



GLOBAL ICT REGULATORY

OUTLOOK 2017



ACKNOWLEDGEMENTS

This first edition of the Global ICT Regulatory Outlook Report was prepared by the ITU Regulatory and Market Environment Division (RME) of the ITU Telecommunication Development Bureau (BDT). The team comprised Sofie Maddens Toscano (Head of division), Youlia Lozanova (lead author), Nancy Sundberg and Carmen Prado-Wagner. The report was edited by Beth Friedemann Peoc'h. The work was carried out under the overall direction of Kemal Huseinovic, Chief, Infrastructure, Enabling Environment and e-Applications Department (IEE), Telecommunication Development Bureau.

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FOREWORD

I am proud to present the *Global ICT Regulatory Outlook 2017* that will be published annually to provide key insights on market and regulatory trends and forecasts in the information and communication technologies (ICT) sector.

The report is global in scope, while also featuring regional analysis and highlights from national experiences. It provides a historical perspective on the recent evolution of ICT regulation in order to make sense of current market and regulatory trends and through a high-level forecast charts the road ahead of us. The 2017 Outlook report is unique in that it encapsulates information that is relevant to concerns of regulatory bodies, operators, service providers and consumers worldwide. As we are faced with digital transformation and the need to address complex issues arising from the new economy enabled by automation and artificial intelligence, ICT regulation is not just about technological progress, but also has broader socioeconomic implications.

The 2017 Outlook report not only documents current trends; it puts forward recommendations on best practice for collaborative – Fifth Generation (5G) – regulation going forward. Content rich and based on extensive evidence, this report will form a valuable basis from which ICT regulatory bodies can engage in meaningful discussion within and across the sectors.

I am sure that the 2017 Outlook report will become an invaluable tool that enables different stakeholders to navigate through rapidly evolving technologies, business models and market structures that are affecting economies, society and people around the world.

I commend this report as a key resource on smart, inclusive and forward-looking ICT regulation in a world of digital opportunities for all. Its findings can provide useful guidance in reviewing and upgrading regulatory frameworks for the ICT sector as the basis for the digital economy today and for the future.



Brahima Sanou,
Director, Telecommunication Development Bureau

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ACRONYMS

4G LTE	fourth-generation long term evolution	CTO.....	Commonwealth Telecommunications Organisation
ADR.....	alternative dispute resolution	DFI.....	digital finance inclusion
ADSL	asymmetric digital subscriber line	DSL.....	digital subscriber line
AI.....	artificial intelligence	EU	European Union
AIP	administrative incentive price	FCA	Financial Conduct Authority
APEC	Asia-Pacific Economic Cooperation	FDI.....	foreign direct investment
AR	augmented reality	FMVNO	full mobile virtual network operator
ARPU.....	average revenue per user	FOI.....	fibre optics installer
AU.....	African Union	FTTH.....	fibre to the home
B2B.....	business-to-business	GCI	Global Cybersecurity Index
B2R.....	business-to-regulator	GDP	gross domestic product
BEREC	Body of European Regulators for Electronic Communications	GNI.....	gross national income
BPG	Best Practice Guidelines	GSR	Global Symposium for Regulators
CERT	computer emergency response team	ICT	information and communication technology
CIIP.....	critical information infrastructure protection	IMF	International Monetary Fund
CIS	Commonwealth of Independent States	IMT	international mobile telecommunication
CoIP	communication-over-IP	ISP.....	Internet Service Provider

IoT.....	Internet of Things	P2B.....	person-to-business
IOT.....	inter-operator tariff	QoE.....	quality of experience
IT.....	information technology	QoS.....	quality of service
ITU.....	International Telecommunication Union	QoSE.....	quality of service and experience
LAC.....	Latin America and Caribbean	R2B.....	regulator-to-business
LDC.....	least developed country	RANaaS.....	RAN-as-a-Service
LMIC.....	low- and middle-income country	RCC.....	Regional Commonwealth in the Field of Communications
M&A.....	mergers and acquisitions	RIA.....	regulatory impact assessment
M2M.....	machine-to-machine communications	RIO.....	reference interconnection offer
M2P.....	machine-to-person	RIIO.....	revenue incentives innovation outputs
ML.....	machine learning	RoI.....	return on investment
MNO.....	mobile network operator	SDG.....	Sustainable Development Goal
MTC.....	machine type communication	SMP.....	significant market power
MVNO.....	mobile virtual network operator	UAS.....	universal access and service
NaaS.....	network-as-a-service	UHDTV.....	ultra-high-definition television
NGA.....	next-generation broadband access	UPI.....	unified payments interface
NGN.....	next-generation network	USSD.....	unstructured supplementary service data
NRA.....	national regulatory authority	VDSL.....	very-high-bit-rate digital subscriber line
OSP.....	online service provider	VDSL2.....	very-high-bit-rate digital subscriber line 2
OTT.....	over-the-top	VoIP.....	Voice-over-IP
PoP.....	physical points of presence	VR.....	virtual reality

EXECUTIVE SUMMARY

Over past decades the world has witnessed a digital revolution that is ushering in huge change. The rate of that change continues to accelerate challenging our governments and institutions to keep pace. The ICT regulatory landscape too is evolving and at an ever-increasing pace. This report measures and monitors changes taking place in the telecommunication/ICT market itself as well as in the regulatory environment. It identifies and analyses seven *market trends* and seven *regulatory trends* and takes an informed view on future regulatory direction. The report builds on extensive data captured in the *ICT Regulatory Tracker*.

Of the many findings featured in this report, one stands out as particularly significant. It is this: the move towards a more open, collaborative regulatory approach, together with the role played by the ICT regulator in orchestrating this, will be critically important in delivering on the rich promise of the digital economy – to the benefit not only of consumers and businesses but to the 3.9 billion people who remain unconnected to the Internet.

SEVEN MAJOR TRENDS MOVING ICT MARKETS

1

ICTs move centre-stage as the digital economy gains momentum.

With the rise of the Internet and mobile communications, ICTs increasingly power the global economy, rendering some markets obsolete and enabling the emergence of others. New efficiencies and opportunities trigger important developments in industry and science – hardly any area of economy and society is untouched. And yet, the global picture remains mixed: while mobile has grown hugely, large populations still have no access to the Internet. This looks set to change as a growing swathe of urban young in developing countries make new demands for future connectivity.

2

Mobile – the engine for expanded local access to the Internet.

By 2017, three-quarters of all global Internet use will be via mobile and much of that growth will come in low and middle-income countries. Significant gaps in penetration remain with more than half the world's population yet to be connected to mobile broadband. Mobile virtual network operators have taken up this challenge, successfully targeting under-served market niches and optimizing network coverage to grow subscriber bases. While fixed connectivity leverages ICT for increased productivity, outreach and efficiency, mobile is set to transform economic sectors across the board.

3

ICTs are less visible but more prevalent.

As ICT moves into each area of our daily lives, cloud computing is the catalyst and enabler of important technological advances. The cloud transforms people's data into an increasingly valuable by-product: today's data trails produced by users using multiple ICTs are massive and growing, generating 'big data'. A new culture of 'dealing in data' is beginning to take root.

4

ICTs are enabling and disrupting industries.

ICT focus has shifted towards building platforms which integrate technologies, networks and devices powering new capabilities and services. 5G mobile broadband is being conceptually enhanced and is now poised to take the integration of communication protocols, devices and applications to the next level. Close-to universal coverage of ICT networks, especially mobile, paves the way for the connecting together of machines and objects, a major trend over the coming years.

5

The rise of the app economy.

The app economy is transforming economic and social activities and opening up channels of innovation, productivity and communication. Technology design deployed by disruptive app companies reduces transaction costs while allowing for increasing economies of scale. The outlook for both network operators and over-the-top providers is bright as they benefit from a virtuous cycle: as the ICT sector outgrows all others, innovation continues to power ahead creating yet more opportunity.

6

Market concentration and consolidation.

The past decade has seen ICT in constant flux – new players, services and delivery platforms have stretched boundaries and changed market dynamics. Led by innovation, digitization and automation, new competitors have gate-crashed markets around the world. In 2016, high-profile mergers and acquisitions swept the ICT landscape, featuring a wide range of market players and deals, from fibre to cloud to artificial intelligence. In some cases, players from the extended ICT sector are opting for strategic partnerships or ‘coopetition’.

7

Cyber threats have grown in scope and scale.

Massive digitization in consumer and corporate life has brought increased risk. The level of threat has grown as the tools in the hands of criminals and terrorists have become more sophisticated. Though cyber readiness has become paramount for building secure ICT networks and services, not all countries are prepared.

SEVEN MAJOR TRENDS THAT CHARACTERIZE THE REGULATORY LANDSCAPE

1

Collaboration – fast-tracking the promise of the digital economy.

With the growing economic confidence of ICTs and related markets has come a new regulatory assertiveness embodied in the G5 collaborative regulation approach. Increasingly, ICT regulators are teaming with regulators from other sectors to address multi-sector issues. Equipped with this collaborative, problem-solving attitude, regulators are better harnessing and maintaining buoyant growth. Key questions for today's regulators include: how to collaborate and with whom? What are we regulating and how?

2

Regulatory landscape continuing to see rapid and fundamental change.

The ICT sector cannot remain narrowly focused on its own players and issues – simply because convergence has blurred boundaries and complicated the rules of the game. The pace of regulation in the ICT sector is faster than in most other industries today, with transformation happening all the time.

3

More regulation being adopted; many countries expand scope of regulatory policies.

From 2007 to 2015, ICT regulation is characterized both by the volume of change and the increasing pace at which it is adopted. No fewer than 52 regulators are now in the G4 category. Fifty-five per cent of countries have moved one generation up the ICT ladder of regulation while 15 per cent have leaped generations in only nine years. In contrast, one-quarter of countries have seen no regulatory movement since 2007.

4

Regulation as an equalizer.

Regulation ensures that all market players – from start-ups to national incumbents to multinational corporations – benefit from a level playing field. Competition is essential today in spurring innovation, diversifying services on offer and improving consumer experience in ICT markets. The regulation of that competition continues to trigger a massive opening up of ICT markets, from basic telephony services to mobile broadband.

5

Focus moves to monitoring and enforcement.

The scope of monitoring and enforcement continues to widen. In 2015-16, challenging issues – including taxation of players without national physical points of presence and the poor quality of information being shared over social media – have sparked passionate global debate. These issues underline the need for more effective monitoring and enforcement of regulation.

6

One model does not fit all – convergence and divergence in complex, fast-moving landscape.

A single ICT regulatory model that fits all does not exist. Points of convergence are emerging however, driven by factors such as efficiency, extended access to networks, affordability and quality of service. New issues are constantly emerging, posing challenges for regulators. Some challenges require collective action from the international community while others will disrupt the market order.

7

Regulators are standing up to challenges, reinventing the rules.

Expectations of ICT regulation have grown. No fewer than 43 countries now conduct a Regulatory Impact Assessment before regulatory decisions are made. Incentive regulation is sometimes included to encourage investment, especially in infrastructure. Ex ante Regulatory Impact Assessment and evidence-based decision-making have become mainstream.



INTRODUCTION

A thriving digital economy needs operators, content and app providers to provide a broad range of products and services to a diverse range of customers. Regulation is the invisible interface that makes the interplay between investors, service and content providers, and consumers smoother, richer in opportunities and more predictable.

This Global ICT Regulatory Outlook 2017 is the first of an annual series of reports tracking market and regulatory trends in the information and communication technologies (ICT) sector and their implications across the economy. It looks at how we got here, what here looks like now, and looks forward to the future.

This edition of the 2017 Outlook captures:

- Seven main trends driving ICT markets.
- Seven key tracks in the regulatory debate that will continue to develop over the year to come.
- Seven forecasts for the transformation of the global regulatory landscape.

The data behind the report was captured through the ITU ICT Regulatory Tracker, an evidence-based tool which covers up to 189 countries and economies over the period 2007 – 2015.

For this report, the Tracker made use of both quantitative and qualitative data derived from 50 indicators, across four clusters – regulatory authority, regulatory mandate, regulatory regime and competition framework – with the main goal of helping decision-makers and regulators more fully understand the ever-changing terrain of ICT regulation. More precisely, the Tracker pinpoints changes in the ICT regulatory environment, facilitates benchmarking and identification of trends, and identifies gaps in existing regulatory frameworks – with the overarching goal of moving towards collaborative regulation for an inclusive ICT sector.

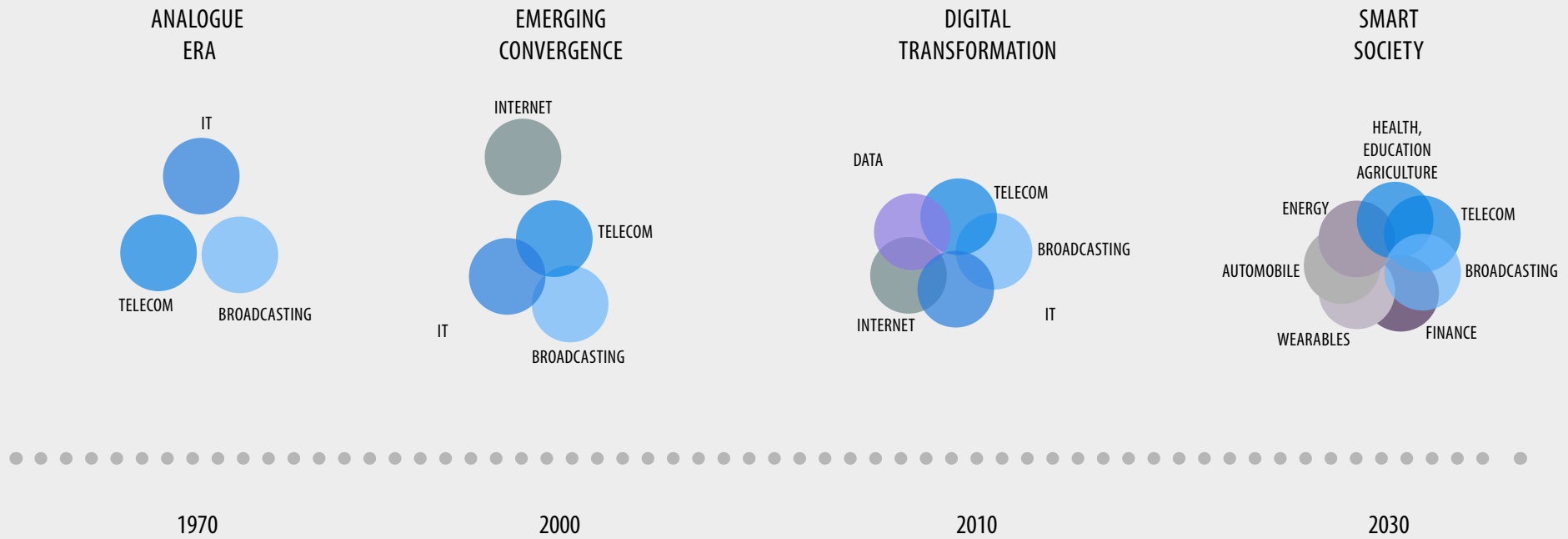
Understanding current trends and challenges across ICT markets and regulatory frameworks can help address the gaps and capitalize on unexplored opportunities. This report provides useful insights and a clear, evidence-based perspective to do that.

Figure 1:

INFOGRAPHIC TIMELINE: NEW CONVERGENCE

Note: The circles represent widely economically & socially integrated sectors.

Source: ITU.



GLOBAL ICT MARKET TRENDS

Over the past fifty years, we have witnessed – and will continue to witness – a digital revolution that is ushering in huge change. The pace of that change continues to accelerate inexorably beyond our expectation, profoundly challenging our governments and institutions to keep pace. With the rise of the Internet and mobile communications, ICTs increasingly power the global economy. Existing markets are transformed beyond recognition, others have become obsolete while new ones emerge. Hardly any area of economy and society has remained untouched.

In centuries past, change took place gradually across many generations. New means of communications were a once-in-a-lifetime occurrence. For example, early on in the twentieth century, fixed-line telephony and radio were the only communication services available to earlier generations. Decades later, new

generations became global citizens thanks to television. Internet has brought multiple change and the pace of that change is accelerating – so much so that rapid, ongoing change characterizes our age. The power of Internet has proved unstoppable. Neither the [dot.com](#) bubble nor the 2008 global financial crisis could do it long-term damage. While the global economy has struggled to shake off pessimism and uncertainty, the Internet marches on – the last decade has witnessed an unfolding patchwork of innovation, diversification and growth. If there is one certainty in this ever-changing environment, it is that more change is coming.

Unfolding wider and deeper, digital convergence has become a reality in many areas (see Figure 1). The analogue era of telecoms and over-the-air broadcasting has been overthrown by powerful digital enablers, which have taken root

across the board. The telecom and broadcasting sectors have converged with IT and the Internet to form today's first generation of digital economies. Ahead of us, convergence is likely to expand further and blend virtually all sectors of the economy and society. ICTs are at the core of the transformative digital convergence towards pervasive augmented services and applications, from mobile money to autonomous cars to health monitoring.

It is increasingly difficult to estimate the size of the ICT sector and revenues since the boundaries between telecoms, IT, ICT and Internet are increasingly blurred.¹ Any estimate depends on categories included and excluded as the basis for calculation. Some analysts have estimated 2016 global ICT revenues

at EUR3.98 billion, and growing to EUR4.46 billion by 2019.² Other analysts had projected the size of the broader 'Internet economy' at around USD4.2 trillion by 2016, equivalent to 5.3 per cent of total gross domestic product (GDP) for G-20 economies alone (and up from 4.1 per cent of total GDP in 2010).³

Recent estimates expect the global information technology (IT) industry market (hardware, software, services and telecommunications) to reach USD3.8 trillion in 2016, up from USD3.7 trillion in 2015, with the US market alone accounting for just over one-quarter or over USD1 trillion.⁴ Other forecasts place worldwide IT spending at USD3.4 trillion in 2016, and growing to USD3.8 trillion at the current dollar exchange rate by 2020.⁵

1 Bob O'Donnell, "10 Tech Predictions for 2017"
2 www.statista.com
3 www.consultancy.uk
4 IDC prediction
5 Gartner Market Databook Q3 2016 update



TREND 1

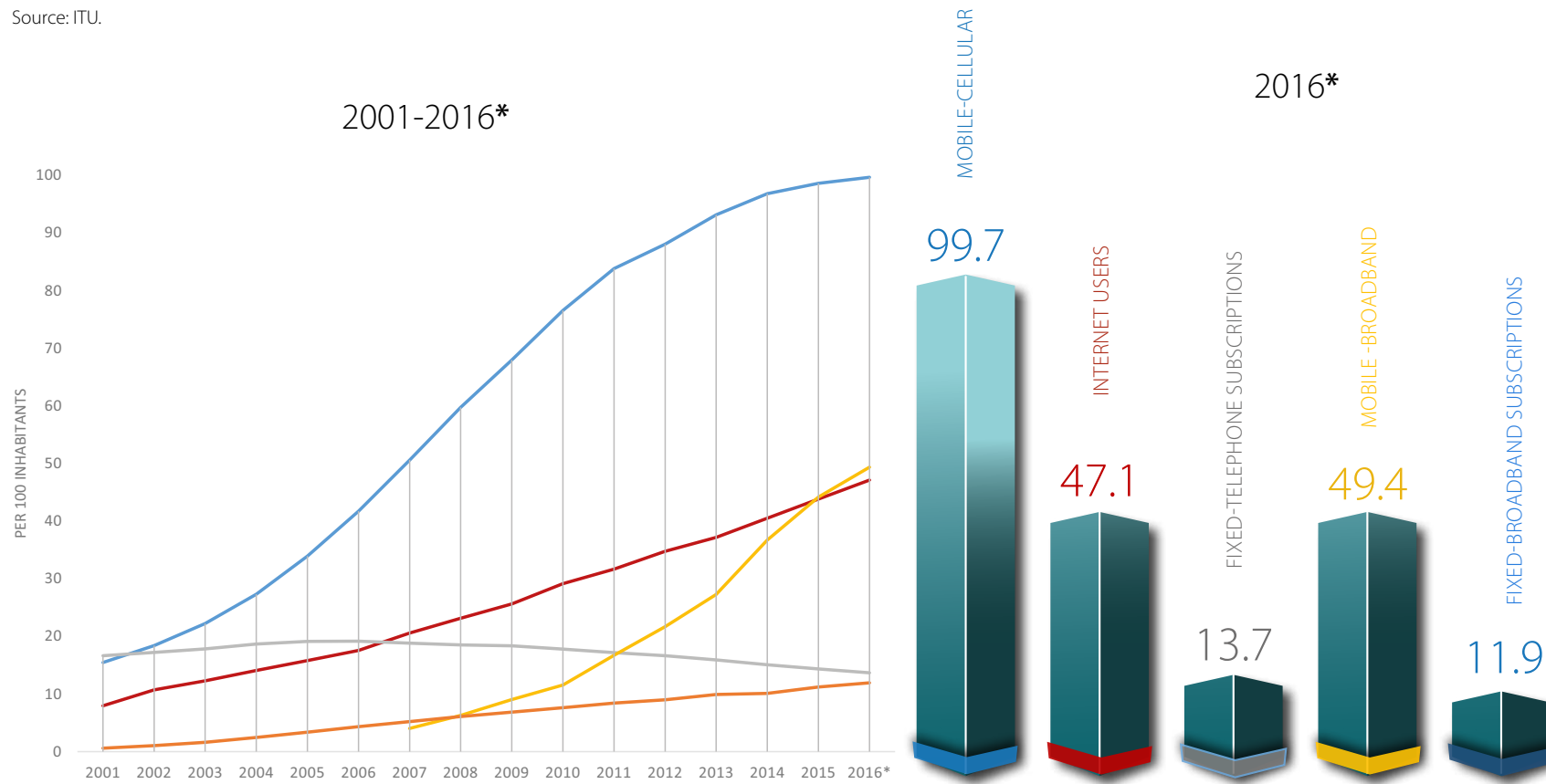
ICT MOVES CENTRE-STAGE AS THE DIGITAL ECONOMY GAINS MOMENTUM

ICT has become both the most and least visible sector as the digital economy expands centre-stage, linking people and machines across diverse aspects of our everyday lives. New efficiencies and opportunities have triggered important developments in industry and science, ushering in new possibilities to our daily lives. Much of this progress is due to massive investment in infrastructure and growing consumer demand. And yet, the global picture remains mixed: while the growth of mobile has been extraordinary, large populations have as yet no access to the Internet. This looks set to change however, with a growing swathe of urban young in developing countries making new demands for future connectivity.

Figure 2:
**GLOBAL ICT DEVELOPMENTS WORLDWIDE,
 PER 100 CAPITA, 2001-2016 AND 2016**

Note: *Estimates.

Source: ITU.



*Affordability drives surge in mobile broadband –
but 5 billion remain beyond its reach*

The growth of mobile has been outstandingly successful. There are now more cellular mobile connections than there are people in the world – 7.3 billion in 2015 – and 49 mobile-broadband subscriptions per 100 capita, globally. While the overall growth for mobile is flattening out, mobile broadband is booming and promises to reach more people more rapidly than any other technology in history (see Figure 2, left chart). Mobile-broadband services have become more affordable than fixed-broadband services. At the end of 2015, average mobile broadband prices corresponded to 5.5 per cent of global gross national income (GNI) per capita – less than half the cost of fixed broadband.⁶

In 2016, just under three-quarters of all Internet use was via mobile as consumers increasingly favoured access via smartphones and tablets.⁷ In developing countries, the number of mobile-broadband subscriptions continues to grow at double digit rates, reaching a penetration rate of close to 41 per cent in 2016.⁸ In spite of these leaps ahead, large populations remain unconnected even though ICT technologies are within reach: 3.9 billion people have not accessed the

Internet (see Figure 2) and 5 billion do not have access to mobile broadband (See Table 1).

Globally, only one-third of the total population has access to mobile-broadband services. Not surprisingly, the proportion in developed regions is close to 50 per cent while 26 per cent of people in Arab States and only 14 per cent of people in Africa enjoy mobile Internet (see Table 1). The bottom line: further efforts are needed in all regions to connect the unconnected to the Internet, from building infrastructure to developing service offers to making services more affordable.

*Technologies coming of age –
some casualties but many new opportunities*

And there are some barriers to accelerated growth: intensified competition between carriers has lengthened the smartphone replacement cycle, a challenge for mobile software developers and handset makers alike. Carriers are looking to alternative sources of revenue – including connected cars, tablets, and IoT devices – to drive growth as phone subscriber growth stagnates.⁹ Telco priorities are shifting towards improved online experience for subscribers, optimizing network

6 ITU, *ICT Facts & Figures 2016*

7 www.reuters.com

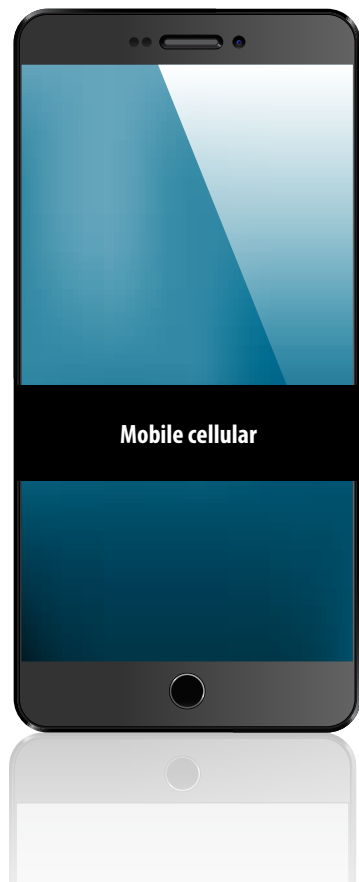
8 ITU, *ICT Facts & Figures 2016*

9 uk.businessinsider.com

Figure 3:
**DEGREES OF CONNECTIVITY,
MOBILE CELLULAR AND
MOBILE BROADBAND, WORLDWIDE,
2016***

Note: *Estimates

Source: ITU, based on data from ITU, Broadband Commission for Sustainable Development and GSMA.



Subscriptions:

99.7%

People covered:

95%

Unique subscribers:

65%

PEOPLE COVERED:

84%

ACTIVE
SMARTPHONES
(INSTALLED BASE):

54%

SUBSCRIPTIONS
49.9%

Mobile broadband

UNIQUE SUBSCRIBERS
32.1%



Table 1:

MOBILE BROADBAND (3G AND 4G) SUBSCRIBERS, BY REGION, END 2016

Region	3G and 4G Subscribers (millions)	Total population, No. inhabitants (millions)	Unconnected people without 3G or 4G (millions)	% Connected by 3G and 4G	3G and 4G as a proportion of % Mobile
Africa	153.10	1,060.67	907.58	14.4%	32.1%
Americas	468.11	1,004.65	536.54	46.6%	64.8%
Arab States	84.78	314.95	237.98	26.3%	42.6%
CIS	91.71	283.09	191.38	32.4%	41.5%
Europe	311.20	635.55	324.36	49.0%	62.3%
Asia & Pacific	1,268.01	4,101.04	2,833.03	30.9%	47.5%
Oceania	22.09	31.60	9.51	69.9%	55.0%
Total	2,376.91	7,399.96	5,030.86	32.1%	49.6%

Source: Broadband Commission for Sustainable Development.

performance, service personalization, subscriber behavior analysis, cybersecurity defense and premium services.¹⁰

Though fixed-broadband adoption is rising steadily, high deployment costs prevent it from skyrocketing at the pace of mobile. In early 2016, three out of four fixed-broadband subscriptions had advertised speeds of 10 Mbit/s and above in developed countries, compared with two out of four in developing countries.¹¹

Amidst ongoing innovation and competition, the rise of some technologies has meant the fall of others. In some markets, the tendency to cut the cord has progressed, for example, during the second quarter of 2016, the US suffered a net drop of nearly 200 000 subscribers in fixed-broadband subscribers due to a 4 per cent decline in copper-based broadband connections,¹² and the telco shifting its focus increasingly to LTE mobile broadband and satellite TV.

¹⁰ Telecoms Intelligence, [Broadband Outlook 2016](#)

¹¹ ITU, [ICT Facts & Figures 2016](#)

¹² [point-topic.com](#)

Figure 4: BY THE NUMBERS

Source: ITU.

At the end of 2016, 3.9 BILLION people -- 53% of the world's population -- are not using the Internet:



In the Americas and the Commonwealth of Independent States (CIS) region, about ONE-THIRD of the population is offline.



Almost 75% of people in Africa are non-users, while only 21% of Europeans are offline.



In Asia and the Pacific and the Arab States, the percentage of the population that is not using the Internet is very similar: 58% and 60%, respectively.



As the sector continues upgrading full-stream, landmark technologies enter into history. Swedish-owned Estonian fixed and mobile operator Telia Eesti have announced plans to phase out its ADSL services over the next four years, while upgrading customers to alternative technologies.¹³ Around 38 per cent or 90 000 of Telia Eesti's 240 000 broadband customers currently use ADSL-based services. Roughly half of these will upgrade to fibre, 40 per cent to VDSL2+¹⁴ and [G.fast](#),¹⁵ with 10 per cent replacing fixed-line service altogether with LTE as an alternative by 2020. Analysts expect that nearly 30 million homes and businesses will subscribe to [G.fast](#) services around the world by 2021.¹⁶

*Global infrastructure and connectivity –
in spite of major progress, access remains a mixed picture*

Massive investment in infrastructure and boosted consumer demand have underwritten the global ICT success story. National fibre backbones have been transformed from straight lines into a proliferation of connections and loops.¹⁷ Because the backbone networks have the capacity to increase exponentially, traffic

has been flowing across networks everywhere, or almost. Proximity to fibre nodes has surged ahead for the world's population:

- roughly two-thirds (excluding North America) are within 50 km (see Figure 5, left chart);
- 43 per cent fall within the 25-km range;
- 20 per cent are within a 10-km or lower radius, enjoying full access to all broadband services in terms of speed and bandwidth.

By early 2016, total international Internet bandwidth had increased more than six-fold to reach 185 000 Gbit/s – up from 30 000 in 2008. Africa has the least international connectivity of all regions: Asia and the Pacific enjoy twice as much bandwidth, the CIS region four times as much, the Americas eight times as much, and Europe more than twenty times as much. Lack of international connectivity is a major bottleneck in the Internet infrastructure of least developed countries (LDCs).¹⁸

Levels of connectivity vary markedly among regions, despite sustained growth. Asia and the Pacific is host to almost half of the world's fibre backbone kilometers.

¹³ www.telegeography.com

¹⁴ The higher generation of VDSL2

¹⁵ A gigabit broadband access technology that exploits the existing infrastructure of wire-pairs that were originally deployed for plain old telephone service (POTS) services.

¹⁶ telecoms.com

¹⁷ ITU has developed a global [Transmission Map](#)

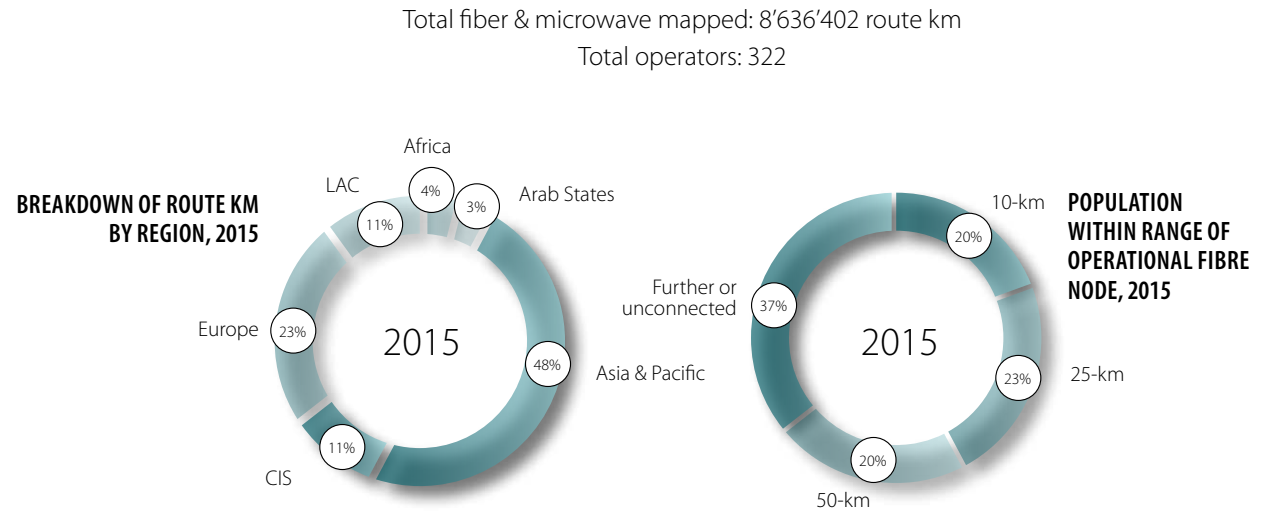
¹⁸ ITU, [ICT Facts & Figures 2016](#)

Figure 5:

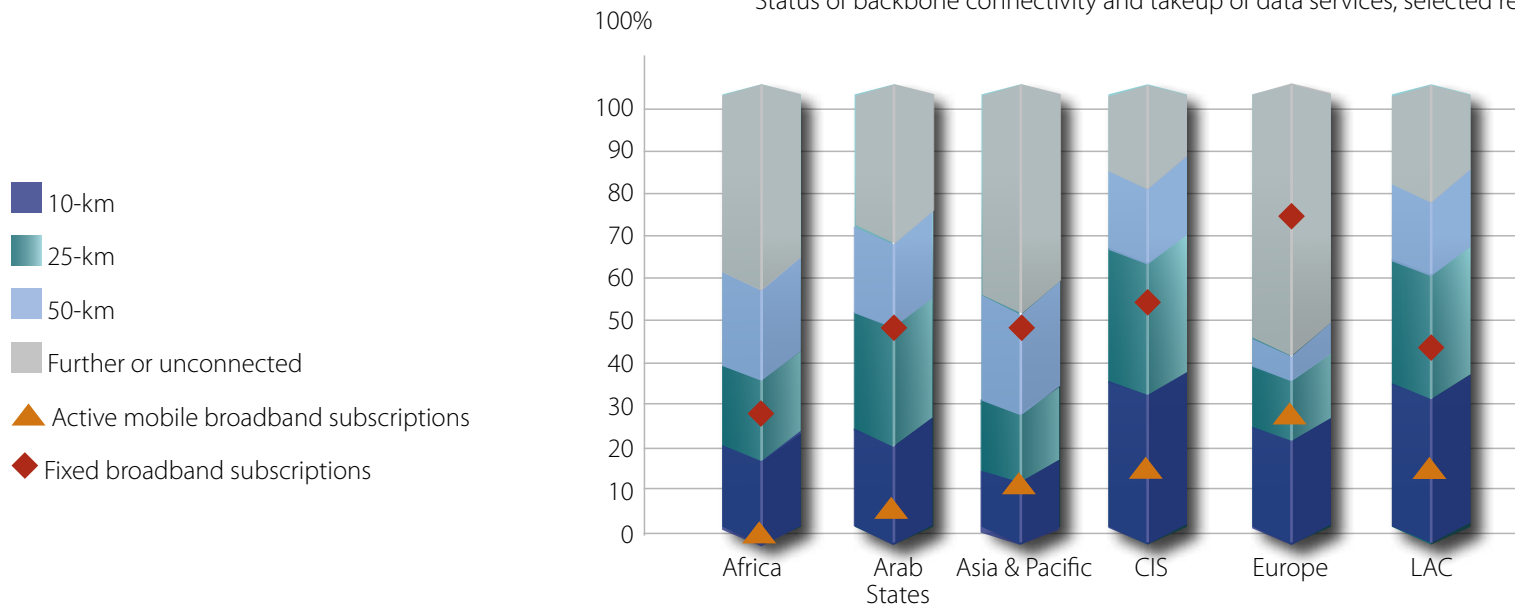
BACKBONE CONNECTIVITY: AVAILABLE CAPACITY VS ACTUAL ADOPTION

Notes: This breakdown is based on the metrics of the [ITU Transmission Map](#) (work in progress). North America is not included in the figures.

Source: ITU.



Status of backbone connectivity and takeup of data services, selected regions, 2015



Europe hosts one-fifth of the total (excluding North America) thanks to profitable businesses and strong policy support for broadband in the region. Africa has seen a relatively slow roll-out of infrastructure because of under-developed national backbones in several countries: it is host to just over one-third of the fibre backbone kilometers to be found in Latin America and the Caribbean, or in CIS States. Arab States host only 3 per cent of the global total.

The future of connectivity looks promising in many developing countries as a rapidly growing young urban class more intimately connected with the world through mobile phones is making new demands – touching on everything from OTT video to app coding. With this growing demand, the networks will follow. The challenge is how to make this happen sooner and in more countries. The Regulatory Trends that follow shed light on a number of salient issues to be addressed.

