTERNS AND USE OF MOBILE SPECTRUM

<table>
<thead>
<tr>
<th>REGION</th>
<th>AREA</th>
<th>TOTAL IMT SPECTRUM POTENTIALLY AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Europe, Africa and the Middle East</td>
<td>1025 MHz</td>
</tr>
<tr>
<td>2</td>
<td>Americas and Caribbean</td>
<td>955 MHz</td>
</tr>
<tr>
<td>3</td>
<td>Asia-Pacific</td>
<td>1025 MHz</td>
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The ITU argues that any mobile network should be designed for the ‘worst case’.

All of these agenda items are concerned with finding additional radio spectrum for (commercial) mobile telecoms networks. As of the last WRC, the amount of spectrum already identified and available at the ITU for IMT services across the three regions is in the first table below. Not content with this, the IMT industry has, over the past few years, pushed for even more spectrum. An ITU working group that considered how much spectrum will be needed for IMT services by the year 2020 has predicted that between 1320 and 1960 MHz will be required (see Report ITU-R M.2290, ‘Future spectrum requirements estimate for terrestrial IMT’). The difference between the lower and higher limits are a consideration of low and high traffic density (e.g. the amount of data that users will consume and how many users will be contained within a given area).

GSMA’S FOCUS ON SPECTRUM

As WRC-15 approached, the GSMA, the industry body for all IMT operators, has narrowed its focus on spectrum that it sees as being the lower hanging fruit for reallocation for mobile services, and has now homed in on the following bands:

- 470–694 MHz – this is the remainder of the UHF television broadcasting band, still in heavy use for digital (and analogue) services in many countries
- 1350–1518 MHz – this spectrum is often governmental and used for fixed links
- 2700–900 MHz – this is an aeronautical radar band, and while in heavy use in some countries, in many there are no radars in this frequency range
- 3400–4200 MHz – this is the satellite C-band used for downlinking from over 150 satellites globally, especially in areas of high rainfall where other frequencies do not function effectively.

But those who currently use this spectrum (e.g. broadcasters, governments, air traffic controllers and satellite operators) have often already given up substantial amounts of spectrum to the mobile industry and are not keen to relinquish yet more. They argue that the IMT industry (and the ITU) have not categorically proven the need for more spectrum. In particular, the European Satellite Operators Association (ESOA) and the European Broadcasting Union (EBU) have disassembled the ITU’s spectrum forecasts and found that the values used in predicting the amount of data traffic far exceed any reasonable forecasts, including those put forward by the mobile industry itself.

The middle table shows population density values (people per square kilometre) contained in the ITU’s predictions and values for Japan, Russia and the UK based on alternative recognised sources. Similar large disparities exist between the amount of data that the model assumes each user generates per month, and the predictions by bodies such as the UMTS Forum and Cisco. It can be seen that even the ITU’s values for suburban population density far exceed the urban population density.

The EBU, ESOA and others claim that the values provided by the ITU’s study group are so high as to be completely unrealistic and may only apply in the most densely populated square kilometre on the planet. They further argue that decisions on spectrum for the whole world should not be taken on such a basis. As an example, they say that the population density value used by the ITU model for urban areas is so high that it equates to putting the entire population of the US into an area the size of Paris. The ITU study group, on the other hand, recognises that its figures are on the high side, but argues that any mobile network should be designed for the ‘worst case’ in...
order that it will then be able to provide a service under all conditions. Whether or not the spectrum requirements for downtown Tokyo on a busy holiday afternoon is applicable for downtown Dar es Salaam is an issue that attendees at the WRC will need to consider.

Satellite operators, the military, broadcasters and others are not convinced that the IMT industry has proven that it needs more spectrum. They argue that developments in technology (such as 4G and, by 2020, 5G), together with an increasing amount of offloading of wireless data onto WiFi will mean that the mobile industry will be able to cope with what some have termed the ‘data tsunami’ for many years to come without access to new spectrum.

But this is not the end of the matter. The same ITU model was used in 2007 to predict both the amount of mobile data that would be generated in the period to 2015 and also the amount of spectrum that would be needed. At that time (2007), the model showed that by 2015 the amount of spectrum that would be needed for IMT services would be 1300 MHz (see Report ITU-R M.2078 ‘Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced’). It also estimated annual mobile data demand growth over the same period. By 2015, the amount of spectrum actually being used by mobile operators was far less than the ITU demand figures, yet the amount of data being carried by those networks was far in excess of the ITU forecast.

As an example, for the three ITU regions, the amount of spectrum that has generally been licensed to mobile services is shown in the third table. The amount of spectrum being used by mobile operators was far less than the ITU demand figures, yet the amount of data being carried by those networks was far in excess of the ITU forecast.

As an example, for the three ITU regions, the amount of spectrum that has generally been licensed to mobile services is shown in the third table. The amount of spectrum being used by mobile operators was far less than the ITU demand figures, yet the amount of data being carried by those networks was far in excess of the ITU forecast.

## Actual Licensed Spectrum

Notable here is that the amount of spectrum that has been licensed is, in most cases, far below that which the ITU has identified for IMT and even further below the original forecasts. This appears to be down to two reasons:

- First, the spectrum identified by the ITU is not vacant. It is being used by a series of incumbent services such as broadcasters and government users. As such, it takes a degree of time for regulators to gain agreements to ‘re-farm’ this spectrum and make it available for mobile services. Some regulators are better at this than others. Even when the re-farming process has been agreed, it can take a long time for regulators to move the incumbent users out of their spectrum and then an equally long time to run award processes (eg. auctions) that allows mobile companies to gain access to it.

- Second, mobile networks are operating far more efficiently than the ITU predicted. Spectrum efficiency is higher and the number of cell sites is also higher, meaning that networks are able to deliver more data capacity in less spectrum. The impact of people offloading traffic onto a WiFi network when they are at home, or in a public hotspot, may also have impacted the actual traffic being carried on mobile networks.

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**Mobile networks are operating far more efficiently than the ITU predicted.**

As an example, the 2100 MHz 3G mobile band was identified for IMT services by the ITU at the 2002 WRC. Many countries have managed to re-farm this spectrum and license it to mobile operators, but in Africa, for example, it is estimated that 30% of countries have still not licensed this spectrum. Conversely, consider the case of the 700 MHz band. It was proposed as a mobile band at the last WRC in 2012 and will be ratified as such at the forthcoming WRC, but it is now licensed and will shortly be in service in a handful of countries, having taken less than three years to go from identification to licensing to usage.

## Weighing up the mobile case

The fact, however, that it has taken over 13 years to get some mobile spectrum from an identification position at the ITU to putting it in use, is exactly the reason that the likes of the GSMA argue that if we are to avoid a future mobile spectrum shortage, decisions over spectrum usage have to be taken now. But if regulators are struggling to convince incumbent spectrum users to clear out of mobile bands that have been identified for ten years or more, it is not going to solve any of their problems if even more bands are identified. The newer bands, having taken longer to identify and study, are more difficult to re-farm than those already identified. Some countries, especially those with a weak regulatory authority, and which already feel mildly embarrassed about their inability to re-farm spectrum for IMT services, will be left with even more egg on their faces as the amount of spectrum they have managed to license is an even smaller percentage of that identified.

To make matters more contentious still, the mobile industry is also developing the next mobile technology, 5G. While it is too early to fully know what 5G might consist of, the industry is trying to carve out a home in the radio spectrum for it. Having recognised that there is little below 6 GHz that has not been studied for possible mobile use, attention is turning to higher frequencies and in particular those above 10 GHz. As with the lower frequency bands being contended at the WRC, these bands are not vacant and are used by many of the same parties that are being put under pressure for mobile spectrum below 6 GHz, ie. government, transport and satellite operators.

These parties argue that if the focus for new spectrum is above 31 GHz (ie. avoiding the spectrum between 10 and 31 GHz), then there is enough relatively free spectrum for 5G and it would not impact their existing operations. There is therefore potential for a compromise here (about as near to a ‘win-win’ as it gets at the ITU). If 5G proponents are willing to stick to new frequencies above 31 GHz, the majority of the objectors would be (relatively) happy.

So what should the administrations attending WRC do? Should they throw their weight behind the mobile industry and forge ahead with identifying new spectrum for IMT services? Or should they take a more conservative approach and delay any decisions on new mobile spectrum until such time as the IMT industry has unequivocally proven its need, given that incumbent users have needs too? Much will depend on national circumstances. Countries that rely heavily on the IMT industry for jobs and wealth creation (eg. those with major manufacturing bases such as South Korea, Japan, China and the US) will no doubt be pressing hard for more mobile spectrum. Those that place more emphasis on the use of the spectrum for some of the other services such as broadcasting, satellite and government will take a different stance. As always, the discussions at the WRC will be long, heated and drawn out but the outcome, whatever it may be, will be worth the effort.

Richard Womersley is director of spectrum consulting at LS telcom, Germany, and co-author of the new book, Understanding Spectrum Liberalisation (CRC Press). See istelcom.com
The terrestrial broadcasting industry came under severe pressure some eight years ago when mobile services started to capture spectrum ranges previously used for the delivery of terrestrial TV and radio services. In 2007 the World Radiocommunication Conference (WRC-07) allocated the 800 MHz band to mobile on a co-primary basis. Three years later Germany was the first country in Europe to auction off the band. Soon after, the first mobile networks were rolled-out. This spectrum allocation was a shock for broadcasters in Europe, which were still savouring the results of the Regional Radiocommunication Conference, RRC-06, which had given them a great plan for digital terrestrial broadcasting in Europe.

However, history repeated itself at WRC-12 when the 700 MHz band was given to mobile on a co-primary basis, this time without even a corresponding agenda item. To many broadcasters and administrations, this came out of the blue. Just recently 700 MHz has been auctioned off in Germany, which again was the first European country to do so.

Since 2012 there has been a debate about the rest of the UHF band. WRC-15 has Agenda Item 1.1, which is looking for even more spectrum for mobile services – and it is no surprise that the remaining part of UHF between 470–694 MHz has been proposed as a candidate band.

But there seems to be wide agreement in Europe that this remaining UHF band should be kept exclusively for terrestrial broadcasting. Yet, companies such as Ericsson and Nokia and organisations such as the GSMA have been lobbying heavily to make 470–694 MHz available to mobile services. They are supported by the administrations of the US, Canada and Mexico.

The argument is that it is vital to mobile network operators to get access to this band to cope with future traffic demands. But there seems to be doubt about this claim among many organisations in Europe as no quantitative evidence has been provided to support it.

**Distribution of Broadcast Services**

Traditionally, broadcast services have been delivered to users by terrestrial broadcasting networks. Analogue transmissions have been superseded by digital transmissions and now the second generation of digital terrestrial broadcasting (DVB-T2) is being deployed across Europe.

But broadcasters have been adopting other distribution options for their audiovisual content, such as satellite and cable networks, as soon as they become available. With the advent of broadband networks, radio and television programmes can be accessed through fixed and mobile networks as well. Indeed, the internet has opened a door for broadcasters to offer more and innovative new services. The integration of social networks has
become an indispensable tool for most broadcasters in the meantime.

As no distribution option can reach all potential users and carry all services, broadcasters cannot rely on a single distribution option to get their content to users. Rather, most of them are employing several distribution channels – and some feel driven to make use of any distribution technology and to be on every new platform.\(^1\) However, using multiple distribution options at the same time is a challenge for broadcasters as it increases complexity and costs. Whatever broadcasters decide to employ as distribution options, there are several basic requirements. In particular for public service broadcasters, issues such as the possibility to provide services free-to-air across large areas to a large concurrent audience without impairing the service quality is absolutely crucial. Moreover, public service broadcasters are strictly regulated in terms of what they can offer and what coverage they need to achieve. Hence, the reach in terms of the extension of geographical coverage areas together with the question of what user devices and usage environments are targeted are vital issues.

In fact, terrestrial broadcasting is the only distribution option which is able to fulfil most of the requirements of broadcasters for linear services. Indeed, terrestrial broadcasting is the only option for free-to-air services in all countries in Europe. There are countries where satellite is also (still) free-to-air such as Germany and the UK but usually the satellite signal is encrypted and services are offered on a free-to-view or subscription basis. Furthermore, terrestrial broadcasting by definition is meant to serve the needs of broadcasters and hence there are no third-party gatekeepers, such as in broadband distribution. Moreover, digital terrestrial television (DTT) supports a unique European broadcasting model which promotes the co-existence of public service and commercial broadcasters, and is the largest source of investments in the local (European) TV content market. Therefore, terrestrial broadcasting remains a vital component in the competition between different distribution options.

**RELEVANCE OF MOBILE NETWORKS FOR BROADCASTERS**

With the increasing importance of smartphones and tablets it became clear to broadcasters that there is a need to assess options to deliver their services to these devices. This includes linear TV as well as nonlinear content such as on-demand TV, catch-up TV, hybrid audiovisual offers and social networks. Nonlinear content offers are mostly requested by a limited number of users at the same time in a given area. To this end, unicast delivery across broadband networks seems to be a viable option to deliver these services as long as the question of costs on the side of broadcasters and users can be controlled.

However, there is an issue with linear audiovisual services on portable and mobile devices. Smartphones and tablets do not contain a broadcast receiver, so they cannot directly access content through terrestrial broadcast networks. On the other hand, mobile networks as of today do not support large audiences requesting the same linear TV stream at the same time in a given area.

The European Broadcasting Union (EBU) has published several technical reports on these issues. By considering the variety of different services broadcasters are already offering or intend to offer in the future, and user habits and expectations for broadcast content, the EBU has developed a methodology to assess distribution options that can meet broadcaster’s requirements.\(^2\)

The core element of this methodology is the investigation of ‘use cases’, which are defined by three elements:

- Service, such as linear TV or on-demand TV
- Device (TV set, laptop, smartphone or tablet)
- Environment, say at home or at the airport.

Examples of use cases for broadcasters are the combination of ‘linear TV – at home – large TV screen’ or ‘on-demand TV – in a public place – tablet’.

The analysis shows that there are relevant use cases which can be enabled by existing distribution options, such as the first of the above examples. However, there are also many relevant use cases for which no satisfactory solution can be found, either because there is no technology that would meet all requirements of broadcasters, such as supporting large concurrent audiences, or the distribution costs seem to be prohibitively high.

This has been confirmed by another – and unprecedented activity – of the EBU over the past two years. The EBU invited the mobile community to work together with European broadcasters on the question, ‘What can LTE [4G] do for broadcasting?’ Many manufacturers joined in but there was not a single network operator that was willing to participate. The results of these intensive discussions are presented in a public report.\(^3\)

Starting from the relevant use cases as described above, the main finding is that state-of-the-art LTE is currently not capable of fulfilling all broadcasters’ requirements. From a technical point of view, the examined use cases could in principle be enabled by LTE eMBMS (multimedia broadcast multicast services) but further development is needed. The technical standard would require substantial modifications such as:

- Larger cyclic prefixes to allow for high-power-high-tower downlinkonly distribution of linear TV across large areas
- The possibility of using an entire LTE carrier for eMBMS thereby removing the 60% limitation
- The capability of SIM-card free reception of free-to-air audiovisual content

No consensus could be reached with respect to conceivable costs of distribution of broadcast content over LTE networks. One of the reasons is that DTT and LTE networks cannot be easily compared as they are optimised for different purposes. DTT networks offer a given number of
linear TV programmes within a given area for particular receiving conditions at a prescribed quality of service independent of the size of the concurrent audience size.

LTE networks carry many different services, so their capabilities need to be adapted correspondingly. However, under the assumption that LTE networks would replace distribution over DTT networks completely, it seems to be evident that at least for the case of linear TV there is a significant increase in distribution costs compared with terrestrial broadcast networks. This is due to the fact that roughly 100 times more transmitting stations are needed for cellular distribution than in high-power-high-tower networks.

Furthermore, there is an issue with business models and regulation. From a public service broadcaster’s perspective, free-to-air distribution lies at the core of any distribution strategy. This is not the choice of the public service broadcaster – rather, it is usually a legal obligation. Clearly, from the perspective of mobile network operators this is fundamentally in conflict with their current business models. They would probably welcome premium content of public broadcasters on their networks but only as long as they could directly monetise it in terms of subscriptions or particular pay-per-view schemes.

In many countries broadcasting is subject to special double regulation. There is regulation that governs transmissions and spectrum usage and at the same time there is content or media regulation which determines what kind of content can be offered by terrestrial broadcasting. If mobile network operators turn into service providers by offering broadcast content themselves, they would become subject to media regulation as well.

SPECTRUM REQUIREMENTS OF BROADCASTING SERVICES

From a broadcasting perspective it is clear that any attempt to further split off more spectrum from the remaining part of the UHF band, i.e. the range 470–694 MHz, will get terrestrial broadcasting into even bigger trouble. It is true that more efficient coding technologies such as HEVC or its successors will further reduce the amount of spectrum needed to carry a TV programme. But on the other hand, to stay competitive with other distribution options it is necessary to offer more and higher quality content on terrestrial networks. Without doing a detailed analysis here, it is quite likely that this may offset any future performance boosts of new broadcast technologies.

It is not just the broadcasters that have this view. Rather, both the CEPT (European Conference of Postal and Telecommunications Administrations) and the European Commission have put this perception in statements.

The EC has recently published its policy objectives for the WRC-15, saying:“

“Considering the importance of the lower part of the UHF band for broadcasting, there is a need to ensure that WRC-15 allows sufficient spectrum to be retained, in the Union, for terrestrial provision of audiovisual media services in the 470–694 MHz band. This is in line with Article 7 of Decision 243/2012/EU which requires member states, in cooperation with the Commission, to aim at ensuring that there is sufficient spectrum available for satellite and terrestrial provision of innovative audiovisual media services to Union citizens, considering also that half of European households currently receive broadcasting through terrestrial services and that broadcasting in Europe currently relies heavily on the 470–694 MHz band.”

The Radio Spectrum Policy Group (RSPG) of the European Commission underlines this in an opinion on the UHF band:“

“RSPG recognises the importance of the DTT platform and the need to provide certainty for investments in broadcast infrastructure. Therefore RSPG recommends that the frequency band 470–694 MHz shall remain available for DTT in the foreseeable future, i.e. 2030.”

In the first half of 2014 the EC invited high-level representatives of stakeholder industries to exchange their views in the so-called high-level group, chaired by Pascal Lamy, with the aim of providing strategic advice to the EC on UHF spectrum. The work ended with the publication of the so-called Lamy Report, which makes very clear statements about the future usage of the UHF band:“

“In most EU member states DTT represents the backbone of the European audiovisual model. It will continue to play an essential role as a major distribution platform for the foreseeable future. Its sustainable development is dependent on spectrum in the UHF band, which gives it capacity to further innovate and develop and thus to remain viable and competitive.”

The CEPT position with respect to a co-primary allocation of the entire UHF band for the mobile service is also clear. No co-primary allocation shall be accepted – at least not at WRC-15. There may be many reasons for this, but one issue has outstanding importance. Currently, the migration from DVB-T to DVB-T2 takes place in Europe. Investing in new network infrastructure requires a stable economic and regulatory environment. A co-primary mobile allocation at this point in time would certainly be a disastrous signal to the broadcast industry, simply because broadcasters have learned their historic lessons. Irrespective of any promises along the lines of ‘a co-primary allocation does not mean usage by mobile networks’, it turned out that whenever there was a co-primary allocation, shortly afterwards the corresponding frequency range was cleared from broadcasting to be used by mobile networks. Consequently, any broadcast network operator would carefully need to assess further investments in terrestrial broadcast networks in case the whole UHF band is going to be co-primary for mobile.

Moreover, there is much political pressure to release the 700 MHz band from broadcasting by around 2020 in the whole EU. Transition from DVB-T to DVB-T2 is part of this process and forces broadcasters and viewers to make substantial investments. In addition, the release of the 700 MHz band presumes unbarred access to the entire 470–694 MHz band for broadcasting to accomplish the required changes of channel assignments of TV transmitters. A mobile allocation below 694 MHz would most likely disrupt this process and lead to delays in releasing the 700 MHz band.

Even though it appears as if the lower UHF band is safeguarded for the time to come there are already new dark clouds on the horizon. They approach under the label of 5G, the next level of mobile communication. The European Commission is engaged in shaping the future European communication infrastructure by funding R&D in many areas of 5G.

Spectrum requirements for 5G focus at the moment on frequencies above 6 GHz. Broadcasters need to carefully observe what proposal will be made for WRC-19 as they also make use of many bands above 6 GHz for satellite broadcasting, electronic news gathering, and fixed links for content contribution or portable cameras. But 5G is supposed to provide very high data rates, which can only be reached if large chunks of spectrum are used. These may indeed be found above 6 GHz.

When looking below 1 GHz it turns out that the entire spectrum allocated to mobile networks is
licensed in pieces of 5–10 MHz, which does not seem to be too attractive for 5G. However, the 470–694 MHz band constitutes a chunk of 224 MHz, which could be tailored to suit the needs of 5G. Therefore, broadcasters need to be aware of the possibility that the debate about the lower UHF band will come back with renewed intensity.

SPECTRUM REQUIREMENTS FOR MOBILE

Spectrum requirements for mobile services are targeting broadcast spectrum, among others. From a broadcast perspective it is therefore crucial to seriously analyse the spectrum requirements put forward by mobile proponents. Regulators and policymakers would be well advised to have a critical look as well.

The current European spectrum policy is based on a demand of 1200 MHz of spectrum for mobile services until 2015. This is in line with the claims of an ITU report published in 2006. However, in the meantime former supporters of this target seem to have adopted a more realistic view. Indeed, there are doubts in Europe that the spectrum requirements put forward by the mobile industry are justified.

The European Commission expressed the view that: “Based on the analysis of spectrum supply and demand, the Commission believes there is currently no need for additional spectrum harmonisation, beyond the 1200 MHz target, in the range 400 MHz – 6 GHz for licensed wireless broadband. The level of under-utilised spectrum for mobile broadband is still significant – approximately 30%.”

The EC RSPG supports this: “The total amount of spectrum already available in Europe for wireless broadband services is nominally 1701.50 MHz comprised of 990 MHz for terrestrial applications, 173 MHz for satellite based broadband and importantly 583.50 MHz for WiFi-type applications. In order to meet the intermediate target in the RSPG radio spectrum policy programme to make at least 1200 MHz of spectrum available for wireless data traffic by 2015, taking the terrestrial component alone would require at least 210 MHz of additional spectrum to be re-allocated to wireless broadband.”

The latter analysis had been published before two more spectrum ranges became available for mobile services. These are the bands 694–790 MHz and 1452–1492 MHz. In total, this gives 136 MHz leaving a minimum gap of just 74 MHz.

Finally, the Lamy report comes to the conclusion: “Noting the recent assignments in the 800 MHz band, the 700 MHz band is not immediately needed for mobile services.”

In 2014 the ITU published a report that contains estimated global spectrum requirements for mobile services for 2020. However, these spectrum requirements have been fiercely criticised by representatives from the broadcast and the satellite industry.∗∗

The criticism focuses on several issues. First, the mobile community put forward prediction methodologies which are not credible from a scientific point of view. The future figures for global traffic growth in mobile networks have been predicted by fitting polynomial curves to the historical data and then extrapolating up to the year 2030. Apart from the fact that by definition polynomials steadily grow thereby not allowing for saturation or decline, the analysis lacks proper modelling of all the factors that may drive or inhibit the traffic growth. This refers in particular to any economic considerations. The ability and willingness of users to pay for new services is key to future traffic development trends, as is the commitment of network operators to invest in their networks. Other inhibitors which are not properly considered are the potential availability of better coding in the future and traffic offloading to other networks.