Looking more closely at how available capacity translates into actual service adoption, we can see:

- Europe – is the clear leader in maximizing numbers of connected subscribers relative to available infrastructure – especially in regard to mobile-broadband services. More than half of those living further than 50 km from a fibre node have a mobile-broadband subscription and close to 90 per cent of those within the 25-km range have a fixed-broadband subscription (see Figure 5, right bar chart). Although the region has not been covered in the current analysis, the situation is likely to be similar in North America.
- Asia and the Pacific – has the highest optimization ratio for fixed broadband and the highest optimization ratio for mobile broadband among developing regions.

- Arab countries – notably have optimized the 25-km range for mobile broadband, counting as many subscriptions as people covered by the service; fixed broadband, however, is lagging behind.
- Africa – fixed broadband take-up continues to be low, although one-fifth of the population *could have ready access* to services. The prospects for mobile broadband look more promising, with two-thirds of people in the 25-km range connected.
- CIS and Latin America and the Caribbean – both have a higher proportion of the population within 50-km reach of fibre node among developing regions at around 80 per cent. Both regions have relatively well optimized the 25-km range for mobile broadband; however, fixed-broadband subscriptions remain far below potential.

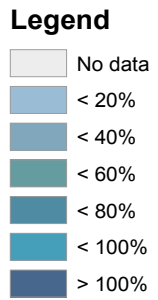
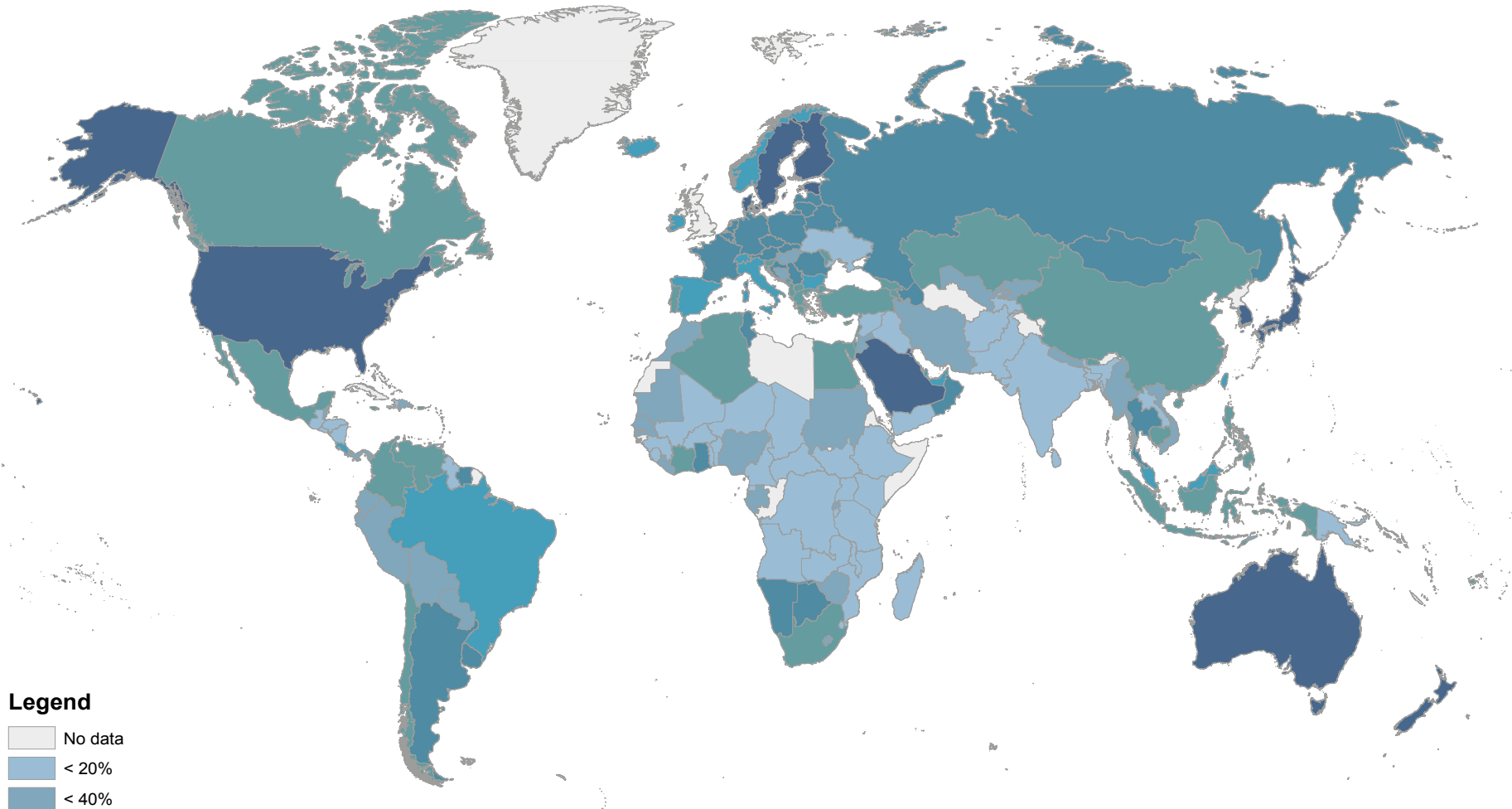
Deploying and extending nationwide broadband infrastructure remains a key target in most countries' plans and digital agendas. While huge efforts have been made to increase international connectivity, many countries still face challenges in deploying and expanding next-generation networks (NGNs) to support continuing growth in data traffic. On the positive side, new international submarine cables have been deployed along the eastern and western coasts of Africa and across the Atlantic, increasing the options for international high-speed connectivity between that continent and the rest of the world. This competition will help to further reduce the costs of international bandwidth. However, the challenge now is to ensure that cable landing stations are connected to domestic broadband networks and operated competitively.



TREND 2

MOBILE - THE ENGINE FOR EXPANDED GLOBAL ACCESS TO THE INTERNET

Mobile is today's ICT poster-child. Generations of mobile-broadband technology have rapidly succeeded each other fueling outstanding growth. By 2017, three-quarters of all global Internet use will likely be via mobile, as consumers use smartphones and tablets to access the web. Much of that growth will take place in low- and middle-income countries. In spite of extraordinary growth, the global picture remains mixed: significant gaps in penetration exist and more than half the world's population has yet to be connected to mobile broadband. Mobile virtual network operators have taken up this challenge however, and are successfully targeting under-served market niches and optimizing network coverage to grow subscriber bases. Many elements are coalescing in new and innovative ways to expand penetration: new technologies are evolving rapidly, sparking agile business models aligned with them and with regulatory incentives while consumer demand continues to outgrow expectation. While fixed connectivity will continue to help leverage ICT for increased productivity, outreach and efficiency, the mobile sector is set to be the engine for transforming economic sectors across the board.



Map 1:
MOBILE-BROADBAND SUBSCRIPTIONS PER 100 CAPITA, 2015

Source: ITU.

The hyper growth of mobile has become emblematic of ICT potential. Generations of mobile-broadband technologies have rapidly succeeded each other in a short timespan. When the first smartphone hit the market in 2007, mobile broadband was in its infancy – today, it has become the dominant communication technology. In a decade, mobile broadband downlink speeds have multiplied from 500 kbits/sec to over 10 Mbits/sec. Greater availability and affordability, combined with speed increases and improved technical capabilities, have powered a brave new world of mobile services, applications and content. Worldwide downloads exceeded 90 billion in 2016, an increase of more than 13 billion across the iOS App Store and Google Play.¹⁹ The amount paid to app publishers reached nearly USD89 billion in 2016.²⁰

As discussed above, cellular mobile connections now surpass the world's population and smartphone penetration amounts to just below 50 per cent globally.²¹

Some analysts forecast that by 2017, three-quarters of all Internet use will be via mobile, as more consumers around the world access the web on smartphones and tablets. Analysts forecast 5.6 billion smartphones by 2020 and around 90 per cent of that growth will come from low- and middle-income countries (LMICs).²² 4G

LTE subscriptions will make up the largest portion of overall mobile subscriptions globally as India and emerging markets in the Middle East and Africa catch up with the rest of the world.²³

And yet despite the huge growth and bright predictions – gaps in penetration persist today, both for narrowband and broadband mobile services (see Map 1 and Table 1).

The top five largest unconnected markets in mobile in terms of absolute subscriber numbers account for nearly half (or 48 per cent) of the total number of people without access to mobile telephony. The top ten largest unconnected markets in mobile account for just over six-tenths or 61 per cent of the total number of people without access to mobile telephony. The top ten markets are: India, China, Nigeria, Pakistan, Brazil, Bangladesh, Ethiopia, Indonesia, the United States and Congo (Dem. Rep.). Half are in Asia, three countries are in Africa (Nigeria, Ethiopia and the Congo D.R.) and two are in the Americas (US and Brazil) (see Table 2).

Regions and countries are at different levels of adoption of mobile-broadband services, too. As discussed in the previous section, more than half the world's population are yet to be connected to mobile broadband services.

19 App Annie, [2016 Retrospective](#)

20 App Annie, [2016 Retrospective](#). This includes revenues across iOS App Store and Google Play as well as third-party Android stores and advertising revenue.

21 ITU, [ICT Facts & Figures 2016](#)

22 GSMA Global Mobile Economy 2016

23 uk.businessinsider.com

*It's in the air –
mobile everywhere*

Everything, everywhere is going mobile – from our identity to health to money and this trend will accelerate. New business models – now accessible to service providers – are as much an enabler of more vigorous competition in mobile markets as they are a driver of consumer demand and adoption.

*MVNOs: agile business model,
massive potential*

Mobile virtual network operators (MVNOs) have existed for two decades. They offer mobile services to customers by reselling wholesale capacity purchased from Mobile network operators (MNOs) owning infrastructure. Driven by commercial interests and regulatory incentives, MVNOs are agile in targeting underserved market niches and optimizing network coverage against subscriber growth. MVNO strategies have been wide-ranging. More traditional commercial partnerships between MNOs and MVNOs based on infrastructure-sharing are part of today's ICT market landscape, from branded resellers to service MVNOs to full MVNOs. By the end of 2018, MVNOs will be serving over 3 per cent of the world's subscriptions.²⁴

Geographically, Europe represents the largest MVNO market while the US, the second-largest geography, has experienced a period of MVNO renaissance after the global financial crisis. Both markets will continue to constitute the largest MVNO customer base for many years while the Asia-Pacific region is emerging as the 'third pole' of global MVNO activities. Some of the largest MVNOs today are LycaMobile, Tracfone, Tesco Mobile and Virgin.

MVNOs are poised to become mainstream and their potential in the mid-to-long term is massive. MVNOs:

- react nimbly to market changes and develop new types of services;
- connect underconnected populations;
- optimize spare capacity of existing mobile networks;
- are not handicapped by legacy network infrastructure or the need for large new capital investments; and
- offer more flexibility with greater diversification of services.

Other market developments favour the growth of MVNOs. There is growing interest in MVNOs offering data connectivity for Machine-to-Machine communications (M2M) and the Internet of Things (IoT) (see Trend 4 here), on the back of expanding 3G and 4G data service offerings from MNOs.²⁵ Recent

²⁴ Informa, [The multifaceted world of MVNOs](#)

²⁵ ITU, [GSR14 Discussion paper on Why Competition matters and how to foster it in the dynamic ICT sector](#)

Table 2:

**TOP TEN LARGEST UNCONNECTED MARKETS
IN MOBILE (UNIQUE MOBILE SUBSCRIBERS),
END 2016**

	Top Ten Markets	Unconnected (millions)	Total population (millions)	% unconnected (penetration)
1	India	660.19	1,334.66	49.5%
2	China	362.28	1,385.28	23.6%
3	Nigeria	101.68	189.41	53.7%
4	Pakistan	101.12	194.79	51.9%
5	Brazil	85.35	210.41	40.6%
6	Bangladesh	75.73	163.87	46.2%
7	Ethiopia	68.45	103.10	66.4%
8	Indonesia	64.45	262.05	24.7%
9	United States	61.88	325.30	19.0%
10	Congo, Dem. Rep.	59.93	80.98	74.0%

Source: Broadband Commission for Sustainable Development.

advances in network architectures have encouraged MVNOs to speculate about the development of services such as network-as-a-Service (NaaS) or RAN-as-a-Service (RANaaS) systems – services which could transform the mobile network environment. In a RANaaS model, mobile network infrastructure and network access is sold wholesale, while multiple consumer-facing services are delivered

virtually through different operators. If it successful, this could make the MVNO model more standard and widespread in mobile operator markets.²⁶ In a slightly more distant future, the provider-subscriber relationship might be turned on its head completely. Service or app providers might offer free services in exchange for users' data on their usage patterns, habits and lifestyles.

²⁶ ITU, [GSR16 Discussion paper on Emerging technologies and the global regulatory agenda](#)

Box 1:

FREEMIUM IS THE NEW PREMIUM

New business models based on partnerships between different market players offer new opportunities to reach out to cost-sensitive segments of users.

In 2016, Freemium Sprint MVNO and Global SIM provider, FreedomPop, launched a new version of its Global SIM called the WhatsApp SIM including unlimited usage of WhatsApp, 100 VoIP minutes, 100 SMS and 200 MB of data as a free monthly package in Spain and the US.

FreedomPop plans on expanding the model. It recently announced its plans to launch Mexico's first 100% free mobile service in conjunction with MVS Communications, a Mexican media conglomerate, and VARIV, a Mexican investment firm. Starting in 2017, FreedomPop will offer a base level of text, voice and data 100% free every month, connecting Mexicans left off the connected grid.

FreedomPop claims more than 1 million global subscribers in 2016. More than half of FreedomPop's subscribers pay nothing for their service each month.

Perhaps FreedomPop's 'freemium' pricing scheme is a sign of things to come: consumers receive a basic service free, while profits come from selling them extras.

Source: Freedompop, MVNOdynamics and The Economist.

Wi-Fi coverage growing rapidly – cable-and-cellular models forging new ground

Wi-Fi coverage in a number of countries is expanding fast, making additional capacity available to both service providers and consumers. Making calls over Wi-Fi has been possible for more than a decade. But it is only in recent years

that networks, handsets and voice-encoding software have been able to provide sufficient quality to make such calls widely acceptable.²⁷ Recent mobile technologies allow the seamless handing over of calls between Wi-Fi and mobile cellular networks. A number of mobile network operators have been using traffic off-loading techniques to relieve congested networks.

27 www.economist.com

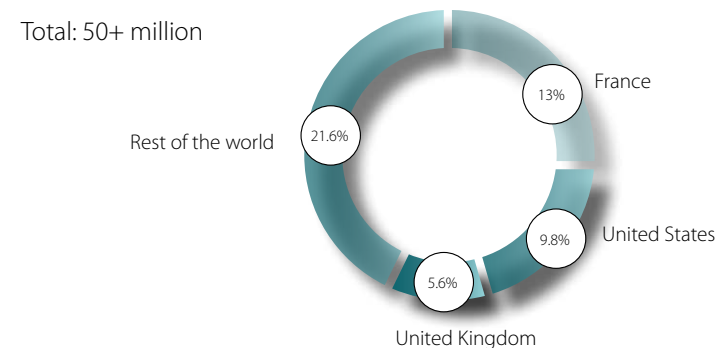
The number of public Wi-Fi hotspots worldwide exceeded 50 million points in 2015, an 80 per cent increase from 2013. The number of hotspots is expected to continue to grow rapidly and to hit 340 million global hotspots by 2018. Today there is one Wi-Fi hotspot for every 150 people on earth. By 2018, there will be one Wi-Fi hotspot for every 20 people in the world.²⁸

France currently heads the hotspot leaderboard with more than 13 million hotspots, having invested early on in expanding its Wi-Fi network. The United States is second at more than 9.8 million and third is the United Kingdom, at 5.6 million (see Figure 6).²⁹ The Netherlands scores the highest in terms of time on Wi-Fi, with traffic going over Wi-Fi (as opposed to mobile networks) 70 per cent of the time a smartphone is used. China and New Zealand follow, with each at 63 per cent. In total, smartphone users in 46 countries spent more than half of their time connected to Wi-Fi.³⁰

Free public Wi-Fi hotspots are increasingly set up by providers of public services – from administrations to libraries, universities and hospitals. Building on this practice, the European Commission encourages each community – from villages to cities – to provide at least one public and free Wi-Fi access points for its citizens.

28 [iPass](#)
 29 [iPass](#)
 30 [opensignal.com](#)
 31 [europa.eu](#)
 32 [Balancing-Act Africa](#)

Figure 6:
WI-FI HOTSPOTS GLOBALLY, 2015



Source: ITU Analysis, based on [iPass](#).

This is complementary to the proposal to consider broadband access as a universal service under the new European Communications Code. Estimates show 40 to 50 million Wi-Fi connections per day could take place thanks to the initiative.³¹ In India, the Ministry of Electronics and Information Technology announced an initiative to roll-out Wi-Fi hotspots in 1 050 Indian villages at a cost of USD62 million. The project will extend nationwide after the initial six-month stretch.³²

Wi-Fi connectivity has opened the way to some new, alternative ways of delivering ICT services of all kinds. The Wi-Fi First model³³ is one example. The model is one where mobile devices and services use Wi-Fi as the primary network with cellular networks used to fill the gaps. This new business model offers lower-cost options for consumers. Free, the French mobile operator, launched a Wi-Fi First venture in 2012 and UK mobile operator EE has claimed the first launch of Wi-Fi calling in the UK in 2015.³⁴ Republic Wireless, Scratch Wireless and Freedompop (see Box 1) piloted the model successfully in the US. One differentiator of the Wi-Fi First model is the absence of time-bound contracts – pure pay-as-you-go. Such ventures raise the bar for both MNOs and MVNOs but also provide new opportunities to relieve overloaded mobile networks.

For pure-play cable operators, Wi-Fi First leverages Wi-Fi to provide multimedia, data and voice services to subscribers. For cable operators partnered with cellular providers via full mobile virtual network operator (F-MVNO) configurations, Wi-Fi First means that in the absence of Wi-Fi connectivity is provided through the cellular partner's network. Such data steering and hand-off mechanisms between technologies are required to ensure good end-user experience.³⁵

33 wiffirst.org/

34 telecoms.com

35 www.lightreading.com

36 Cisco, "Cisco Visual Networking Index (VNI) Mobile Forecast Projects Nearly 10-fold Global Mobile Data Traffic Growth over Next Five Years", 2015

37 europeanlawblog.eu

Mobile network operators are also increasingly hooked on Wi-Fi. Cisco VNI 2015 estimated that by 2014, 46 per cent of mobile data traffic was offloaded to WiFi networks, and that figure will grow to 60 per cent by 2020.³⁶

While Wi-Fi offers real opportunities for boosting connectivity and reducing cost, certain aspects need to be handled with care. Frequency needs to be coordinated across commercial and other services, and those operating a spectrum commons regime. In some cases, the liability of open Wi-Fi operators can also prove problematic.³⁷

International mobile roaming – MVNOs poised to provide free / low-cost ICT access to millions

New mobile technologies and greater competition are pushing mobile players to diversify their offer and meet specific user-groups' demands – either ethnic, demographic or professional. Both infrastructure sharing and international roaming regulations are more relaxed and incentive based compared to ten years ago – which has helped pave the way for new, global mobile businesses. In the

European Union, regulation setting upper limits on wholesale and retail data roaming services has driven the creation of MVNOs focused on providing data services to customers roaming outside their home markets. European regulations set a margin between the maximum wholesale and retail data rates sufficiently large to enable new entrants to provide roaming services profitably.

Market players have been enthusiastically responsive to such regulatory incentives.

Roaming-only MVNOs have been present in the European market since 2014.

There are a number of notable examples of such MVNOs:

- The Central African mobile group Azur, owned by BinTel Ltd, launched an MVNO in France at the end of 2016, with a view to targeting the Central African diaspora. Users can have one French number and one for use in either Gabon, the Central African Republic or the Republic of Congo.³⁸

- Likewise, China Unicom Global (CUG) launched its new CUniq MVNO service in London in 2016. The Chinese firm's '1-Card-Multi-Number' service enables customers to buy a SIM abroad and stay connected within the UK, Hong Kong, China and Mainland China. CUniq was jointly launched by CUG and Isle of Man-based Manx Telecom, and piggybacks on the O2 UK network.³⁹
- Adopting a similar strategy, Pareteum, a global provider of mobile proprietary Software Defined Network Architecture platforms, is planning an expanded Global Cloud Platform services agreement with Vodafone Enabler in 2017. The new venture allows for the creation of unique global roaming MVNO service offerings backed by a Tier-1 network operator.⁴⁰

38 www.telegeography.com

39 www.telegeography.com

40 www.telegeography.com

- Elsewhere, Japan Communications Inc. (JCI) has put in place a full MVNO agreement in association with the Belgium-based wholesale carrier BICS. It will offer subscribers a SIM card that will work under one contract all over the world.⁴¹

Such developments might presage the end of mobile roaming and international communications in their current form. As well as doing cross-border business more readily than other market players, MVNOs also require lower investment and lower level regulatory compliance. A handful have already gained multi-national or global reach without having to roll out infrastructure or acquire multiple authorizations. While subject to national regulations as virtual players, the time to market for their services has greatly decreased while overall ease of doing business has increased. As a result, millions of users now have free or low-cost access to ICT services that have historically been the most costly.

The future for mobile – transforming economic sectors across the board

The mobile sector is set to continue its advance towards connecting the next billion potential users. Many elements are coalescing in the sector to ensure its future is profoundly vibrant and innovative: new technologies evolving at a rapid pace, agile business models aligned with technologies and regulatory incentives, and a consumer demand that continues to outgrow expectation. While fixed connectivity will continue to help leverage ICT for increased productivity, outreach and efficiency, the mobile sector is set to be the engine for transforming economic sectors across the board. It is on its way to becoming the main platform for all services to grow and thrive (see also Trend 4 here and the discussion on 5G mobile).

41 www.telegeography.com



TREND 3

ICTs ARE LESS VISIBLE BUT MORE PREVALENT

As ICTs increasingly underpin economic and social activity in countries and are interwoven in communication protocols, production processes and transactions, both wireless communications and broadband are considered a public utility. For some countries access to fast Internet connectivity is now considered nothing less than a human right. As ICT moves into each area of our lives, cloud computing represents a major advance. Cloud computing has become the catalyst and enabler of important technological advances that will help address some of the key challenges that governments and businesses face, including social challenges in the areas of environment, education and healthcare. The cloud not only stores, sorts and analyzes big data but transforms people's data into an increasingly valuable by-product of service providers and online service providers (OSPs). Today's data trails produced by users using multiple ICTs are massive and growing, generating 'big data'. A new culture of 'dealing in data' is beginning to take root.

*ICTs becoming a public utility
and access a human right*

ICTs today constitute the underlying fabric of economic and social activity in countries around the world. Largely invisible, ICTs are so entrenched in communication protocols, production processes and transactions that both wireless communications and broadband are considered a utility. Consumers expect their availability, in the background, always-on, at highest quality levels. Countries such as Finland and Costa Rica have deemed access to fast Internet connectivity nothing less than a human right. Other countries like the US classify broadband as a public utility for regulation purposes.⁴² All this is a far cry from the early 1990s when telecom was an industry based on a physical network – landlines were commonplace and analogue mobile services were yet to explode.

As a result, the fabric of our daily lives and how we as individuals interact with the agencies around us has changed beyond what could have been imagined mere decades back. Surfing on social media outlets on a city bus or streaming music at home characterize the new normality. A panoply of services is now within reach making physical distance and presence irrelevant. Increasingly online shopping is superseding taking a trip to the store – while shops themselves are disappearing.

42 www.nytimes.com

43 [MIT Technology review](#)

44 [Telecom TV Tracker](#)

We have goods delivered at home or access them instantly online. Increasingly intellectual copyright – books, music, film – is bought and sold digitally making CDs, DVDs and paperbacks increasingly obsolete.

*Cloud computing –
more pervasive, more innovative, creating raft of online services*

The engine for this digital revolution is cloud computing. It has transformed the economics of the IT and software industries, creating a whole raft of new online services⁴³ in doing so. The time is right – technology innovation, business challenges and opportunities are coalescing to make cloud computing more pervasive, more acceptable and more innovative in addressing challenges facing today's IT professionals and business leaders.

The worldwide cloud infrastructure services market grew 49 per cent on an annual basis in Q4 2016 with Amazon Web Services (AWS) continuing to dominate with a 34 per cent global market share. Microsoft, Google and IBM together accounted for 31 per cent of the market while Alibaba and Oracle held around 2 per cent each. Analysts forecast the market will reach USD55.8 billion in 2017, representing a 46 per cent growth from the total value in 2016.⁴⁴

Cloud computing delivers on-demand computing of all sorts through vast, fully automated data centres. The model offers multiple advantages:

- It acts as a utility bringing processing power into homes as readily as electricity or water.
- It enables users – individuals, businesses and developers – to choose how much computing power and support services they need.
- It de-couples ICT back-end infrastructure and expertise from physical office premises, eliminating servers and IT staff desks.
- Businesses and organizations increase efficiency and reduce operational cost while focusing more clearly on their core activity.
- Start-ups' time to market is reduced dramatically as is upfront investment in IT infrastructure.
- Organizations enjoy greater agility and flexibility – receiving the right service via simple online service reconfiguration, rather than having to manage the upgrade and replacement of physical assets.

With the Bring-Your-Own-Device trend at the workplace, we may well be moving towards 'computing without computers'. Increasingly sophisticated voice-controlled multi-task assistants like Siri, Alexa or Cortana could replace human assistants.

Although they are mainly used in personal life, they will soon become part of the workplace. As dictating emails or a flow of thoughts has become reliable and easy,

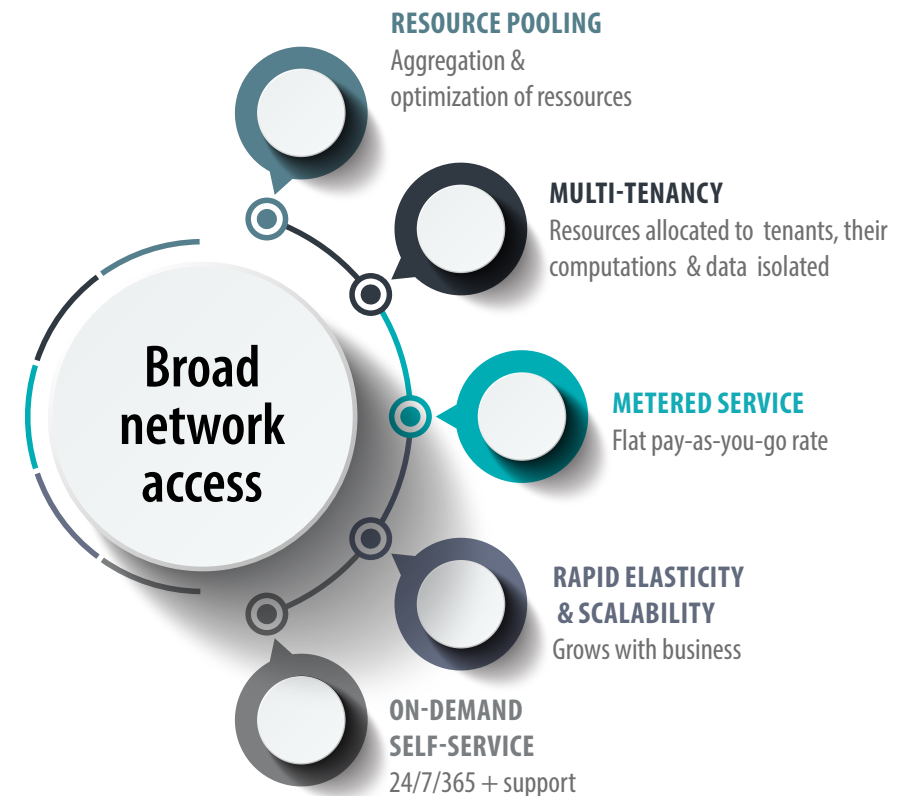
Figure 7:

WHAT'S IN A CLOUD: KEY CHARACTERISTICS OF CLOUD COMPUTING

Note: Multi-tenancy: physical/virtual resources allocated to tenants and their computations and data are isolated from and inaccessible to one another.

Resource pooling: cloud service provider's physical or virtual resources can be aggregated in order to serve one or more cloud service customers.

Source: ITU



Box 2:

CLOUD COMPUTING TODAY AND FOR THE FUTURE

On the technology front, cloud computing represents the catalyst and enabler of important technological advances – Mobile Computing, Big Data, Internet of Things, Machine Learning and Artificial Intelligence (AI), new computer user interactions, and many more. On the business front, cloud computing is an important technology model that will help address some of the core challenges that businesses and governments face in terms of digital transformation, business transformation, service delivery and to meet the needs of constituencies. Societal challenges such as environment, education, healthcare and many others can also be addressed given the very nature of what the cloud offers in terms of agility, cost and innovation.

Source: ITU-D Study Group 1, [Final report on Question 3/1: Access to cloud computing: Challenges and opportunities for developing countries](#) (password-protected, available to ITU TIES users).

voice assistants are well set to complement or even replace some traditional user interfaces. Apart from not requiring physical space, the decisive advantage of voice-controlled assistants lies, again, in the cloud where information, resources, and protocols stay ready to respond to customers' demand, within seconds. The tremendous amount of data on facts, patterns and behaviours powers deep learning and some more advanced forms of artificial intelligence (AI). Augmented reality (AR), or the integration of digital with a physical, real world environment, is only a step away.

There are especially exciting opportunities for emerging countries. Analysts at the Wall Street Journal note that China and other emerging countries have not developed robust IT infrastructures, which means they can embrace the cloud more quickly – and exploit new opportunities faster—since they won't be held back by tasks like integrating legacy technology. At the same time, the cloud will provide new opportunities in these emerging countries. In India, for example, far more people use cell phones than landlines. As the cloud eliminates barriers to what mobile devices can do, the devices will become the conduit to open up huge new markets.⁴⁵

Big data, but whose data?

A new culture of data dealing is taking root

The cloud not only stores, sorts and analyzes big data but transforms user data into an increasingly valuable by-product of service providers and online service providers (OSPs). Today's data trails produced by the ever-growing number of ICT users using multiple ICTs, simultaneously, and for longer periods of time are massive and growing. While users collect information and content over the Internet, OSPs collect and retain data on users' online behaviours and content, as well as personal data on the users themselves. These now trivial, highly automated data exchange protocols create the visible-invisible digital blueprint of all of us and all of our activities online. This generates huge volumes of data – big data (see Box 3).

The visible data trail is what users have intentionally published or shared online. This trail can be controlled or reversed – for example through enforcing the right to be forgotten. The invisible trail, however, remains the property of the service provider or OSP and is potentially much larger.

Users' invisible data often becomes part of the OSPs' business model and generates revenue. On the positive side, additional revenue flows from anonymized

45 The Wall Street Journal

Box 3:

BIG DATA

Every day, we create 2.5 quintillion bytes of data – so much that 90% of the data in the world today has been created in the last two years alone. This data comes from everywhere: sensors used to gather climate information, posts to social media sites, digital pictures and videos, purchase transaction records, and cell phone GPS signals, to name a few. This data is big data.

Google was one of first data entrepreneurs, applying big data to predict the spread of the seasonal flu from Internet search queries it receives. Airplane engine manufacturers can predict when an engine part will break before it actually does, allowing that part to be changed at a convenient time and place rather than when the airplane is in mid-flight. And a Dutch mobile phone operator discovered that changes in the signal strength of cell towers could be translated into local weather data, thus giving the operator a potentially lucrative and very comprehensive network of thousands of weather stations capturing real-time data.

All of these are examples of big data – our ability to gain insights from large amounts of data that would not be attainable from much smaller amounts, and that in turn leads not only to higher efficiency but to innovative new products and services. As in other instances, an increase in quantity results in a change in quality. We have seen this in the past, too. If one takes a photo of a horse galloping across the field every minute, then they are still just photos. But if one takes a photo every sixteenth of a second, and shows the resulting images in fast succession, the vast increase in the quantity of captured information translates into a new quality: film; and an industry was born. Something similar is happening with big data.

In a word, big data spells good news for big business as it allows them to optimize production processes or create new revenue streams. The use of big data for customer or social profiling can be more nuanced. It is not currently clear where the line should be drawn between private and public or shared information. New face recognition techniques can easily be linked to records about where your car goes, how much of your income you spend on dining out or hotel stays, and who your relatives and friends are. Real-time recognition and tracking are already technically possible for both machines and humans. And while this can be a game changer for national security services, it also has a dark side. Errors or issues with the quality of records – or with the subjective profiling of individuals based on their characteristics or habits – can be potentially damaging, and appropriate safeguards need to be put in place.

Source: ITU, adapted from [GSR-14 Discussion Paper on Big Data - Opportunity or Threat?](#) and IBM.

customer data enables OSPs to provide free or low-cost services. With new big data techniques, the same user data can be repackaged into several by-products creating multiple, visible, revenue flows. The negative aspect is the blurred line between personal data and commercial arrangements, especially if a legal framework for privacy and data protection does not exist. Who has access to anonymized data? How should it be used? Is user consent required? Legitimate concerns remain in answering such questions, given the absence of transparency around the commercial use of user data. Similar concerns relate to third-party service providers: shopping records, health details, driving or dating behaviour are all sensitive issues potentially leaving users exposed to predictive profiling based on what they could do or what they could have done rather than on what they do – and the possible sanctions based on such predictive profiling.

Our use of apps feeds even more personal data to providers with an increased likelihood our privacy will be breached. Using more than one app for the same kind of activity means we leave parallel data trails with each service provider. Similarly, if we happen to use – even occasionally – Google, Here, TomTom and Apple for real-time traffic information, we might well feed all of those with our

personal data on trips and trips' attributes. This data is transferred back to the app HQ even when not in use. While personal information is systematically anonymized or encrypted, the probability of leaks, hacks or re-identification remains. High-profile cases of user data breaches have made headlines in recent years. In the near future, when connected cars and self-driving cars become mainstream, information flows will intensify. What is more, information-sharing options might be designed in for security reasons. This is likely to be the case for other connected devices as well – from health monitors to surveillance systems to connected umbrellas – leaving users with little control over their invisible – indelible – data trails.

Only those who are not connected are truly invisible – not tracked or on record. The data blueprint of people in many developing countries is currently more limited. This is likely to change as users adopt new services and devices and the quality of networks and user experience improve. A new culture of 'dealing in data' is beginning to take root.



TREND 4

ICT_s TODAY – BOTH ENABLING AND DISRUPTING INDUSTRIES

ICT focus has shifted towards building platforms in the quest to integrate technologies, networks and devices powering new capabilities and services. This momentum around platforms – powered by three technologies: mobile, social and the cloud – has fueled the app economy, bringing with it huge opportunities for improved public service delivery and new models of mobile entrepreneurship. A new platform at the nexus of technology and business innovation – 5G mobile broadband – is being conceptually enhanced and is now poised to take the integration of communication protocols, devices and applications to the next level, helping expand and enhance business and government services alike. Close-to universal coverage of ICT networks, especially mobile, paves the way for the connecting up of machines and objects, a major trend over the coming years.

A key challenge facing the ICT sector is how best to accomplish the integration of technologies, networks and devices so that they can power new capabilities and services. To meet this challenge, the focus of ICTs has shifted from technologies to platforms (see Box 4).

While the ICT ecosystem embodies a new level of interconnectedness and interdependence, it has also become the platform – from which other industries are innovating and transforming. The native digital platforms of Airbnb, Amazon and Uber have been followed by second-generation digital platforms such as

Nike+ Accelerator and Rolls Royce, the aero engine manufacturer now using the platform to improve engine-related operation and services to airlines (see examples in Box 5). Each is as least as much a disrupter as an innovator.

Platform momentum has fueled the rise of the sharing economy – or the app economy (see also Trend 5). Platforms have come of age powered by three transformative technologies: mobile, social media and the cloud. Mobile has brought almost everything within reach: convenient widely available, mobile broadband enables anywhere, anytime Internet connection, spurring social media

Box 4:

WHAT'S IN A WORD: PLATFORM

In construction, a platform is something that lifts you up and on which others can stand. The same is true in business. By building a digital platform, other businesses can easily connect their business with yours, build products and services on top of it and co-create value.

A platform is a plug-and-play business model that allows multiple participants (businesses and consumers) to connect to it, interact with each other and create and exchange value.

We typically think of companies competing over products. But in today's networked age, competition is increasingly over platforms. Build a better platform, and you will have a decided advantage over the competition.

Source: Adapted from [Harvard Business Review](#) and [Platform Thinking](#).

Box 5:

FROM PRODUCTS TO PLATFORMS, IN THE ICT SECTOR AND BEYOND*ICT SECTOR*

Machine-to-machine (M2M) sensors have been used for many years; however, the nearly universal coverage of mobile and the cloud has paved the way towards the Internet of Things (IoT) – which is a more integrated, efficient and smarter version of it. The transition to IoT involves greater innovation and interconnection of these devices, an intersection between M2M and machine-to-person applications (M2P), and improved cloud services and big data analytics, all intimately linked to the development of 5G mobile (IMT-2020), common standards, and other new delivery platforms. Integration of these components will fuel the growth of IoT.