UNREALISTIC ASSUMPTIONS

Furthermore, the traffic forecasts are based on highly unrealistic assumptions about future demand such as user densities in some cases exceeding 200,000 users/km², data rates above 400 Mbps for some applications and high mobility assumed in the home and in the office.

Global spectrum demand has been derived from the predicted global data traffic figures. However, the link between the two is not clear. Indeed, there is no one-to-one correspondence between traffic and spectrum demand. In fact, network configuration plays a crucial role in the capability of the network to deal with traffic. Deploying more base stations is a very efficient way of increasing network capacity without the need for additional spectrum.

Deriving global spectrum demand from predicted global traffic does not provide any relevant information at all. Even if in some areas of the world such as Asian capitals there may be a tremendous growth of traffic and consequently a high demand for spectrum, this has no impact on what happens in the middle of France or Germany. Spectrum demand depends on location and time. Consequently, a global spectrum demand figure is useless from a practical point of view. Admittedly, it proved to be a very successful lobbying tool for global spectrum allocation and harmonisation to the detriment of broadcasters.

Interesting insight into the relation between traffic growth and spectrum requirements can be obtained by looking at the mobile market in the US. Verizon, the mobile network operator, had a market share of 34% in Q3 of 2014 in number of subscriptions. Assuming that traffic is equally distributed between operators this corresponds to 34% of US data traffic going across Verizon networks, and 79% of Verizon’s data traffic has been delivered over its LTE networks. Thus, about 26% of total US data traffic has been carried by Verizon’s LTE networks. At the same time these Verizon LTE networks were using just a total of about 40 MHz of spectrum. So in the US 26% of mobile traffic is carried by 40 MHz only.

Hence, one could argue that it should be possible to carry the
entire traffic by $4 \times 40 \text{ MHz} = 160$ MHz, to make a generous calculation. Allowing for guard and duplex bands one could arrive at 200 MHz or even 250 MHz. However, this is almost an order of magnitude less than the spectrum requirements published in the ITU’s report.

A recent study suggests that the FCC has significantly overestimated the spectrum demands for mobile, according to one commentator, and it should ‘own up’ to errors and devise realistic forecast models, as spectrum is a precious national asset which has to be managed carefully.\(^\text{18}\)

**CONCLUSION**

The mobile sector is constantly repeating its mantra that more spectrum is needed for mobile networks to cope with future traffic growth. A glance at different markets around the world tells that there seems to be a huge gap between this claim and reality. Apparently, mobile network operators are able to cope with data traffic demands and still make good profit with the spectrum they already have. Furthermore, there is a lot of spectrum which has been allocated to mobile services but has not been licensed yet, leaving it unused.\(^\text{19}\) Therefore, the question arises why the mobile industry is pushing so hard to get hold of even more spectrum all over the world.

There may be many different explanations, but with regards to the spectrum bands broadcasting is using for terrestrial delivery of its services, some special issues seem to be important. A general observation is that mobile operators seem to have realised in recent years that providing connectivity alone is no longer a futureproof business model. Hence, they are pushing into the market of offering audiovisual services, becoming service providers themselves.

This conjecture can be supported by analysing corporate mergers which took place during recent years or are about to take place:

- US mobile network operator AT&T and the world’s largest TV satellite operator and PayTV provider DirecTv are about to merge\(^\text{20}\).
- There are rumors that TV satellite operator Dish and T-Mobile will combine\(^\text{21}\).
- In Germany, Vodafone bought TV cable network operator Kabel Deutschland\(^\text{22}\) and in Spain it acquired the leading cable TV operator Ono\(^\text{23}\).
- Telefónica has acquired Spanish pay TV provider DTS\(^\text{24}\) and a majority stake in France’s Canal+\(^\text{25}\).
- There is speculation that Vodafone may bid to acquire Sky, one of the largest European pay TV operators.\(^\text{26}\)

The intention behind all the mergers is evident. Mobile network operators want to integrate different infrastructure, ie. mobile networks, fixed networks and satellite, and try to establish access to audiovisual content, preferably via existing profitable pay-TV platforms. This allows the control of distribution and the offer of attractive content.

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Broadcasters are a persistent obstacle for mobile network operators in their effort to further expand in the audiovisual market. They generate, aggregate and offer premium content making use of dedicated distribution paths such as terrestrial broadcast networks and they still reach a huge audience with their programmes.

Mobile operators would welcome the premium content produced by broadcasters to be made available on their mobile and other networks but they have no intention of offering it on a free-to-air basis. Instead, they want to take broadcast content and monetise it through subscription, or even better, pay-per-view schemes, which may be an attractive part of future audiovisual content offers.

However, the perception that mobile network operators would like to take over the task of broadcast network operators, ie. replacing terrestrial broadcasting by delivery over mobile networks, is wrong. There is absolutely no sign anywhere that they would show any interest in doing so. Actually, within the current mobile network operators’ business models the required investments in mobile networks to satisfy the requirements of broadcasters such as the obligation for free-to-air audiovisual content provision would not be viable.

In summary, all this seems to indicate that the major incentive to get hold of the entire UHF band is not shortage of spectrum but rather the attempt of mobile network operators to get rid of a powerful competitor (ie. the broadcasters) in their effort to gain ground in the hard-fought market segment of audiovisual content provision.

**ROLAND BEUTLER** is a strategist in programme distribution at Sudwestrundfunk (SWR), Germany’s south-west regional public broadcaster. He is active in several groups at the European Broadcasting Union and iTU and has published books on frequency and network planning for digital terrestrial broadcasting systems.

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**REFERENCES**

- **Distribution option or Technology refers to the physical network of delivering content. This encompasses terrestrial, cable and satellite networks. However, fixed and mobile broadband networks also belong to distribution options. This is in contrast to a platform, which consists of two elements, ie. a service or a set of services that is offered together with a piece of hardware or software necessary to access the service. The platform operator does not necessarily need to operate a physical network. There are platforms on traditional broadcast networks such as a pay-TV platform on cable or satellite. Well-known internet platforms include Netflix and Apple TV.**

- **In Germany, Vodafone bought TV cable network operator Kabel Deutschland\(^\text{22}\) and a majority stake in France’s Canal+\(^\text{23}\).**

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lummeting electronics and communication costs have set the stage for a rapid expansion of the internet of things (IoT) – the many everyday physical items that now have sensors and network links, enabling them to remotely share data about themselves, their users and environment. In the next decade, technology companies and consulting firms expect tens of billions of IoT devices to be deployed, with an annual economic impact in the trillions of dollars.

Companies manufacturing IoT devices are only one part of a broader ecosystem of organisations developing the IoT. The data created by devices can be shared via communications networks, platforms (including social media sites), and accessed and controlled by third-party applications – often running on users’ smartphones (which themselves contain an increasingly diverse range of sensors).

This article examines the concepts, technologies, and societal changes influenced by the IoT and related technical developments – which include convergence, cloud services, data analytics, the proliferation of sensors, measuring and monitoring humans, machines and things – that are leading to a shift from human-to-human communications, to machine-to-machine and everything-to-everything communications.

The purpose is to raise awareness among the ICT regulatory community of the changes led by the advent of IoT, examining the challenges and opportunities to understand how this is impacting consumers, businesses, governments and society at large. The most important regulatory implications are in licensing, spectrum management, standards, competition, security and privacy.

IoT Concepts and Deployment

The ITU’s definition of the internet of things (IoT) is: “A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.” This refers to the network of remotely linked tags, sensors and actuators (motors and other mechanisms to cause an action within a device) that are increasingly being built into objects throughout the physical world, driven by ongoing rapid falls in the cost of microchips, sensors and communications capacity. Collectively, with slightly different emphases, these technologies are also known as ubiquitous/pervasive computing, cyber-physical systems, smart environments/spaces/cities, the industrial internet (focused on manufacturing processes), and ambient intelligence.

The term machine-to-machine (M2M) communication is used to refer to communication directly between IoT devices, often via cellular networks. The mobile industry association, GSMA, predicts between 1 and 2 billion M2M connections by 2020. This has regulatory implications for switching and roaming.

IoT enables a very broad range of applications – from more efficient agriculture, manufacturing, logistics, counterfeit detection, monitoring of people, stock, vehicles, equipment and infrastructure, to improved healthcare, retailing.
traffic management, product development and hydrocarbon exploration. It also enables new business models – such as car and truck rental clubs, whose members can book and use vehicles parked around their neighbourhood almost on-demand; or ‘pay-as-you-drive’ insurance based on precise driving patterns, behaviour and risk.

The simplest IoT technology, the passive radio frequency identification (RFID) tag, is already widespread in retail, transit ticketing and access control. Near field communication (NFC) is now included in newer smartphones, with one prominent application being contactless payments via Visa’s payWave and Mastercard’s PayPass standards. Specialist sensors and processors in smartphones, watches, bracelets and clothes can collect, process and share data about individuals and their environments.

RFID and NFC only work at close range. M2M systems send information over cellular networks, such as electricity meter readings to energy companies, and car airbag deployment notifications to emergency services, with hundreds of millions of systems being deployed around the world. Both have regulatory implications for licensing and spectrum management. Many M2M devices use standard mobile subscriber identity modules (SIMs) for identification and authentication. Unlike mobile phones, these devices are often located in diverse, unsupervised locations, and subject to wind, rain, large temperature changes, and vibration. To protect the SIM and also prevent theft, it is often attached permanently and securely to the device.

M2M communications are often periodic and uplink heavy (especially if video is being streamed from cameras, sometimes in high definition), whereas many core and access communications networks are configured to support the downlink-heavy communications typical of internet use. In the ITU-T model, communications network providers are responsible for:

- Access and integration of resources provided by other providers
- Support and control of the IoT capabilities infrastructure
- Offering IoT capabilities, including network capabilities and resource exposure to other providers.

Depending on the requirements of specific applications, there may be some degree of business integration between device, network, platform and application providers.

DEVELOPMENT TRENDS AND AREAS OF APPLICATION

The IoT sector has grown sometimes unevenly over the last 15 years, as hardware developments have made these technologies available at the low cost, size and energy consumption necessary. But many applications have been incremental improvements to existing business processes, developed by the incumbent firms that can afford the investment required. It may require the further growth and entry into new markets of businesses specialising in IoT services, along with further cost reductions, to enable the radical disruption of existing industries that is predicted by many technology companies and consulting firms.

With NFC, smartphones can act as a universal platform for individuals to interact with IoT objects, removing one of the main cost barriers to growth. Payment, ticketing, vouchers and customer loyalty applications will become cheaper and easier to manage, and allow much greater sophistication in pricing, marketing, product management and analysis. Gartner has forecast that about $36bn of NFC payments will be made worldwide in 2017, although this has been reduced by more than 40% from previous forecasts due to slower growth than expected to date.

So far, IoT technology has been most broadly used in logistics and inventory management. Retailers can track products from the factory, through distribution networks – with real-time updates to orders and routes – to warehouses, into stores, triggering replacement when taken off the shelves, enabling customer self-payment, and replacing theft and shrinkage. Customer flow can be monitored continuously, enabling better retail layout. Shoppers can also take advantage of tags, using smartphones to access online information about products from the manufacturer, retailer, independent reviewers and friends, and even make price comparisons with other retailers. Customers can be given dynamic offers and shown display advertising based on their known preferences or demographics (the latter approximately determined by camera image analysis, and more precisely using signals from wireless devices such as smartphones). The use of data about individuals raises significant questions of privacy regulation.

Manufacturers can embed sensors throughout their production processes, enabling much more precise control and hence increased efficiency and quality, while significantly lowering waste, energy use, the risk of accidents and product damage. Similar techniques can be used through the whole lifecycle of equipment, vehicles, and the built environment, allowing for just-in-time repairs that minimise downtime and cost. And farmers can use IoT systems to carefully monitor soil and crop condition, precisely adjusting planting and pesticide use to maximise yield and minimise environmental impact, and enabling better food traceability.

Businesses will likely be the biggest users of IoT technologies, with one analysis estimating that by 2019 enterprises will be using 40% – 9.1 billion – of deployed devices, with the highest-spending industry sectors being manufacturing, transportation and warehousing, and information.

Another analysis predicts that by 2020 there will be 2.1 billion M2M device connections, with two-thirds of these in utilities industries, one-fifth in security applications, and smaller numbers in the automotive and transport sector, healthcare, government, retail and financial services.

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Applications will spread from developed to emerging economies, and from limited commercial markets to a broad spread of consumer applications.³

The table show the areas where IoT usage is currently receiving the most attention from key ICT stakeholders, and identifies possible developments. At the macro-level, two of the areas of greatest IoT development and investment are smart cities – where infrastructure and building systems will improve the efficiency and sustainability of a whole range of urban activities – and smart power and water grids.

Closer to the individual, ‘connected vehicles’ with hundreds of separate sensors will be safer, more reliable, and able to participate in sophisticated congestion management systems. And population health and wellbeing – a challenge to governments around the world as populations grow older, with a corresponding increase in age-related chronic conditions – could be significantly enhanced with IoT-based systems used by individuals, carers, primary care doctors and hospitals.

CHALLENGES AND OPPORTUNITIES
The public and private sector are continuing to fund significant levels of IoT research and development, in areas such as modularity, reliability, flexibility, robustness and scalability. But the basic capabilities needed for many applications are already well understood, and becoming available through smartphones and other standard platforms. These devices will also address some of the cost issues that have held back growth in the past, although cost and reliability remain issues for large-scale systems, as does connectivity.

IoT technical standards have evolved from a variety of different applications and stakeholders, which have different aims and requirements, and more work is needed to integrate different standards frameworks. A significant opportunity is the greater use of open data, open platforms, and application programming interfaces (APIs), which can enable a higher level of innovation in IoT systems. These issues are now discussed in detail.

COST AND RELIABILITY
For IoT to become a truly ubiquitous technology, the cost of tags, sensors and communications systems needs to fall to a level where they are a very small fraction of the total cost of the objects they are attached to, with readers also easily available. Even the cheapest (printed) tags, quick response (QR) codes, have not yet had a high response in consumer-targeted marketing campaigns. This is partly because specific software can be needed to read the codes, which is beyond the initial motivation of some users to install, and users need to position phone cameras so the code is in focus and can be accurately read. In response, companies are developing more aesthetically attractive codes that can include images, such as the ‘dotless visual codes’ being used by Chinese e-commerce giant Alibaba to combat counterfeits.

High reliability levels also become important

### OVERVIEW OF KEY AREAS OF APPLICATION TO DATE

<table>
<thead>
<tr>
<th>Areas of application</th>
<th>Drivers</th>
<th>Examples</th>
<th>Possible development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smart cities</strong></td>
<td>Continued urban growth, presenting quality-of-life issues. By 2025, there are likely to be 30 cities with a population of more than 20 million. Over half of these will be in India, China, Russia and Latin America. Large public and private-sector investments, such as Saudi Arabia’s $70bn four ‘economic cities’ project; South Africa’s $7.4bn smart city in Modderfontein; Muscat in Abu Dhabi; Accra in Ghana; Yachay in Ecuador, plans for over 100 smart cities in India; and an $8bn smart city technology investment fund in China.</td>
<td>Monitoring and maintaining critical infrastructure such as roads, bridges, tunnels, railways, ports, communications, water and power, Doha, São Paulo, and Beijing have used water pipe and pump monitoring sensors to reduce leaks by 40-50%. Networked traffic signals dynamically manage traffic movement across a city in response to measured and predicted changes in congestion and accidents. Congestion charging systems reduce vehicle commuting time by 10-20%.</td>
<td>Continued deployment of sensors and metering system will enable greater city coverage and new applications, as will greater availability of communications capacity, distributed, intelligent network analytics, and platforms for small and medium-sized businesses and software developer interaction.</td>
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<td><strong>Smart meters and grids</strong></td>
<td>Environmental sustainability – to increase energy efficiency, reduce power consumption, especially at times of peak demand. Enable consumers to better understand and reduce energy usage, and switch to suppliers offering tariffs closer to their needs. Integrate variable renewable and home energy sources into grid. Fraud and theft can be remotely detected and meters disabled.</td>
<td>1.1 billion smart meters estimated to be installed by 2022, 80 million in Japan, hundreds of millions in EU, and 150 million in India. Smart water meters can enable leak detection. Installations in the US, Malta, India and Canada have an average reduction of water use of 5-10%.</td>
<td>Could save 33% of the total cost of constructing a grid using traditional methods. Reduce downtime and waste through better load balancing and voltage regulation, and faster detection and diagnosis of faults.</td>
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<td><strong>Connected vehicles</strong></td>
<td>Faster and more targeted emergency response to accidents. Enable drivers to monitor their car condition and driving habits, enabling them to improve vehicle reliability and fuel efficiency, as well as keep track of journeys. Pay-as-you-drive insurance. Stolen cars can be remotely tracked and disabled. Autonomous driving.</td>
<td>Worldwide, the top 14 car manufacturers, which account for 80% of the global market, all have connected vehicle strategies. The European Union is close to agreeing requirement for all new cars and small trucks sold to feature an ‘eCall’ system from April 2018.</td>
<td>90% of consumer cars sold in the US by 2020 estimated to have an internet connection, an increase of over 80% since 2015. Cars share congestion and road problem data, enabling other cars to avoid congestion and notify repair and emergency services of problems. More efficient insurance markets, particularly for underserved groups such as young adults.</td>
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<tr>
<td><strong>Healthcare</strong></td>
<td>Improve efficiency and care in existing healthcare settings. Enable much greater use of remote telehealth provision, with greater patient comfort and lower cost. Let individuals monitor own health, improving wellbeing by better managing conditions such as stress, encouraging exercise and healthy eating, diagnosing medical conditions more quickly, and encouraging compliance with treatment regimes.</td>
<td>Patients with chronic conditions such as diabetes can monitor and report warning signs, using devices such as connected insulin pumps and blood-pressure cuffs. Annual cost of chronic conditions could reach $5.5tr (trillion) by 2025, with remote monitoring reducing this by 10-20%.</td>
<td>‘Quantified self’ systems measure heart rate, breathing, temperature, sleep and brainwaves, and apps help users record diet and alcohol intake – increasingly linked to a user’s smartphone. Patients can share data to reassure carers and relatives, share advice in online patient forums, and volunteer information to medical researchers.</td>
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² www.iicom.org

³ September 2015 Vol 43 Issue 3 | InterMEDIA 29
in large-scale systems that can include thousands of sensors, devices and readers. Trials of the most important RFID standard, EPCglobal, by retailers such as Walmart and Tesco, found some difficulties in detecting tags due to product orientation and the blocking effect of nearby materials.

Powered tags relying on batteries must minimise energy consumption, which is encouraging further research into and development of energy scavenging, low energy protocols and algorithms. An example is Bluetooth low energy (BLE), which is supported by new smartphones. BLE tags advertise their presence by sending out a message every second, and can operate for up to one year using a lithium coin cell battery. They currently cost under $5, which is likely to drop further. Another example is EnOcean, which is an ultra-low power wireless standard that supports energy harvesting wireless technology for smart buildings. Such sensors can be powered entirely using motion, light or temperature differences.

There is a coordination issue, where IoT infrastructure needs to be deployed in a specific industry sector before applications – which brings the concrete benefits of IoT – can be deployed. Large investments may be needed to finance the development of infrastructure and applications, with the risk of speculative investments not being repaid as quickly as expected.

Due to the immature and fragmented markets for many IoT services, which increase development and operational costs, a Korean government review found limited application of IoT e-government pilot projects, and a low rate of introduction of IoT services in small and medium-sized enterprises (SMEs). To encourage new businesses to develop and use IoT applications, a number of governments (including Korea, China, India and the UK) are supporting the development of IoT business incubators and innovation centres, which include platforms and testbeds for startups and SMEs. These can increase market entry and hence increase competition and reduce cost.

The most ambitious smart city projects, such as India’s 100 smart sustainable cities project, are spending hundreds of millions of dollars to build more liveable and sustainable communities. Creating city-wide infrastructure for smart cities needs a strong commitment from local governments and other authorities, as well as large investments and strong partnerships between municipalities, businesses and contractors. Laying new fibre-optic cables to increase the communications bandwidth available for smart city applications, for example, can be done more cheaply if contractors can take advantage of shared infrastructure (such as road trenches and utility tunnels) coordinated by a local authority.

This can be particularly effective when a smart city is built on a greenfield site. The ITU-T focus group on smart sustainable cities has developed focus group specifications for multi-service infrastructure in such new-development areas. It gives the example of the new Indian city, Lavasa, where a single company has been appointed to establish, maintain, and grant rights to assets such as dark fibre, rights of way, duct space and towers, on a lease/rent/sale basis to telecoms services. In existing cities, deployment of systems is much more likely to be on an incremental basis.

**CONNECTIVITY**

For IoT system designers, there is a choice between centralised, cloud-based functionality and more distributed applications, where some data is stored and processed on or near to sensors. Centralised systems allow a small number of powerful computers to manage large numbers of cheap devices – although those devices must have a network interface that can connect to the internet or mobile phone networks.

This configuration has advantages when large amounts of sensor data must be brought together for processing. In a more distributed system, devices can send data to smartphones or other nearby computing devices over a local radio protocol such as Bluetooth, which process data before in some cases sharing it further across a global network. This increases system responsiveness to a local user, and can provide more privacy protection to data about people – which is especially valuable for sensitive information such as health data.

Some radio protocols (such as ultra-narrow band) can provide longer-range coverage, which can be useful for smart city applications such as streetlight management, video surveillance and environmental monitoring. Using application-specific networks can increase costs and reduce the opportunity to improve security and reliability compared with multipurpose networks. Where mobile phone network coverage is available, 2G and 3G networks can be used by most IoT applications. The increasing coverage of 4G networks provides a high-throughput and low-latency option for high-value IoT applications such as video surveillance.

The development of 5G cellular networks, expected to be deployed in the early 2020s, will provide a number of benefits for IoT applications, especially high-bandwidth ones such as video sharing. It will bring significant improvements in wireless communications, using smart radios and spectrum sharing with 1,000 times higher spectral efficiency. It will support cooperative relays and femtocells, enabling low-power sensors to communicate further while reducing the possibility of interference between communicating devices.

And it will include features to support device-to-device communication (such as traffic offloading), and explicit support for IoT/M2M systems.

The GSMA identifies sub-1 ms latency and >1 Gbps bandwidth as defining features of 5G, noting that many of the other goals can be met gradually using existing protocols, and that autonomous driving, augmented and virtual reality systems and tactile
internet interfaces are the main technologies today that would require such low latency and high throughput. These could be used in gaming, telemedicine and manufacturing. 5G will also likely support software-defined networking (SDN), allowing operators to run production and test networks above physical networks, and separate IP control and data planes, increasing security and reducing costs. And it could provide support for running cloud computing in core networks, hence moving analytics closer to IoT edge devices. SDN and femtocells are already being deployed in some 4G networks.

Where a company such as a smart meter operator is managing thousands or millions of M2M devices via mobile data networks, they have very different requirements from a typical mobile telephone customer. They need comprehensive network status information to determine whether a non-communicating device or its network connection is faulty. They want a single subscription for the system, not on a per-device basis. And in many cases, the intended device lifetime will be much longer than individuals typically own a mobile phone – perhaps a decade or more. Replacing a device or even communications module within it will require either an expensive service visit, or a complicated process for customers that may cause faults. Not all mobile network operators can yet cope with these requirements, although many have set up specific business units to address them.