ACCOMMODATION

Airbnb is a native digital platform that operates as a market platform for users to list, find and rent lodgings, primarily on a short-term basis. As of May 2015 Airbnb had over 1.4 million properties available for tenants, from single rooms in apartments to private islands.

Although Airbnb is not publicly traded, its total worth was estimated at USD24-25 billion, making it more valuable than the Marriott and Starwood Hotel chains, and only slightly behind the Hilton Group. Currently Airbnb does not generate profit, although its revenue forecast for 2016 was approximately USD900 million.

RETAILERS

Retailers are shifting from distribution channels selling products, to engagement platforms co-creating value. Online retailers like eBay, Etsy, and Amazon have led the way, and now traditional retailers are following.

Nike, the shoemaker, for example, is also shifting from products to platforms. Building on the success of its Digital Sport products, Nike recently launched its Nike+ Accelerator to help companies build on the Nike+ platform. “We are looking for people who want to create companies that build upon the success of [Nike+] to make the world more active.” Nike is basically operating as a franchise and positioning itself as a platform for well-being and sports – and all kinds of related products, services and applications, from wearables to fitness advice to wellbeing counseling.

and apps usage and time spent online. In the background, the cloud meets the needs of players in all areas of social and economic activity.

Consumers have become 'prosumers' with opportunities becoming available to all – from government to business to individuals. Looking at the example of global players of the sharing economy, figures point to real economic opportunities being created for all (see Box 6).

The ICT sector is in flux as are the platforms themselves, evolving and reinventing the economics of virtually all industry sectors as well as different layers of society. It is a time of huge opportunities and new models of mobile entrepreneurship are abounding. Banks, hospitals and venture capitalists are joining the race and early movers keep their competitive advantage for a period.

*Mobile revolution –
extending access to financial and health services for millions
worldwide*

Digital financial services is a telling example of the transformative power of ICTs on an entire economic sector. Safaricom's M-Pesa services in Kenya registered USD1.5 billion of real-time payments per month in 2015. This market segment did not exist before the take-up of mobile money in 2007. Mobile money accounts

Box 6:

AN INSIGHT INTO THE ECONOMIC IMPACT OF AIRBNB IN EUROPEAN CAPITALS

In Portugal, the Airbnb community generated EUR268 million of total economic activity in Lisbon alone in 2015. Even more importantly, much of the income went to middle-class families and local businesses. The government also benefits. Portugal revised its tourism laws to clarify that residents can share their homes and benefit from smart and streamlined regulations that apply consistently across the country. Airbnb and the City of Lisbon signed an agreement to simplify the payment of tourist tax and promote responsible home sharing. In Paris, Airbnb began collecting and remitting tourist taxes from guests on behalf of hosts in 2016, amounting to an estimated EUR1.2 million in tax revenue to the City of Paris in the first three months of operation alone.

Source: [Airbnb, Overview of the Airbnb Community in Lisbon & Portugal](#).

are making financial services available to people who previously had no access to formal financial institutions. In 2015, mobile money services are thriving in six out of seven countries where less than 20 per cent of the population have access to

financial institutions such as banks.⁴⁶ Indeed one-third of countries with mobile money services had ten times more registered mobile money agents than bank branches. The number of mobile money accounts reached 411 million globally in 2015, an increase of one-third from 2014. Today mobile money is available in 93 countries,⁴⁷ a compelling illustration of the contribution made by digital platforms to bridging long-standing gaps in industries beyond the ICT sector.

ICTs have expanded and improved public service delivery in developed and developing countries. In low- and middle-income countries (LMICs), the number of mobile-enabled health products / services has doubled in the past five years⁴⁸ and there are now over 165 000 mobile applications for health.⁴⁹ Fifty-nine per cent of patients in these markets are using mobile health applications and services, compared with only 35 per cent in high-income countries.⁵⁰

5G here stands for the family of ITU specifications for mobile broadband communications called the International Mobile Telecommunication system “IMT for 2020 and beyond” or [IMT-2020](#).

5G mobile: a platform for the next wave of the digital revolution

Close-to universal coverage of ICT networks, especially mobile, paves the way for the connecting up of machines and objects, a major trend over the coming years. This is a significant challenge in terms of what is required and the sheer volume of the task. Current forecasts range from 50 to 80 billion connected devices in 2020,⁵¹ although some estimates go as high as 1 trillion connected devices already in 2015⁵² – which could be overrated by a factor. The value of related products and services at the 2020 horizon is estimated at USD300 billion,⁵³ up from USD7 billion in revenue in 2015.⁵⁴ The impact of IoT on consumers’ lives and corporate business models is rapidly increasing as the cost of ‘instrumenting’ physical things

46 ITU, Global Dialogue for Digital Financial Inclusion 2016, [Digital financial services: Regulating for financial inclusion, An ICT perspective](#)

47 GSMA, [2015 State of the Industry Report: Mobile Money](#)

48 GSMA, [Mobile Economy 2016](#)

49 Institute for Healthcare Informatics Health, Sept. 2015

50 Economist Intelligence Unit, 2012 in Emerging mHealth, Paths for Growth, PWC 2012

51 [Cisco; Idate](#).

52 [IBM](#)

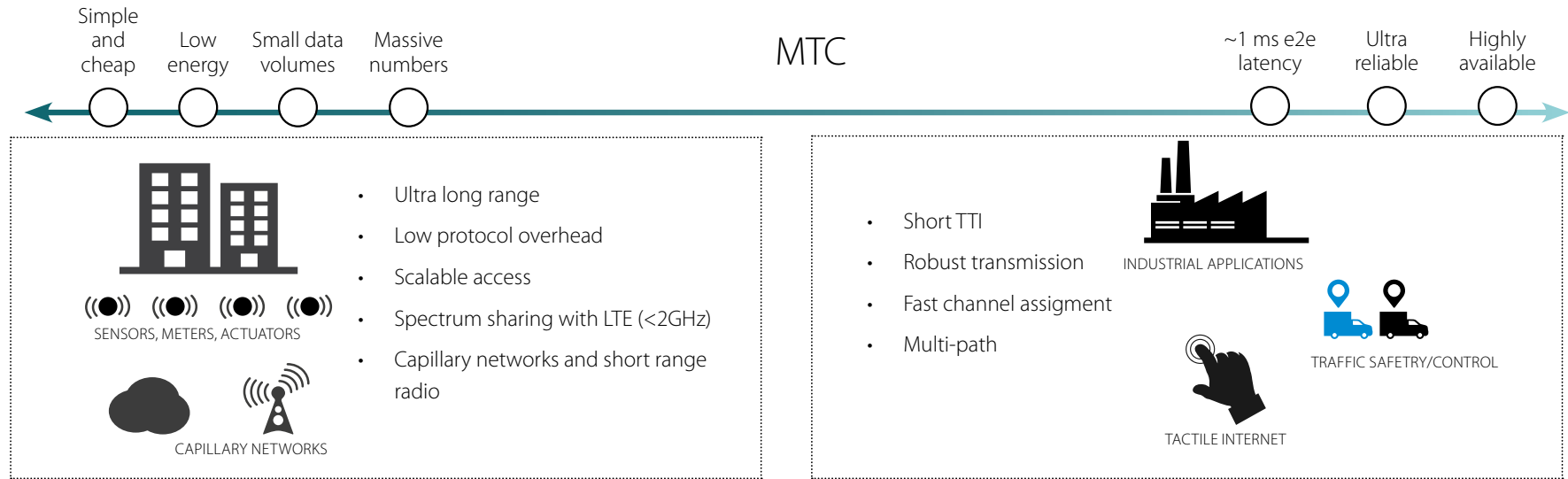
53 [Gartner](#)

54 [IBM](#)

Figure 8:

MACHINE-TYPE COMMUNICATIONS

Source: Ericsson



with sensors and connecting them to other things – devices, systems and people – continues to drop.⁵⁵

New platforms are needed to support machine-type communications (MTC) beyond networks and services (see Figure 8). The level of integration this requires and the various scenarios that countries might choose to adopt add to the overall challenge. New platforms will have to cater for a massive number of devices

while incorporating previous generations of mobile-broadband technologies and providing new capabilities for real-time, ultra-reliable communications.

One such platform is being conceptually enhanced – 5G mobile broadband. At the nexus of technology and business innovation, 5G mobile broadband is now poised to take the integration of communication protocols, devices and applications to the next level. This will accelerate and boost business and government services

Box 7:

5G MOBILE-BROADBAND SERVICES – THE HEADLINES

- 5G is being standardized at ITU under the name IMT-2020.
- The scope of 5G is much broader than previous generations of mobile-broadband communication systems and is more than just an enhancement to the traditional mobile-broadband services in terms of speed and throughput.
- 4G and 5G are expected to co-exist for potentially a long time; they are complementary technologies that will leverage all types of communication between humans and machines.
- Uses foreseen include optimization of traditional mobile broadband scenarios as well as ultra-reliable and low-latency communications and massive machine-type communications (such as M2M, M2P).
- 5G will enable a new generation of connected devices – from the connected car and intelligent transport systems to augmented reality, holography and wearable devices.
- 5G will enable new service delivery models in the area of mobile education, connected health and emergency telecommunications.
- 5G will be a cornerstone for countless activities related to attaining the goals set out in the 2030 Agenda for Sustainable Development.

Source: ITU.

alike. The characteristics of 5G mobile broadband (see Box 7) were set out at the 2015 World Radiocommunication Conference (WRC-15)⁵⁶ and are evolving as part of the preparatory work for WRC-19.⁵⁷

5G could reach 150 million 5G subscriptions globally in 2021.⁵⁸ 5G networks based on standards meeting IMT-2020 requirements will likely see commercial deployment in 2020. The launch of pre-standard, pre-commercial networks is

⁵⁶ [World Radiocommunication Conference 2015 \(WRC-15\)](#)

⁵⁷ [World Radiocommunication Conference 2019 \(WRC-19\)](#)

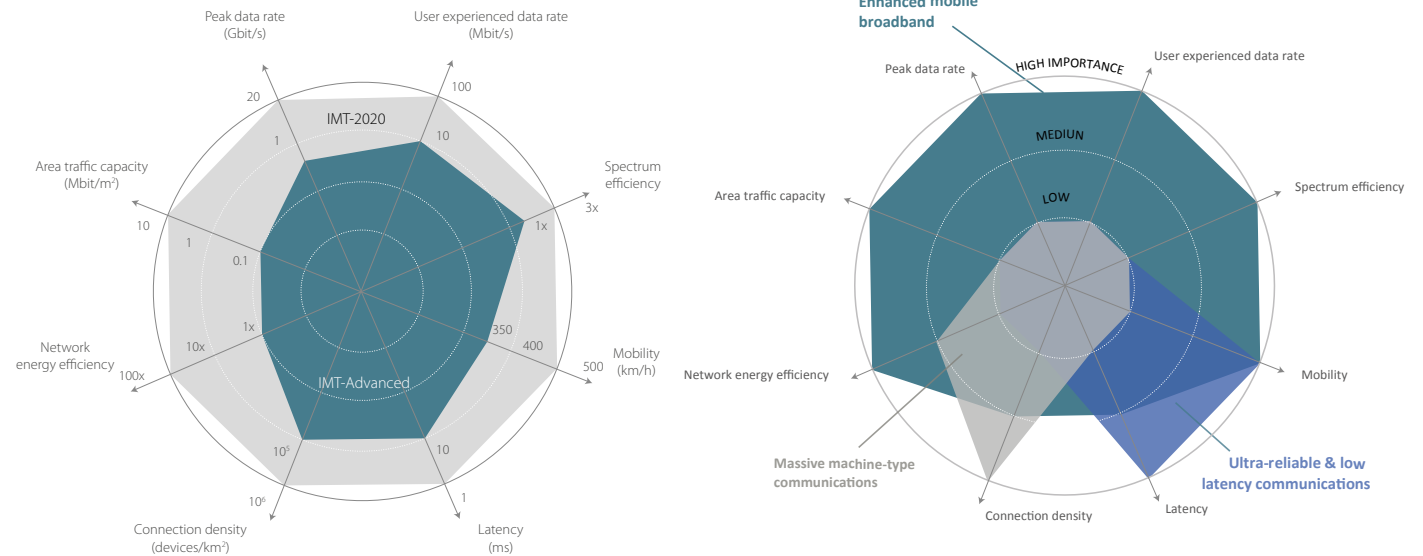
⁵⁸ [Ericsson Mobility Report 2016](#)

Figure 9: 5G USAGE SCENARIOS AND THE RELEVANCE OF KEY CAPABILITIES

Note: The values in the figures above are targets for research and investigation for IMT-2020 and may be revised in the light of future studies.

Further information is available in the IMT-2020 Vision Recommendation (Recommendation ITU-R M.2083).

Source: Recommendation ITU-R M.2083, "IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond."



anticipated sooner in selected markets such as China, Japan, Korea (Rep.) and the US.⁵⁹ 5G cannot be everything to everyone. However, as it takes shape, this platform for the future will:

- be designed around the key principles of flexibility and diversity;
- encompass many features for countries to select according to need;
- be designed in a modular way – not all features need be implemented in all networks. Figure 9 illustrates some examples of what 5G mobile-broadband services might look;

- support low to high mobility applications and a wide range of data rates to match demand in multiple usage scenarios;
- support high-quality multimedia applications over many services and platforms, with improvements in performance, service and user experience.

59 Ericsson Mobility Report 2016

Machine-type communications, Internet of Things – set to soar

Will advanced platforms and capability drive machine-type communication (MTC), or vice versa? Probably the two phenomena will grow and shape each other. Arguably, the lack of a powerful platform might be a reason for MTC not becoming pervasive sooner. In 2015, reports estimated there were some 13 billion connected things in 2015,⁶⁰ far below the potential of MTC (note that MTC definitions vary considerably). According to ITU, countries with the highest M2M penetration are high-income, highly industrialized economies, such as some EU countries, Korea (Rep.) and the US (see Figure 10). Connected devices will number 9 billion by 2018, and anywhere between 21 and 34 billion by 2020. Connected devices in OECD households alone will number 14 billion by 2022, up from around 1.4 billion in 2012 – in ten years a leap from ten connected devices per household (with two teenagers) to fifty.⁶¹

Overlapping concepts co-exist under the MTC umbrella (see Box 8). These blurred lines have led to discrepancies in estimates of connected devices. Estimates of connected devices vary considerably depending on whether cellular networks are included, or whether devices are connected to the Internet.⁶²

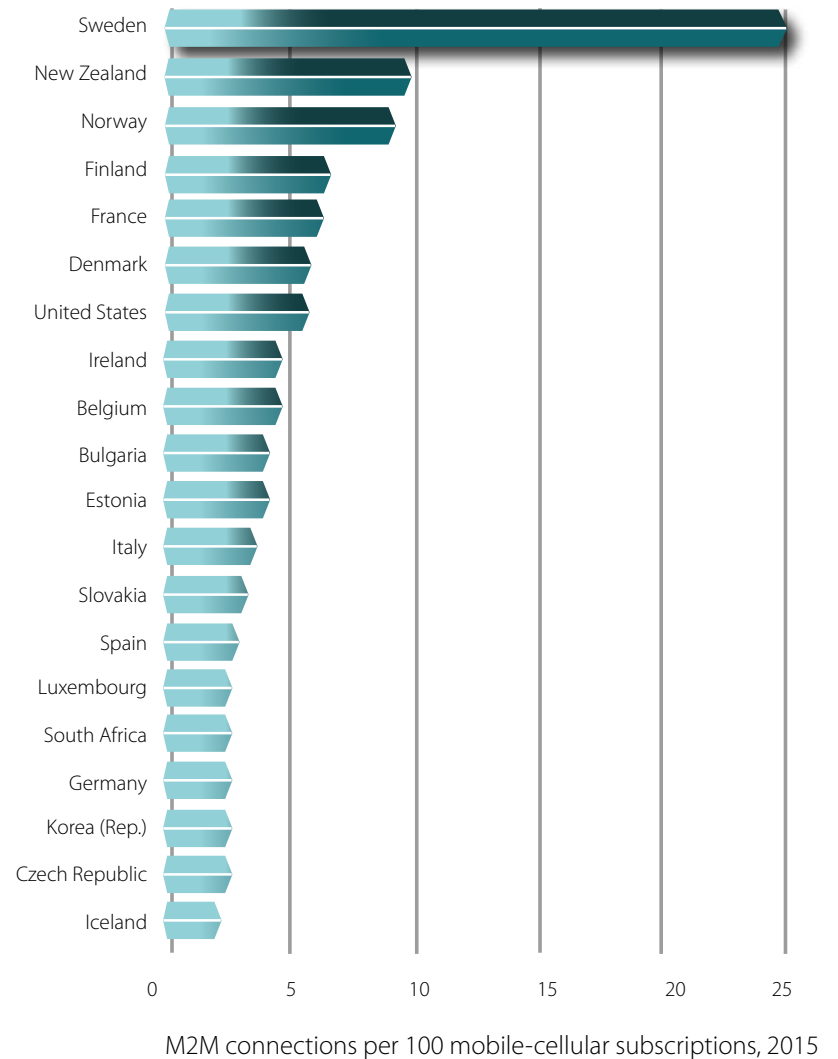
60 IDC, [Worldwide Internet of Things Forecast](#)

61 OECD, [Technology Foresight Forum 2014 - The Internet of Things](#)

62 www.nickhunn.com

Figure 10:
THE INTERNET OF THINGS IS IN ITS EARLY STAGES

Source: ITU.



Box 8:

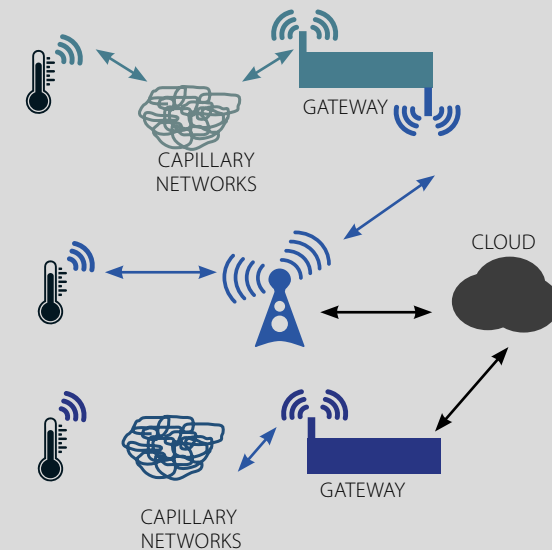
DEFINING MACHINE-TYPE COMMUNICATIONS

Machine-type communications (MTC) is a broad term defined as data communication among devices without the need for human interaction. MTC services are supported at the physical layer using cellular systems such as GSM, CDMA1x and UMTS. LTE migration is under investigation by many cellular operators. Most MTC applications are uplink-centric (i.e. data is transmitted up from the devices to the network). M2M solutions are used, among others, in surveillance systems, home security and building access control.

Machine-to-machine communications (M2M) communications have been around for decades. M2M is used for automated data transmission and measurement between mechanical or electronic devices. The key components of an M2M system are: field-deployed wireless devices with embedded sensors or RFID- Wireless communication networks with complementary wireline access that includes, but is not limited to cellular communication, Wi-Fi, ZigBee, WiMAX, wireless LAN (WLAN), generic DSL (xDSL) and fibre (FTTx). M2M has been an enabler of all sorts of sensor technologies and use cases. The M2M applications typically use both uplink and downlink transmission. M2M are widely used for tracking and payment. Fleet management and traffic sensors along with credit, vending and gaming machines are examples of M2M.

Internet of Things (IoT) can be viewed as a global infrastructure for the Information Society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable ICTs. By its name, it implies that devices or objects have to be connected to the Internet; however in a number of cases, IoT devices would connect first to a local network, or a capillary network, and then to a cellular network and the cloud (see Figure here). A capillary network is the equivalent of local connectivity behind a gateway. Some analysts are of the view that the bulk of IoT devices will probably use Wi-Fi, Bluetooth, ZigBee or even cables to provide an internet connection to the cloud. Others have coined the term 'fog computing' to cover this local connectivity, effectively seeing it as a local cloud, often with the addition of local processing and control.

Source: ITU, adapted from ITU, Ericsson, IEEE, Gartner, Oxford Economics, Creative Connectivity.



Box 9:

FROM INTERNET TO ENERNET

Riding on the 5G ecosystem and powered by IoT, a new generation of seamless networks tailored to specific industry sectors is emerging. Enernet, for example, is a dynamic, distributed, redundant and multi-participant energy network built around clean energy generation, storage and delivery. It serves as the foundation for smart cities. Like the Internet, it allows businesses without their own infrastructure to ride atop existing networks thanks to innovative, distributed technology. SolarCity, Sunrun and a host of others are moving the world off fossil fuels and onto clean energy supported by smart equipment, services and software, offered via existing utility networks. Enernet can serve as an inner layer for self-driving cars, allowing batteries to recharge as they go.

Source: techcrunch.com.

However it is defined, MTC will play a significant role in future market growth/ opportunities and business integration. Drivers of MTC will include advances in digital connected platforms such as 5G, by major technology trends (for example miniaturization of electronic components), increased data storage capacity and availability of solar cells and never-recharge batteries. The next step is full-fledged convergence between the MTC ecosystem (the 5G platform) and the one providing various ICT services to users (mainly 4G and fibre optics). An all-inclusive, flexible and customization-friendly platform will be a major advance, connecting more people and devices, more rapidly and more cost-effectively.



TREND 5

THE RISE OF THE APP ECONOMY

The app economy has unleashed a 'virtuous cycle', transforming multiple economic and social activities on its way, opening up new channels of innovation, productivity and communication. The rise of the app economy and ubiquity of smart mobile devices create great opportunity for companies who can leverage global scale solutions and systems. Technology design deployed by disruptive app companies – such as Uber or Airbnb – reduces transaction costs while allowing for increasing economies of scale. The outlook for both network operators and over-the-top providers (OTTs) is bright as they benefit from the virtuous cycle – as the ICT sector outgrows all others, innovation continues to power ahead creating more opportunities for growth.

In very little time, OTTs and OSPs have established themselves as important, permanent elements in the ICT sector.

The top three social networks have amassed more than one billion active users. Roughly one-quarter of the world’s population is signed up to Facebook, by far the most popular (see Figure 11). Social media users numbered 2.3 billion in 2016,⁶³ with 85 per cent accessing social media through a mobile device.⁶⁴ And it is not just the breadth of social media or user numbers that are so impressive – it is also the depth in terms of frequency and time of usage. Facebook Instant Messenger, for example, is replacing SMS for a significant share of the market, serving up to 1.86 billion daily active users at the end of 2016 and forecasted to surpass 2 billion in 2017.⁶⁵

The success of social networks has largely been the success of mobile. Their integration into apps have made it simple and convenient for users to use ‘on the go’. With mobile- broadband penetration soaring worldwide, online social networking will surely endure in modern

63 www.statista.com, wearesocial.com

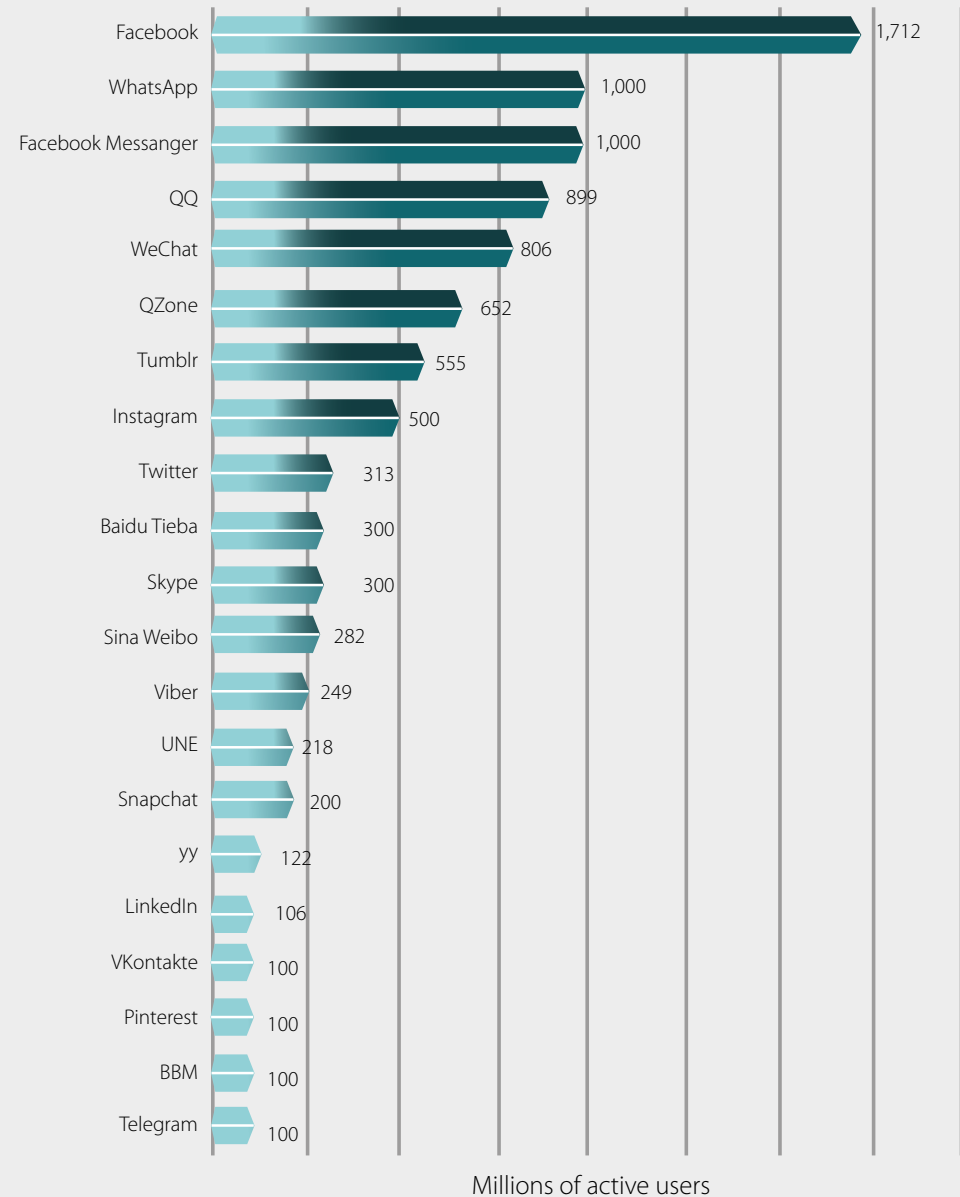
64 wearesocial.com

65 www.statista.com

Figure 11:

MOST FAMOUS SOCIAL NETWORK SITES WORLDWIDE, 2016, BY NUMBER OF ACTIVE USERS (IN MILLIONS)

Source: Statista.



culture. By 2017, ownership of smartphones is forecast at 2.6 billion users, over one-third of the world's population.⁶⁶ Growth of mobile broadband will expand further social networks' user base and market power. New services and applications will emerge, further shifting the ICT sector in the direction of the app economy.

The app economy – a melting pot of people, technology and business

The app economy has unleashed a 'virtuous cycle' that has moved the ICT industry to the next level, transforming multiple economic and social activities on its way (see Box 10). The app economy is the platform of platforms enabling not only entrepreneurship, collaboration and sharing among all market players and enabling consumers themselves to play in the market. The app economy is opening up new channels of innovation, productivity and communication, creating a melting pot of people, technology and business.

Economics of the app economy – greater scale, diminishing cost

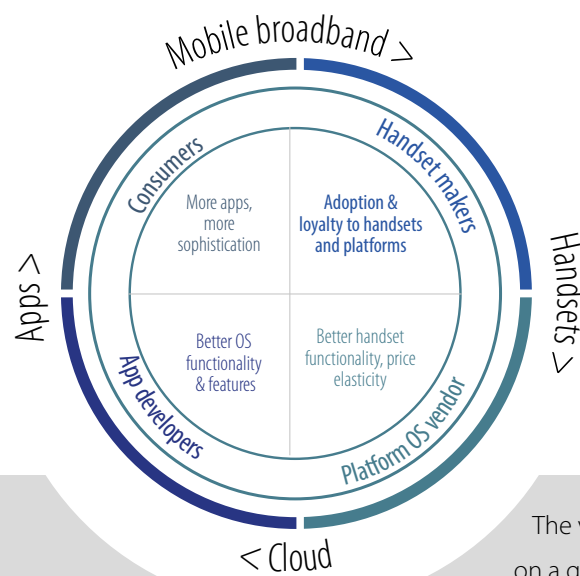
What sets the app business model apart is the two-sided or multi-sided nature of its market. Such markets feature one or several platforms enabling interactions between end-users, engaging all sides in transactions and in meeting charges as appropriate. Platforms court each side while seeking to make money.⁶⁷ They can use consumer data to create additional revenue streams through advertising and other by-products of consumer anonymized data profiles or use patterns. Because of what economists call 'network effects', these platform products enjoy increasing returns to scale, which explains their extraordinary impact.⁶⁸ Multi-sided markets are more complex, less centralized and less predictable than traditional ICT markets, with no one-way, linear relationship between a service provider and a subscriber.

Technology design deployed by disruptive app companies – such as Uber or Airbnb – reduces transaction costs. Offers can be placed and accessed in a new marketplace built on websites, mobile apps and back-end software. The model massively reduces search-related transactions costs – and so something that

⁶⁶ www.statista.com.

⁶⁷ MIT, Jean-Charles Rochet, Jean Tirole, [Two-Sided Markets: An Overview](#)

⁶⁸ Harvard Business Review, [Strategies for two-sided markets](#)



Box 10: THE 'VIRTUOUS CYCLE' OF THE APP ECONOMY ECOSYSTEM

How has the app economy come about? One factor of success for OTTs and OSPs is that their services can be encapsulated in apps and used anytime and anywhere via a smartphone. Building on that success, apps have become a game changer for the rest of the ICT sector.

One definition of the app economy is the sum of all economic activity, products and services required to deliver app functionality to end users via mobile-broadband services. This definition includes all economic activity in the app value chain required to deliver apps and broadband-enabled handsets (see Figure here). Another definition is to include all economic activity associated with producing the app platforms (primarily, iOS and Android), the apps that run on them, and the Internet infrastructure, such as cloud services, that supports them.

The app economy enables a virtuous cycle of development in the digital ecosystem. Consumers want high-quality handsets at the lowest price, a large selection of apps and operating systems with extensive feature sets. Developers want the largest market possible of profitable consumers, high-quality development tools, and a minimum of problems of platform incompatibility. The operation system platforms (such as iOS and Android) need to appeal both to consumers and developers.

The virtuous cycle functions in this way: large numbers of consumers on a given platform lead to more profitable app development which in turn produces more apps which in turn attract more consumers. And so the cycle continues. Handset manufacturers with greater scale will be able to lower unit costs, fine-tune production value chains and extract the greatest discounts from their suppliers, enabling them to be more competitive in the handset market.

As a result, some of the most successful app providers have experienced more growth than many other players in the ICT sector. Global OTTs and OSPs are operating international business models that show no signs of reaching a maximum efficient scale. The global scale of those players, however, also has a downside. One of the early hopes that many associated with the rise of the Internet was a 'democratization' of marketplaces in which many small-scale sellers could reach many buyers with unique niche preferences. As the Internet matures, a mixture of both has occurred, with companies like eBay providing small-scale marketplaces and Google enabling advertisers to operate at any scale. Many of these companies wield significant market power (SMP) and profile themselves as natural monopolies (see also Regulatory Trend 3).

Source: ITU, adapted from ITU, Ericsson, IEEE, Gartner, Oxford Economics, Creative Connectivity.

was technically possible became commercially feasible as well.⁶⁹ This model also enables app providers to grow beyond limits (see Boxes 10 and 11).

Network operators eye OTTs as partners for growth

OTTs have had a strong bond with users from the start; with the traditional ICT sector, the situation has been more complex. Now governments also look at establishing new channels for outreach and dialogue, and potentially more. In early 2017, Denmark announced that it would be creating a new diplomatic posting – a ‘digital ambassador’ – to deal not with States and international organizations, but with increasingly powerful tech companies like Facebook and Google.⁷⁰

The outlook for both network operators and OTTs is bright – the ICT sector is growing much faster than any other, innovation continues to race ahead and there will be more opportunities for growth. To date however, network operators have failed to tap into the significant new value inherent in the explosion of e-commerce, advertising and digital media content.⁷¹ As competition intensifies, we are likely to see more players embracing partnership strategies. Views of OTTs

are changing. Although often perceived as a disruptor of established business models, and a threat to traditional market players, OTTs are increasingly seen more positively as an opportunity for re-valorizing the core business of network operators and for building partnerships. Options vary from loose collaboration to integrated mobile network operator (MNO)-OTT offers to revenue-sharing arrangements. With OTTs in the ascendant, network operators are evaluating how best to team with them thereby diversifying their offer and delighting their subscriber base. While some network operators have successfully launched their own content offers, competition with OTTs is no longer seen as the best strategy. Instead, a growing number choose to serve as platforms for content providers, such as OTTs and OSPs, expanding their proposition to a variety of players and industry verticals. There are many reasons for network operators to adopt a platform strategy:

- Competing with OTTs and OSPs on service and innovation is both expensive and problematic – network operators lack the skillset of native digital players. Dropbox is a good example of a rapidly evolving, nimble native digital company. Launched in 2008, it provided file back up. Over time however, it

⁶⁹ ITU, [GSR16 Discussion Paper “The race for scale: market power, regulation and the app economy”](#)

⁷⁰ [The Washington Post](#)

⁷¹ PWC, [Strategy and Enabling the OTT Revolution](#)

Box 11:

OTTs AND THE RACE FOR SCALE

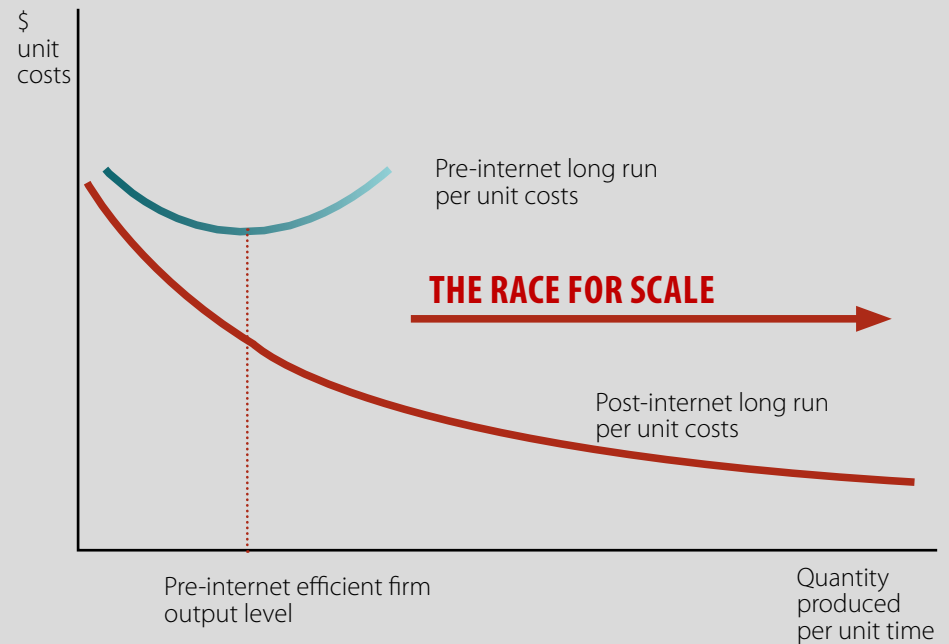
The rise of the app economy and ubiquity of smart mobile devices create great opportunity for companies who can leverage global scale solutions and systems. The growth of OTTs is driven by falling transaction costs, falling organizational costs and increasing economies of scale.

Businesses featuring physical products, stores and factories cannot grow indefinitely since their physical assets will become too large to manage effectively and unit costs will rise. Economists characterize this as 'diseconomies of scale' (represented by the upward slope of U-shaped blue curve in Figure here). The point at which unit costs start to rise marks the 'maximum efficient scale'. While this maximum efficient scale is small compared to the entire market size, there will be room for several large firms to compete in the market.

In the digital world, the traditional long-run cost curves are superseded by long-run cost curves that see unit costs continue to fall regardless of production levels (the red curve) – i.e. diseconomies of scale never set in. Under such conditions, firms that identify new business models are in a global race with competitors. As companies like Uber or Airbnb pull ahead of the competition, their unit costs fall and competitors can no longer keep up.

Source: ITU, adapted from ITU, Ericsson, IEEE, Gartner, Oxford Economics, Creative Connectivity

DECREASING COSTS AND THE RACE FOR SCALE



increased the value of its premium offering⁷² – first by offering shared folders, making it a collaboration tool and then adding features which automatically sync smartphones and other devices for uploading photos.