IoT systems are built on fixed and wireless communications standards, but it can still be difficult to connect together systems in different industry sectors or reuse system components. The great heterogeneity in application programming interfaces and middleware (software components) makes it difficult to write applications that will run on different systems – therefore users often have to rely on a single set of applications for a single set of IoT components. More standardisation would enable more innovation, and enable information to flow between industry verticals like consumer electronics and the automotive industry. There is a need for interoperability, connectivity, access control, service discovery, and privacy services, built on IoT-optimised protocols where necessary. Greater configurability allows components to be used in a wider variety of systems, but can increase complexity and price.

Because IoT applications have strongly heterogeneous requirements, there is a need to fit different communications protocols to different applications – for example, using IoT-specific protocols such as the constrained access protocol (CoAP) in resource-constrained systems. Most applications will be built around the internet protocol, except on very constrained devices. M2M devices can connect directly to other machines, but frequently there are gateways connecting IoT devices, which provide added value services such as protocol conversion, filtering and caching; and back-end hubs – which can run on smartphones, gateways, or for global scale in the cloud.

Even if integration of infrastructure and networks can prove challenging between organisations – whether public or private sector – data from disparate systems can still be integrated at data hubs, including cloud services. Companies such as Intel are building system frameworks to connect together disparate applications and networks via cloud services.

Much of the value from IoT systems will come from integration of separate, proprietary silos, especially for large organisations with a broad range of partners – in the same way that development of shared technologies for personal computers, like operating systems and processors, enabled much greater levels of distributed innovation and consumer choice in the 1980s. Improved data sharing will also allow the development of specialised data analysis providers, which can increase the value of that data. This does however depend on consumer trust in the security and privacy protection of the data.

STANDARDS
To date, IoT technical standards have evolved from a variety of different applications and stakeholders that have different aims and requirements. A universal and uniform network of ‘things’ is unlikely to develop in the medium term. Smart meters are unlikely to communicate directly with heart rate monitors, or recipe planners; some networks will use public infrastructure, others will be entirely private; some applications have high bandwidth and interactivity requirements (such as video surveillance) while others may focus on transferring short bursts of information (such as smart meters). But with effective standards, these networks can be bridged.

Greater technical standardisation can both reduce the barriers to entry to IoT markets and increase economies of scale – the latter helping suppliers to compete internationally. Without this, national markets may face the issues identified in a Korean government review, where large businesses are developing IoT platforms, but lack leadership in the global market, which in turn makes it difficult for local SMEs to enter the market – and leaves them dependent on global suppliers. Because of the strategic dimensions of IoT deployment for economic and industrial activities, states may have an incentive to seek reinforced cooperation at the national and regional level.

However, the diversity of IoT systems and users means that there is a limited constituency actively pushing for standardisation. Many of these users – for example in the healthcare sector – do not have a great deal of experience in communications standards bodies. Standards need to be carefully designed so they do not constrain innovation in still-young IoT markets. However, partial or too-late standardisation can complicate innovation due to industry coordination problems and fragmented technology options.

In an effort to deal with these issues, the ITU-T has created a Global Standards Initiative on Internet of Things (IoT-GSI) to “promote... a unified approach in ITU-T for development of technical standards (recommendations) enabling the internet of things on a global scale”, and to “act as an umbrella for IoT standards development worldwide”.

Other international communications standards bodies have ongoing IoT-related activities. The Institute of Electrical and Electronics Engineers (IEEE) considers IoT-related issues in a range of its communications standards, and the leading internet
commercial standards body, the Internet Engineering Task Force (IETF), has considered IoT issues a number of working groups.

There are a number of IoT-specific standardisation groups. The OneM2M group brings together manufacturers, service providers, end-users, and regional standards bodies from North America, Europe and East Asia. It has developed a suite of standards for M2M and other IoT applications, including a set of security solutions. Another is the Industrial Internet Consortium, which includes some of the largest companies developing IoT technologies, such as AT&T, Cisco, General Electric, IBM and Intel. The consortium is developing use cases, reference architectures and frameworks, and aims to influence global standards processes. A third is the AllSeen Alliance, a consortium that is developing the open source AllJoyn software and services framework. And the mobile industry association GSMA works with its members to drive M2M standardisation.

There are also IoT application-specific standards frameworks, such as the M/490 smart grid reference architecture, which can be reused in other IoT domains. This was created following a specific mandate from the European Commission to European standards organisations, principally ETSI, CEN and CENELEC. These standards bodies are able to create standards that can be referred to by EU regulations and directives – one example of a mechanism by which policymakers can incentivise the creation and use of specific technical standards. Another is for governments to support the development of standards and products, implementing them using R&D funding and prioritising the use of such products in government-funded programmes. Without such incentives, it can be in the interests of large companies to attempt to create their own proprietary de facto standards as barriers to entry to competitors.

Many IoT systems will require very limited human interaction – for example, an on/off switch, or a bus stop notifying passengers of the time until the next bus arrival. Requiring a separate smartphone app or other type of software to interact with such systems will be an unnecessary burden for users. One suggestion for standardising the user interface to these systems is that they locally broadcast a uniform resource indicator (URI), which is currently most commonly used to identify web pages. Other smart devices in range can then list and interact with such devices, via a web browser or more specialised software.

OPEN PLATFORMS, OPEN DATA AND APIs

A mechanism for encouraging much greater analysis and integration of IoT data is sharing information under non-proprietary, open source licences. This makes it available for new applications without the need for time-consuming data discovery and licence negotiation.

One example is Amsterdam’s Open Data programme, which has catalogued 438 datasets about the city. Partners contributed to and analysed these datasets – including by designing a sensor to enable individuals to monitor and share pollution, noise and light intensity data from their neighbourhood. Amsterdam is also one of eight cities participating in a CityService Development Kit (CitySDK) project, which lets programmers write software that can access data and shared IoT services via open application programming interfaces (APIs) – such as services to improve transport, help report problems to the city council, and guide tourists around places of interest.

As part of the Amsterdam initiative, a number of “Living Labs” have been set up in communities to experiment with smart city initiatives, identifying successful ideas so they can be implemented across the city. An example is in Jburg, which has “projects like free WiFi and a new fibre network, personalised television and transport services, and a co-working space allows residents to test projects to improve healthcare, environment, transport, and energy programmes in the city”.

Another example of the use of open source approaches is in the Korean government’s IoT master plan. The government will collaborate with the private sector to develop an open IoT platform, and all ministries will be encouraged to collaborate with businesses across the country. This will stimulate an open IoT ecosystem, which is intended to improve interoperability, reduce costs through economies of scale and scope, and enable flexible responses to environmental changes.

A test-bed for small and medium-sized enterprises will reduce development costs and time-to-market, and support collaboration between businesses in different areas. The ecosystem will support startups to turn ideas into businesses, using tools including open source hardware (circuit diagrams, board plans, and specifications required for hardware development) and software, and DIY open labs.

Part two of the article in the next issue will discuss regulatory implications in detail.

IAN BROWN is professor of information security and privacy at the Oxford Internet Institute. This article is adapted from a discussion paper presented at the ITU’s Global Regulators Forum in Gabon in 2015, which has a full reference list. The author is grateful for comments by Rudolf van der Berg, Pierre-Jean Benghozi, Małyn Fidler, Simon Forge, Ben Hawes, Gilad Rosner, and ITU staff.

The EU framework review has trade-offs that can’t be ignored in communications policy, writes Peter Alexiadis in part one of an analysis of the issues.

The review over the summer of 2015 of the current EU regulatory framework for electronic communications networks and services brings with it unique challenges for both policymakers and industry. The full implementation of the results of the review by 2020 coincides with two other milestone events, namely: the realisation of the proposed ‘2020’ goals for the EU’s Digital Agenda; and the scheduled launch of 5G technology for wireless applications across the European Union.

This confluence of three important regulatory milestones in electronic communications policymaking demands that any proposed changes to the current EU regulatory framework need to be sensitive to a wide range of commercial, policy and institutional factors. More importantly, the ability of the framework to be robust and forward-looking in its perspective should be more important than ever.

This two-part article seeks to explore the fundamental policy drivers that should shape the economic regulation of the electronic communications sector by 2020. However, rather than considering the merits of each individual policy item in its own right, the analysis seeks to explore a range of issues which involve a series of policy trade-offs that legislators and enforcement agencies cannot afford to ignore.

OVERARCHING REGULATORY POLICY DRIVERS

The pursuit of a comprehensive new policy paradigm for the regulation of key operators in the electronic communications sector requires the striking of an appropriate balance between a number of fundamental policy drivers.

First, at an analytical level, this policy formulation needs to take into account that the application of ex-ante and ex-post enforcement regimes vis-à-vis market players with market power (whether characterised as ‘dominant’ or as ‘SMP’ operators) might require a major re-alignment to be able to pursue coherent goals in tandem. The current ‘hardwiring’ of the respective ex-ante and ex-post regimes is arguably ill adapted to address the full range of potential market failures arising in the immediate future.

Second, at an industrial policy level, the relationship between the twin economic goals of pursuing economic incentives designed to facilitate the creation of pan-European markets, on the one hand, while at the same time encouraging growth in local infrastructure investments, on the other, needs to be better understood and rendered empirically verifiable. Lying at the heart of this policy trade-off is the role which all stakeholders attribute to an effectively functioning wholesale access regime.

While the sector continues to muddle its way through the fulfilment of these fundamental policy pillars, it also needs to be understood how each individual element of this policy metric will interact with the other.

Beyond these operators-specific concerns, the interests of consumers are also being pursued through the sectors-specific approach taken to both consumer protection and data protection measures falling within the EU regulatory framework for electronic communications networks and services.

A dis in part one of an analysis of the issues
The way in which these key drivers of regulatory policy interact with one another is reflected in the diagram below. Beyond these high level policy pillars lies a series of overarching policy trade-offs that need to be brokered if progress is to be made in delivering a new regulatory model. This article discusses seven key such trade-offs – four of which are covered in this first part.

**TWIN GOALS OF GREATER INVESTMENT AND LESS REGULATION**

The European Commission spent an inordinate amount of time under commissioner Neelie Kroes, then of DG Connect, extolling the virtues of how DG Connect’s policies were designed to incentivise investment in next-generation fixed and mobile networks. The benefits of such investment were supposed to be seen in greater levels of innovation and higher levels of broadband penetration, which would be coupled with growth in jobs and productivity. Apparently, the incentives for this increased investment activity are supposed to be drawn from lower compliance costs due to the withdrawal of unnecessary regulatory obligations, on the one hand, and from ‘stable’ fixed wholesale charges, on the other.

To this end, the message to fixed incumbents has been clear – not only would a range of wholesale access obligations be removed, but insofar as they continued, they would be subject to a costing formula which would be prone to yield higher prices in most cases.

There are two fundamental problems with this line of thought:

- First, it needs to be acknowledged that the removal of wholesale access obligations and the raising of access charges are more likely to lead to less effective competition from access seekers, as their costs are raised. In the absence of fully fledged alternative network deployments, this would invariably lead to less head-to-head competition with fixed incumbents. Accordingly, the question must be asked whether next generation network deployment is more likely to occur under conditions of quasi-monopoly or under conditions of robust competition. Competition case law is replete with findings that the competitive process is that which is best attuned to delivering successful outcomes in terms of consumer welfare. It is also out of step with the logic of investing in fibre to the home (FTTH), given that each investor is likely to become a localised ‘monopoly’ of sorts.

- Second, the jury is still out in Europe (without prejudice to the investment patterns which might characterise other jurisdictions) on whether there exists a direct causal link between the winding back of regulation and the positive investment commitment of the deregulated entity. Investment decisions are based on many different motivations, including anticipated rates of return, the maturity of a market, the ability to build scale and scope, among others. Indeed, as noted above, all other things being equal, it is usually sustainable competition which drives investment. To date, the empirical evidence suggests that investments made by new entrants measure more than reasonably against those made by incumbent EU operators. It is therefore unfounded for the Commission to simply presume that investment volumes will jump directly as a result of the removal of regulatory obligations on dominant (SMP) operators.

At a minimum, one would imagine that the promise of removal of ex-ante legislation would be counter-balanced by the commitment of the currently regulated operator to invest if this were conditioned by reference to pre-arranged investment milestones (in other words, the creation of a ‘sunset’ clause situation premised on the achievement of investment targets, rather than regulatory milestones, measured in numbers of competitors, penetration levels, etc.). Under such a scenario, one could at least take some comfort in the fact that any potential increase in prices brought about by a loss in competition might be counter-balanced by net welfare gains brought about by increased investment, which would in turn lead to greater innovation.

In the absence of empirical evidence supporting the existence of an established trade-off between less regulation and more investment in any given member state, one is left with the unsatisfactory situation of less regulation, which leads possibly to less access-based competition, which in turn cannot guarantee greater levels of investment beyond the unilateral promises of EU incumbent operators (absent the existence of genuine head-to-head network competition).

This is the policy position that was a hallmark of commissioner Kroes’ single market proposals of 2013. One can only hope that it will not also be a hallmark of the EU policy that will emerge from the current review of the regulatory framework taking place in 2015/16.
**CONFLICT BETWEEN GREATER CONSOLIDATION AND LESS REGULATION**

Another key element of the Commission’s vision of the electronic communications sector of the future is one on which European players can achieve far greater scale and scope so as to challenge larger non-EU operators, especially those from the US and certain parts of Asia. Accordingly, the culmination of this trend has supposedly prompted the Commission to take a more lenient view towards consolidation in the electronic communications sector than has traditionally been the case, especially as regards mobile-to-mobile mergers. Such a simplistic approach is subject to criticisms:

- First, it is difficult to reconcile the Commission’s supposedly more lenient approach to greater consolidation with the view that the sector should be characterised by significantly less ex-ante regulation. The traditional way in which complex competition concerns post-merger are addressed is through the implementation of a variety of behavioural remedies, usually associated with clearly defined access terms and conditions.

- These remedies, in order to be effective, need to be implemented by sector-specific regulators, as merger authorities are usually unable to put into effect the level of ongoing monitoring required to ensure that behavioural remedies are working satisfactorily. To therefore assume that one can pursue a twin-track policy of greater consolidation and less regulation is therefore exceedingly difficult to reconcile in practice. If greater consolidation is indeed a policy goal that should be genuinely pursued by the Commission, it needs to be counterbalanced by more targeted, rather than less, regulation. This is necessary to ensure that a regulatory ‘safety net’ can catch what might otherwise be errors in merger analysis.

   Indeed, it might even be the case that some forms of regulation should arguably be increased in their scope by providing controls at the retail level rather than only at the wholesale level, while the scope of national regulatory authorities’ powers to implement merger remedies should be carefully considered. (For example, retail price commitments which apply for a reasonable period after merger clearance has been granted might address the traditional concerns of merger review bodies that a merger leading to a high level of concentration will lead to an increase in retail prices).

- Second, the pursuit of the goal of greater consolidation in practice also encounters unexpected difficulties from other quarters. For example, a host of notified mergers over the past few years have been focused on in-country consolidations within the EU, rather than on truly pan-European ventures that bring together networks across member states in an attempt to provide seamless pan-European services.

If anything, current commercial practices suggest that operators are more interested in withdrawing from many EU member state markets, rather than expanding across them (thus, mobile operators such as O2, Orange and KPN have already withdrawn from a number of EU member state markets, or are in the process of doing so). Indeed, the operators most likely to adopt a pan-European stance are likely to be non-EU operators, which are much more likely to view the EU in commercial terms as a single economic unit. Indeed, it is some of the more notable OTT (over the top) providers of communications services which are most likely to achieve the sort of EU-wide scale and scope to which the Commission aspires.

The goal of achieving greater consolidation at a European level, while lessening regulation simultaneously, also does not appear to be realisable without a departure from basic principles of regulatory policy. Insofar as the goal of achieving greater scale for European operators might be said to outweigh remedial shortcomings brought about by less regulation, the reality is that it will not be European operators that will drive pan-European network and service aspirations. Those goals will be achieved predominantly by non-EU telecoms operators. By contrast, the consistent pattern displayed by EU-origin operators is to seek greater in-country consolidation, while often withdrawing from those national markets considered to be not ‘core’ to their business.

**PAN-EUROPEAN MARKETS RESPOND MORE TO COMMERCIAL INCENTIVES THAN HARMONISATION**

One of the hallmarks of the 2014 proposals was the European Commission’s desire to complete an internal market for electronic communications, but this goal unfortunately became conflated with the idea that legislation could of itself foster the growth of pan-European ‘markets’ in the sector. It was decided that this could be achieved by adopting a range of new regulatory measures, including:

- An authorisation ‘passport’ which would allow operators to move freely around Europe to provide services on the basis of a single member state authorisation
- More synchronised spectrum assignments among the EU member states
- The promotion of consolidation within the sector
- The possibility of the rise of pan-European MVNOs (mobile virtual network operators) as a result of amendments to the roaming regulation.

Aside from widespread push-back from national politicians and Euro-parliamentarians to a number of these measures, the fundamental defining element shared by these diverse goals – the creation through regulatory intervention of large EU operators with scale and scope to match their non-EU counterparts – was always doomed to failure, for a number of reasons:

- First, the Commission’s ‘passport’ proposal was little more than an idea searching for a problem in order to give it the status of a ‘solution’.

Authorisation procedures under the EU regulatory framework have been straightforward and efficient for service providers for a number of years, and real
The Commission’s greatest opportunity for success in creating a truly pan-European ‘market’ lies in the original plan of having MVNOs introduced under the aegis of the revised roaming regulation, yet even this goal is compromised to the extent that mobile termination rates are not the same across all EU member states. Regional markets might also be capable of developing in the Nordic region, which is bound by common cultural and linguistic characteristics (which, at the very least, will allow scale to be reached for content input markets).

Yet one needs to acknowledge that electronic communications network markets are by and large national in scope, and on member state budgets. By the same token, a harmonised approach to spectrum licensing arguably opens the door for the adoption of a more harmonised approach to spectrum valuation. Without a common understanding of the valuation of underlying scarce resources, the desire to foster pan-European markets may have little chance of success. Having said that, the prospect of 5G technology being available from 2020 simultaneously across the EU at least provides for the first time a platform for a common spectrum licensing policy to be adopted across the member states.

Fourth, ‘markets’ are created by the forces of supply and demand. Regulation can support that process or hinder it, but is unlikely to be able to drive it. Insofar as consumers of electronic communications services continue to consider that their needs are satisfied locally, the idea that legislators can create pan-European markets seems far-fetched. By contrast, in the field of business communications, demand-side markets are often pan-European in scope, but by the same token ex-ante regulation often finds no role to play in relation to such markets if ex-post enforcement is effective.

Similarly, markets for the sale of services over the internet are clearly potentially EU-wide in their scope, even allowing for linguistic and cultural differences, and it is here that the Commission can lower entry barriers and artificial restrictions on cross-border trade; in this respect, the announcement by competition commissioner Margrethe Vestager in March 2015 that she would investigate online markets through the vehicle of a sectoral inquiry is to be welcomed.19

The Commission’s greatest opportunity for success in creating a truly pan-European ‘market’ lies in the original plan of having MVNOs introduced under the aegis of the revised roaming regulation, yet even this goal is compromised to the extent that mobile termination rates are not the same across all EU member states. Regional markets might also be capable of developing in the Nordic region, which is bound by common cultural and linguistic characteristics (which, at the very least, will allow scale to be reached for content input markets).

Yet one needs to acknowledge that electronic communications network markets are by and large national in scope, and even increasingly sub-national insofar as alternative infrastructure rollout occurs.21 There is nothing contradictory in acknowledging such market dynamics, while at the same time also conceding that services and products can in theory be sold across the EU member states if artificial barriers to their sale are removed. This latter aspect of an emerging ‘digital Europe’ should not be confused with the sort of economic regulation which characterises the electronic communications sector, but unfortunately such confusion continues to intrude into EU policymaking. (In other words, it should...
be the physical availability of commonly available services across national borders which should be the determining issue, rather than their provision across borders according to a particular business model or via a predetermined set of market actors.)

REALISING THE LIMITS TO THE ‘TECHNOLOGY NEUTRALITY’ CONCEPT

Over the course of the time, the mantra that the EU electronic communications regulatory framework should embrace the principle of ‘technology neutrality’ has led policymakers to make wrong policy choices. The principle of technology neutrality constitutes a sector-specific application of the broader notion of ‘substitutability’ that is designed to facilitate the process of technological convergence by decoupling the regulation of certain services or networks from their technological capabilities. In relation to the process of remedy selection, the concept provides some assurance that no particular technological solution will be artificially disadvantaged or penalised through unjustifiably inconsistent regulation.

Unfortunately, an over reliance on what is an otherwise laudable policy goal has meant that key strategic policies run the risk of being ineffective if the concept is pursued indiscriminately. It should not be forgotten, for example, that arguably the EU’s greatest success in policymaking has been the adoption of the GSM standard for mobile telephony, which drove Europe’s advantage over the US for a number of years with respect to mobile communications. By the same token, it might be proportionate to craft differentiated remedies for particular operators, at least where this is justified by reference to particular market failures which the remedy in question seeks to address.

Thus, it seems counterproductive for EU policymakers to pursue technology neutral solutions where technology specific solutions would serve an overarching policy goal better, and where such solutions serve to reconcile other important policy choices. Accordingly, it would be wholly legitimate for policymakers to insist that newly deployed fibre be based on an open architecture model that facilitates access, regardless of whether or not it is subject to an asymmetric access obligation at the time.

Similarly, it would be appropriate to maintain access obligations on operators which embrace new generations of technology, unless that policy orientation is overridden by a clear desire to incentivize alternative operators to engage in new network investments.

Part two will continue the analysis of trade-offs.

PETER ALEXIADIS is a partner in the Brussels office of Gibson, Dunn & Crutcher, focusing on competition law, intellectual property law and EU communications policy. He is also a visiting professor at King’s College, London. With thanks to my colleague, Charles Clarke.