- Skype, one of the first Voice-over-IP (now Communication-over-IP, CoIP) providers remains one of the world's most popular apps almost 15 years after its launch – despite a number of competing apps. Its first-of-its-kind features provide a clear competitive advantage and user brand loyalty has remained strong over time.
- Some very successful OTT players have leveraged the 'freemium' model – a combination of 'free' and 'premium'. Amongst those players who have built on this are CoIP providers, business-to-business (B2B) and person-to-business (P2B) platforms such as LinkedIn, Box and Yammer. Users enjoy free basic but need to upgrade to a premium subscription to access full functionality. The model is now an established success for OTTs. It is not, however, an option for network providers who are unable to compete at that level.
- Network investment is the largest potential barrier to becoming a platform for OTT players. However, network upgrades will enable operators to offer a range of advanced services: upgraded traffic management; tiered quality of service; 'big data' and customer analytics; advanced security and location-based services; and sophisticated cloud computing. Typically, operators possess large amounts of customer data – not just demographic, but also on usage, online behaviour, location and so on. Operators could package anonymous versions of this data and sell on to businesses in retail, travel and other consumer-facing industries. These businesses, in turn, could use the data to refine their customer understanding and improve their marketing efforts through behavioural targeting, personalized marketing, targeted location-based ads, and other services.⁷³

72 [Harvard Business Review](#)

73 [PWC, Strategy and Enabling the OTT Revolution](#)



TREND 6

SHARP RISE IN MARKET CONCENTRATION AND CONSOLIDATION

The past two decades have seen ICT in constant flux as new players, services and delivery platforms have stretched boundaries and changed market dynamics. This in turn has impacted market structure with business models being created, adapted, refined and redefined. Since the 2008 crash, more consolidation has meant fewer firms fighting for market share. Led by innovation, digitization and automation, new competitors have gate-crashed markets around the world, putting incumbents and inside-the-box players under increasing pressure. In 2016, high profile mergers and acquisitions (M&A) swept the ICT landscape, featuring a wide range of market players and deals, while other market segments are riding out tough market conditions or are breaking into adjacent markets to develop new capabilities. In some cases, players from the extended ICT sector are opting for strategic partnerships or 'coopetition'.

In 2016, high profile mergers and acquisitions (M&A) occurred across the board (see Table 3). Companies merge either to loosen competitive pressure or to create a new line of business. Struggling players merge to create 'a second chance'. Increased competition from OTTs and OSPs also drives the business decisions of ICT market players in general and M&As in particular.

In the context of the M&A frenzy, three patterns have emerged:

- Competitors become partners: when competitors of the same kind decide to play together;
- Going vertical: when players break into adjacent business segments to diversify service offers and increase their appeal to consumers; and
- Across the board: when players converge – mobile operators become OTTs, IT businesses embrace the cloud and IoT, or non-tech companies become OSPs.

Different combinations of these exist at national, regional or global level, with a resulting increase in consolidated markets with more diverse players. Competition issues therefore arise putting regulatory frameworks under increasing pressure (see Regulatory Trend 6).

Mobile and fibre – businesses jockeying to ride out tough market conditions

Pure-play businesses in core ICT number fewer than five years ago, increasingly offering new services and packages. In some market segments, the trend has been more visible – the few pure cable or leased lines providers that remain have merged and bundled offers to ensure competitiveness and profitability. Consolidation within the same line of business has been intense and is global. Operators are scaling up in core market segments at country level,⁷⁴ especially in mobile and fibre. For both, a larger market share protects against competitors and tough market practices such as predatory pricing. Likewise, mergers can leverage infrastructure and assets of both firms while optimizing future investment. The rationale behind M&As in specific market segments may differ, however.

Mobile, once the fastest growing segment, is seeing its once high average revenue per user (ARPU) decline as mobile markets saturate. According to ITU research, mobile ARPUs are falling in half of all countries, stable in one-quarter and increasing in one-quarter. Companies can no longer rely on new customers to drive growth. For example, smartphone markets in developed

countries are reaching 55 per cent penetration.⁷⁵ While consumers' expectations grow in sophistication and performance across their devices, the industry is shifting away from long-term contracts. Companies are changing gear to focus on mitigating churn, or their cancellation rate, while expanding service offerings.⁷⁶ The fewer the competitors, the more manageable the task is.

In fibre, consolidation is characterized by investment strategy. Fibre deployment is costly and the rapid increase of OTT and 4kTV⁷⁷ traffic make it difficult to countenance investment levels and implementation timelines. Estimates show, for example, that deploying fibre to the home (FTTH) throughout the EU (100 per cent homes passed, 50 per cent connected) will cost a massive EUR156 billion, though the reuse of existing infrastructure could reduce that figure.⁷⁸ Tapping into a pool of shared resources provides a much needed safety net and flexibility. By teaming up, fibre providers are better placed to achieve nationwide fibre coverage and have a competitive advantage. Beyond pure-play fibre ventures, fibre rollout is further

accelerated by partnerships with government, local utilities, financial investors and challenger telcos.⁷⁹

Regional consolidation – pushing the market ahead

Over the past year, consolidation within an individual country has been more prominent than consolidation across a region. Exceptions to this trend include regional and international players such as Bharti, Cable and Wireless, Liquid Telecom, Liberty Global, SoftBank and Vodafone all of which expanded throughout all regions (see Table 3). While such expansion is an opportunity for higher revenue and profits, it also pressures companies to innovate, and grow their subscriber base and ensure adequate return on investment (RoI). Some already have a subscriber base equivalent to a medium-sized country, with revenues comparable to the budget of such a country. While some players seem unstoppable, others show signs of slowing down.

⁷⁵ ITU.

⁷⁶ www.telecomengine.com

⁷⁷ UHD-1, or ultra-high-definition television (UHDTV), is the 4K standard for television having a resolution of 3840 × 2160p or four times the one of a full HD TV. Some 4kTV content is already provided by Netflix, Amazon, Hulu and YouTube.

⁷⁸ [FTTH Council](#)

⁷⁹ Arthur D. Little, [Race to Gigabit Fiber](#), 2017.

Table 3:

EXAMPLES OF RECENT MERGERS AND ACQUISITIONS INVOLVING ICT PLAYERS, 2016 - JANUARY 2017

Legend: Status: A= approved; C=completed; D=in discussions; O=ongoing; P=preliminary.
 Note: * Acquisition, the acquirer is listed first; ** Merger

Country	Companies		Sector	Strategic objective	
Pattern: Convergence					
Brazil	**Telefónica Spain	AxisMed Brazilian chronic-care management provider working with health care providers to remotely monitor outpatient conditions	C	Mobile/Apps	e-health profiling
China	* LeEco (video content creation, smartphones, cloud, online finance)	Vizio, US-based smart television manufacturer	C	Content/ apps/ hardware/pay-TV	Enhance content creation capabilities
US	*AT&T	Time Warner	A	Wireless/ISP/media	Complement its distribution network
US	*Verizon Communications Inc	Yahoo's operating business; Fleetmatics (fleet and mobile workforce management); Vessel (online video subscription service) and Telogis (cloud platform for fleet tracking)	A	Fibre/cloud/IoT	Accelerate OTT video efforts and enhance content discovery
Global	**Cisco	AppDynamics (application intelligence software & cloud)	O	IT/IoT/apps	Strengthen market position
Global	*SoftBank Group Corporation	ARM Holdings plc	C	Mobile/ ISP/IoT	
Global	Oracle Corporation	NetSuite, Inc.	O	IT/cloud	Transition to cloud
Global	Micro Focus International plc	Software Business division of Hewlett-Packard Enterprise	C	IT/big data/security	Change of focus
Global	*Apple	Flyby Media (AR); Emotient (AI); Leart Sprout (e-education); Turi & Toplejump (Machine Learning); Glimpse (wearable e-health)	C	Software	Expanding focus
Global	*Google	Orbitera (cloud software); Anvato (Cloud-based video); API.AI (AI); Eyefluence (VR); Webpass (ISP); Cronologics (smartwatches)	C	IoT/ AI	Expanding focus
Global	*General Motors	Cruise Automation (autonomous vehicles)	C	Software/	Strengthen long-term market position
Global	*Unilever	Dollar Shave Club (online men's razor merchant)	C	IoT/AI	Enhance competitiveness
Global	* Wal-Mart Stores, Inc.	Jet.com (online retailer)	A	Vehicules/ Automation	Compete with OTTs

Country	Companies			Sector	Strategic objective
Vertical market consolidation: The bigger, the better					
Canada	*Bell Canada Enterprises	Manitoba Telecom Services (MTS) (leading operator in Manitoba offering quad-play of communication & pay-TV)	0	Retail/online	Consolidate market share & secure investment
Denmark	**Vodafone (mobile)	Liberty Global (Ziggo) (fixed broadband)	0	Retail/online	Consolidate market share, Integrated offering
Estonia	**Elisa (mobile)	Starman (cable)	0	Mobile/fixed bb/ pay-TV	Consolidate market shares
India	**Vodafone India	Idea (4 th mobile operators)	D	Mobile/broadband	Escape predatory pricing
Japan	*KDDI	NifMo (MVNO operated by ISP Nifty)	0	Broadband/mobile	Differentiate services
Lithuania	**Omnitel (mobile) & Baltic Data Center (IT)	TEO LT (fixed line)	A	Broadband/mobile/ IT	Uniting Telia Company's Lithuanian subsidiaries.
Netherlands	Liberty Global (fiber)	Vodafone (mobile)	C	Fibre/mobile	Break into adjacent markets
New Zealand	**Vodafone NZ	Sky Network (country's largest pay-TV operator)	C	Mobile/cable	Develop a content offer
Russian Fed.	*Rostelecom (state telecom incumbent)	SAFEDATA LLC (Russia's largest provider of commercial data centers, traffic exchange service and content delivery)	A	Broadband/cloud	Scale up in its core segments
South Africa	*Internet Solutions (Dimension Data MEA)	ISP MWEB Connect (MultiChoice)	0	ISP/broadband/Wi-Fi	Entry into the consumer broadband market
UK	*British Telecom (biggest broadband provider)	EE (largest mobile operator)	0	Mobile/broadband	Network integration & optimization
Pure-play consolidation					
China	**Tencent (China)	Supercell (Finnish mobile game company)	C	Apps	Innovation
Croatia	*H1 Telecom	Optima Telekom	A	Broadband ISP	Consolidate market shares
Ghana	**Bharti Airtel (BA, 3 rd mobile operator)	Tigo (Millicom Int. Cellular) (4 th mobile operator)	D	Mobile	Consolidate market shares

Country	Companies			Sector	Strategic objective
Italy	** Open Fiber (joint venture of Enel and the bank Cassa Depositi e Prestiti)	Metroweb & Metroweb Genoa		Fibre	Optimize costs
Pakistan	**Warid Telecom Pakistan, Bank Alfalah and VimpelCom	Pakistan's Mobilink and Warid Telecom (Warid)	A	Mobile	Consolidate market shares
Russian Fed.	*VimpelCom	SIM Telecom (MVNO specializing in services for migrant workers)	C	Mobile	Diversify subscriber base
US	*InSite Wireless Group LLC	Capital Tower Group (CTG) DAS and telecom assets (partial)	C	Mobile towers	Increase market share
Global	**Analog Devices, Inc	Linear Technology Corporation	C	Semiconductor	Consolidate market shares
Global	*Fitbit	Pebble & Vector (smartwatches)	C	Wearables	Leverage on competitors knowledge
Global	*SES Global	O3b Networks (one of the larger satellite ISPs)	C	Satellite	Market consolidation
Rule the region					
India/Africa	**Bharti Airtel	Some of 15 African subsidiaries could be merged to cut a USD12 billion debt. BA has sold its Sierra Leone and Burkina Faso operations, as well as some of its tower businesses.	P	Mobile	Reorganizing assets
LAC	*Cable & Wireless Communication	Liberty Global	D	Broadband/cable	Regional expansion
Serbia/Slovenia	**Telekom Slovenije	Telekom Srbija	D	Fixed incumbents	Alternative to privatizing state-owned incumbents
South Africa	*Liquid Telecom (majority-owned by Econet Wireless)	Neotel (mobile) [ongoing acquisitions in South Africa, Botswana and Tanzania]	A	Fibre	Pan-African broadband network

Disclaimer: The list is non-exhaustive and for illustration only.
Source: ITU research.

Most acquisitions by regional players are procompetitive or neutral to competition. They often bring fresh FDI flows, new technologies and new business practices. In addition, consumers benefit from the company's experience in other markets. Each market is different however and there is always a risk that the operator's business model may not fit the opportunity. Similarly, regulatory frameworks – both legally permissible and what is effectively enforced – can be just as much an enabler of market expansion as they can be a roadblock to it.

Regional and international players pose important challenges in terms of competition policy. Defining market power and building a case for abuse of dominance can be challenging since the scope of most national regulations do not consider market players' position beyond national borders (see Regulatory Trend 6). While regional and global consolidation has advantages, it also presents challenges to our notion of a level-playing field for international and national players as factors such as cross-subsidization of operations in different countries and economies of scale require closer scrutiny.

Verticals – new partnerships for new opportunity

Industry consolidation is booming between operators across the layers. M&As between operators with mobile and fixed assets, either fibre or cable are growing. As a result, larger players with greater market power now dominate in a number of markets.

Both fixed and mobile operators are breaking into adjacent markets to develop new capabilities, providing appealing, integrated offers while ensuring sufficient RoI. OTT digital video streaming services were well-placed to complement Verizon's classic mobile broadband offers.⁸⁰ Vodafone's New Zealand business is merging with the country's largest pay-television provider to create an integrated telecoms and media group, countering Internet rivals such as Netflix.⁸¹

As 4G mobile broadband establishes itself, and with 5G in sight, mergers of mobile and fibre companies are increasingly a marriage of convenience. Companies that own Wi-Fi hotspots are also targets for M&A since they offer network capabilities for mobile traffic offloading, under both 4G and 5G scenarios.

For telecom incumbents, mergers also help ensure strategic assets for growth in the mid-to-long term. Teaming up with cloud providers or data analytics firms

80 www.verizondigitalmedia.com

81 www.ft.com

improves productive efficiencies and opens new revenue streams; it can also strengthen competitive edge and enable new services.

While providing benefits, some M&As reduce choices and lock in customers. Bundles can also be difficult for regulators to oversee and such offers may justifiably be blocked on occasion.

*Mergers and acquisitions –
the only show in town is convergence*

Convergence is the rule of thumb in 2016 for mergers and acquisitions as players combine telecom, media and IT capability. We are slowly but surely approaching a point where the only business imperative that makes sense is converge or go out of business.

Traditional retailers such as General Motors and Wal-Mart buy online platforms to re-locate elements of their brick and mortar business online (see Table 3). Leading tech companies such as Apple and Google are acquiring forward-looking startups, including Virtual Reality (VR), Artificial Intelligence (AI), Machine Learning (ML) and all sorts of wearable devices. IoT and cloud firms are more than ever a target for established IT and telecom businesses. The surprise acquisition by Cisco of App Dynamics is one stunning example.⁸²

As companies overhaul their business models, some carriers are pursuing 'bolt-on' acquisitions in areas such as IoT and OTT video services.⁸³ SoftBank acquired ARM Holdings in 2016 for a record USD32.4 billion (see Box 12). More record-

Box 12:

THE DEAL OF THE YEAR 2016

SoftBank Group's USD32.4 billion deal for ARM Holdings is the largest completed deal in 2016. This is only the latest big-ticket deal made in anticipation of the enormous potential of IoT technologies to disrupt and transform businesses and the economy. ARM, best known for the microprocessors that power most smartphones, has been diversifying into IoT (including security) through multiple acquisitions. Though many may recall SoftBank as an IT company, today it is a multinational mobile telecommunications holding company and therefore a non-tech buyer.

Source: Ernst & Young.

82 www.forbes.com

83 www.ey.com

breaking deals are in the 2017 pipeline, with the acquisition of Time Warner by AT&T for USD85 billion.⁸⁴

Other economic sectors are moving closer to ICTs, powering a new generation of acquisitions. With almost 5 000 fintech companies in the payments space, acquisition is a good way for telecom incumbents to acquire innovative solutions.⁸⁵ In addition to M-Pesa, players from across the board are adopting mobile payment solutions, from bKash and Grameenphone in Bangladesh to India's all-platform Unified Payments Interface (UPI)⁸⁶ to Wing in Cambodia. Similarly, all major mobile carriers in Brazil have entered partnerships with financial firms to offer mobile payment solutions – Banco do Brasil has joined forces with carrier Oi, Banco Bradesco is partnering with America Movil's Claro, and Vivo, the leading local carrier, has made a deal with MasterCard.⁸⁷

For a business operating in a single market, convergence can be a disrupter of its core business – it complicates and brings new imperatives, opening the door for new players while pushing others towards the exit.

Coopetition

Rather than M&A, players from the extended ICT sector opt for strategic partnerships or 'coopetition'. Coopetition is the act of cooperation between competing companies to unlock synergies created by partnering with competitors.⁸⁸ The strategic partnership builds strong ties with the competitor and taps into additional resources while preserving some latitude, for example revisiting business decisions at a later stage. Coopetition leads to competitive advantage and leveraging strategic assets – a win-win deal for all parties concerned. Increasingly, coopetition models cross the boundaries of the core ICT sector.

Recent examples of coopetition strategies:

- Botswana Power Company (BPC), the national power utility, partnered with Pan-African telecoms carrier Liquid Telecom to create a new telecoms network provider in Botswana. Under the agreement, BPC – which has an optical fibre cable network that is embedded on some of its high-voltage transmission lines – will lease excess optical fibres from its network to Liquid Telecom. This allows BPC to make optimal use of these assets while providing Liquid Telecom with resources to serve the network needs of its wholesale

84 www.cnbc.com

85 www.mckinsey.com

86 uk.businessinsider.com

87 analysis.openmobilemedia.com

88 www.investopedia.com

and retail clients in the region. It's the first time that BPC's fibre network will be commercialized to provide networks services across the country and for Liquid Telecom it's the latest in its efforts to expand its reach across Africa.⁸⁹

- SoftBank has invested USD1 billion in US satellite firm OneWeb, a US startup that is planning to build a global satellite telecommunications network starting in 2018.⁹⁰ The planned OneWeb network will allow users to communicate with others even when ground-based infrastructure is damaged, such as in a disaster. It will also benefit people in developing countries where communications infrastructure is underdeveloped.⁹¹
- German telecoms giant Deutsche Telekom (DT) is said to be interested in establishing a strategic partnership with the Bosnian multi-service operator BH Telecom. It is understood that DT has delegated an advisor to assist the government of the Federation of Bosnia and Herzegovina as it implements reforms. As a result, there has been speculation that the State could sell a minority stake in BH Telecom to the German outfit with a view to improving the former's business operations. Notably, DT already has an interest in one of Bosnia and Herzegovina's operators, with its Croatian unit Hrvatski Telekom holding a 39 per cent stake in HT Mostar. Earlier the government claimed it

had no current plans to privatize BH Telecom. The government previously confirmed (November 2016) that the International Monetary Fund (IMF) expect the restructuring of both BH Telecom and the country's other state-owned telco, HT Mostar, as a condition of the financial body's EUR550 million (USD575 million) loan deal with Bosnia and Herzegovina.⁹²

ICT sector as we know it – disappearing

The nature, significance and proliferation of M&As raise important questions as to the future of the wider ICT sector and its scope. As recently as five years back, it was much easier to define where the ICT sector ends. Today's ICT sector is spilling across multiple sectors. In ten years' time, ICT as a distinct industry sector will have dissolved – and will be fully integrated into the local, national and global digital economy.

Between now and then, mergers are a good indicator of future trends in ICT markets and beyond. What looks like a wildcard acquisition today is probably going to shape the next 'big thing'. New players are likely to turn the box inside out and break the rules. To see what the future has in store, keep the acquisitions Uber and Airbnb will make on your watch-list.

89 www.africatelecomit.com

90 SoftBank

91 www.telegeography.com

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TREND 7

CYBER THREATS HAVE GROWN IN SCALE AND SCOPE

With massive digitization in every aspect of consumer and corporate life has come increased risk, increased insecurity. The level of threat has grown more serious as the tools in the hands of criminals and terrorists have become more sophisticated and complex. The growing number of connected platforms offers new vectors for attack. Governments and corporations address cybersecurity and cybercrime-related issues at various levels – from privacy-by-design technologies to piecemeal regulation to institutional collaboration within and across national borders. Though cyber readiness has become paramount for building safe, resilient and sustainable ICT networks and services, not all countries are as prepared as they might be – as is flagged in the ITU Global Cybersecurity Index.

Analysts predict the cost of global cybercrime will soar to USD6 trillion annually by 2021, up from USD3 trillion in 2015.⁹³ Global spending on cybersecurity is projected to exceed USD1 trillion in total over the next five years up to 2021.⁹⁴ Data breaches will cost USD2.1 trillion globally by 2019, almost four times the estimated cost in 2015.⁹⁵

The level of threat has grown more serious as the tools in the hands of criminals and terrorists have become more sophisticated and complex. The growing number of connected platforms offers new vectors for attack.⁹⁶ Malicious online agents are numerous, organized and have different motivations whether political, criminal, terrorist or hacktivist. Disabling electricity and financial systems through interference with ICT networks is a reality today – and such activities pose a threat to national security.

Cybersecurity and cybercrime-related issues are addressed at various levels – from privacy-by-design technologies to piecemeal regulation to institutional collaboration within and across national borders. Cyber readiness has become paramount for building safe, resilient and sustainable ICT networks and services.

93 Cybersecurity Ventures, [2016 Cybercrime Report](#)

94 Cybersecurity Ventures, [2016 Cybersecurity Market Report](#)

95 Juniper Research, [The Future of Cybercrime & Security: Financial and Corporate Threats & Mitigation](#)

96 ITU, [Global Cybersecurity Index & Cyberwellness Profiles 2015](#)

Box 13:

CYBERCRIME AND CYBER THREATS – AN EVER WIDENING FIELD OF ACTIVITY

Damage associated with cybercrime activities includes damage and destruction of data, stolen money, lost productivity, theft of intellectual property, theft of personal and financial data, reputational harm, embezzlement, fraud, post-attack disruption to the normal course of business, forensic investigation, and restoration and deletion of hacked data and systems.

Cyber threats have evolved from targeting and harming computers, networks, and smartphones – to targeting people, cars, railways, planes and power grids. With mass deployment of M2M, IoT, and in particular self-driving cars and connected medical devices, cyber threats shift from being virtual to physical and immediate.

Source: ITU and Cybersecurity Ventures, 2016 Cybercrime Report.

The Global Cybersecurity Index for 2015 has found that cyber readiness of countries worldwide varies considerably, based on a five-branch composite index that evaluates legal, technical and organizational measures, capacity building and cooperation. The latest assessment is presented in Box 14.

Highlights from the Index include:

- The most targeted countries, such as the US and Canada, are also those with the most robust cyber readiness.
- Asia-Pacific countries with advanced ICT markets display a high-level of readiness – Australia, Malaysia and New Zealand lead the way.
- EU boasts half of the top 25 countries, their preparedness boosted by EU Directives that provide a common framework for EU27.
- Oman and Qatar feature in the top 25 as well as Brazil, the only Latin America country.
- The first African country, Mauritius, is ranked 32nd and the first CIS country – Azerbaijan – is 37th.
- Emerging countries and high-income economies are also to be found in the top group.
- Developing countries – in some cases hosts *and* targets of cyber threats – appear to be insufficiently prepared to fight such threats.
- Globally, more effort has been invested in legal aspects while capacity building efforts are lagging. Note that developments related to legal and regulatory frameworks are discussed in Regulatory Trend 5.

Box 14:

GLOBAL CYBERSECURITY INDEX 2015

The Global Cybersecurity Index (GCI) measures and then ranks countries' commitment, preparedness and capability in regard to cybersecurity, using five key indicators as set out below. In so doing, the Index offers a high-level, but nevertheless highly indicative perspective – it does not document in detail countries' capabilities or possible vulnerabilities.

GCI's ultimate goal is to help foster a global culture of cybersecurity and its integration at the core of ICT systems and services. The project has been led by ITU.

The five designated areas that form the basis for GCI indicators, in accordance with the Global Cybersecurity Agenda, are:

- Legal Measures
- Technical Measures
- Organizational Measures
- Capacity Building
- Cooperation

The latest top ranking is presented in the table here.

Note: * Based on secondary data
Source: ITU.

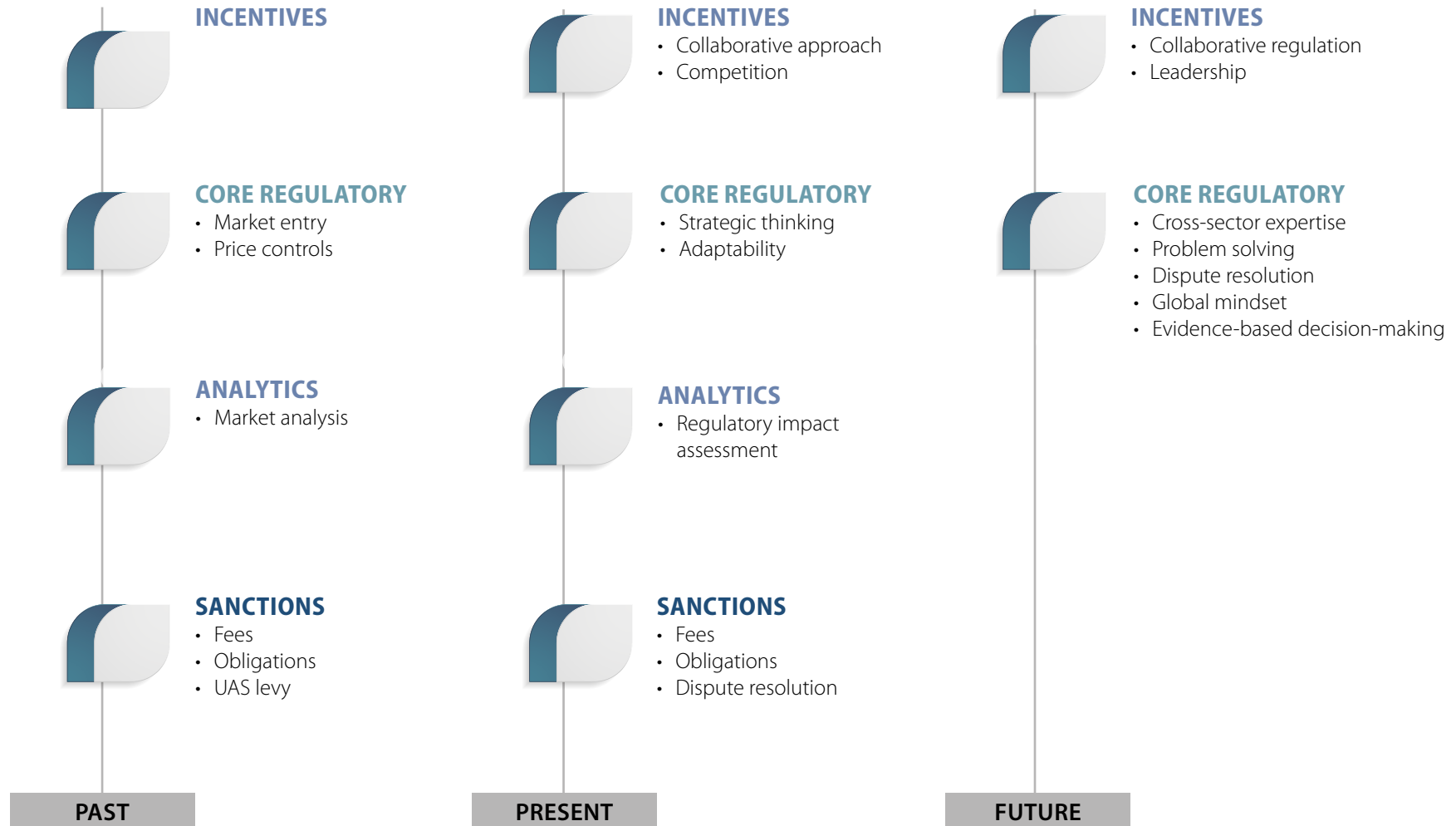
Global Cybersecurity Index 2015, Top 25 countries

	Country	GCI
1	US	0.824
2	Canada*	0.794
3	Australia*	0.765
4	Malaysia	0.765
5	Oman	0.765
6	New Zealand*	0.735
7	Norway*	0.735
8	Brazil	0.706
9	Estonia*	0.706
10	Germany*	0.706
11	India*	0.706
12	Japan*	0.706
13	Korea (Rep.)	0.706
14	United Kingdom	0.706
15	Austria*	0.676
16	Hungary*	0.676
17	Israel*	0.676
18	Netherlands*	0.676
19	Singapore	0.676
20	Latvia*	0.647
21	Sweden*	0.647
22	Turkey	0.647
23	Hong Kong, China	0.618
24	Finland	0.618
25	Qatar	0.618

Figure 12:

EVOLUTION OF REGULATORY MANDATES AND SKILLS

Source: ITU.



GLOBAL ICT REGULATORY TRENDS

INTRODUCTION: WHERE DOES ICT REGULATION COME FROM, WHAT IS IT AND WHERE IS IT GOING?

Today, ICTs are an engine for social inclusion and economic empowerment. In less than a generation, the ICT sector has transformed itself from a silo network industry with prevalent public service into a constellation of technologies, services and products that make markets tick ever faster, heralding change in all areas of our personal, professional and community life, from economy to science to politics.

As this profound change takes place, challenges are many – and the role of regulation is ever more delicate and important. Regulators seek a balance to ensure that opportunities outweigh challenges, even as conventional means of doing business are often superseded by market disruptors.

Today's regulators have to be more explorative, reflective and creative. They have developed a yin-yang view of regulatory issues, looking both at hindrances and drivers for innovation, investment and market growth. Incentive regulation has complemented and, to some extent, replaced regulatory obligations. New regulatory tools have emerged to match market realities while parties involved in ICT markets and beyond are forging collaborative approaches to leverage their varied expertise. The goal of regulators is to have as few regulatory blind spots as possible.

REGULATION IS A RUNWAY

Regulation is like a runway. Without it, market players, especially new categories, could not take flight and gain altitude. Without coordination with other air-traffic, passenger safety is compromised. Likewise, without regulation, ICT consumers would lack a safety net. Last but not least, the pilot has the role of ensuring a smooth journey and safe arrival at the destination. The ICT regulator is indeed piloting in all weathers, operating on-board controls and liaising with air traffic control. While the autopilot handles tedious work – maintaining direction and altitude – the pilot concentrates on safety-critical aspects like navigating, route planning and communications.⁵ Use of the autopilot is not adequate for negotiating a turbulent flight in thick cloud. And yes, the ICT regulator is essential if ongoing, rapid and profound change is to be navigated through to the desired destination.

The ICT Regulatory Tracker (see next section) is a new and authoritative data tool developed by ITU. It captures data from the past nine years with a special focus on the past year. It forms the basis for our identification of *seven major regulatory trends* that are shaping ICT regulation.

The ICT Regulatory Tracker has been our compass and guide through the volatile currents of regulatory trends, providing a wealth of information to track their trajectories and enable a better understanding of them.

The seven trends we identified bring to the fore regulators' focus on efficiency and the impact of regulation. They signal too a broader approach to the development of incentives as a means to help protect consumer rights and respond to their demands. If we were to single out a regulatory goal, it would be to create open markets where regulation encourages the growth of networks, the provision of services and the diffusion of content and applications – in an affordable, competitive and safe way.

The major trend towards collaborative regulation is set to lead the ICT sector and will set direction for young digital economies over the next decade. Collaborative regulation is not a fundamentally new idea; however, we suggest a new concept of regulation as a process driven by synergies to build common ground across many sectors, including regulators, other government agencies, ICT market players and consumers. This is discussed in detail in Regulatory Trend 7.

ICT REGULATORY TRACKER IDENTIFIES FIVE GENERATIONS OF REGULATION

RATIONALE

The ICT regulation landscape is constantly evolving and at an ever-increasing pace. In order to measure and monitor the changes taking place in the telecommunication/ICT regulatory environment, ITU has designed an analytical tool that looks at a variety of traditional and new subjects in order to make sense of this rapid evolution and to anticipate future change.

WHAT IS THE ICT REGULATORY TRACKER?

The tool – the ICT Regulatory Tracker – covers 185 ITU Member States and Hong Kong, China over the period 2007 – 2013, 187 countries in 2014 (adding Nauru)

and 189 countries and economies in 2015 (adding Solomon Islands and Somalia). The full list of countries can be found in Annex 1. A note on the methodology of the ICT Regulatory Tracker and a full list of the indicators is provided at the end of this report. Detailed methodology can be found in Annex 2.

The ICT Regulatory Tracker is an evidence-based tool that makes use of both quantitative and qualitative data derived from 50 indicators, ranging from accountability to quality of service obligations and monitoring to competition in market segments, across four clusters – regulatory authority, regulatory mandate, regulatory regime and competition framework (see Figure 13). Leveraging a large amount of historic regulatory data, the tool is devised to help decision-makers and regulators more fully understand the ever-changing terrain of ICT regulation.

Figure 13

STRUCTURE OF THE ICT REGULATORY TRACKER

Source: ITU.

CLUSTER

01
REGULATORY
AUTHORITY
SEPARATE ICT REGULATOR

02
REGULATORY
MANDATE
WHO REGULATES WHAT

03
REGULATORY
REGIME
WHAT REGULATION EXISTS
IN MAJOR AREAS

04
COMPETITION
FRAMEWORK
LEVEL OF COMPETITION IN THE
MAIN MARKET SEGMENTS

WHAT DOES THE TRACKER DO?

The Tracker pinpoints the changes taking place in the ICT regulatory environment. It facilitates benchmarking and the identification of trends in ICT legal and regulatory frameworks. The Tracker helps identify gaps in existing regulatory frameworks, making the case for further regulatory reform towards achieving a vibrant and inclusive ICT sector.

The Tracker does not measure the quality or the performance of regulatory frameworks in place, but records their existence and features. It enables users/countries to track progress and identify the major regulatory trends driving the ICT sector since 2007. It has also led to the definition of five 'generations of ICT regulation'.

GENERATIONS OF REGULATION

The Development Bureau of ITU annually collects data on the regulatory environment of over 186 countries and economies that is captured through self-reported data provided by ITU Member State Administrations. These data have been coded giving each country a score (between 0 and 100) for every year between 2007 and 2015. Based on their scores, countries have then been

associated with a generation of regulation. Thus far, five generations of regulation have been identified, starting with the command and control approach of the first generation through to a fifth generation based on collaboration that is harmonized across sectors. The rationale behind the generations is explained in Figure 14 below. Throughout the report they will be referred to as G1 through G5.

The ICT Regulatory Tracker tracks the transition of countries through generations one to four. The Trackers' indicators correspond closely to the guiding principles outlined in the ITU Best Practice Guidelines of the Global Symposiums for Regulators (GSR) adopted annually by the global community of ICT regulators⁹⁷ (see also Table 4). The Best Practice Guidelines are considered as the core of modern ICT regulation and the expression of collective wisdom of the current bodies in charge of ICT regulation.

G5 regulation, collaborative regulation, is the desired destination for regulation at this point in time and reflects the maturity of ICT markets globally. It is different from G4 regulation in the means it uses and the mechanisms that have been put in place to increase synergies across the sectors and create efficiencies across public administration bodies. Due to the recent focus on these issues and the scarcity of available data that is directly relevant to it, the fifth generation has not

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Figure 14:
GENERATIONS OF REGULATION

Source: ITU.