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De Groof, Economic Journal V.92 – 93. 5 For example, in September 2014, 5 member states agreed to deregulate voice markets on the understanding that incumbent operators would boost investment in broadband infrastructure. See: bit.ly/1Y3Np2F 6 In January 2012, the European Commission proposed a comprehensive reform of data protection rules, a key enabler of the digital single market. 7 Enhancing the broadband investment environment – policy statement by vice president Knezevic, 2 July 2012. 8 Commission recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, 2013/A/HU/EU. bit.ly/1YQUR4L 9 Raising rivals’ costs is where a firm raises the costs of its rivals relative to its own. A classic example is a ‘margin squeeze’, which typically arises in telecoms where a vertically integrated dominant supplier prices wholesale access to a network or an input vital to a downstream product or service at such a level that ‘an equally efficient’ downstream competitor of the dominant firm cannot purchase the input at that price and compete with the downstream retail arm of the vertically integrated firm. 10 At the analytical level, the nature of that symbiotic relationship was made clear by DG Competition’s director-general Alexander Italianer on 20 February 2015, when he declared that: “Unfettered competition can lead to private monopolies destroying competition. To prevent this happening, there is ex ante regulation and ex post competition enforcement…” and “Competition enforcement can be adequate to safeguard competition, but, often, regulation is necessary to open markets to competition in the first place.” Market Opening Regulation vs Competition? 48th Innbruck Symposium, 2015. bit.ly/10YSBBP 11 The position espoused recently by competition commissioner, Margrethe Vestager, confirms the traditional view that investments are usually spurred by competition: “So far it seems as if it is still competition that will lead to investment and not the other way round.” See also ETTA (2014). The future of regulation: An analysis of developments in EU telecommunications markets and the implications for the European Commissioner’s review of relevant markets, and Ofcom’s strategic review of digital communications, announced on 12 March 2015. 12 for example: bit.ly/1ojzYs4 13 for example: Articles 5 and 6 of the Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive). 14 These in-country mergers do not sit comfortably with the policy pronouncements of Commission president, Jean-Claude Juncker. See: Juncker defends ‘pan-European telecom operators’. Europolitics. See: Proposal for a Regulation concerning the European single market for electronic communications and to achieve a Connected Continent, Brussels, 14 November 2014. 15 A ‘EU passport’ refers to the legal framework proposed for an European electronic communications provider across the whole EU in accordance with the proposal for a Regulation of the European Parliament and of the Council laying down measures concerning the open internet and amending Regulation (EU) No 533/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the EU. 16 See, for example, Article 12(2) (obligations of access to, and use of, specific network facilities) of the Access Directive. 17 See the Proposal for a Regulation concerning the European single market for electronic communications and to achieve a Connected Continent, Brussels, 14 November 2014. 18 See, for example, Articles 8, 10, 11, 12 and 13. 19 See, for example, Articles 5 and 6 of the Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive). 20 Commissioner Vestager announces proposal for e-commerce sector inquiry. EC press release, 26 March 2015. More problematic, in the author’s opinion, is the Commission’s investigation into the exclusive licensing practices of the Hollywood studios, given the traditional importance in the media sector of exclusive distribution relationships. See: Commission sends statement of objections on cross-border provision of pay-TV services available in UK and Ireland, 23 July 2015. bit.ly/1MWfPZx 21 For example, see BERR opinion. Phase II investigation pursuant to Article 19 of Directive 2002/64/EC as amended by Directive 2013/19/EU; see specifically the Commission decision concerning wholesale broadband access, UK/2000/573S, 56-Geoffre (2008) 2D/2014/00. 22 See Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive). 23 See Commission Decision: Restrictions on the Number of Network Operators, 14 June 2002. 24 See, for example, Ofcom’s decision on Bit increase in December 2012. 25 The network operator is under an obligation to meet all reasonable written requests for access to its physical infrastructure ‘under fair and reasonable terms and conditions’. [7] That obligation can only be overcome where objective reasons justify the failure of the network operator to grant access. For example, a number of NIASs have taken the view that symmetric deep physical fibre access is appropriate, while SMP-based regulation of fibre access would have a negative impact on investment incentives across the sector – see BERR report of October 2011 on the implementation of the NIA’s Recommendation, with regard to Spain, France, Portugal and Croatia.
Should governments be putting more emphasis on industrial policy and developmental approaches in ICT, ask Morten Falch and Anders Henten

Industrial policies – meaning policies by which governments attempt to shape sectoral allocation of the economy are back in fashion.” So said Nobel prize winning economist, Joseph Stiglitz and colleagues, in 2013. The quote highlights that there are two approaches to ICT policy – regulatory and developmental. In telecoms, the objective of a regulatory approach to policy is to create a stable policy framework for a liberalised telecoms market with real competition. The instruments are rulemaking and correction of market failures. The argument is that a stable regulatory environment reduces transaction costs and stimulates investments but direct market interventions are to be avoided.

In contrast, the developmental approach stimulates investments and the use of technology through various public sector activities. The instruments could be demand stimulation via public consumption or subsidies to use or supply ICT services. This includes direct market intervention, such as in public-private partnerships that give public support to infrastructure development.

So a country that is a developmental ‘state’ contrasts with the regulatory state, where the state is mainly concerned with creating a framework for economic competition, but not with direct intervention in substantive matters. Japan has been mainly a developmental state (while the US is mainly a regulatory state). Chalmers Johnson claims that state intervention in Japan and especially the role of the ministry of trade and industry (MITI) played an instrumental role in the successful economic development of the country, and that other East Asian countries (Hong Kong, Taiwan, Korea and China) have each developed their own versions of the developmental state.

And in the European Union, both regulatory and developmental approaches are evident, connected to two different streams of policy initiatives. The first focuses on reforming the telecoms service industry through a series of regulatory packages, while the second has a broader perspective, as it comprises the entire ICT ecosystem and includes a series of consecutive development plans such as eEurope, i2010 and Europe 2020. Historically, public ownership has been the main mode of regulation of public utilities (including telecoms) in Europe. According to Giandomenico Majone, European countries were forced to change their mode of governance towards a regulatory mode in response to the challenges created by increasing international competition and deepening economic integration within the EU in the late 1970s. This included privatisation of public enterprises including public utilities, liberalisation of markets, and regulatory reforms. With privatisation, new modes of governance had to be developed.

Tilting back to development

The concept of the developmental state is applied in a recent study on European broadband strategies. In this study, the US is seen as a good example of a regulatory state, while South Korea applies the developmental model. Between these two extremes we find most of the EU countries. The UK is leaning towards the regulatory model, while France is more oriented towards the developmental mode. But even in the US, a number of developmental initiatives have been taken.

How to expand high-speed networks has led to focus on the entire ICT ecosystem.

The European telecoms reform implemented in the 1990s has been successful in terms of market growth, but it has turned out that the regulatory mode of governance also has limitations. In the past decade it has been realised that the EU liberalisation initiatives have been unable to create sufficient investments in networks. Public initiatives are seen as necessary if the objectives of Europe 2020 are to be achieved, especially in rural areas. The Digital Agenda for Europe, which is one of the pillars of Europe 2020, supports research and also service and infrastructure development. So the implementation phase has been followed by a maturity phase with a focus on consolidation and investments rather than on competition. The key issue of how to expand coverage of high speed networks has led to more focus on the entire ICT ecosystem, and more developmental initiatives in the second stream of policy initiatives.
The rationale for increased focus on investments rather than on competition has been a sluggish development in telecoms investments since the year 2000. It can, however, be argued that the main reason for this is that as ICT equipment becomes cheaper, the ICT investment ratio is underestimated. Development in the mobile sector illustrates this well, as it has seen a decline in revenues, while the range of services has been expanded and the traffic has continued to grow at high rates.

Another argument is that the regulatory reform was initiated in a period where competition on the existing well-established copper infrastructure was needed. Today a key issue is to make a new (fibre based) infrastructure available by stimulating network investments. So far, the regulatory remedies applied in European regulation have not been successful in encouraging this type of investment.

A number of East Asian countries have for many years been ahead of Europe, both in coverage of ICT infrastructure in development and use of advanced applications. They have achieved this by a deliberate developmental strategy. The US has been lagging behind parts of Europe, but during the past few years has experienced high growth in broadband infrastructure. This is not the result of a developmental policy, but regulation aiming at establishing multiplatform competition. Triple play, Netflix and the iPhone revolution have all contributed to this.

European policy has been somewhere in the middle, but it has been less successful than the strategies applied in US and in East Asia. The series of regulatory packages has proved insufficient to stimulate investments, and since the financial crisis, the EU has put more emphasis on developmental policies. The question is whether this strategy can be implemented with the same level of success as in East Asia. Europe still applies a more mixed strategy with wide variations from country to country.

But on the other hand, it is not obvious that adoption of a strictly regulatory approach, as in the US, will become feasible. A regulatory approach will only be successful if it leads to more competition from new entrants providing innovative solutions. The convergence between IT and telecoms has been dominated by the IT sector. The failure of the Europe-based Nokia is the most prominent example of this. In the US – and to a certain extent in East Asia – telecoms markets have benefited from having a strong domestic IT industry, which has been able to challenge telecoms operators by developing new services and business models.

A USEFUL CONCEPT

The concepts of regulatory and developmental states can be applied as a framework for analysing and comparing broadband policies in developed and developing countries, and are informing ongoing research. Research questions include the role of the regulator, public initiatives that facilitate both demand and supply of broadband services, and the use of public-private partnerships.

One good example is the institutional framework for telecoms regulation in Denmark. This framework has undergone major revisions in the past four years. The legislation governing the regulation has remained unchanged, but the telecoms authority has been abolished, and its responsibilities reassigned across no fewer than five ministries.

This could indicate less focus on sectorspecific regulation, but whether it will lead to a strengthening of developmental initiatives or just a removal of telecoms from the political agenda continues to be a subject for discussion.

MORTEN FALCH and ANDERS HENTEN are senior academics at the Department of Electronic Systems and Center for Communication, Media and Information Technologies, Aalborg University, Denmark.

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From Henten and Falch (2015).4 The authors also introduce an intermediate column in the table, namely the “positive state”, which is more applicable than the developmental state to Western Europe and North America. “The positive state, for instance, focuses on stimulation and redistribution, while the developmental state focuses on economic growth. Nevertheless, compared to the regulatory state, they share the approach of direct government intervention in the market, and the policy instruments applied are, to a large extent, similar.”

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The authors also introduce an intermediate column in the table, namely the “positive state”, which is more applicable than the developmental state to Western Europe and North America. “The positive state, for instance, focuses on stimulation and redistribution, while the developmental state focuses on economic growth. Nevertheless, compared to the regulatory state, they share the approach of direct government intervention in the market, and the policy instruments applied are, to a large extent, similar.”

To be continued...
The goal of promoting digital infrastructure is seeing economic and social progress. **PETER LOVELOCK** takes stock of Asian developments

**A** sia is in transition – and when talk turns to the region’s adoption of digital technologies, it is easy to be impressed by the numbers. Whether the number of mobile subscribers, the growth of broadband networks, or the use of social media, Asia consistently tops the list. But of far more interest is how such digital technologies contribute to economic and social development.

In a recent study covering five Asian economies – India, Indonesia, Japan, Korea and Vietnam – we found much to learn from the approaches being adopted in both developed and emerging nations. Countries here are moving from an internet economy towards a fully digital one, increasingly relying upon the internet as a core part of the infrastructure underlaying the economy. What this means is that, in addition to the exciting and disruptive developments within what we think of as the ‘tech sector’, many traditional sectors are in the midst of transformation and rejuvenation via the internet and, with it, are fostering economy-wide growth and innovation.

What we are seeing is that non-internet companies of all types are increasingly using the internet. As digital technologies become accessible and affordable to more people, it also means that more people can, and are, creating apps, platforms and networks. Some of these have been so successful they have gone global. Others are changing the digital landscape of their domestic markets.

Zomato, for example, is one of India’s recent outstanding global success stories: an aggregator site that offers online access to many thousands of small restaurants that would otherwise not have the wherewithal to ‘go tech’. It has created a digital ecosystem that empowers restaurants with a range of digital capabilities to enable greater reach and more effective interaction with customers. Zomato began its overseas expansion in 2012 and now covers 330,000 restaurants in 19 countries.

We find the same story playing out throughout other markets across the region, be they emerging or developed. In South Korea, one of the world’s most connected economies, a similar aggregator, Baedal Minjok, is empowering local ‘mom-and-pop’ shops to go digital. In the past, these shops typically resorted to flyers, neighbourhood restaurant guides or ads in local newspapers for marketing. Now some shops are spending 25% or more of their original marketing budget on Baedal Minjok, and are seeing twice the benefits in revenue growth. Furthermore, shops are using Baedal Minjok for their day-to-day operations to monitor customer experience and adjust their business strategy.

Another trend is that e-commerce is leading the development of a digital economy ecosystem. For instance, PeaceSoft in Vietnam heads a group of companies, including eBay Vietnam, shipping and cash-on-delivery gateway ShipChung, warehousing and fulfillment agent BoxMe, and online payment system NganLuong. Given the low penetration rates of credit cards and debit cards in Vietnam, NganLuong designed a payment wallet solution, offering multiple types of settlement methods including credit and debit cards, bank transfers, mobile phone billing, ATM payments and others. Nowadays, only 30% of NganLuong’s revenues come from within the PeaceSoft group, while some 70% is being generated from the 20,000 merchants that NganLuong is connected to. Innovators such as NganLuong are helping introduce sellers and consumers to new forms of payments, opening the doors to a range of online services.

Similarly in Indonesia, online retail innovator Doku is encouraging digital adoption by making it easy for businesses to process all types of payments online, and by doing so encourages merchants themselves to go online and invest in digital technologies. Although clients initially came
from the insurance and airline sectors, Doku now has merchants in industries as varied as property, food and beverage, marketplaces and transport. In recent years in Indonesia, over 20 sizeable e-commerce companies have emerged either locally or as foreign ventures.

TRANSFORMING TRADITIONAL: ADDRESSING THE GAPS
A digital economy is essentially a knowledge-based economy that comes with specific skillsets that many economies do not yet have enough of. Organisations, both public and private, and often in collaboration, are stepping up to fill the skills gap with e-learning and massive open online courses (MOOCs). They offer solutions to challenges common to many countries such as a lack of qualified teachers, the high cost of training, and the lack of support and incentive for skills upgrading.

For instance, Vietnamese e-education platform GiapSchool is run as a social enterprise, offering courses free of charge. In comparison to other forms of e-learning in Vietnam, GiapSchool provides opportunities for students to interact with other students and lecturers, which has been missing in prior e-learning ventures. GiapSchool succeeds because it engages with specialists who can produce high quality course materials, and is accessible from multiple devices.

Similarly, on the other side of the spectrum, in highly developed Japan where the population is ageing and job markets are being restructured, there is a focus on the reskilling and continuous learning of older workers using MOOCs. Building on the lessons learned from existing MOOCs such as Coursera, edX and Udacity, JMOOC was created as a partnership among Japanese academia and corporations.

Another interesting case is the use of technology by Aeon Agri Create to boost the agriculture sector in Japan. Most of the farmers on Aeon farms are tech-savvy youngsters with little or no experience in agriculture. But Aeon Agri Create is using a network of smart devices and sensors – in the sprinkler systems, heating systems, fertilising and harvesting facilities – to collect data, which is then analysed and shared with the farmers, making crop production and management easier, smarter, and less-dependent on generation-steeped human knowledge and participation.

GOING DIGITAL: MORE THAN JUST TECHNOLOGY
Indeed, in all of the examples provided above from countries as varied as India, Indonesia, Japan, South Korea and Vietnam, going digital is not just defined...
Mobile payments are fundamentally important where there is a relative lack of computers.

by the hardware, software or network, but is more often associated with connecting and reaching out to individuals and communities regardless of their location; a faster way to access information and services; and new and better ways to do business, learn and spend leisure time.

These examples all show that they are more service businesses than technology businesses. Ultimately, it is not about how ‘high-tech’ a business becomes but about using digital technologies to empower people by equipping them with the tools, knowledge and skills to leverage the opportunities that a digital economy offers.

Organisations able to leverage the data and interpret it intelligently will gain a competitive edge. Another motivation for establishing JMOOC in Japan, for example, was to enable the collection and analysis of educational data so that courses offered could be tailored to the individual needs of students and working professionals.

Of course, for this transition to a digital economy to be successful, business and regulatory environments are important. Possibly, the only thing worse than prohibitive regulations are uncertain regulations. Yet this is the position many start-ups face. In India, for example, although governments are encouraging start-ups through incubators, funding and tax relief, the paperwork required to obtain licences, certificates and permissions is often mountainous. This is set to change though, under the government’s Digital India programme.

In Indonesia, regulatory uncertainty and lack of clarity has limited direct foreign investment in e-commerce. However, in 2014 there was a change in the regulatory environment to remove restrictions on e-commerce markets, including an amendment to banking regulations that has spurred the growth of mobile payments – a fundamentally important enabling given the relative lack of computers, credit cards and bank accounts, but the increasing ubiquity of smartphones.

Evidently, locally-based start-ups can innovate and disrupt by pushing boundaries, not only technology boundaries, but regulatory boundaries and business models as well – business models that not only value economic wealth creation, but also social benefits. As we transition to a digital economy, it will increasingly become the case that there is no longer an ‘internet business’, but instead business is the internet, as the internet increasingly underlies all sectors of the economy.

To be successful this transition calls for collaboration between many different players in different sectors, including in government and civil society.

PETER LOVELOCK is director of TRPC, a consulting and research company for the ICT industries in Asia-Pacific. This article is a snapshot of ongoing digital economy work at the firm. See trpc.biz for more details.

EIGHT RECOMMENDATIONS

1 Have vision: A digital economy is a fully ‘connected’ economy, enabled by ubiquitous affordable internet access. Progress towards a digital economy therefore calls for governments to be able to state a clear vision for digital advancement, accompanied by equally clear priority areas for state action and enablement.

2 Transparency: Government policies designed to create an environment that attracts investment and encourages entrepreneurship need to be transparent – regulations should be consistent and predictable, and they need to encourage appropriate approaches to technology-neutrality, safety and security.

3 Regulatory alignment: Recognising that a key advantage of the digital economy is the access local SMEs have to global markets, governments need to ensure that local regulations in areas such as payments, security and consumer protection are compatible with other regional economies and trading partners. Alignment efforts not only enable local companies to scale but also facilitates inward investment into the local market.

4 Build the digital ecosystem: Progress towards a fully developed digital economy also requires the emergence of a domestic digital ecosystem, including a focus on the creation or development of auxiliary sectors, such as distribution, and operational and design skills.

5 Lifelong human capacity building: An adaptable focus on human resources is vital if the benefits of a digital economy are to be fully and continuously realised. Both fulltime education, and on-the-job skills and knowledge training, need to be reviewed regularly and promoted in light of what the internet can offer online and interactively.

6 Simplify business processes: Reviewing and addressing procedures that keep business costs high is fundamentally important if the digital economy is to become pervasive, particularly for start-ups. The greater use of digital technologies and streamlining processes for business applications, approvals, payments and registrations should be priorities.

7 Minimise unintended impacts: Regulatory overreach can have a chilling effect on investment and innovation in the digital economy. Where regulation is necessary, such as with national security or consumer protection, it should be ‘smart’ and not create uncertainty or negative unintended consequences.

8 Consult and engage with industry: By understanding the multisector impact of the internet, for example in areas such as agriculture, health and education services, government should engage with industry directly in two ways. First, to inform better the national policy planning process to strengthen a holistic approach to the creation of a digital society. Second, to encourage the widespread adoption of industry standards, of interoperability, safety and security, and codes of conduct for social media.
OECD WEIGHS IN ON THE ISSUES

A biennial report from the OECD is a major review of global digital economy factors

The OECD Digital Economy Outlook report is certainly a comprehensive analysis of the building blocks of the digital ecosystem and emerging trends. In the latest 2015 edition, it is considered, not surprisingly, that the potential of the digital economy is a long way from being realised; that governments are waking up to the fact that they need national digital agendas and that ‘internet policymaking’ depends on a ‘set of coherent, whole-of-government policies’; and that internet governance and the preservation of an open internet is a vital.

POSITIVE OUTLOOK
In an overview of the digital economy, the report notes that the outlook for the ICT sector is positive, despite not being fully recovered from the recession. Evidence from OECD countries reveals ‘significant potential’ to improve coverage and quality of fixed and mobile broadband, and it is noted that the OECD has a new methodology for measuring fixed broadband speeds (it reveals a rate of only 7.3 subscriptions per 100 people for speeds more than 25/30 Mbps).

“Policymakers are testing innovative licensing schemes to increase efficiency in the use of spectrum. They also now recognise the role of fixed infrastructures as a critical building block for offloading and backhauling wireless traffic and to enable better use of available spectrum,” the report says, which is why emerging economies, which lack fixed infrastructure, have more of a challenge. In OECD countries, about 75% of smartphone data takes place on fixed WiFi systems.

The digital economy has begun to transform industries such as banking and the media, while new business models are appearing in the sharing economy. Most companies with more than ten employees have broadband but still relatively few use enterprise resource planning software (31%), cloud computing (22%) or receive electronic orders (21%).

In 2014, 82% of the adult population used the internet and most do things such as email and social media, but there are wide variations in take up of activities such as e-government and e-banking. Vigilance is essential to ensure competition and trust and governments must do much more than encourage broadband and uptake of ICTs and the internet.

“They must also engage in further and renewed efforts to protect competition, lower artificial barriers to entry, strengthen regulatory coherence, improve user skills, and build trust in essential infrastructures and applications.” That’s partly because competition is being challenged by convergence in IP networks, and among telecoms operators and OTT players, and bundled offers. Issues to watch out for are zero-rated services, mobile consolidation and of course privacy and security. (It is reported that the growing profile of privacy and security issues “has not been matched by an equivalent acceleration in the development of metrics and other evidence needed by policymakers to evaluate the nature of the problem.”)

On national digital economy strategies the report identifies a number of ‘key pillars’ and gives copious examples from various 2020’ strategies around the OECD nations, with detailed attention to Brazil and Egypt. “Very few national digital strategies have an international dimension,” it is noted. “Among those that do, key issues are internet governance, climate change and development cooperation.” Germany and Sweden, in particular, emphasise global security and development.

INTERNET GOVERNANCE
The report places much importance on internet governance, with 2015/16 likely to be critical in shaping the landscape, and one of the many meetings that will weigh up the open internet will be the OECD ministerial meeting in 2016. The new sustainable development goals (SDGs) place a stronger emphasis on increased access to ICTs to create an inclusive and global digital economy, and will drive interest in internet governance.

There is a plethora of stats and commentary on ICT investment patterns and uptake (for example, the transition from copper and cable to fibre is occurring at only a gradual pace) and also on emerging areas such as the sharing economy and internet of things, where there is new regulation emerging in numbering and spectrum policy.

The report includes the OECD’s broadband and mobile price ‘baskets’ in a section on digital economy foundations, and notes that another report, ‘Triple and quadruple-play bundles of communication services’ (OECD, 2015) puts forward, for the first time, benchmarks for these bundles.

Turning to the internet, there is a section that proposes that the number of routed autonomous systems in a country may be a proxy for market competition.

POLICY AND REGULATION
A chapter on trends in policy and regulation covers:

■ Industry consolidation – poor fixed competition is a feature of large countries such as the US and Canada, but in mobile there has been consolidation or market entry in various countries.

■ Convergence, service bundles and OTT – authorities face increasing complexity in converged bundles, and there has been a ‘dramatic increase’ in partnership between operators and OTT players, some of which could have major market implications. Also analysed is the connected TV market, which some operators say could overwhelm the internet.

■ Net neutrality – the report notes that the literature on net neutrality is recent but growing rapidly, and there is as yet no unified approach among OECD countries. Also discussed is internet traffic exchange and content distribution networks, which have become important in reducing traffic costs. Zero-rating is also examined.

■ Advanced fixed networks – policies for fibre, vectoring and so on are discussed in detail.

■ Wireless - not least, spectrum policy, white spaces, numbering etc get a thorough airing.

REFERENCE
The IIC
COMMUNICATIONS POLICY AND REGULATION WEEK 2015
5-8 October, Washington DC

TWO KEY EVENTS IN THE IIC CALENDAR

THE 46TH ANNUAL CONFERENCE
Trends in Converged Communications: Fostering Innovation and Growth
7-8 October 2015
At the Ronald Reagan Building, International Trade Center
2015 discussion themes will include:

- Pathways for converged communications competition policy
- Connecting the unconnected in emerging and mature markets
- OTT convergence models – legacy media versus digital native
- Internet of everything – how do we ensure positive societal gain?

THE ANNUAL INTERNATIONAL REGULATORS FORUM (IRF)
Developing Models in Response to Regulatory Disruption
5-6 October 2015
Hosted by the FCC

2015 discussion themes will include:

- Regulatory disruption to initiate regulatory innovation
- Competition and allowing market failure
- Reducing the digital divide, increasing access

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ISSN 0309 11 8X

Printed in England by Charlesworth Press, Flanshaw Way, Flanshaw Lane, Wakefield WF2 9LP, UK

Annual subscription £175

Online: www.iicom.org

International Institute of Communications
Highlands House, Room 106,
165 The Broadway, London SW19 1NE
Tel +44 (0)20 8544 8076 | Fax +44 (0)20 8544 8077