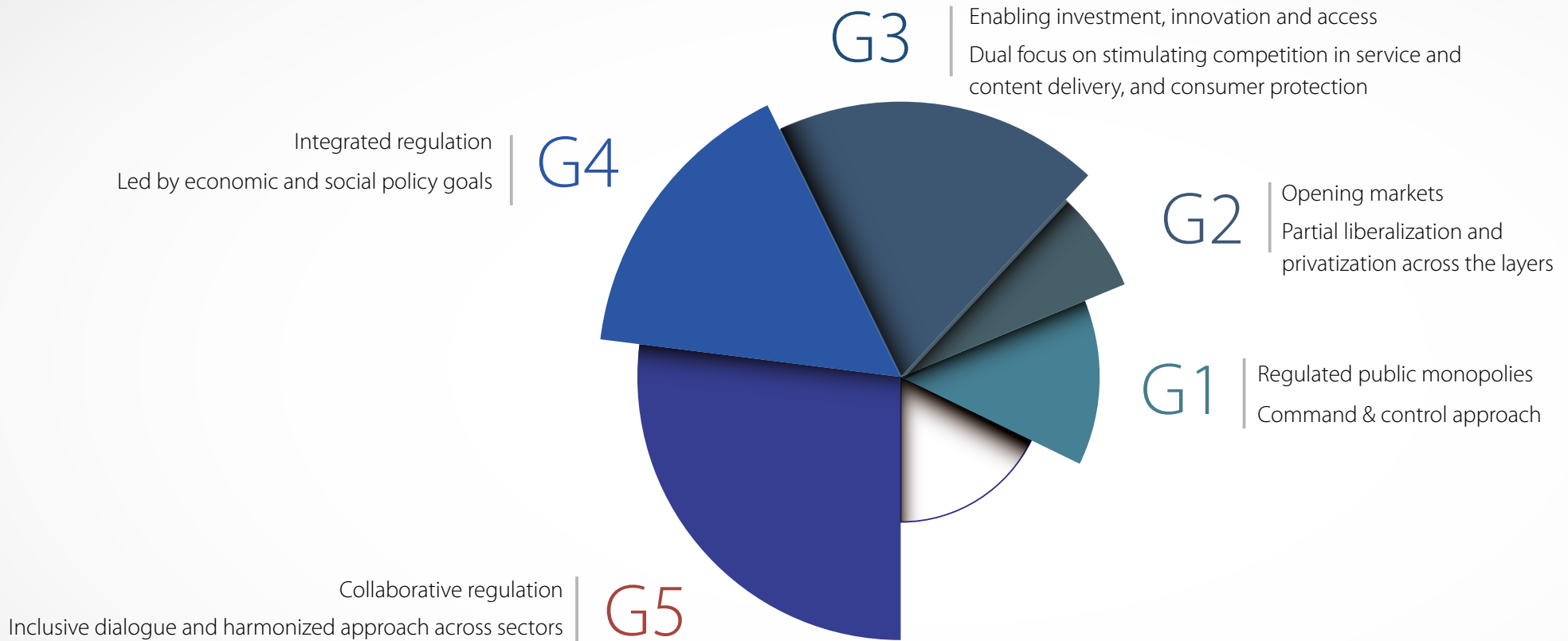
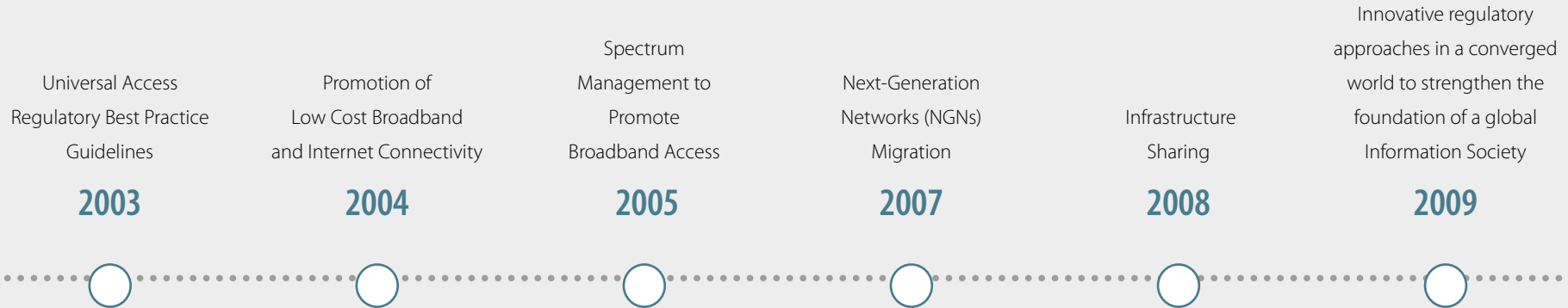


Table 4:

TOPICS OF THE BEST PRACTICE GUIDELINES OF THE ANNUAL ITU GLOBAL SYMPOSIUM FOR REGULATORS (GSR), 2003-2016

Source: ITU.



yet been fully included in the ICT Regulatory Tracker although it is clearly flagged.

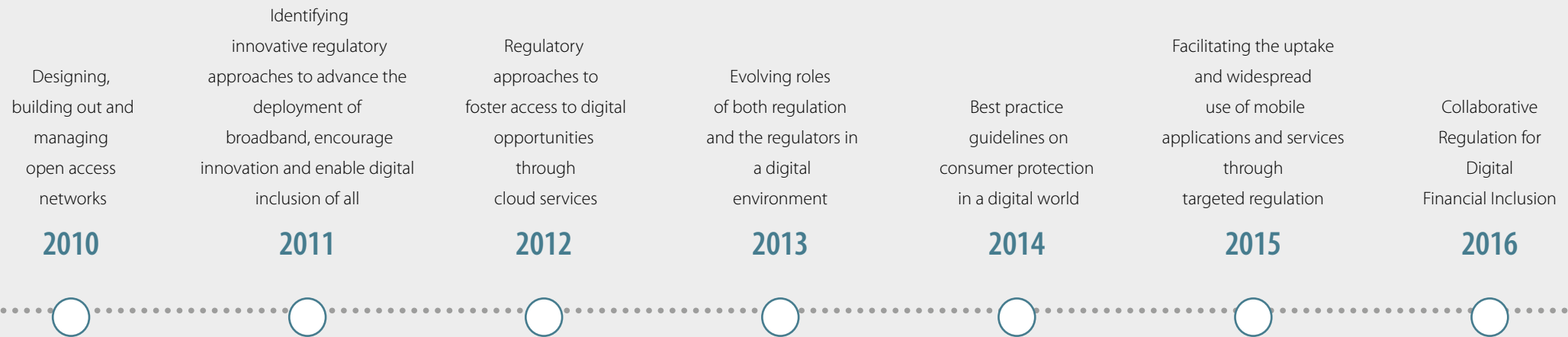
The table below summarizes the four focus areas of the Tracker and the differences among the five generations of regulation.

TELECOM AND ICT REGULATION HAVE COME A LONG WAY

Telecom and ICT regulation has come a long way over the past 20 years. Compared to the mid-1990s nothing is the same – both with regard to the ICT regulator, the body of regulation they deliver and the markets they oversee (see Figure 15). Twenty years ago, mainstream telecom regulation used to be prescriptive and not necessarily grounded in market realities. Some ten years ago growing awareness of the need for wide public consultations in the decision-

making process in regulatory practices led to collaboration. Today, collaborative regulation is considered the norm. At the same time, the role of ICT regulator has grown from being an extension to the policy-maker to a separate, autonomous institution with a full-fledged mandate and a solid market stance. Increasingly, the effectiveness of the regulator depends on their ability to work with stakeholders from other sectors of the economy and to join forces to resolve common issues.

Supported by a vibrant ICT regulatory climate and the leadership of the ICT regulator, key markets, such as mobile and broadband, have thrived and are now considered to provide highly valued products and services, both socially and economically, to the majority of the world's population.



Global trends

ICT regulation has evolved globally over the past ten years (see Figure 16, left chart) and has experienced steady transformation as countries have been transitioning to higher generations of regulation.

Back in 2007, four out of five countries worldwide were either in G1 or G2 regulation. Only Belgium had achieved G4 regulation. A 20 per cent minority of developed, mainly European countries, constituted the core of the G3 group.

Nine years later, this trend has been turned on its head with 58 per cent of the world's nations now in G3 and G4 regulation. Fewer than one in six countries are still in G1 and one-quarter of all countries are in G2. G4 countries alone make up 28 per cent out of the 189 countries covered. Countries from all regions have

joined the race for better, more adaptive and market-wise ICT regulation, from Australia to Mexico and from Kenya to Moldova to Saudi Arabia.

The different regions are at a varying level of regulatory maturity (see Figure 16, right chart). Although we can see that patterns based on income distribution and global development coincide with the advancement of regulatory policies, the picture is more complex than that. Highlights from the regions are provided below in this section.

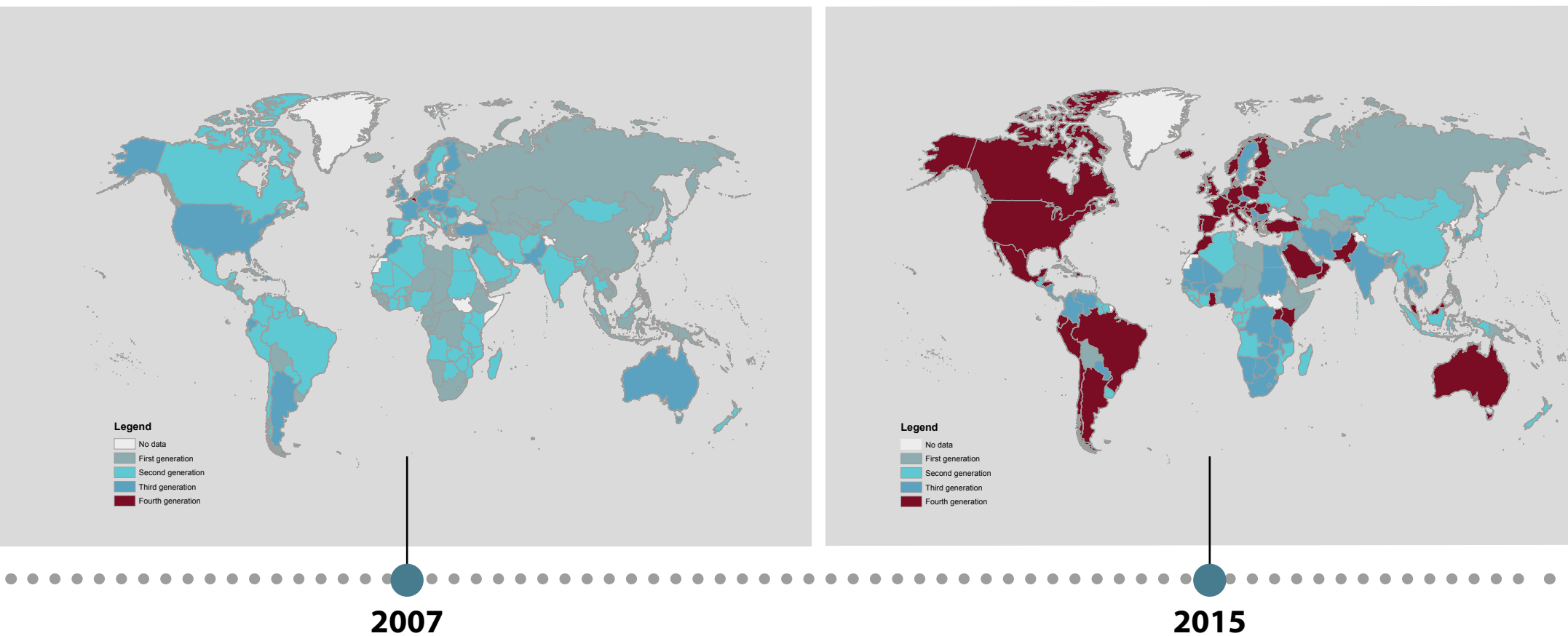
Table 5:
**RATIONALE
FOR
GENERATIONS
OF
REGULATION**

Source: ITU.

	1. Regulatory authority	2. Regulatory mandate	3. Regulatory regime	4. Competition framework
G1	<ul style="list-style-type: none"> • Consolidated with policy-maker and/or industry 	<ul style="list-style-type: none"> • Business as usual 	<ul style="list-style-type: none"> • Doing as we have always done 	<ul style="list-style-type: none"> • State-owned monopoly
G2	<ul style="list-style-type: none"> • Separate agency 	<ul style="list-style-type: none"> • First wave of regulatory reform 	<ul style="list-style-type: none"> • Doing more 	<ul style="list-style-type: none"> • Liberalization
G3	<ul style="list-style-type: none"> • Separate agency, autonomous in decision-making 	<ul style="list-style-type: none"> • Advanced liberalization of ICT sector 	<ul style="list-style-type: none"> • Doing the right things 	<ul style="list-style-type: none"> • Partial competition
G4	<ul style="list-style-type: none"> • Separate agency with enforcement power 	<ul style="list-style-type: none"> • Adjacent issues become core mandate 	<ul style="list-style-type: none"> • Doing the things right 	<ul style="list-style-type: none"> • Full competition
G5	<ul style="list-style-type: none"> • Separate agency as part of a network of partner regulators 	<ul style="list-style-type: none"> • Separate agency as part of a network of partner regulators 	<ul style="list-style-type: none"> • Doing things together 	<ul style="list-style-type: none"> • Intra-modal competition

The policy and regulatory landscape has been redrawn over the past decade Maps 2 and 3 depict the changing regulatory landscape over the past decade. Some trends have emerged:

- In many countries, regulators have kept up with multiple ICT markets in a growth spurt and have adapted relevant regulations to create an enabling environment for further investment and innovation.
- Some G4 regulators have managed to ride ahead of the wave and shape markets rather than catching up with them.
- Others have managed to carry out meaningful regulatory reforms yet lack the institutional capacity to effectively implement and enforce them.
- Still others have contented themselves with keeping old regulations in place, with market players looking to take advantage of existing loopholes rather than responding to incentives.
- A few have actively banned new services to protect national incumbent operators – often state-owned – thereby decreasing quality and choice of services to consumers.



Maps 2 and 3:

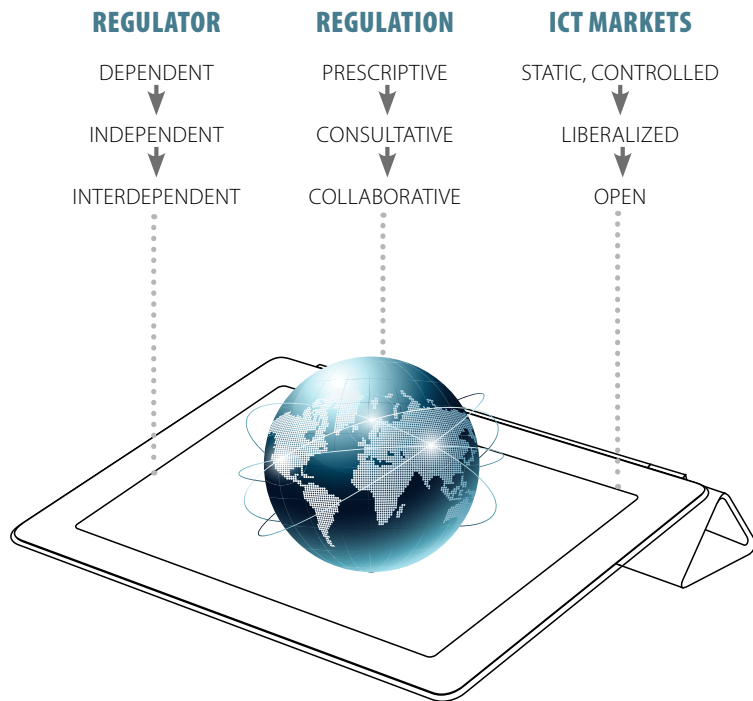
CHANGING REGULATORY LANDSCAPE IN THE ICT SECTOR, 2007 AND 2015, BY GENERATION OF REGULATION

Source: ITU.

Figure 15:

CHANGING PATHS OF THE ICT REGULATOR, REGULATION AND MARKETS

Source: ITU.



G4 and G5 ICT regulation is the way forward

A lot still needs to be done to create a level playing field for traditional and new players in the digital environment and bridge the connectivity gaps. We argue that G4 and G5 ICT regulation is the way forward, through strengthening regulatory institutions' capacity and heightening regulatory standards, while listening to and collaborating with all stakeholders involved in the broader ICT sector.

The regulatory journey ahead brings along many challenges, ranging from conflicting interests of market players to the mismatch of consumer demand and service affordability and availability. Before discussing the future, it is helpful to take stock of the past to see where we stand today and how we got here.

To do so, it is worth looking at the leading G4 regulators that have been paving the way to modern regulation. European Union (EU) countries took 16 out of the top 25 spots with Ireland coming first for a second consecutive year (see Table 6). Nine countries from three more regions have topped the race (Americas, Arab States and Asia-Pacific). They have all made significant progress over the past nine years, although most of them were already in the list of the top performers in 2007. New entries in 2015 include Argentina, Brazil, Croatia, Dominican Republic, Malaysia, Mexico, Oman, Saudi Arabia, Singapore and Turkey.

Not all of these top-ranked countries have fully realized digital opportunities; however, they have opened the way to meaningful change and can expect tangible improvement in their ICT sectors as well as the entire economy over the short- to medium-term.

Table 7:
**HISTORICAL
TOP 3,
ICT REGULATORY TRACKER,
2007-2015**

Source: ITU.

Year	1st score	2nd score	3rd score
2007	Belgium (85.5)	Hungary (83.5)	Latvia (83) Portugal (83)
2008	Italy (86.3)	Austria (86)	Belgium (85.5) Hungary (85.5)
2009	Iceland (91)	Germany (88.5) Poland (88.5)	Belgium (87.5)
2010	Iceland (92)	Italy (91.3) Portugal (91.3)	Slovenia (91)
2011	Portugal (93)	Iceland (92)	Italy (91.3)
2012	Australia (94)	Portugal (93) Slovenia (93)	Brazil (92.5)
2013	Australia (94.5)	Croatia (93) Ireland (93) Portugal (93) Slovenia (93)	Brazil (92.5)
2014	Ireland (95)	Brazil (94.5)	Italy (93.3)
2015	Ireland (97)	Slovenia (95)	Brazil (94.5)

Table 6:
**ICT REGULATORY TRACKER,
TOP 25, 2015**

Source: ITU.

Country	Cluster 1. Regulatory authority	Cluster 2. Regulatory mandate	Cluster 3. Regulatory regime	Cluster 4. Competition framework	Overall Score 2015	Rank 2015	Rank 2007	Change in rank	
1	Ireland	20	19	30	28	97.0	1	19	18
2	Slovenia	19	19	30	27	95.0	2	8	6
3	Brazil	19	20.5	27	28	94.5	3	81	78
4	Italy	19	19	28	27.3	93.3	4	36	32
5	Mexico	19	20	26	28	93.0	5	109	104
6	Croatia	19	19	28	27	93.0	5	29	24
7	Poland	19	18	28	28	93.0	5	5	0
8	Portugal	19	19	28	27	93.0	5	3	-2
9	Turkey	19	19.5	30	24.3	92.8	9	25	16
10	Australia	18	19.5	28	27	92.5	10	5	-5
11	Hungary	18	21.5	26	27	92.5	10	2	-8
12	Montenegro	19	20	26	27	92.0	12	32	20
13	Dominican Rep.	19	19	26	28	92.0	12	26	14
14	Norway	18	17	30	27	92.0	12	16	4
15	Lithuania	19	18	28	27	92.0	12	15	3
16	Finland	18	18	28	27	91.0	16	28	12
17	France	18	19.5	30	23	90.5	17	11	-6
18	Greece	20	17	28	25.3	90.3	18	10	-8
19	Iceland	18	18	26	28	90.0	19	36	17
20	Switzerland	17	18	28	27	90.0	19	19	0
21	Malta	18	16	28	28	90.0	19	11	-8
22	Austria	18	16.5	28	27	89.5	22	7	-15
23	Oman	17	19	28	25.3	89.3	23	88	65
24	Saudi Arabia	20	20	23	26.3	89.3	23	66	43
25	Malaysia	19	22	26	22	89.0	25	74	49
26	Singapore	17	19	26	27	89.0	25	46	21
27	Argentina	18	20	23	28	89.0	25	29	4
28	Belgium	16	18	28	27	89.0	25	1	-24

The scores of the Tracker have also gone higher. In 2007, Belgium was the top-ranked country with a score of 86. In 2015, four countries – Cape Verde, Georgia, Morocco and Uganda – ranked 34th, with the same score (86) while the score of Ireland, the 2015 top-ranked country, is 97 or only three points away from the full score. While it is not our intention to assume that regulation in countries at the top of the ICT Regulatory Tracker are near perfect, we consider that a close-to-full score suggests significant achievements and leadership. Once the ceiling of the fourth generation has been reached, the next frontier is collaborative regulation – the ability to speak other regulators’ languages and jointly establish the rules for a thriving digital economy.

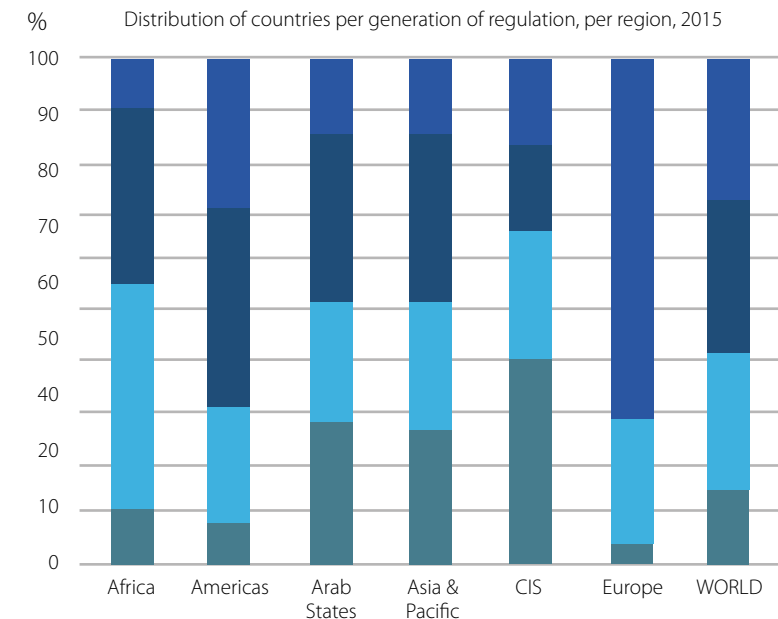
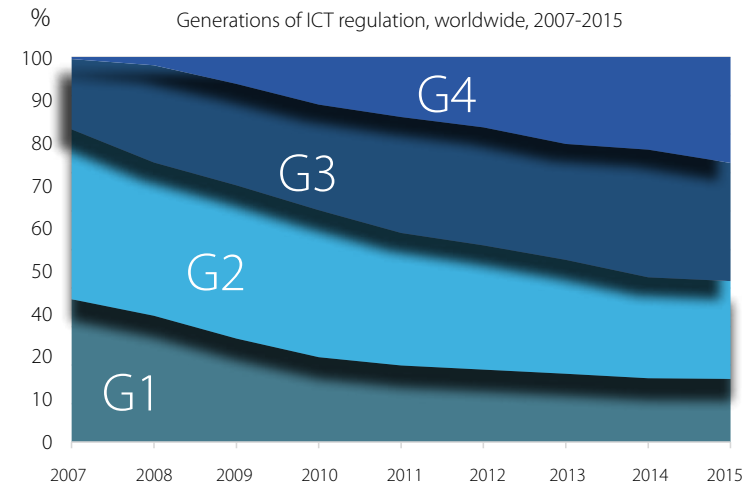
Until now, EU countries have had clear dominance over the top three ranks of the ICT Regulatory Tracker (see Table 7). They figure among the front-runners of G4 regulation, including Austria, Belgium, Germany, Iceland, Ireland, Italy and Portugal, and some of the early adopters from Central Europe, including Croatia, Hungary, Latvia and Slovenia. Iceland and Ireland remained first for two consecutive years each, respectively in 2009-10 and 2014-15. Portugal retains the greatest number of top spots – five; it was third in 2007, second in 2010, first in 2011 and again second in 2012 and 2013.

Only two extra-EU countries, Australia and Brazil, have featured in one of the first three spots. Australia remained at the top spot for two consecutive years, in 2012 and 2013. Brazil held one second spot and three third spots in nine years.

Clearly, there has been a race to the top as only 15 countries, in total, have rotated around the 35 top spots over that period.

Figure 16:
EVOLUTION OF REGULATION, WORLDWIDE

Source: ITU.





ICT Regulatory Tracker Score Breakdown

G1: $\geq 0 < 40$

G2: $\geq 40 < 70$

G3: $\geq 70 < 85$

G4: $\geq 85 \leq 100$

Notes : Data for

2007-2013: 186 countries and economies

2014: 187 countries and economies

2015: 189 countries and economies

ALL REGIONS ARE DIFFERENT

In addition to the top ranking of countries, world averages and the most dynamic countries' group also provide key insights into patterns of progress towards better regulatory frameworks for the ICT sector. Regional trends also provide important – and complementary – clues.

The following section provides a bird's-eye view of the six regions, keeping the main focus on what has changed and where to expect more change.

AFRICA

- In 2007, countries in Africa were equally split between G1 and G2 regulation. By 2015, 15 countries migrated to G3 regulation. Four African countries reached G4 among a total of 52 countries globally – Cape Verde, Ghana, Kenya and Uganda. Africa has the lowest percentage of G4 countries compared to the other regions, despite the extraordinary progress it has collectively achieved.
- In 2015, Ghana is the highest ranked African country followed by Kenya, Cape Verde and Uganda, while Burkina Faso, Botswana and Malawi are now virtually ready to step into G4, too, with their latest scores standing respectively at 82, 84 and 83 points.
- Only five African countries remain in G1 in 2015. However, they are not likely to move up in the ranking in the next few years as their national ICT sectors all operate under exclusive state monopolies.



Figure 17:
GENERATIONS OF REGULATION IN AFRICA, 2007 AND 2015

Source: ITU.

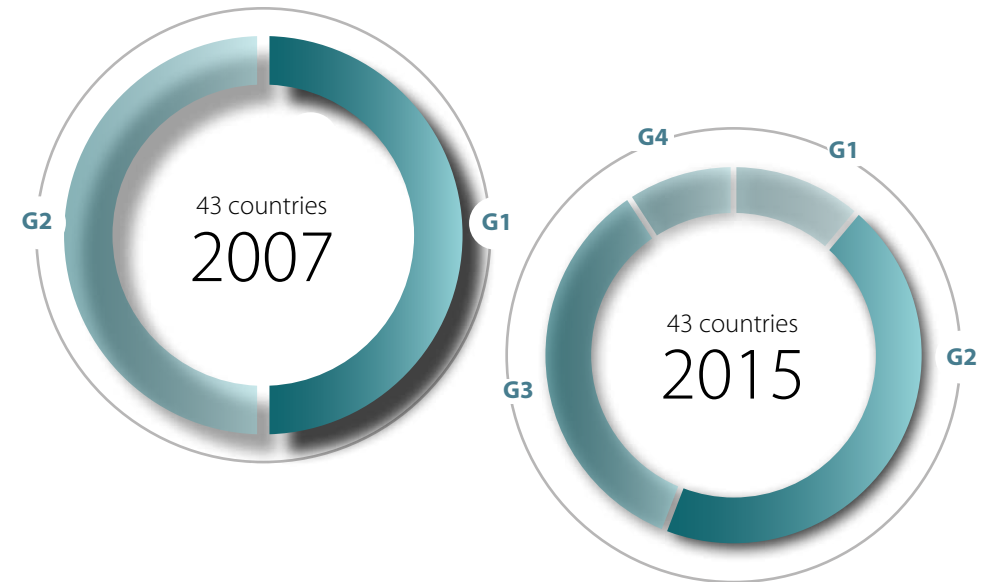


Table 8:

AFRICA TOP 5, ICT REGULATORY TRACKER, 2015

Country	Rank 2015	Score 2015	G
1. Ghana	33	88.3	4
2. Kenya	39	87.5	4
3. Cape Verde	46	86.3	4
4. Uganda	48	86	4
5. Botswana	55	84	3

Figure 18:
GENERATIONS OF REGULATION IN THE AMERICAS, 2007 AND 2015

Source: ITU.

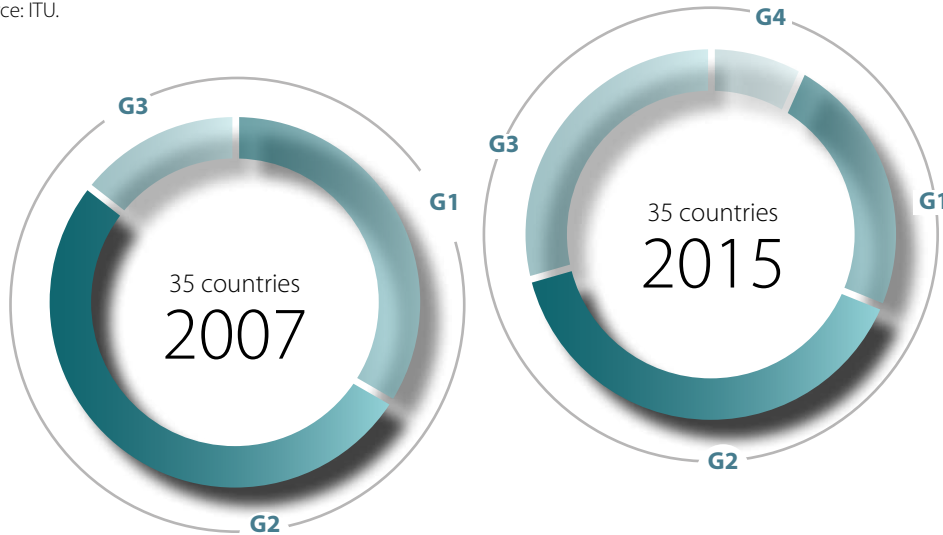


Table 9:
AMERICAS TOP 5, ICT REGULATORY TRACKER, 2015

Country	Rank 2015	Score 2015	G
1. Brazil	3	94.5	4
2. Mexico	5	93	4
3. Dominican Rep.	12	92	4
4. Argentina	25	89	4
5. United States	30	88.5	4

AMERICAS

- There are four Latin America countries in the top 25 (Brazil, Mexico, Dominican Republic and Argentina) while there were none back in 2007. This demonstrates the dynamic pace of evolution both in regulation and the ICT markets across the region.
- A total of ten countries have joined the G4 bandwagon, including Canada, Chile, Ecuador, Honduras, Peru and the United States.
- Since 2007, 19 countries from the Americas have moved to G3 or G4 regulation. This shift in the regulatory paradigm explains, at least in part, the strong growth of market penetration of both basic voice services and broadband across the region.
- The Americas count only three G1 countries in 2015. Following recent developments at the end of 2016, Cuba – which is one of them – is expected to embark on reforming its telecom sector and head to G2, if not leapfrogging to G3 ICT regulation in a short time.



ARAB STATES

- In 2007, only two Arab countries – Morocco and Jordan – had reached G3 and the remaining countries from the region were equally split between G1 and G2.
- In 2015, Oman and Saudi Arabia feature in the top 25 and Morocco joined the group of G4 countries. Bahrain and Egypt, although still in G3, are well on their way to enter G4, with their respective scores standing at 84.8 and 82.8 points.
- In 2015, there were roughly as many countries in G1 and G2 ICT regulation as there were in G3 and G4. The region is changing at its own pace as new benefits become available to ICT consumers and new opportunities open up for private sector stakeholders.
- Almost one-third of the countries in the region remain in G1 in 2015. Among those, Libya has recently created an ICT regulatory authority while Kuwait and Djibouti are in the process of creating one. It might take those new regulators a few years to get on their feet and make a difference – however, they will undoubtedly upgrade their regulatory regimes to help their national ICT markets connect the large population of unconnected, who are also those most in need of ICT services.



Figure 19:
**GENERATIONS OF REGULATION IN ARAB STATES,
2007 AND 2015**

Source: ITU.

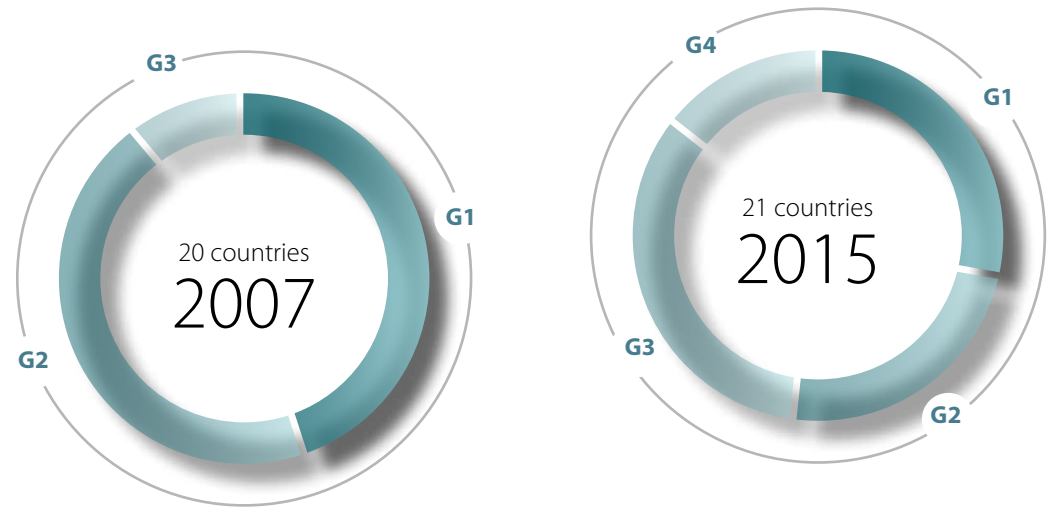


Table 10:

ARAB STATES TOP 5, ICT REGULATORY TRACKER, 2015

Country	Rank 2015	Score 2015	G
1. Oman	23	89.3	4
2. Saudi Arabia	23	89.3	4
3. Morocco	47	86.2	4
4. Bahrain	53	84.8	3
5. Egypt	57	82.8	3

ASIA-PACIFIC

Figure 20:

GENERATIONS OF REGULATION IN ASIA-PACIFIC, 2007 AND 2015

Source: ITU.

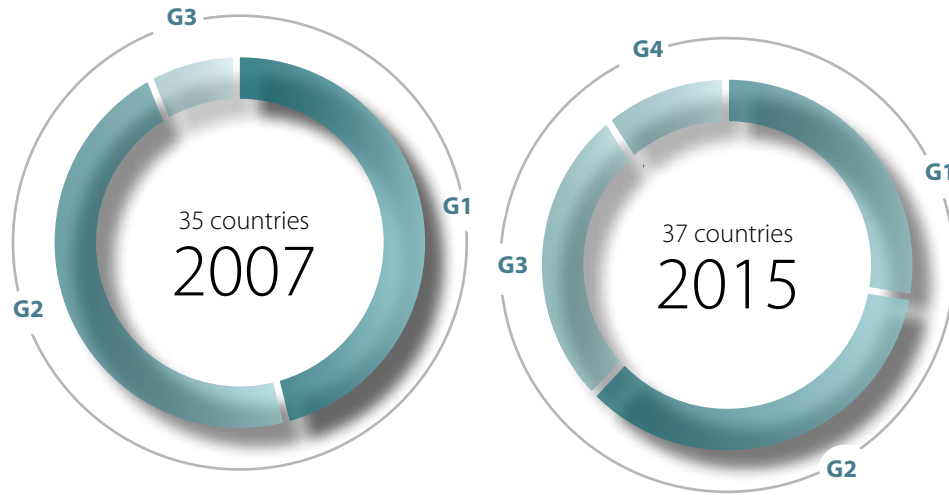


Table 11:

ASIA-PACIFIC TOP 5, ICT REGULATORY TRACKER, 2015

Country	Rank 2015	Score 2015	G
1. Australia	10	92.5	4
2. Malaysia	25	89	4
3. Singapore	25	89	4
4. Pakistan	34	88	4
5. Hong Kong, China	61	81.8	3

- Of all regions, Asia-Pacific is the most complex to analyze. It is home to 37 countries with highly heterogeneous characteristics – from least developed countries (LDCs) and small island developing States to middle-income countries to some of the most ICT-savvy countries in the world.
- Australia, Malaysia and Singapore are the only countries from Asia-Pacific in the top 25, ranked respectively tenth and 25th (Malaysia and Singapore *ex aequo*). Australia has lost five ranks since 2007 and Malaysia and Singapore have just entered the top 25. Pakistan was ranked 22nd in 2007 but moved down 12 places in 2015.
- In relative terms, only ten per cent of countries in the region belong to G4 in 2015, while the other countries are roughly split between G1, G2 and G3.
- Asia-Pacific is the region with the highest number – ten – of G1 countries in 2015, mainly small islands and LDCs. Among them, Papua New Guinea and Tonga have good chances to take off in the near future, getting closer to the average level for the region, both in terms of ICT market regulation and adoption.



COMMONWEALTH OF INDEPENDENT STATES (CIS)

- In 2007, Georgia was the only CIS country in G3. It has kept the position of regional leader over the past nine years, although it has gone down from the 27th to the 48th rank. Moldova has caught up with Georgia to become the second – and last for the time being – G4 country in CIS.
- One-third of the countries in the region figure in either G3 or G4 in 2015. In addition to Georgia, they include Armenia, Kyrgyzstan and Moldova. Over 40 per cent of CIS countries remain in G1 and one-quarter in G2.
- Some progress has been made with regard to market liberalization, however competition policy and free market-based mechanisms have had limited use. At the same time, no major reforms have been planned for the coming years, with little change in prospect.
- CIS is the only region where a G2 country is featured in the top five – Azerbaijan.



Figure 21:
**GENERATIONS OF REGULATION IN CIS,
2007 AND 2015**

Source: ITU.

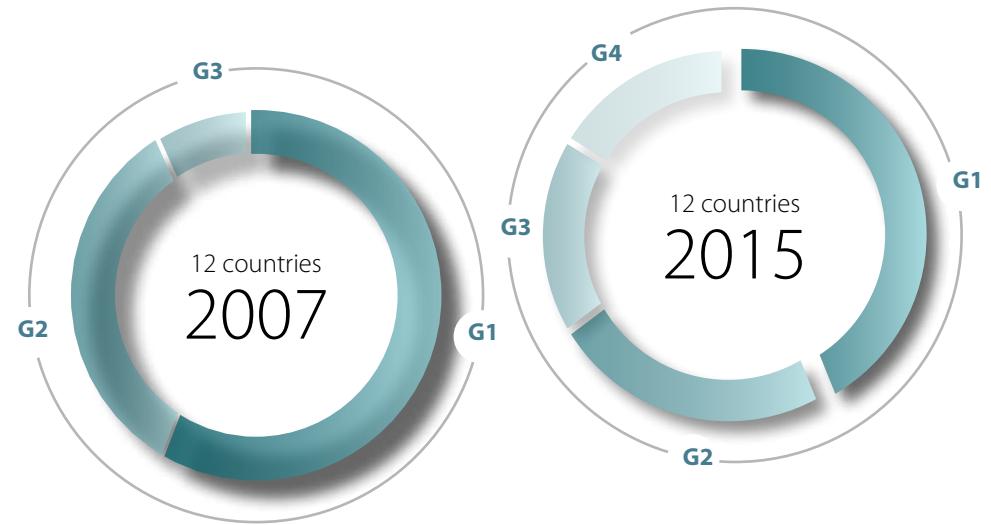


Table 12:

CIS TOP 5, ICT REGULATORY TRACKER, 2015

Country	Rank	Score	G
1. Georgia	48	86	4
2. Moldova	50	85	4
3. Armenia	79	78.5	3
4. Kyrgyzstan	103	72.5	3
5. Azerbaijan	127	63.2	2

Figure 22:

GENERATIONS OF REGULATION IN EUROPE, 2007 AND 2015

Source: ITU.

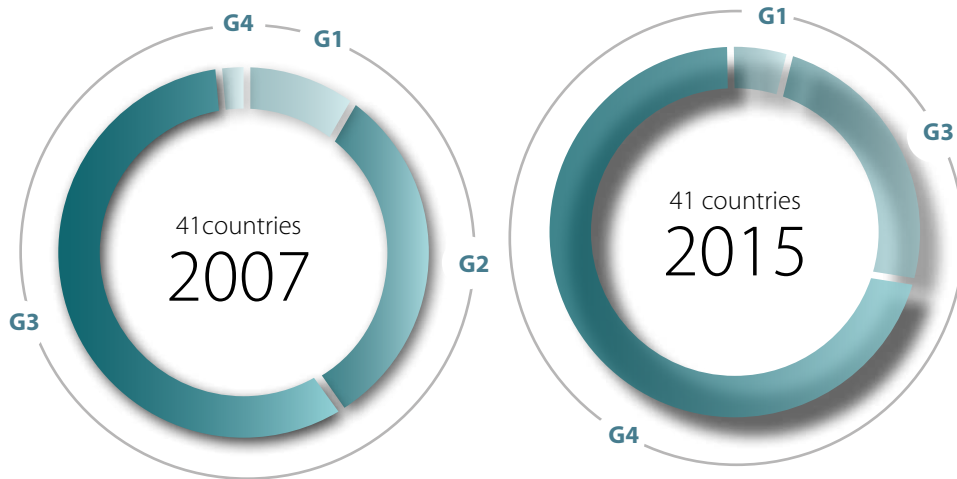


Table 13:

EUROPE TOP 5, ICT REGULATORY TRACKER, 2015

Country	Rank	Score	G
1. Ireland	1	97	4
2. Slovenia	2	95	4
3. Italy	4	93.3	4
4. Croatia	5	93	4
5. Poland	5	93	4

- In 2015, over 70 per cent of European countries are in G4 regulation, up from only one country, Belgium, in 2007. Countries across the board have massively moved to the highest generation of regulation in only nine years. Europe has been the most dynamic of all regions and the most advanced in terms of ICT regulation to date.
- One-quarter of European countries are in G3, including the majority of the Balkan States (Albania, Bulgaria, Serbia, TFYR Macedonia). Lichtenstein and Luxembourg also fall in this category.
- In 2007, there were 17 European countries in G1 and G2. In 2015, there are no longer any G2 countries and only two countries, Andorra and Monaco, are in G1. The latter can be considered irreducible because of their micro market size and natural monopoly-like situation with regard to ICTs.
- The regional regulatory harmonization has been a mainstay of market growth in Europe for over two decades and is thus more advanced than in any of the other regions. Not surprisingly, this has led to EU countries scoring high in the ICT Regulatory Tracker. Norway and Switzerland, although not in the EU, have been following their lead with regard to ICT regulation and have mirrored EU directives in their national regulations. Turkey and Montenegro, countries who are candidates for EU accession, have also been aligning their regulatory framework to the EU's.





TREND 1

THE MOVE AWAY FROM SECTOR-SPECIFIC TOWARDS HOLISTIC REGULATION

CONTEXT: REGULATORY LANDSCAPE CONTINUING TO SEE RAPID AND FUNDAMENTAL CHANGE

Over the past ten years, ICT markets have been changing at the speed of a rollercoaster – and regulation has followed. Important transitions have occurred at multiple levels: from business models to market maturity to the regulatory approaches for handling these (see Figure 23). The time when the telecom sector was like any other sector is long gone. The ICT sector of today cannot afford to remain narrowly focused on its own players and its own issues – simply because convergence has blurred boundaries and complicated the rules of the game. The pace of regulation in the ICT sector is faster than in most other industries today, with transformation happening all the time. This pace of regulation drives markets to achieve and grow.

Monolithic telcos are long gone as ICT has moved centre-stage

State-owned incumbents have been privatized or have built partnerships with public and private players to increase their market share in a competitive environment. Monopolies have broken up to compete with rival home-grown start-ups, foreign giants and increasingly global digital players. Moreover, ICT sector players work more and more with non-traditional ICT players because ICTs are increasingly recognized as essential pillars in many areas of life in the converged ecosystem. School, government, health sector connectivity as well as digital financial inclusion require access to ICTs/telecommunications networks and services. The degree of telecommunications liberalization impacts other sectors since market restrictions result in less competition, higher prices, poorer quality of service and fewer connectivity options.

ICT regulator role now driven by cross-sector consumer needs and competition

ICT regulators have matured to lead markets rather than having to catch up with them. The focus of regulation has shifted from operators and service providers to the services they deliver and the experience of consumers. Ex post regulation has

proven more practical and less invasive than ex ante regulation, with competition law being the primary source of rules and regulatory practices. Ultimately, ICTs have become so tightly woven into virtually all other sectors of the economy that ICT regulation has had to broaden its scope beyond the sector itself. Modern ICT regulation needs to root itself across sectors – in the same way that other sectors' regulations now need to keep a live link to ICT regulation.

The new regulatory role – cross-sector, collaborative, holistic

The bottom line is ICT regulators need to enable more and better services for consumers. To achieve this central objective they need to adopt a cross-sectoral, collaborative and holistic view – and ensure this remains in line as markets evolve and mingle with the sectors around. Looking back, we have seen how old regulation prevents regulators and investors from looking ahead and preparing for the next wave of technological change.

Over the past decade, a new kind of convergence has become possible: telecom players have become major players in other areas and sectors while other sectors' players are becoming telcos. One recent example of this change concerns Orange in France. Orange bought Groupama Banque in order to enter the mobile money

market with its newly branded Orange Bank.⁹⁸ At the same time, in Kenya, Equity Bank has become a mobile virtual network operator (MVNO) and will deliver mobile services to consumers under the brand name Equitel.⁹⁹

In this new world then, holistic cross-sectoral collaboration is more than ever required along with innovative regulatory approaches such as co-regulation and self-regulation, leading to new forms of collaborative regulation. The success or failure of collaborative businesses revolves around user trust, and appropriate regulation is a key element in these new models.

⁹⁸ Orange
⁹⁹ Developing telecoms

Some regulators are embracing change, some are resisting

In other sectors of the economy, such a profound transformation would have happened over half a century. In the ICT sector, regulators have had to run in order to stand still and enable markets to reach their full potential. This is now happening across all regions and in the great majority of countries – although disparities remain. The G1 countries have taken no risk; they have, however, earned no benefit either. The somewhat conservative G2 regulators have often adopted a wait-and-see approach, creating momentum in their markets while not necessarily capitalizing on their full potential. The ambitious and highly proficient

Figure 23:

ICT MARKETS IN A DIGITAL TRANSFORMATION

Source: ITU



Box 15:

AUSTRALIA RECOGNIZES NEED FOR SPEED TO FOSTER DIGITAL ECONOMY

In Australia, the Government's Strategy on the Digital Economy recognizes that rapid evolution of digital technologies can present challenges for policy makers and regulators: a balance needs to be struck between the need for a regulatory environment that protects consumers and the need to facilitate the growth of the digital elements of the economy. Examples of the implementation of this strategy include:

- The Competition Policy Review (the Harper Review), which looked at new challenges brought about by technological change – for example the impact of Uber on the established taxi business.
- The Financial System Inquiry (the Murray Inquiry) which aimed to develop a nation-wide digital identity strategy to help streamline individuals' engagement with government. The inquiry looked at clarifying regulators' powers to ensure they can regulate new payment systems including digital currencies (e.g. Bitcoin) and other payment systems as they emerge. Also addressed were priority areas of existing financial regulation to make them technology neutral, and ensure they did not impede innovation and competition in the financial system.

Source: Australia, Department of Industry, innovation and Science (DIIS).

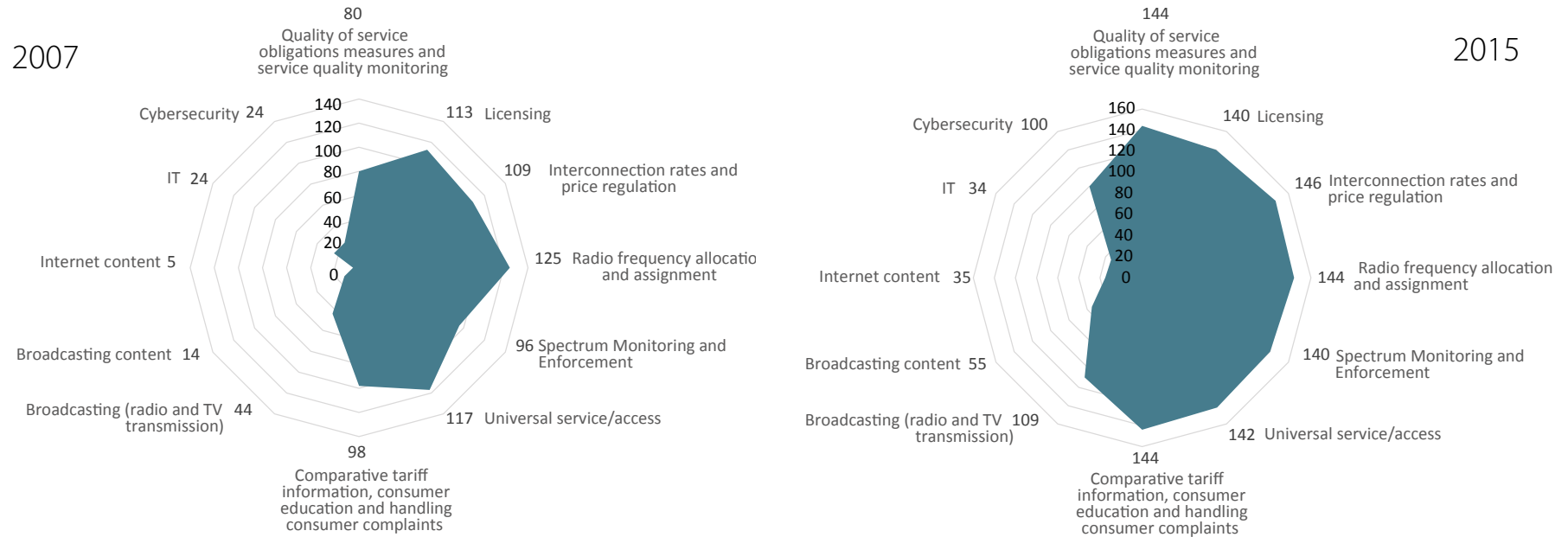
G3 regulators have been running against the clock to catch up with market growth and disruption. The front runners, such as the G4 countries, have tuned their regulatory regimes to open the way to further, faster technological change (see also Box 15). The fifth generation of ICT regulation is more holistic, liberal and future-oriented than those generations that preceded it. It takes into account the broader digital transformation that ICTs enable across the different layers of the economy. Centered around consumer interest and private-sector initiative, it rewrites the rules in a simpler, modular and universal manner.

Expanding role of the ICT regulator: Key in enabling success of new digital economy

Against this background of profound and rapid change, the role of the ICT regulator is undergoing significant change. Not only is the role proving increasingly important across many different industry sectors but it is also expanding into previously uncharted territories at the very forefront of the new and pervasive digital economy.

Figure 24:
EXPANDING MANDATE OF THE ICT REGULATOR, 2007 AND 2015

Note: number of countries
 Source: ITU.



ICT regulator is central in moving towards more collaborative approach

As we move towards more collaborative regulation, the specific expertise of the ICT regulator emerges as a core strength and serves as a universal interface across the other sectors of the economy. Conversely, other sector regulators

need to more fully understand the new, more generic ICT norms in order to enable a constructive dialogue first and then more collaborative regulation (see Trend 7). With the evolution from G1 to G4, and then G5, the mandate of regulators has been getting broader, touching upon multiple areas (see Figure 24). Some of the features of the core mandate – such as interconnection, universal access and consumer protection – have been adopted by over three-quarters

Box 16:

SMARTPHONE APPS MANDATE INCREASINGLY FALLING TO ICT REGULATORS

A telling example is smartphone applications, which have ridden the wave of smartphone adoption since 2007. Nine years later, 23 ICT regulators have acquired the mandate to regulate this booming market, from Finland to Kenya and from Cambodia to the United Arab Emirates. This is interesting indeed, given that only about half of those countries have some kind of legislation or regulation in place. What is more, at least 40 countries have some kind of regulation on online applications so more regulators may be acquiring this new responsibility.

“We recognize that creating a converged reference framework for competition, interconnection and interoperability can effectively facilitate the relationships among the various providers of infrastructure and services, as well as among them and apps and content providers.”

GSR15 Best Practice Guidelines to facilitate the widespread adoption and use of mobile applications and services through targeted regulation

Source: ITU.



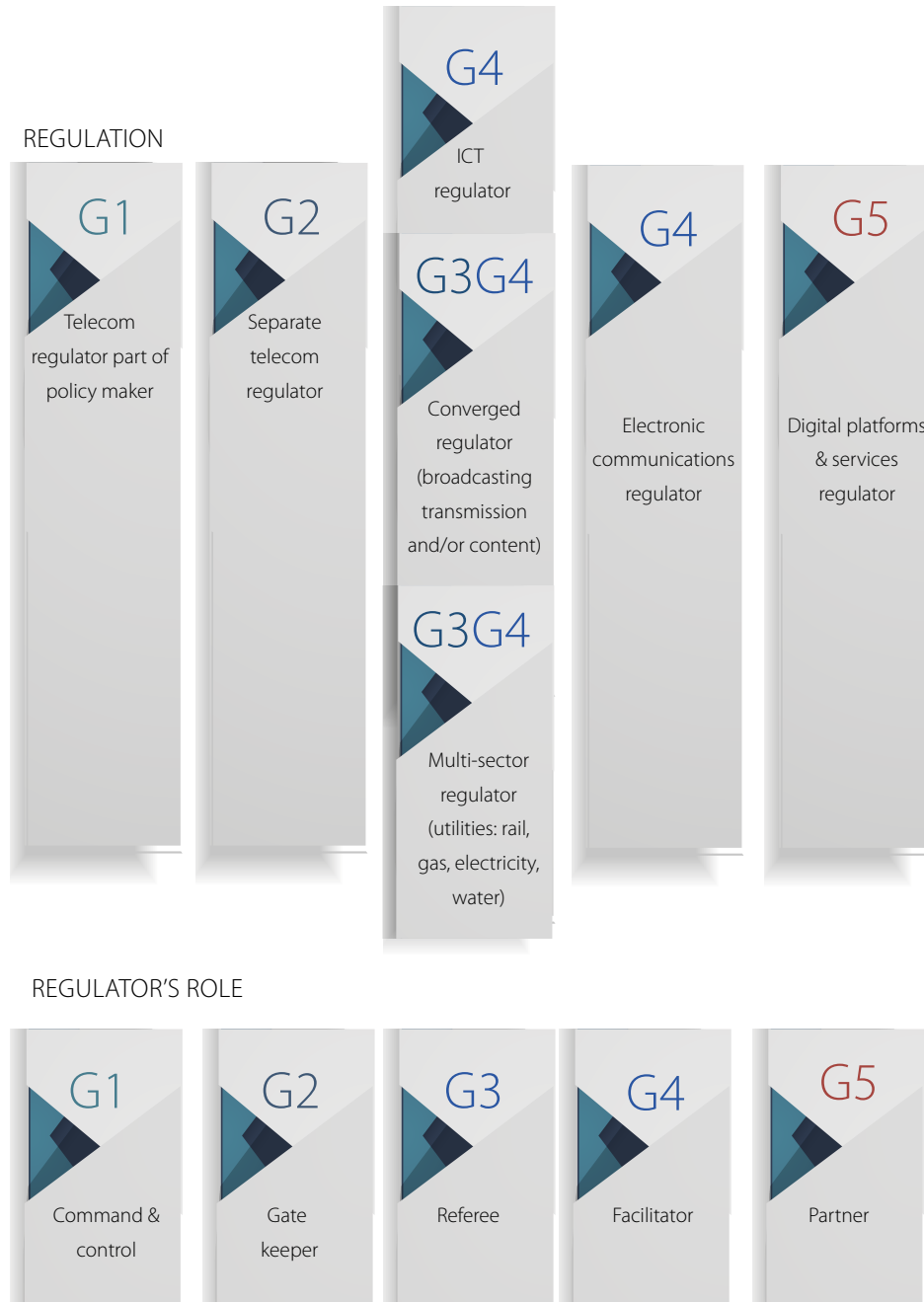
of ICT regulators in 2015, showing a steady institutional reinforcement curve. In addition, nine out of ten ICT regulators also take part in spectrum allocation and assignment, which are vital for the sector to thrive. Cybersecurity, growing in importance, now falls within the duties of some 100 ICT regulators.

Sharp expansion of ICT regulator's role to include broadcast and broadcast content

Convergence between telecom/ICTs and the broadcasting sector has been a major drive for markets, too. As a result, the number of ICT regulators that have been given responsibilities for broadcasting (radio and TV) transmission have more

Figure 25:
EVOLUTION OF THE REGULATORY AUTHORITY

Source: ITU.



than doubled between 2007 and 2015, reaching 109 countries. A similar trend can be observed with regard to content. In 2015, at least 55 ICT regulators were in charge of overseeing broadcasting content and 35 were tasked with Internet content. In 34 countries, the ICT regulator is also responsible for issues related to Information technology (IT).

While multi-sector regulatory model has struggled, cross-sector collaboration marches on apace

Interestingly, and perhaps counterintuitively, the number of multi-sector regulators has grown only marginally. In 2007, there were nine multi-sector regulators ruling the ICT sector and in 2015, there were 14. The multi-sector model has been struggling to prove its concept and deliver beyond the promise of centralizing multiple agencies under a common administrative governance. This limited growth may also suggest that the collaboration among multiple autonomous agencies, if effective, can go a long way towards achieving the

goals of the sectors they oversee – without the burden of restructuring multiple government agencies. Given also that, of course, the scope of their work is holistic and based on common, or federating, goals such as social and economic good, growth and innovation.

As the ICT Regulatory Tracker shows, the more inclusive and holistic structure of a digital or electronic communications regulator seems to be better suited for the growing multi-sector convergence sweeping the ICT sector. The evolution of the scope of the ICT regulator is summarized in Figure 25.

ICT Regulators at the forefront of dealing with new challenges – OTTs and OSPs

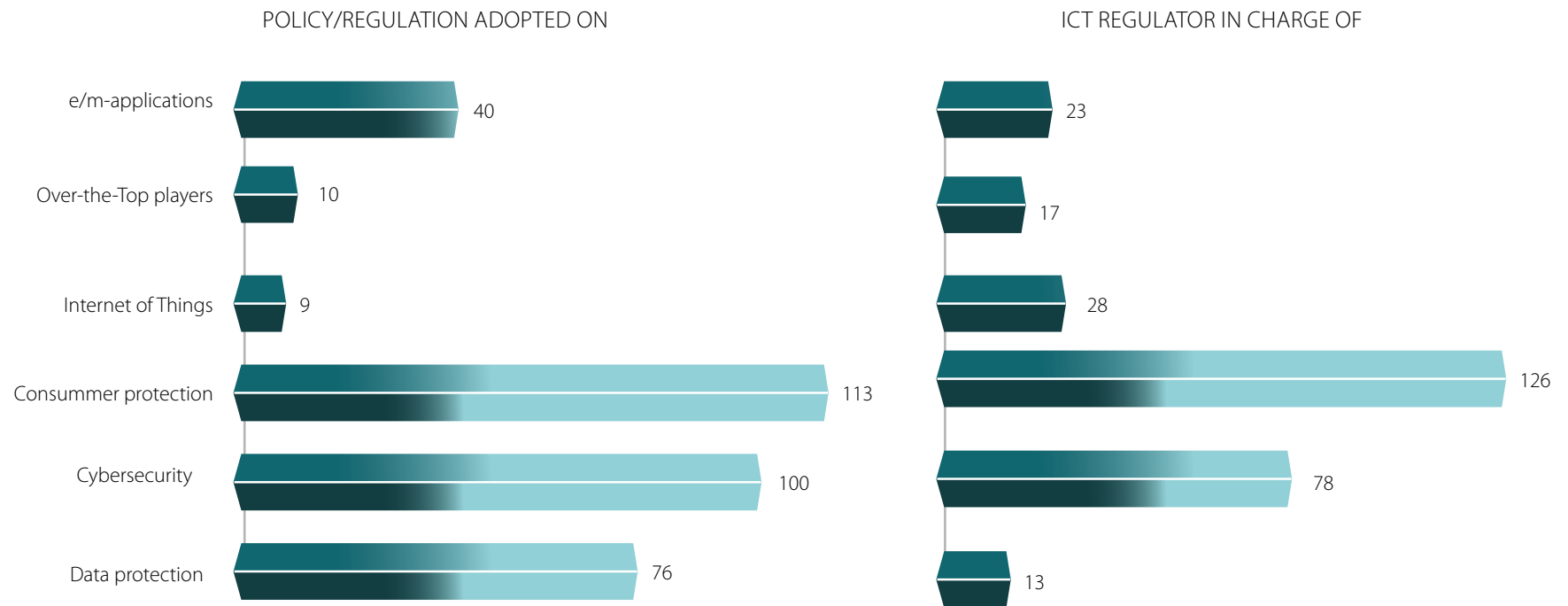
As the pace of change quickens, ICT regulators have been taking on new tasks that require new skills. These spill over into new areas which have not previously existed – or have not been widely implemented as of ten years ago (see Box 16 and Figure 26). These areas arise from the new digital economy, which has been growing in spread and intensity and will no doubt shape the future of several sectors of the global economy.

Seventeen ICT regulators have so far been assigned to deal with the new and challenging areas of over-the-top (OTT) players and online services providers (OSPs), such as Google, Facebook and Alibaba. From the start these areas were not clearly defined and their monetization potential was largely underestimated. The issues involved in regulating such areas are certainly complex and multi-faceted and for the time being there is no universal agreement on what would constitute good OTT/OSP regulation. National views on issues like net neutrality, content regulation and even the definition of regulated services or relevant markets diverge significantly. The 17 countries which have assigned ICT regulators to take on these challenges include Australia, Bulgaria, Canada, Iran, Trinidad and Tobago, and Viet Nam. The current EU approach to regulating OTTs is highlighted in Box 17.

Figure 26:

NEW AREAS OF REGULATION AND THE ROLE OF THE ICT REGULATOR, WORLDWIDE, 2015

Source: ITU.



Box 17:

WHAT REGULATORY TREATMENT FOR OTTs? THE EU RESPONSE

Following the adoption of the EU Digital Single Market strategy in 2016, the European Commission proposed a new European Electronic Communications Code which merges four existing telecoms Directives (Framework, Authorisation, Access and Universal Service Directive), which also cover OTTs.

The new Code proposes that new online players who provide equivalent communications services to those provided by traditional telecoms operators are covered by similar rules, in the interest of consumer protection. However, the Commission has been careful that such regulation is not extended unduly.

Communications services which use numbers to enable all end users to reach each other (i.e. to call phone numbers/be reachable via a phone number) are very similar to traditional telephony and SMS services. The new Code clarifies that such services will have to provide contractual information to their customers, and also the switching and emergency call rules apply. End-users will also be able to call harmonized numbers with an important social value (e.g. missing children helplines).

On the other hand, over-the-top (OTT) services that do not use numbers (e.g. WhatsApp) will be subject to more focused obligations. They will have to make sure that:

- their servers and networks are secure
- disabled users have equivalent access to their services
- their users can reach the EU emergency number 112 if there is evidence it is needed for public safety reasons and that the technical standards are available.

Source: [European Union](#).



TREND 2

PACE AND VOLUME OF REGULATION ARE INCREASING

CONTEXT: MORE REGULATION BEING ADOPTED; MANY COUNTRIES EXPAND SCOPE OF REGULATORY POLICIES

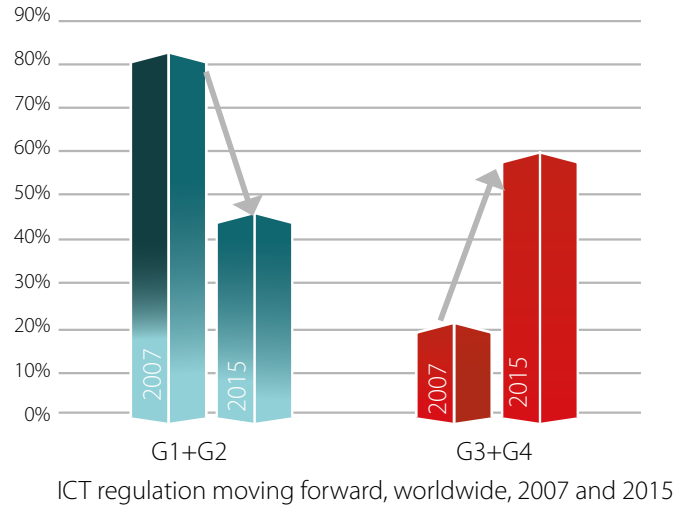
In the period from 2007 to 2015, ICT regulation is characterized both by the volume of change and the increasing pace at which it is being adopted. In this context there is much that is positive and extremely encouraging. No fewer than 52 regulators are now in the G4 category. Fifty-five per cent of countries have moved one generation up the ICT ladder of regulation while 15 per cent have leaped generations in only nine years. In addition, there are some surprises in the list of countries ranking as the most dynamic, making major leaps forward in a short period of time. Extraordinarily, one country has leapfrogged from G1 directly to G4. Such developments are welcome and timely for those markets in need of guidance and safe passage through the stormy growth of the ICT sector.

On the other hand, we should note that for more than one-quarter of countries there has been no movement through regulatory generations since 2007. At the global level however, the proportion of G1 and G2 countries has been reduced by half while 58 per cent of countries now rank as G3 or G4, a three-fold increase since 2007 (see Figure 27, left chart).

Figure 27:

LEAPING A GENERATION AHEAD, 2007-2015

Source: ITU.



52 REGULATORS NOW RANK AS G4 – THEY WILL HELP SHAPE DIGITAL WORLD OF TOMORROW

Globally, there are now 52 G4 regulators (the full list is in Table 14). While they may have not achieved all of the policy and regulatory goals they aspire to, they have sought to regulate markets that were struggling and where consumers needed empowerment. Their regulatory initiative and swift action should be praised and encouraged. They represent the future – while some already meet requirements to be ranked as G5 regulators.

CHANGE IN GENERATION 2007-2015

Source: ITU.

GENS	Same GEN	1 GEN earned	2 GEN earned	3 GEN earned
G1-G1	28			
G1-G2		29		
G1-G3			10	
G1-G4				2
G2-G2	19			
G2-G3		44		
G2-G4			19	
G3-G3	4			
G3-G4		30		
G4-G4	1			
TOTALS	52	103	29	2

They will shape the networks of tomorrow, and will help define services to consumers as well as rules of thumb for the digital world as a whole. Credit should be given to all those regulators that have been working extremely hard to develop their ICT regulatory frameworks – with a full set of assets to trigger innovation and secure investment both in the short and long term.

Table 14:

ICT REGULATORY TRACKER, G4 COUNTRIES, 2015

Source: ITU.

Region	Nb	Country
Africa	1	Cape Verde
	2	Ghana
	3	Kenya
	4	Uganda
Americas	5	Argentina
	6	Brazil
	7	Canada
	8	Chile
	9	Dominican Rep.
	10	Ecuador
	11	Honduras
	12	Mexico
	13	Peru
	14	United States
Arab States	15	Morocco
	16	Oman

Region	Nb	Country	
Asia-Pacific	17	Saudi Arabia	
	18	Australia	
	19	Malaysia	
	20	Pakistan	
	21	Singapore	
	CIS	22	Georgia
		23	Moldova
		24	Austria
	Europe	25	Belgium
		26	Bosnia and Herzegovina
27		Croatia	
28		Cyprus	
29		Denmark	
30		Estonia	
31		Finland	
32		France	
33		Germany	

Region	Nb	Country
Europe	34	Greece
	35	Hungary
	36	Iceland
	37	Ireland
	38	Italy
	39	Latvia
	40	Lithuania
	41	Malta
	42	Montenegro
	43	Norway
	44	Poland
	45	Portugal
Europe	46	Romania
	47	Slovakia
	48	Slovenia
	49	Spain
	50	Switzerland
	51	Turkey
	52	United Kingdom

UP AND COMING – THE MOST DYNAMIC REGULATORS ARE MAKING IMPRESSIVE PROGRESS

Though they do not figure in the top lines of the latest ranking, a handful of countries deserves special mention. They have made significant progress in reforming and invigorating their regulatory frameworks (see Table 15). As reflected in their scores, these countries have accomplished a major leap forward in a short period of time by forging important regulations in multiple areas simultaneously – even if improvements in their regulatory frameworks might take several years to translate into real outcomes in markets.

Mexico and Vanuatu rank effectively as the most dynamic countries for the period 2007-2015, while the most dynamic region is Latin America with five countries in the top ten of the fastest achievers. The leap in the score of Honduras is partly due to successful reforms in the area of mobile number portability, universal service and spectrum auctions – and partly to the fact that a more comprehensive set of national data has become available in 2010.

In Mexico, the telecom regulator, COFETEL, went through a major internal reform in 2013. Technical duties such as type approval for ICT equipment were awarded to a new government body, IFETEL, while COFETEL was given enhanced enforcement

Table 15:
**ICT REGULATORY TRACKER,
 TOP 10 MOST DYNAMIC
 COUNTRIES
 2007-2015**

Source: ITU.

	Region	Country	Rank 2015	Score 2015	Generation	Ranks earned	Score earned
1	Latin America & Caribbean	Honduras	34	88.0	4G	105	65.0
2	Latin America & Caribbean	Mexico	5	93.0	4G	104	50.3
3	East Asia and Pacific	Vanuatu	83	77.8	3G	103	77.8
4	Latin America & Caribbean	Brazil	3	94.5	4G	78	40.2
5	Latin America & Caribbean	Dominica	99	73.5	3G	72	69.0
6	Arab States	Oman	23	89.3	4G	65	38.3
7	Latin America & Caribbean	Chile	34	88.0	4G	59	39.5
8	Africa	Congo (Rep.)	120	66.7	2G	58	64.2
9	Latin America & Caribbean	Trinidad & Tobago	53	84.8	3G	54	41.8
10	East Asia and Pacific	Cambodia	101	73.0	3G	53	59.0

power. Under the patronage of President Enrique Peña Nieto, structural and policy reforms were enacted. Access to ICTs, including broadband and the Internet, were recognized a human right. In the area of competition, new rules for defining dominant market players came in force matched with the legal ground for the regulator to impose sanctions in case of abuse. As a result, prices for ICT services have decreased and the competitiveness of markets has increased.

Vanuatu ranks second by leaping an impressive 103 ranks and adding 78 points. Since the creation of the Telecommunications and Radiocommunications Regulator in 2008 and the adoption of the Telecommunications and Radiocommunications Regulation Act 2009, the ICT sector of this Pacific island has been liberalized and various core regulations have been implemented, ranging

from interconnection to scarce resource management to technology neutrality.

The regulator is now looking to address issues such as universal access, consumer protection, competition and institutional capacity building as their home ICT markets continue to mature.

In Africa, the Agence de Régulation des Postes et des Communications Électroniques (ARPCÉ) of the Republic of Congo has forged a vision to enter the top five African countries that are most advanced in terms of electronic communications. Their substantive work in key areas – such as broadband access over fibre optics, Internet Exchange Points, infrastructure sharing and numbering – has removed obstacles to private initiative and is likely to result in higher penetration levels for ICT services in the near future.

Figure 28:

CONNECTING THE NEXT BILLION: TECHNOLOGY RACE

Source: Adapted from
Broadband Commission for Digital Development,
State of Broadband 2015.



125 years
Fixed lines



tbc
Fixed broadband



13 years
Google users

**Number of years until connecting
1 billion users**

Likewise, the Telecommunication Regulatory Authority of Oman approved a set of executive regulations in 2013 which elaborate on the policies set out in the Telecom Act. The Act set out the core principles for the sector while executive regulation deals with each issue in more detail. Executive regulation covers issues such as licensing, technical specifications, type approval of telecom equipment and various rules governing the usage of telecommunications services.

The remaining countries in the top ten of the most dynamic reformers include Brazil, Cambodia, Chile, Dominica, and Trinidad and Tobago (see Table 15).

It is important to track progress in the five countries in G2 and G3 over the next three to five years as they have great potential to leapfrog ahead again and achieve a G4 rating.

A ROLLER-COASTER RIDE FOR REGULATORS

As seen in the previous section, many ICTs have become pervasive, indispensable and transformational in less than a generation. While it took the basic fixed line telephone service 125 years to connect one billion people worldwide, mobile broadband achieved this in five short years, at the same time providing more and more advanced services to consumers (see Figure 28). We can safely say that there has been a rush for ICTs – and a rush for regulation.

Since 2007 and fueled by technological change, we have witnessed a sharp acceleration in the pace of ICT regulation. Developments such as mobile broadband and service providers' business models (for example MVNOs and Voice-over-IP (VoIP) providers) have underwritten a frenetic pace for ICT markets. In this turbulent environment, it is simply not enough for ICT regulators to 'go with



11 years
Mobile users



8 years
Facebook users



5 years
Mobile broadband

the flow'. They have had to acquire new skills in formulating a response and must continually deal with new areas as newer technologies emerge.

TODAY'S REGULATOR – A BALANCING ACT ON THE HIGH WIRE, WITH MUCH AT STAKE

In many ways today's regulator is caught between potentially conflicting pressures and their work is increasingly characterized by trade-offs, compromise and striking the right balance. They have had to grapple with developing the most appropriate kind of regulation while at times considering whether regulation was needed at all. Regulators have had to be both hands-on and hands-off – depending on the various issues at stake.

As gatekeepers of markets, they need to allow innovations to reach the masses while being mindful of long-term outcomes on markets and investors – especially with regard to fixed infrastructure facilities. Consumer protection rules have become more stringent and are more closely monitored, while market entry has become more open and interconnection obligations are more relaxed.

Box 18:

SOME REGULATION NEEDS REGULAR REFRESHMENT

One illustration of this need is the EU telecom package. The first Framework Directive was adopted in 2002 and the second and current was adopted in 2009 and transposed in national law of EU countries in 2011. The current telecoms rules are currently under review, via the so-called 'connectivity package' launched in September 2016. The Commission proposed a new European Electronic Communications Code including forward-looking and simplified rules that make it more attractive for all companies to invest in new top-quality infrastructures, everywhere in the EU, both locally and across national borders.

Source: ITU and ec.europa.eu.

CRANKING UP THE PRESSURE STILL FURTHER

Players such as Over-the-Top (OTTs) and Online Service Providers (OSPs) coupled with newly mainstream technologies such as drones and nanosatellites will further accelerate the pace of regulation. There has been a wave of regulation covering new and existing areas ranging from cybersecurity to online content to net neutrality (see Trends 1 and 5); this has impacted the ICT sector both directly and indirectly.

As a result, the pressure on regulators is higher than ever and they must be vigilant for any new development or emerging issue that would require their rapid intervention. Conversely, they are scrutinized by service providers and operators eyeing their every step towards the removal of entry barriers and high compliance costs, while evaluating regulatory predictability and guarantees of a return on their investment.

MOST COUNTRIES MOVING IN THE RIGHT DIRECTION

The scoring in the ICT Regulatory Tracker between 2007 and 2015 shows a greater number of countries moving towards more advanced regulation, with G5 highly collaborative regulation increasingly in sight as the desired destination – a welcome and most encouraging development. In addition, more regulation is being put in place in multiple areas simultaneously – although this does not necessarily mean the quality of regulation has improved (the ICT Regulatory Tracker does not measure the quality of regulation).

Since 2007, ICT regulators have had to step into many more areas and the configuration of issues addressed depends on the circumstances of national markets and policy priorities. As a result, their scores have increased, as has their national body of regulation. This more recent picture contrasts sharply with what was happening in the 1990s and the early 2000s, when there was a relatively established and predictable sequence of progressing up the regulatory ladder – a move from privatization to the establishment of a separate regulator and then to partial liberalization in response to issues relating to market dominance.

REGULATORY CYCLES ARE SHORTER AND SMARTER, AND WITH LONGER SHELF-LIFE

The regulatory cycles in the ICT sector (elapsed time between inception, subsequent adoption and through to replacement or removal) have shortened in order to respond to the needs of fast-evolving markets, though there are exceptions.

Recent best practice regulation, in general, has tended to be technology neutral in order to extend its lifespan. In many cases however, regulations need to be updated roughly every five years. National broadband plans are a good example. ITU research has shown that the average shelf life for a plan is five years.

While regular review of rules and regulations is considered best practice, this review process must not be too lengthy. In many developing countries, it is not unusual to have draft regulation stuck in the pipeline for 5-7 years or more, during which time it becomes obsolete. Such setbacks to regulatory decision-making processes still need to be overcome through streamlining in order to maximize both the usefulness of new regulations and the transparency of the process.



TREND 3

REGULATION AS AN EQUALIZER

CONTEXT: REGULATION PLAYS AN EQUALIZING ROLE, LEVELS THE PLAYING FIELD

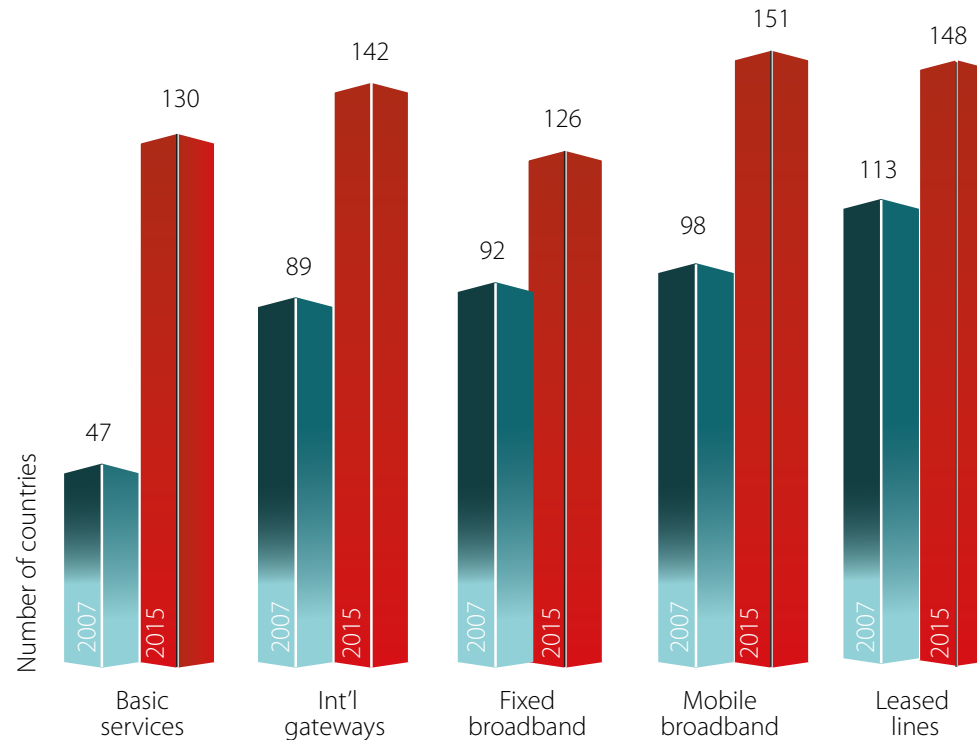
Regulation is not only the canvas against which the converged ICT sector moves ahead, but also ensures that all market players – from start-ups to national incumbents to multinational corporations – benefit from a level playing field. Competition regulation enables the market to generate new value propositions to cater for consumer choice. Regulation must also strike a balance between intervention and non-intervention, avoiding unnecessary overregulation that can stifle innovation.

Figure 29:

COMPETITION IN THE MAIN ICT MARKET SEGMENTS, WORLDWIDE, 2007 AND 2015

Note: According to data available for 189 countries and economies.

Source: ITU.



Competition is essential today in spurring innovation, diversifying services on offer and improving consumer experience in ICT markets. The regulation of that competition has triggered a massive opening of ICT markets, from basic telephony services to mobile broadband (see Figure 29). The liberalization of international gateways has been instrumental in enabling Internet connectivity over fixed and mobile platforms alike. Of all ICT segments, mobile broadband stands out as the most competitive, with 151 markets characterized by partial or full competition in 2015. Leased lines, a major pillar of connectivity in many developed

and developing countries, follow closely behind although their importance is diminishing.

Some countries have recently adopted new competition laws or are reviewing their competition frameworks.

- ENCOM Argentina, the ICT regulator, has signed a decree establishing guidelines aimed at improving convergence within Argentinian communications market, promoting the deployment of next generation networks (NGNs) and boosting broadband penetration.¹⁰⁰

- In Pakistan, it has become apparent that the Telecom Policy 2015 is partly incongruous with the national Competition Policy 2010.¹⁰¹ As a result, the Government has issued a recommendation to review and align the Telecom Policy and further engage in ICT regulatory reform.
- A new draft Competition Law was adopted in Thailand in December 2016. Although the New Act will not apply to businesses which are governed by specific legislation regulating competition within a certain sector and administered by a sector-specific regulator such as the National Broadcasting and Telecommunications Commission (NBTC), the ICT regulator, synergies will likely be sought on specific cases such as mergers and acquisitions.¹⁰²

There is also a growing trend towards harmonizing general competition rules with ICT sector-specific regulations. Following its Digital Communications Strategic Review, the UK telecoms regulator Ofcom issued its Work Plan for 2016/17 which notes that general competition law principles have wider relevance to Ofcom's regulatory work, in particular with regards to issues such as SMP, improving access to fibre and consumers' switching service offers and providers.¹⁰³ The Australian Government has been working on new legislation repealing the

telecommunications-specific anti-competitive conduct laws of the Competition and Consumer Act 2010.¹⁰⁴

Strengthened competition frameworks provide equal opportunities for traditional network operators and service providers in the majority of markets today.

However, new complexity brings new challenges: over-the-top players and online service providers ride over the infrastructure of network operators and benefit from a competitive advantage. Their network-free business model enables them to diversify and monetize services while leaving network operators to take on the work of expanding and upgrading networks for higher speeds and bandwidth.

At the same time, we should note that some analysts argue that OTTs create momentum for network operators by increasing the value and desirability of access to networks. In this way, OTTs valorise the core business of network operators while meeting consumer demand for content.

The delicate challenge for regulators then is this: should they level up requirements to OTTs, or level down those for network operators and service providers? In the latter case, the focus of regulation shifts from the service provider to the service itself, aligning regulations and relaxing sector-specific rules. This in

101 [Policy Note: Telecom Policy 2015 – Telecom Competition Rules Incongruities With The Competition Act, 2010](#)

102 [Allen & Overy](#)

103 [CompLaw Blog](#)

104 [Australia Ministers for the Department of Communications and the Arts](#)

turn raises the major and unresolved issue of enforcement of national regulations upon global players without POP – as mentioned in Regulatory Trend 4.

BROADBAND MARKETS CONTINUE TO FORGE AHEAD

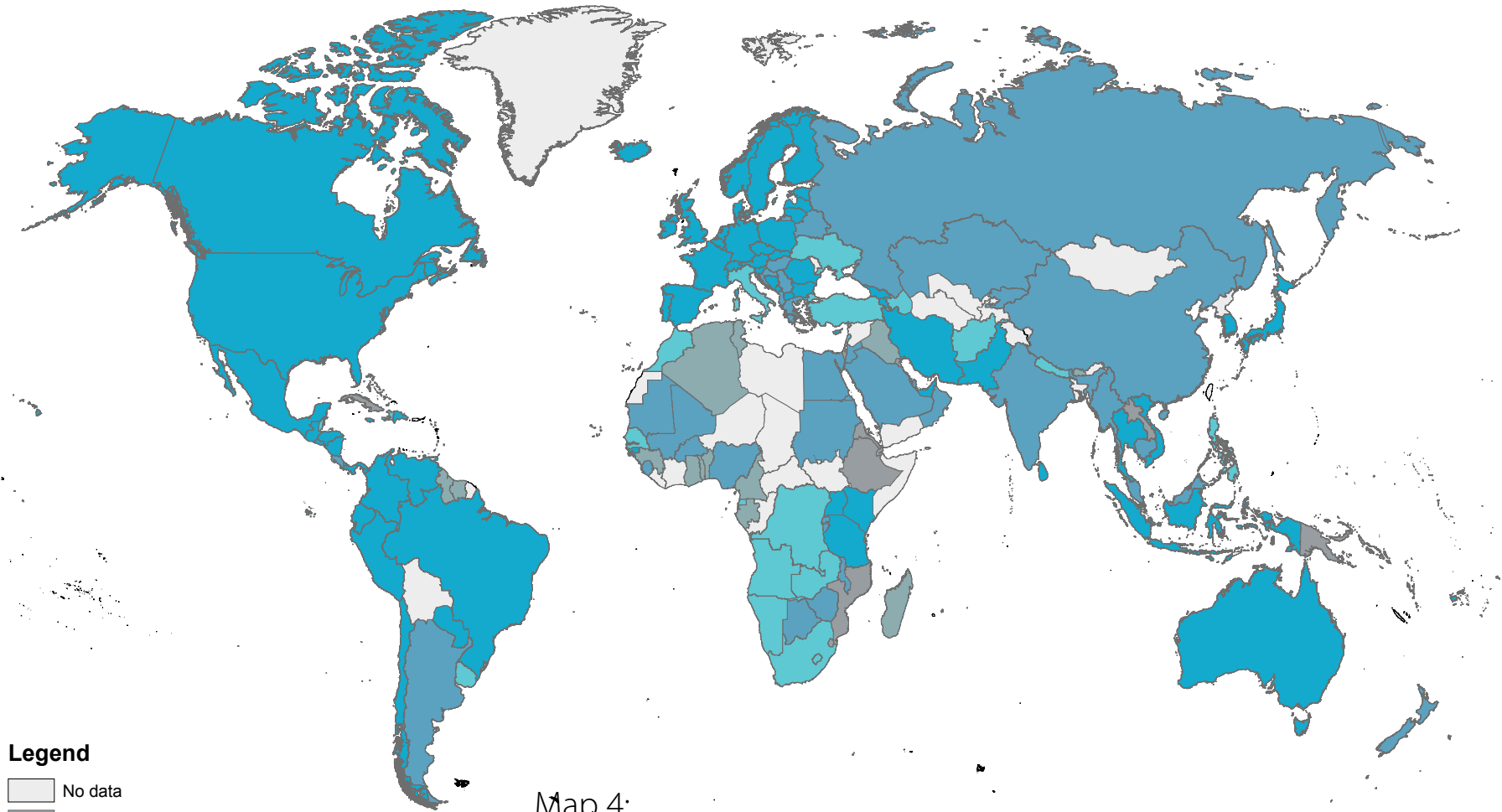
All broadband market segments are on the rise and consumer demand has never been stronger. Competition policy and regulatory frameworks have been providing strong impetus for markets to innovate and grow with regulators keeping a wide array of investment incentives at hand. Countries that opened broadband markets have seen much more rapid service penetration than countries with limited competition (see Map 4). G3 and G4 countries have opened all of their broadband markets to competition while G2 peers have opened only a few. Countries with no competition were split between G1 and G2 regulation. As seen in our discussion of Trend 6, higher generations of regulation are by nature more enabling and create more vibrant ICT markets. Broadband markets reflect this – the more open they are, the more consumers are connected and in a shorter time span.

GSR Best Practice Guidelines for enhancing ICT market competitiveness are highlighted in Box 19.

BROADBAND MARKETS ARE SET TO CONNECT THE NEXT BILLION

Broadband markets hold the greatest promise for connecting the next billion and facilitating enormous social and economic development. Significant effort has been invested in regulatory environments that enable broadband markets to thrive and broadband remains high on the policy agenda of countries worldwide.

In developed countries, next-generation broadband access (NGA) deployments and network upgrades have increased significantly. Core broadband technologies (DSL, Internet over cable) have also grown, though at a slower pace. In developing countries where fixed services are less widespread, mobile broadband has been the major channel for delivering Internet and content to consumers. Mobile broadband has grown faster than any other technology before. We expect it to grow further and even faster, with the next generation of mobile-broadband technologies hitting the market powered by drones, high altitude planes and satellites – along with 5G deployment. Fixed wireless broadband, including WiFi, where Internet access is often provided as a free or very low-cost service, continues to see steady growth.



Legend

- No data
- Monopoly
- 1 Competitive market
- 2 Competitive markets
- 3 Competitive markets
- 4 Competitive markets

Map 4:

COMPETITION IN BROADBAND MARKETS, 2015

Note: The broadband markets covered are: DSL, cable, fixed wireless broadband and 3G/4G mobile broadband (IMT).

Source: ITU.

Box 19:

ENHANCING ICT MARKET COMPETITIVENESS

We, [the regulators at the Global Symposium for Regulators], recognize that legal and regulatory frameworks need to be kept open, forward-looking, neutral and flexible to allow leveraging on new technologies, innovative services and new business practices, such as cloud computing, social media, mobile broadband, big data, and the Internet of Things, for users to benefit from a variety of services provided at all levels of the ICT markets.

We, recognize that creating a converged reference framework for competition, interconnection and interoperability can effectively facilitate the relationships among the various providers of infrastructure and services, as well as among them and apps and content providers.

ICT regulators should adopt targeted regulatory measures to promote the development of broadband networks and services and provide for affordable and widespread access to m-services and apps by consumers, guarantee healthy competition between market players while promoting innovation and ensure consumer protection in a digital environment.

We are mindful that the ICT regulator is increasingly seen as a partner to market players and an advocate for consumers' rights. Their decisions are taken based on evidence and technical expertise to foster access and use of ICTs, competitiveness of the markets, and overall social and economic development.

Source: ITU, [GSR Best Practice Guidelines 2013, 2014 and 2015](#).

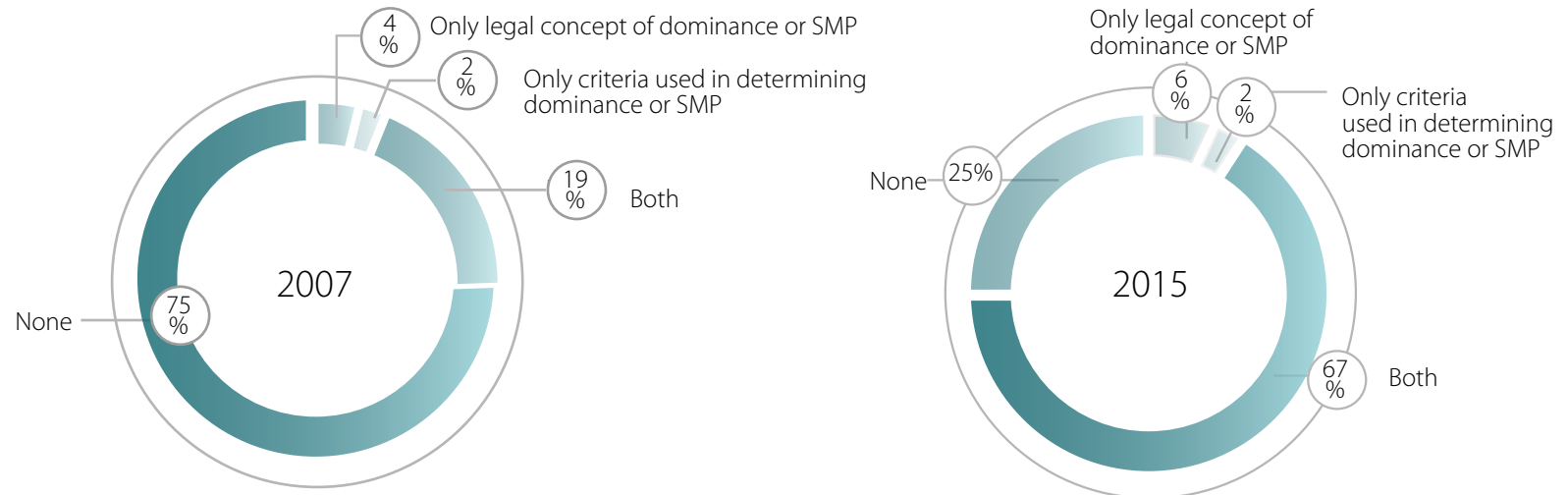
Market dominance – a multi-pronged issue requiring solutions

Regulators increasingly recognize the role of competition as both catalyst and equalizer. In 2007, over three-quarters of countries had neither a legal concept, nor specific criteria to determine market dominance (see Figure 30). In 2015,

this proportion was reduced to one-quarter while 67 per cent of countries now have both a legal concept and criteria for dominance. Those not having defined dominance include G1 and G2 countries with monopoly fixed-line incumbents. Not addressing market dominance, however, has a negative effect on growth and consumer benefits.

In a more diverse and disruptive market place, dominance is taking on a new dimension – and regulatory rebalancing of dominance definitions and criteria is

Figure 30:
**LEGAL
 FRAMEWORKS
 FOR DETERMINING
 ICT MARKET
 DOMINANCE,
 WORLDWIDE,
 2007 AND 2015**



Source: ITU.

now needed. The advent of new and powerful global players is posing challenges to which the regulatory community needs to respond:

- Legal concepts that once applied to players with significant market power (SMP) do not address new players such as OTTs and OSPs. One can argue that legal concepts should focus on anticompetitive practices (i.e. power to exclude) instead of market power, and that these should be investigated on a case-by-case basis.¹⁰⁵
- Assessing market dominance at the national level is now inadequate where

global competition is involved. There is a widening gap between national/local competition in networks and global competition in online services, applications and content. Global players enjoy important competitive advantages which can lead to SMP, such as economies of scale combined with network economies and immediate global coverage. This in turn raises issues as to applicable law and jurisdiction.

- Applying traditional structural indicators of market power is also problematic. On one hand, they fail to provide evidence on dominance of new players;

¹⁰⁵ ITU, *Regulating the App Economy*, forthcoming in 2017

on the other hand, competition between a few players can be intense and displace market leaders quickly. Additional measures are therefore needed to provide evidence of dominance and abuse of dominance. New sources of SMP now need to be taken into account such as the collection, use and resale of user data. A continuous monitoring process will help flag issues and address them before they become too big to resolve.

Foreign ownership is forging ahead

Allowing foreign ownership and foreign direct investment (FDI) helps create a level playing field. The Tracker shows that removing restrictions on foreign investment is a regulatory measure that correlates directly with enhanced competition. Leveling the playing field for domestic and foreign market players not only increases the number of service and access providers but also allows for the delivery of more and better services that meet consumer needs.

Between 2007 and 2015, the Tracker shows a steady increase in foreign ownership and FDI (see Figure 31):

- All main market segments have seen an increase of between 15 and 45 per cent in legal foreign ownership.
- Internet service provision has seen the biggest growth with 35 additional countries now allowing at least some degree of foreign ownership.

- With 142 countries allowing foreign players to invest in ICTs, facility-based operators represent the most open market segment today.
- In 63 per cent of countries worldwide, overall, no restriction whatsoever exists to foreign ownership in 2015. Virtually all G4 countries fall into this category as well as many G3 countries.
- Majority ownership or controlling interest is allowed in a further 15 per cent of countries, mostly in G3 regulation.
- In 25 countries, FDI is capped to minority ownership, and these are virtually all G2 countries.
- Seven per cent of countries banning foreign ownership are all G1 countries.

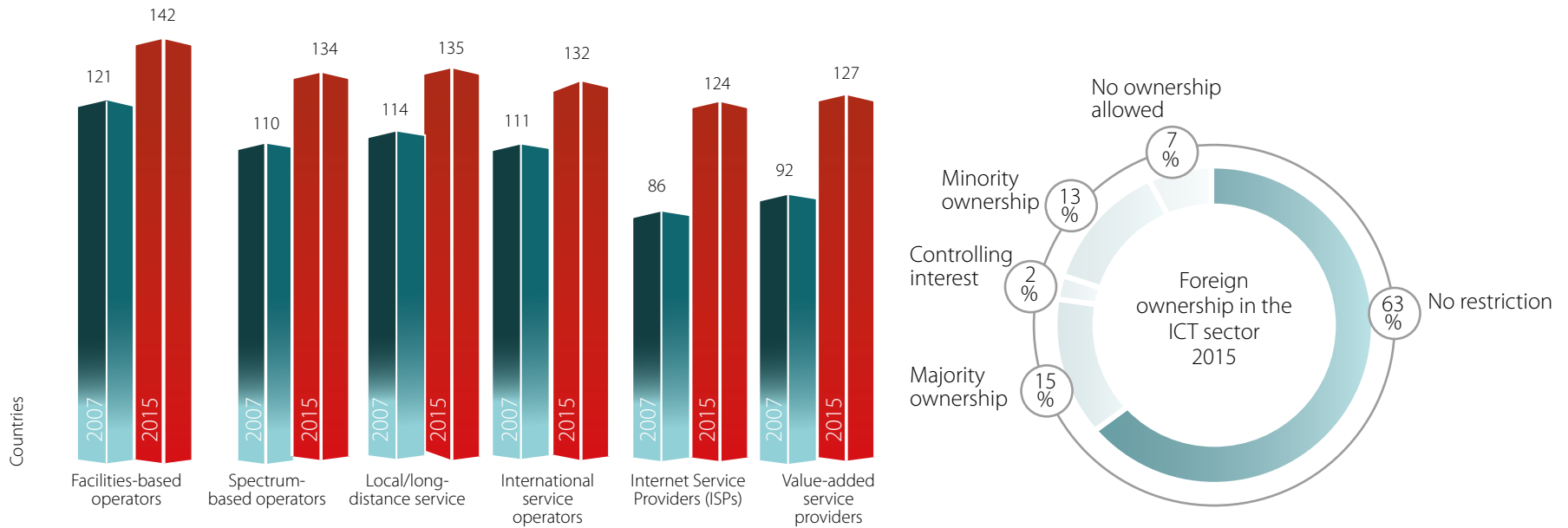
Licensing – the move towards simplicity

Since the early 2000s, many countries have reformed their licensing regimes. This reform has followed two main trends – simplification of licences and reducing administrative barriers to entering the market.

Simplification involves the consolidation of different services into a generic categorization or the unification of all services under a single licence or concession. General authorizations and unified or class licences fall under this broad category. This simplification replaces a regime in which for example, a single

Figure 31:
FOREIGN OWNERSHIP FRAMEWORK, WORLDWIDE, 2007 AND 2015

Source: ITU.



telecommunications operator would have to hold as many licences as the different services it provided.

The second reform trend consists of reducing or eliminating the administrative and formal procedures required to enter the market – for example the general authorization category is enhanced to allow the provision of more services and only requires registration or a simple notification. Some countries have gone a stage further and opted for deregulation of services, which includes the elimination of licences or concessions and even the need to notify or register with the regulator.

Since 2007, many countries have combined both trends for greater simplification and flexibility.

- Countries which have adopted general authorization, class licences or unified licences have increased 70 per cent, from 65 to 113 (see also Figure 32).
- Multi-service licences are still in use in one-fifth of all covered countries, but their number is decreasing as countries move to simplified licensing regimes.
- More and more regulators are allowing some kind of licence exempt use of spectrum in order to promote WiFi connectivity and meet pent-up demand. In 2015, the proportion of markets allowing licence exempt schemes has

increased to 18 per cent, allowing more freedom for market players to manage spectrum among themselves. It also provides opportunities for non-traditional players, such as municipal and academic networks, to function in the market along with established players, enhancing competition and facilitating market entry.

- Converged licensing frameworks – unified and simplified – are playing an important role in G4 regulation, rendering the market attractive, enhancing ease of doing business, and helping unlock market potential. This report notes that such reforms are most effective if technology neutrality and flexibility are applied to the rights and obligations of ICT operators, and to elements such as interconnection, numbering, universal service, and spectrum use.
- With the advent of app economy players, licensing matters have become more complex. One argument has it that offering substitutable services should be subject to the same licence fees obligations as MNOs, subject to modification of the definition of relevant revenues for the purposes of calculating licence fees.

Box 20:

RATIONALIZING LICENSING REGIMES

We, [the regulators at the Global Symposium for Regulators], believe that adopting administratively simplified and flexible models such as general authorizations or unified licences, where appropriate, can contribute to facilitating market entry and stimulate competition and innovation.

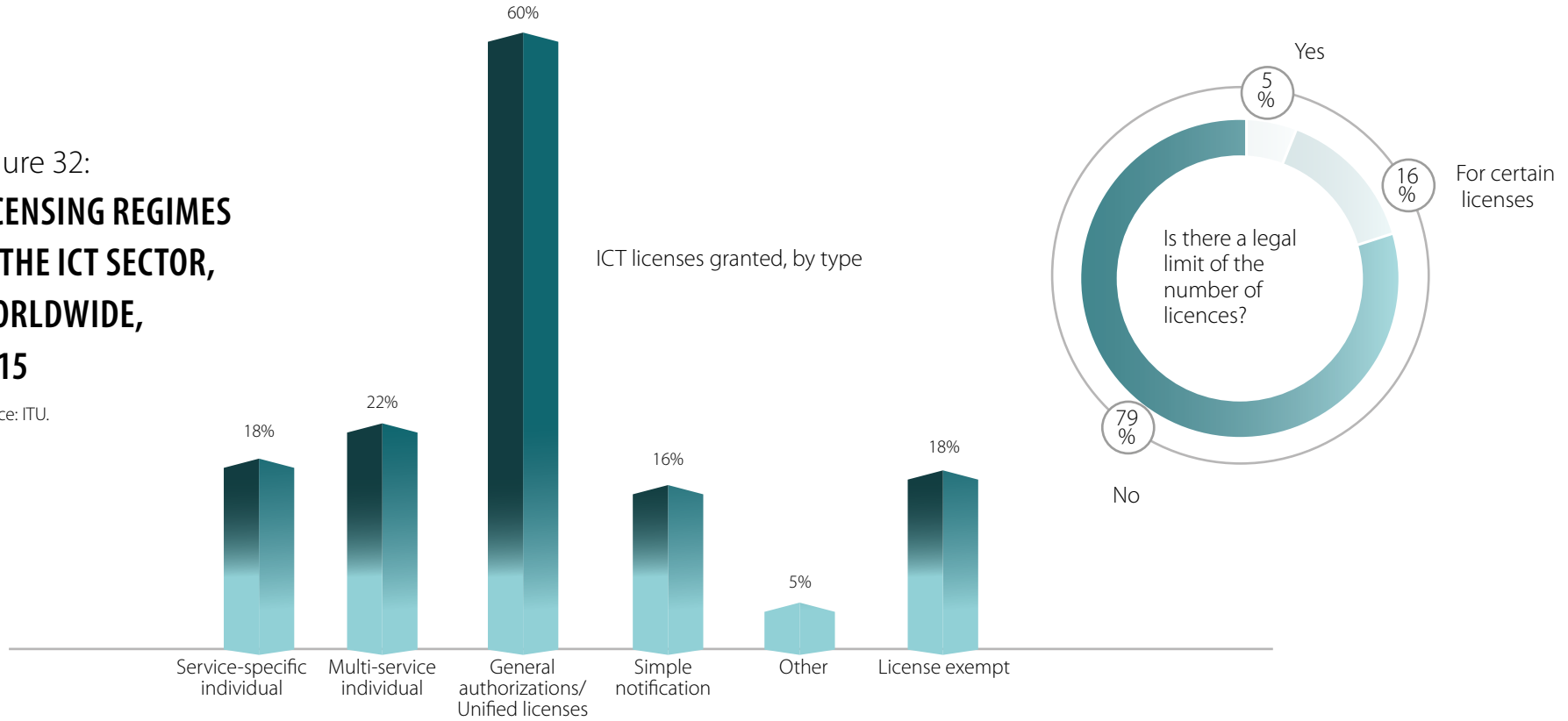
In order to facilitate entry in the broadband market and increase competition at all network layers, licensing regulation can be simplified and a unified licensing framework can be introduced with all services unified under a single licence or concession.

In order to enable ICT operators to start their activities rapidly, regulators need to consider reducing licensing fees as well as the administrative and formal requirements to enter the market and provide service. Provisional licences may be delivered free of charge (or only covering administrative costs) during a renewable trial period ahead of the delivery of the final licences.

Source: ITU, [GSR Best Practice Guidelines 2012 and 2013](#).

Figure 32:
**LICENSING REGIMES
 IN THE ICT SECTOR,
 WORLDWIDE,
 2015**

Source: ITU.



This is based on the conclusions that:¹⁰⁶

- National operator revenues are challenged by OTTs, which could result in a loss of funding for regulators;
- Advertising and data revenues should count for licensing fees – the specific business model used by OTTs is not relevant;
- Advertising and data revenues rely on communications services in any case.

Practically speaking, however, enforcement of such licence fees is likely to be challenging – especially under general authorization regimes as global players might not even have a POP in a country of operation. Levelling the playing field among operators, national and global, and finding practical enforcement mechanisms is currently one of the main challenges in the area of licensing.

Quality of service (QoS) is moving centre stage

Regulation is pressing for greater accountability and measurement in the QoS area: such regulation will build on and replace monitoring schemes that have been in place for some years. Historically, these have at times targeted dominant operators, at other times all players or groups of players for a narrow set of requirements, in an attempt to level the playing field and deter abuse of market power. Now real

change is underway. The mass adoption of the Internet, new market dynamics and increased consumer demand all contribute to this pressure for change as more countries move towards a G5 framework with fully integrated monitoring of performance and QoS. Such a framework will:¹⁰⁷

- act as a base for plans and strategies;
- check progress on policy objectives or regulatory targets;
- help to assess priorities and strategies;
- provide information on all aspects of ICT markets, from infrastructure to services to online content.

A number of regulators now plan schemes or revise existing schemes for QoS monitoring with service quality extended to cover quality of experience as well.

¹⁰⁶ ITU, [Regulating the App Economy](#), forthcoming in 2017

¹⁰⁷ Adapted from ITU, [GSR-14 discussion paper on Monitoring the Implementation of Broadband Plans and Strategies](#)

Table 16:

DIRECT CONTRIBUTIONS OF QUALITY OF SERVICE MONITORING TO ACHIEVING REGULATORY TARGETS, PRESENT (WHITE) AND POTENTIAL OPTIONS (BLUE)

QoS area	Monitored players	Regulatory targets							
		Checking claims by operators	Helping customers make informed choices	Improving user experience	Understanding the state of the market	Maintaining or improving quality in competitive markets	Maintaining or improving quality in the absence of competition	Helping operators to achieve fair competition	Making inter-connected networks & platforms work well together
Setting targets	Dominant traditional operators only						+	+	+
	Dominant players, incl. OTTs/ OSPs						+	+	+
	All traditional operators				+				
	All service providers, incl. OTTs/ OSPs				+				
Making measurements	Dominant traditional operators only								
	Dominant players, incl. OTTs/ OSPs								
	All traditional operators	+			+				
	All service providers, incl. OTTs/ OSPs	+			+				
Publishing measurements	Dominant traditional operators only						+		
	Dominant players, incl. OTTs/ OSPs						+		
	All traditional operators	+	+	+	+	+			
	All service providers, incl. OTTs/ OSPs	+	+	+	+	+			

Note: A '+' occurring in an entry in this Table indicates that the activity contributes to achieving regulatory targets.

Making measurements is assumed to be required by publishing measurements and setting targets, but making measurements is not awarded '+' just because publishing measurements or setting targets is awarded '+'.

Source: ITU, adapted from ICT Quality of Service Regulation: Practices and Proposals.

About Table 16:

- It shows how QoS monitoring directly contributes to achieving current regulatory targets.
- It identifies two methods for expanding the scope of monitoring.
- OTTs and OSPs are grouped with traditional operators across the three stages of QoS monitoring. If they have a dominant position, they are considered as traditional operators with significant market power.
- Target setting and technical requirements must take into account QoS of higher tier services' dependency on QoS of lower tier services. Such target setting will improve users' trust across all ICT markets.

A monitoring and feedback framework plays an essential role in creating a fair and transparent environment with equal opportunities for all. Reviewing and tuning monitoring is essential as service deployment gives way to adoption and use. Important too is the integration of QoS monitoring since ICTs increasingly underpin other sectors of the economy. This will enable monitoring of services such as e-health and e-government, helping to identify shortages or gaps early on, and track progress towards ICT and sectoral QoS targets.

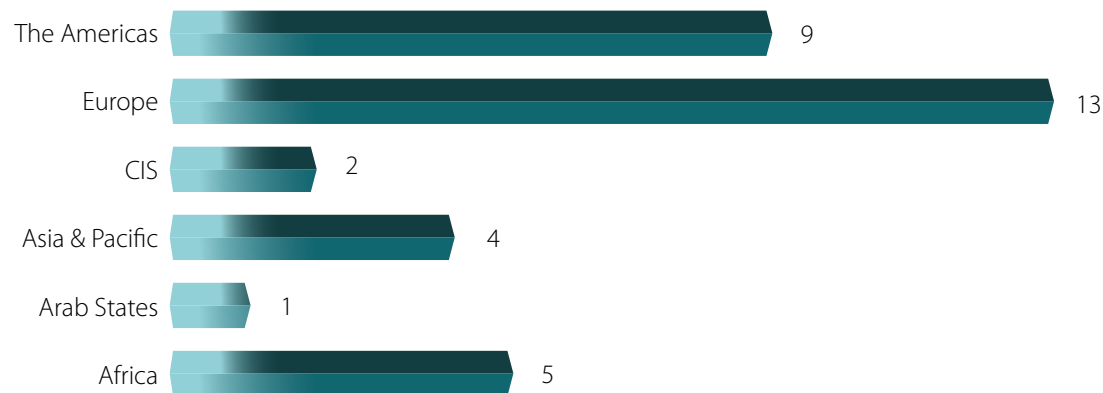


Figure 33:

NET NEUTRALITY (TRAFFIC MANAGEMENT) REGULATIONS, COUNTRIES BY REGION, 2015

Source: ITU.

*Net neutrality –
direct intervention needed only in less competitive markets*

Net neutrality is a growing issue and a growing number of ICT regulators from all regions have tried to ensure competitive neutrality across service providers and delivery platforms (see Figure 33).

Net neutrality issues arise from vertical integration or revenue sharing arrangements between traditional network operators, ISPs, and content providers. With the rise of interactive multimedia services delivered over the Internet, some traditional service providers have throttled or degraded OTT content because it competes with their own content services (i.e. discrimination arising from vertical integration) or because the service provider is sharing revenue with other content services on its network. In response, independent OTT providers and end user groups have advocated for net neutrality laws to prevent such discrimination.

Regulatory approaches to net neutrality need to take into account local conditions, particularly the level of retail competition to access the market. In competitive markets, mandating net neutrality may be excessive: barriers to users switching between ISPs will be low, and ISPs will be less likely to discriminate against unaffiliated OTT content. However, in less competitive markets, regulatory intervention may be required. Such intervention can range from lighter-touch options – such as requirements for transparency or minimum quality of service – to more direct approaches, such as no-blocking or non-discrimination rules that apply to Internet traffic.¹⁰⁸ Approaches differ across regions, with the US and the EU having strong positions. As a result, the number of countries with net neutrality regulation is higher in these regions than in others. For countries that do not have specific net neutrality regulation in place, either the Competition Authority or the ICT regulator can step in to resolve disputes.

¹⁰⁸ This paragraph is adapted from ITU, [Interactive multimedia services for Asia-Pacific: trends and insights, 2015](#).



TREND 4

FOCUS MOVES TO ENFORCEMENT & MONITORING

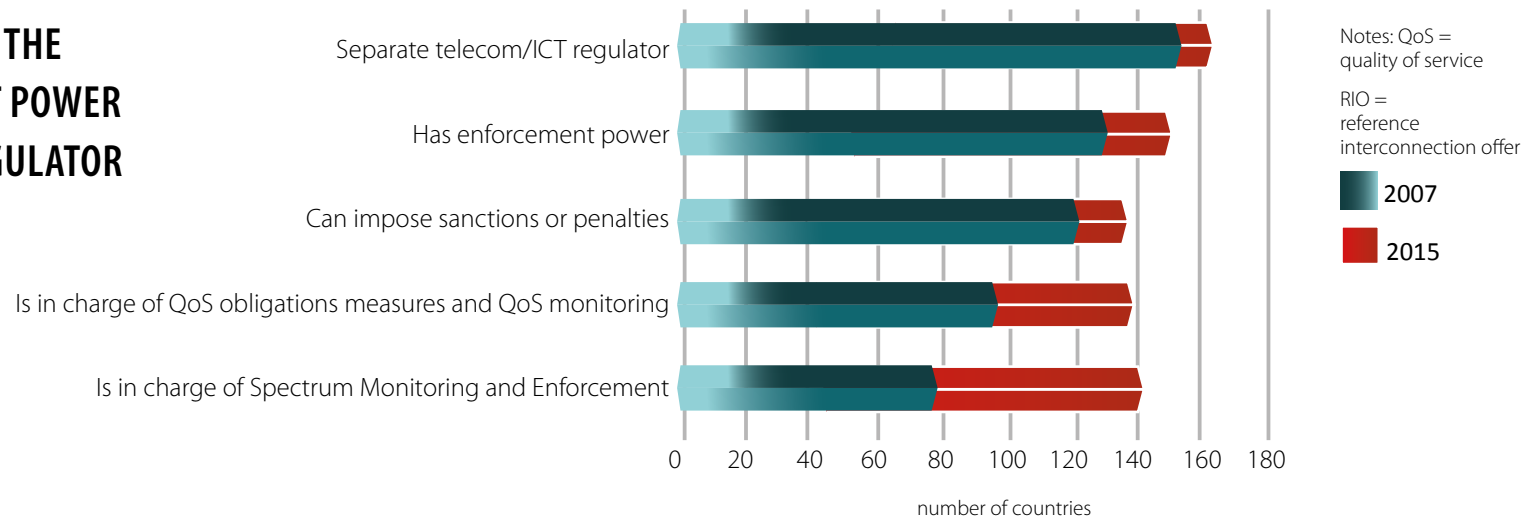
CONTEXT: THE SCOPE OF MONITORING AND ENFORCEMENT IN THE ICT SECTOR CONTINUES TO WIDEN

In the aftermath of the 2008-09 global financial crisis, regulatory monitoring over ICT networks has been reinforced in areas such as interconnection and infrastructure sharing (see Figure 35 and Map 4). Recently, OTTs, OSPs and the like have slowly but surely become an enforcement priority – without, for the time being, clear rules or specific tools to effectively enforce regulatory rules on them. In 2015-16, challenging issues – including taxation of players without national physical points of presence (POP) and quality of information being shared over social media – have given rise to passionate global debate. All of these issues point to the need for more effective monitoring and enforcement of regulation.

Figure 34:

EVOLUTION OF THE ENFORCEMENT POWER OF THE ICT REGULATOR WORLDWIDE

Source: ITU.



FINDING THE RIGHT BALANCE

In this context, regulation is very much the art of finding the right balance between incentivizing and policing the ICT marketplace. While incentives can stimulate creative destruction and genuine market growth in key areas such as infrastructure extension and upgrade, monitoring and enforcement of rules are essential to protect consumers in critical areas such as cost and conditions of services. With regard to appropriate content – typically over OTT platforms – flaws remain in existing regulations or in many cases there is no regulation at all. This further complicates enforcement and leaves it to dispute resolution bodies to make law on a case-by-case basis.

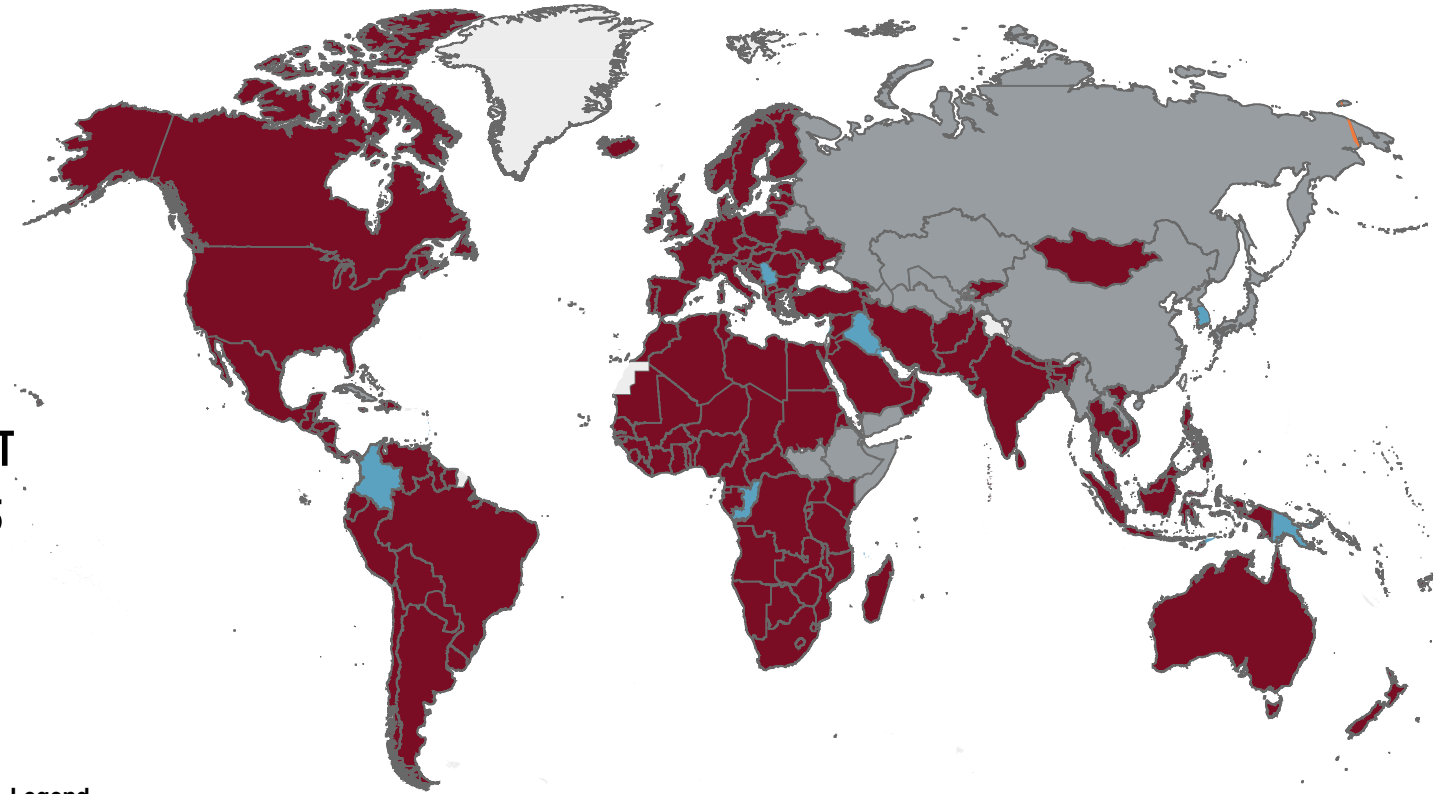
Our analysis shows that since 2007 more regulators have been awarded enforcement powers (see Figure 34). Currently, some 129 regulators or close to 80 per cent have the mandate and legal instruments to enforce rules and regulations in various areas.

REGULATORY INTERVENTION AND ENFORCEMENT AS MARKET ENABLERS

The ICT regulator can create a level playing field using intervention and enforcement – and in so doing, can play the important role of market enabler (see also Trend 3). The Tracker shows that since 2007, although most regulators

Map 5:
**ENFORCEMENT
POWER OF THE ICT
REGULATOR, 2015**

Source: ITU.



Legend

- No data
- No separate regulator
- Separate regulator exists
- Separate regulator with enforcement power

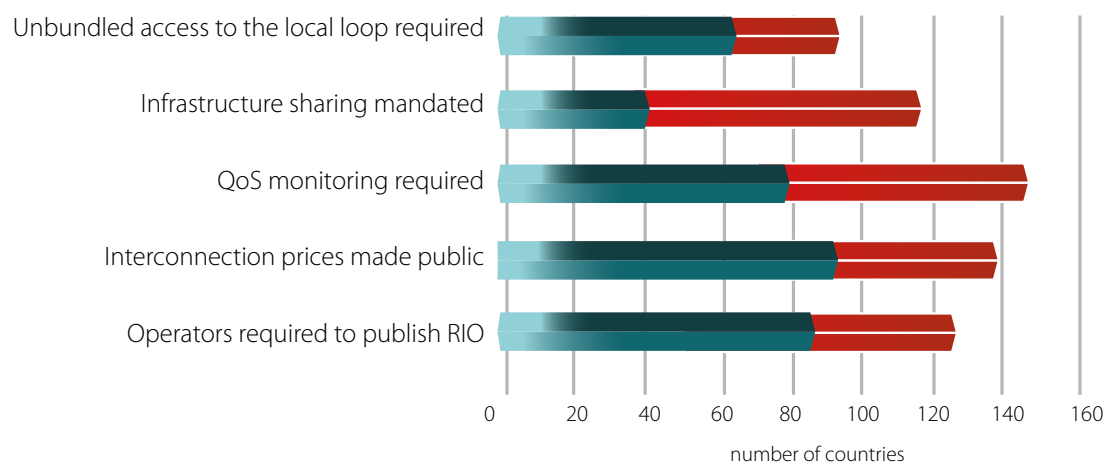


Figure 35:

REQUIREMENTS AND OBLIGATIONS IMPOSED BY THE ICT REGULATOR WORLDWIDE, 2007 AND 2015



Source: ITU.

were legally entitled to police ICT markets and impose sanctions and penalties, the supervisory capacity of ICT regulators has steadily improved with more than 90 per cent now having enforcement powers (see Figure 34) – even if the number of regulators has grown only marginally in that period. Spectrum and monitoring service quality have been increasingly entrusted to regulators.

Looking ahead, regulators will have to ensure – through enhanced market monitoring and regulatory enforcement – that the best interest of consumers is protected, while promoting the initiative of market players and spurring further innovation. It is therefore important that regulators have the right toolkit of functions and powers to address adequately the challenges that lie ahead.

MONITORING AND FEEDBACK FRAMEWORKS CONSIDERED INCREASINGLY ESSENTIAL

Monitoring and feedback frameworks are now essential elements in any ICT regulatory framework which itself has to fit within an overall coordination framework that extends beyond the traditional ICT sector. Integration within this bigger picture is essential for achieving the goals of regulation and ensuring that all market parties, both business players and consumers, enjoy a fair outcome. This is particularly relevant to contracts and licences, not only for consumers but for operators and service providers too.

In the aftermath of the 2008-09 global financial crisis, we have seen increased focus and activity in specific areas for ICT regulators:

- Monitoring has been reinforced in areas of interconnection and infrastructure sharing (see Figure 35).
- Monitoring progress in implementing national broadband planning, network deployment, availability and adoption has been a high priority.
- Spectrum monitoring and enforcement have become a major focus for migrations from 2G to 3G to 4G mobile data networks, and in view of an eventual transition to 5G. Some 85 per cent of regulators have the mandate to monitor compliance with the requirements of spectrum licences and to enforce penalties if needed.
- Quality of service (QoS), and the quality of consumer experience, have become a key area for regulators. Many countries like Poland and Kenya have adopted new regulations that give greater powers to regulators over a greater number of QoS issues.

Monitoring and enforcement measures need to be reviewed and adjusted over time as priorities shift from deployment of services to their adoption and use.

Such review should address established benchmarks for broadband capacity, speeds and spectrum allocations as demand and usage continues to develop.¹⁰⁹

In the framework of universal access and service (UAS) policies, international best practice shows that UAS projects and programmes should have built-in monitoring and feedback requirements to ensure that their reach, costs, benefits and outcomes can be measured and achieved in a timely manner.

CONSUMER PROTECTION – NEXT CHALLENGE: REGIONAL AND INTERNATIONAL COOPERATION AND ENFORCEMENT

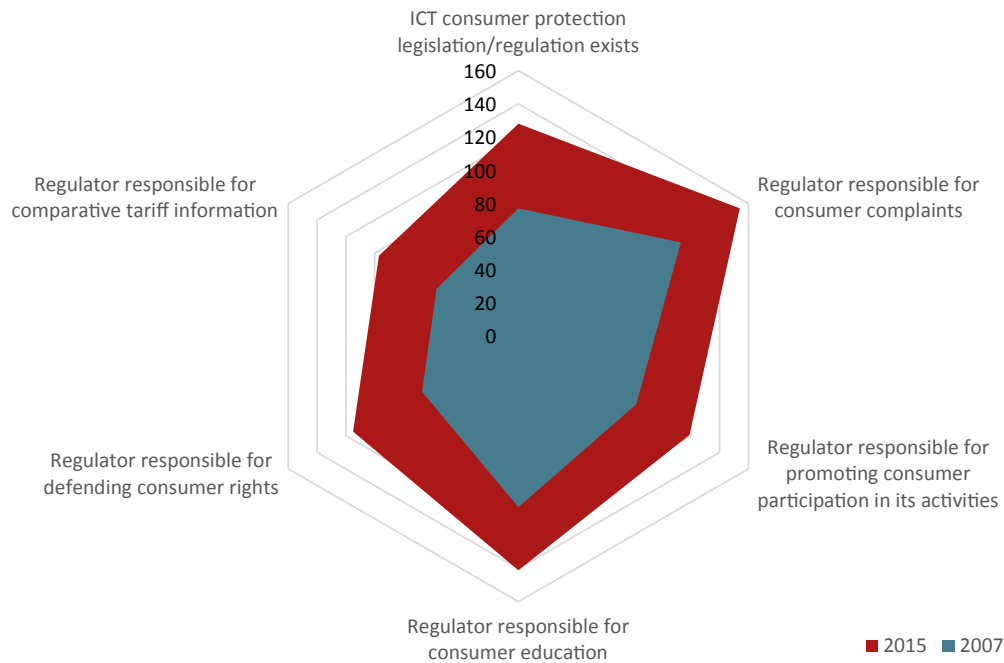
Consumer protection is essential if consumers are to benefit from services provided at all levels of the market.¹¹⁰ Regulators have recognized that frameworks need to be kept open, forward-looking, neutral and flexible in order to leverage new technologies, innovative services and new business practices – such as cloud computing, social media, mobile broadband, big data, and the Internet of Things.

¹⁰⁹ GSR14 Discussion Paper on Monitoring the Implementation of Broadband Plans and Strategies, ITU

¹¹⁰ ITU, GSR14 Best practice guidelines on consumer protection in a digital world

Figure 36:
**ICT CONSUMERS ARE GETTING BETTER PROTECTION,
 2007 AND 2015**

Note: number of countries
 Source: ITU.



ICT consumer protection framework, 2007 and 2015

113 ICT REGULATORS NOW IN CHARGE OF CONSUMER PROTECTION

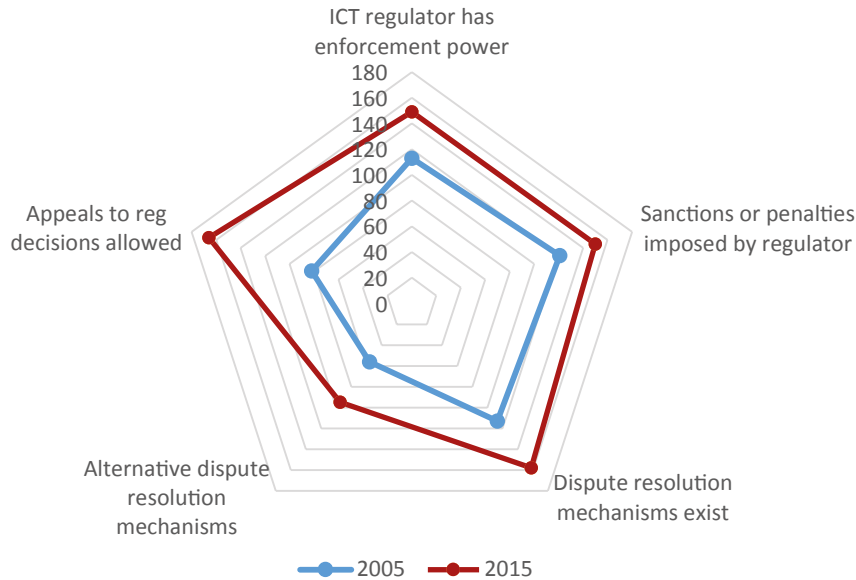
As ICT consumer protection regulation has become mainstream, 113 ICT regulators are now in charge of this area, with 126 countries having adopted consumer protection legislation or regulation. Such regulation is likely to prove useful for resolving, or at least positioning, issues pertaining to other sectors and once again, a holistic consumer-centred approach, technology-neutral policies, a focus on services and service quality and getting their scope right will be of prime importance.

Figure 36 shows:

- Today’s ICT regulator has a central role in all areas of consumer protection including the handling of consumer complaints and consumer education.
- Around 130 countries have adopted ICT consumer protection legislation while close to 160 regulators provide consumer redress.
- Enforcement of QoS requirements, licence obligations and consumer redress have helped create a market place where consumers thrive and take full advantage of ICT services.

Regulators, globally, have recommended that OTTs adopt more transparency around data processing, obtaining the consent of their customers through

Evolution of the main areas of regulators' enforcement powers



Alternative dispute resolution mechanisms in use, 2005 and 2015

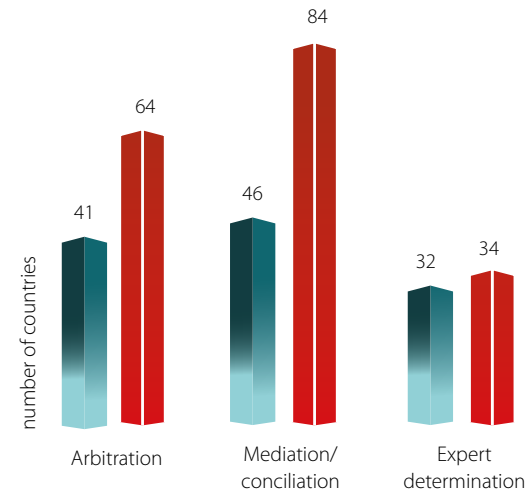


Figure 37:
EVOLUTION OF THE MAIN AREAS OF ICT REGULATORS' ENFORCEMENT POWERS WORLDWIDE, 2005-2015

Note: number of countries
Source: ITU.

opt-in before sharing their data, and allowing users to select the status of their communications (private or public). Users should be able to make informed decisions about how much of their data can be accessed by others and the usage that third parties make of it.¹¹¹

The challenge for consumer protection in the coming three to five years is to come to grips with the global nature of services provided over the Internet. This will

require increasingly regional and international cooperation as well as international norms and enforcement mechanisms. Such efforts will mainly be led by regional and sub-regional organizations such as the EU, ITU, the African Union (AU), the Commonwealth Telecommunications Organisation (CTO) and the Regional Commonwealth in the Field of Communications (RCC).

111 ITU, [GSR14 Best practice guidelines on consumer protection in a digital world](#), ITU

DISPUTE RESOLUTION FRAMEWORKS INCREASINGLY ADOPTED AS REGULATORS' ENFORCEMENT POWERS INCREASE

Although disputes can sometimes be a sign that markets are moving forward; they can be destructive to the ICT sector, undermining competition, jeopardizing regulatory certainty and reducing incentives to invest. Effective resolution is central to the deployment of high-speed, ubiquitous broadband infrastructure, playing a role in achieving connectivity goals and helping markets evolve.

Over the last decade, ICT markets have been characterized by strong growth, multi-lateral convergence and the rise of disruptive players. Speed of change and complexity have resulted in gray areas with no regulatory blueprint. Older regulation has sometimes become increasingly contentious and, paired with the constant transition of legacy rights, has produced an increasing number and variety of disputes. Faster and more cost-effective resolution is urgently needed.

ICT regulators play a key role. They have the double mandate of anticipating and addressing problems of market failure, a complex and delicate task. Dispute resolution is the ex post regulatory response to dominance or other contentious situations in ICT markets. Mechanisms need to be swift and nimble to respond to the demand of market players, while applying regulation sensibly and minimizing implications for consumers. The powers of the regulator need to be proportionate to the issues at stake. Strong enforcement powers and the authority to impose

sanctions are paramount in channeling disputes and forging win-win outcomes – and this is the case for four out of five regulators today (see Figure 37). On the other hand, allowing appeals and fair appeal processes to regulators' decisions are essential for guaranteeing accountability and transparency of regulation-making and dispute resolution. Some 90 per cent of countries allow appeals to regulatory decisions today, a sign that ICT regulatory frameworks have achieved a level of maturity.

There is no single best practice for dispute resolution. The main options are litigation and alternative dispute resolution (ADR) mechanisms, including arbitration and mediation. While formal dispute resolution mechanisms are important as a basic guarantee that policy will be implemented, alternative dispute resolution mechanisms provide quick, efficient and flexible problem solving.

Since 2005, the number of countries with a clear dispute resolution framework has grown by 28 per cent to reach 158 countries (see Figure 37). Just over one-half of countries have set a framework for ADR, up from less than one-third of countries ten years ago. ADR mechanisms provide quicker and less-costly redress – these appeal to policy-makers and regulators who may want to use minimal but focused regulatory intervention. By 2015, 90 per cent of countries applying ADR techniques were using mediation, and arbitration is well-established in two-thirds of those

countries. One-third of countries also have expert determination arrangements in place. The establishment of dispute resolution mechanisms is linked to the growing enforcement powers of ICT regulators. With this, requirements for transparency and accountability have also grown, allowing for appeals to regulatory decisions. In 2015, appeals were allowed in almost 80 per cent of countries worldwide (see Figure 37).

In several countries (mostly EU), consumers now have access to collective redress, as well as individual litigation or redress.¹¹² This channel makes for easier and more cost-effective protection of rights of a great number of consumers, providing for consumer empowerment and enforcement of competition rules – real progress in defending consumers' rights and a more balanced market.

*Controversial issues – privacy, data protection, cyber security –
urgently require stronger measures*

The issues of privacy, data protection and cyber security continue to pose questions for which the regulatory community has no fully developed answers – and rules are either under-enforced or no rules are set at all. Controversial and culturally-tinted issues – such as privacy and data protection, as well as critical

information infrastructure protection – have become enforcement priorities following a series of large-scale breaches into global OSPs. Commercial practices such as the collection of personal information, and its use and monetization by service providers have become a growing area of concern and a compelling candidate for the imposition of more stringent rules.

Attention to cyber threats and security has never been greater and with this heightened attention has come a call for increased regulatory enforcement. Who should enforce, how and in what exact circumstances remains largely disputed and unclear at the moment. Diverging regional approaches in the EU and the US add an additional layer of complexity. The urgency of these issues, however, may well work as a strong catalyst for the adoption and enforcement of concrete measures and the creation of jurisdiction scenarios. It is likely to be a trial-and-error approach until we have sufficient distance to assess the pros and cons of enforcement approaches to online platform players.

¹¹² See <http://www.collectiveredress.org/collective-redress/what-is-collective-redress>

TREND 5

THERE IS NO ONE MODEL FOR BEST REGULATORY PRACTICE

CONTEXT: ONE MODEL DOES NOT FIT ALL – CONVERGENCE AND DIVERGENCE IN COMPLEX, FAST-MOVING LANDSCAPE

The regulatory landscape is hugely varied, fast-moving and extremely complex. It is no surprise then that a single ICT regulatory model has not been developed to date. Points of convergence are emerging however, driven by factors such as efficiency, extended access to networks, affordability and quality of service. However, some regulatory topics are generating more attention and will evolve at a faster pace than others, helping to shape markets and changing the established market order. At the same time, new issues are constantly emerging, posing growing challenges to regulators. Some topics are so intricate that they require collective action from the international community, while others will potentially disrupt the market order in the ICT sector as well as in others.

Table 17:

TOPICAL ISSUES AT STAKE AND REGULATORY INTERVENTION

Note: This list is indicative and not exhaustive.

Source: ITU.

Many ICT regulators have addressed	Some regulators have addressed	Some ICT regulators are looking into	Issues on ICT regulators' horizon
• Competition	• Privacy & data protection	• OTTs/OSPs	• Autonomous driving car
• Licensing	• Net neutrality	• e/m-applications	• Blockchain
• Price regulation	• Spectrum trading	• Digital financial services	• Electronic currencies (e.g., bitcoin)
• Interconnection	• Structural separation	• Internet of Things	• Automated Electronic Trading
• Number portability	• ICT accessibility	• Cloud computing	• Counterfeiting

Core regulatory topics have been much debated over the years. Competition, licensing and price regulation are of course amongst the main pillars of all generations of regulation and there are multiple patterns and nuances of established regulation in these areas. Nevertheless, even for these regulatory staples, none is set in stone as new issues come into play and as markets evolve, necessitating further development and tuning. Even on the issue of competition, there is often debate on the principles to follow and the tools to use. Recently, this debate has questioned whether or not regulation should be limited to access bottlenecks in broadband networks. An opposing view is that ex post competition law might be adequate for both traditional infrastructure players and OTTs'

businesses. However, networks are so important that their regulation is likely to remain a major focus and is unlikely to disappear. But should the overall scope of ICT regulation be narrowed down to these issues? Issues surrounding competition are discussed in more detail in Trend 3.

In contrast to areas of relative stability, some regulatory areas have been in flux for a decade or more, with divergent patterns setting in. For example, spectrum trading has been embraced by a slowly-growing number of regulators while being vigorously opposed by others. Net neutrality follows a similar growth path. Disruptive and genuinely new phenomena often remain untreated for some time before a leader, or leaders, establish the way forward. Many of the issues of today's

Evolution of regulatory regimes in the ICT sector, worldwide

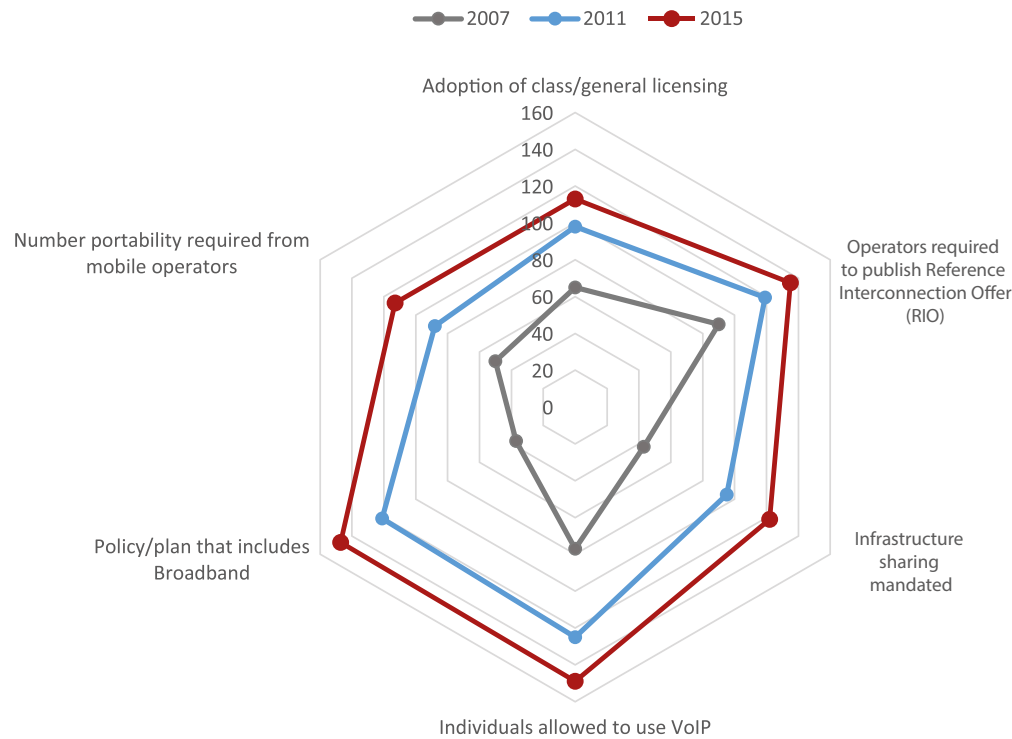


Figure 38:
**QUANTITATIVE MAPPING:
 UNEVEN GROWTH IN THE
 ADOPTION OF KEY
 REGULATORY PRACTICES,
 2007-2015**

Note: number of countries

Source: ITU.

ICT regulation are not only complex, they are also very challenging, such as the regulation of OTTs. Issues further down the road, online currencies for example, remain a sort of a regulatory nebula – until their importance demands attention.

The following sections take a closer look at the various areas of convergence and divergence in terms of regulatory treatment. They look at issues facing regulators and emerging trends. They also explore issues that have not yet been addressed at all, or have not been addressed by a great number of regulators (see also Table 17). The analysis touches upon the different regulatory patterns that have shaped the ICT sector to date, identifying some of the main growth areas for ICT regulation.

REGULATORY PRACTICE: AREAS OF CONVERGENCE

Quantitative mapping of key areas of regulation enables tracking of trends across the board (see Figure 38).

*Unified licensing regulation is forging ahead –
increase of 73 per cent*

Licensing of operators and service providers has come a long way since the advent of fixed and mobile broadband. The need for faster and easier market entry has accelerated regulatory reform in this area. The liberalization of licensing regimes has facilitated a crowded ICT market place today – from service-specific individual licences to multi-service and class licences to general authorizations. The number of countries with a unified licensing regime has jumped from 65 to 113 between 2007 and 2015.

*Infrastructure sharing has driven service innovation, lower-cost
services and revenue diversification*

Infrastructure sharing has been another flagship area for regulators, much the same as licensing. In the aftermath of the global financial crisis of 2008, the leveraging of established facilities has driven service innovation by non-facility operators while providing much needed diversification of revenues for facility-based operators. In the countries where infrastructure sharing has been mandated, such sharing has tripled since 2007, increasing the competitiveness of markets and bringing new, lower-cost services to consumers.

*Number portability –
300 per cent increase since 2007*

Number portability implementation has been a major competitive landmark for the mobile sector in all regions. The number of regulators requiring mobile number portability has topped 113 in 2015, up from 50 in 2007. The number of markets where mobile number portability from one service provider to another is actually used, 78, has grown three-fold since 2007. Many countries are still to implement number portability, however the trend is to facilitate consumer flexibility, allowing consumers to switch providers and take advantage of the best service offers.

*Voice-over-IP has thrived through
removal of regulatory barriers*

Some of the first converged digital services have been widely democratized since they were first introduced a decade or so ago. Voice-over-IP (VoIP) has grown into one of the most popular free services. Skype remains a market leader in many countries, however more recent services like Viber and WhatsApp now have millions of subscribers, too, and their business model has become profitable. Regulation, or more accurately, the removal of regulatory barriers, has been an important facilitator of what is today a major alternative communication channel in some 150 countries worldwide.

Box 21:

UPDATE ON DIGITAL PLANS AROUND THE WORLD

- “Digital India”. The Prime Minister’s vision is to transform India into a digitally empowered society and knowledge economy. The strategy is built around three key pillars: creation of digital infrastructure, delivery of services digitally and digital literacy.
- With the view of creating a Digital Single Market, the EU Commission adopted [a set of initiatives](#) and legislative proposals to move forward with the European Gigabit Society. Alongside creating a widespread and reliable 5G connection for European citizens, the Commission states that by 2025 all schools, transport hubs and main providers of public services as well as digitally-intensive enterprises should have access to Internet connections with download/upload speeds of 1 Gigabit of data per second.
- The National Broadcasting and Telecommunications Commission of Thailand released a [statement](#) in October 2016 to push forward a national plan to roll out a broadband Internet network in almost 4 000 villages at a cost of USD325 million to promote broadband service access to remote areas.
- British Prime Minister Theresa May [pointed out](#) that her government will address the problem of failing rural broadband in the UK more closely. The PM built her statement on the recent report “[Building Gigabit Britain](#)” by the Independent Networks Co-operative Association (INCA), which highlights the target of 80 per cent fibre-to-the-premise across the country.
- South African Telecommunications and Postal Services issued its [national integrated white paper](#) on an ICT policy in September 2016, covering all main targets and new national policies in the domain with the overarching incentive to create a digital society and set a positive example for neighboring countries.
- The Government of Dominican Republic [decided](#) to install 5 000 free Wi-Fi hotspots in public areas. This decision goes along with the government strategy to improve connectivity throughout the country, especially in rural areas.
- New Zealand is set to [extend broadband](#) to rural areas where Internet blackspots are especially frequent. The extension programme will cost New Zealand’s Government NZD102 million and is part of the overall strategy to provide 99 per cent of the population with Internet coverage by 2020.
- Madagascar announced a [public project](#) to provide schools and hospitals with Internet broadband connection, also covering remote areas. The coverage is expected to be free of charge, or at least at a low cost in order to achieve maximum outreach.
- The Algerian Government has passed a [new telecommunications bill](#), which replaces the old one dating back to 2000. The new bill widens the coverage, includes new virtual actors and possibly open access to alternative operators.

Source: ITU research and Telegeography.

Broadband planning and policy in place in 147 countries

New policy instruments have also come of age as emerging issues must be dealt with in new ways. National broadband plans and related policies – which mainly came to prominence after the 2008 global financial crisis – have been employed as a means of channeling stimulus funding and are now widespread across 147 countries. Up from only 37 countries in 2007, these national plans and related policies have been used to reconnect economic sectors in order to improve efficiencies and create new business opportunities. While the average broadband plan is now seven years old, many countries get back to the drawing board to revise and upgrade their policy frameworks for the digital economy (see Box 21).

NEW ISSUES, DIVERGING APPROACHES

Slow progress on secondary spectrum trading

Other regulatory practices have been gaining momentum while experiencing slower adoption. Although they remain limited to fewer jurisdictions, the regulatory treatment of issues such as secondary spectrum trading or net neutrality can have a significant impact on how national markets develop. In these

areas, there is no single regulatory perspective and policy priorities often come into play when it comes to decide whether to regulate certain areas or not. This is how regional approaches often shape up.

Net neutrality – divergent approaches in place across 34 countries

New issues have emerged over the past five years with the advent of OTTs. One such issue is net neutrality, which imposes significant limitations on the extent to which carriers can make deals with OTTs. It is arguable that adopting a case-by-case approach based on actual evidence of market development is both more practical and flexible than pre-emptive regulation. Operators could continue to have the flexibility to manage their networks and explore market-driven approaches while OTTs can match spare capacity and consumer demand. By 2015, 34 countries had embodied both approaches in their laws on net neutrality.

Big challenge waiting in the wings: the Internet of Things

Twenty-eight regulators including Ireland, Qatar, Pakistan and United States already have jurisdiction over the Internet of Things (IoT) and we can safely expect that this is an area where ICT regulators will be increasingly called upon for their

expertise and power of enforcement. The complexity of the Internet of Things has generated much discussion since the early 2000s, but wider adoption is only now beginning to take off. As yet it is unclear whether specific IoT regulations – and if so, which regulations – will be needed to enable its mass application or, alternatively, if existing, holistic regulations such as those on data roaming, data protection, latency and more generally QoS will be sufficient. This is definitely a track to follow. About ten countries have adopted related regulations (similar in number to e/m-applications).

Global issues need concerted action from international community for real progress

A number of thorny regulatory topics can only be partly addressed at the national level and require concerted action by the international community. Data protection and privacy number among such topics.

100-plus regulators now with cybersecurity mandate – four-fold increase over nine years

Cybersecurity has risen sharply up ICT regulators' agenda over the past ten years. In 2007, there were 24 ICT regulators with a mandate over issues related to cybersecurity. In nine years, their number has grown more than four-fold. Data protection and privacy stand out as issues that need defining in terms of the spread of new services and applications – whether these include e-health solutions, self-driving cars or industrial IoT. Such issues certainly extend beyond ICT-sector regulation while requiring the best of the specialized expertise of the ICT regulator. These emerging areas are in addition to the core cybersecurity issues related to critical infrastructure protection and national cybersecurity incident response teams.

International momentum on data protection but challenges remain

In regard to data protection, global convergence has started to emerge in terms of the content of and approaches to lawmaking. The trend is towards laws mirroring the model of the EU Data Protection Directive and the establishment of special,

independent and adequately resourced privacy or data commissioners with strong investigative and enforcement powers.¹¹³ ‘Model Laws’ have been drafted with support of the ITU and the EU for the Caribbean, Central and sub-Saharan Africa.

There is strong global support too for closer and more effective cross-border cooperation. Part of this concerns the development of rules and tools to allow international data transfers – either because they occur between countries that effectively have the same levels of protection – or because ‘appropriate safeguards’ are provided by various means and mechanisms such as data transfer contracts,

binding corporate rules, sectoral codes of conduct or privacy seals.¹¹⁴

Some challenging questions, however, remain unanswered. It is arguable that when OTTs offer substitutable services they should be subject to the same data protection and privacy obligations as network operators. Such regulatory treatment may, on the other hand, be seen as excessive because the business model of OTTs often relies on monetizing the data of their customers. The potential EU approach is to introduce new rules that would force them to share data with third parties, including businesses. Consensus on the approach is

113 ITU, [GSR-16 Discussion Paper, Maintaining trust in a digital connected society](#)

114 ITU, [GSR-16 Discussion Paper, Maintaining trust in a digital connected society](#)

Box 22:

AUGMENTED REALITY GAMES AND LEGAL GRAY AREAS

Legal gray areas also exist with regard to augmented reality (AR) applications as players’ locations are logged. But how much data can these games legally collect from users? For example, the Pokémon Go app initially requested full access to its players’ Google accounts. This meant that the company could access the contents of players’ Gmail, Google Docs, Google Drive, and Google Calendar accounts.

If a simple gaming app with access to a player’s camera and GPS data can raise questions about user privacy – and present serious security issues, more advanced AR and AI applications could present far more significant, more concerning levels of threat.

Going forward, it will be particularly difficult to address these security issues in markets such as the financial services sector or healthcare.

Source: Adapted from [silicon.co.uk](#).

Box 23:

PRIVACY AND DATA PROTECTION REGULATIONS

We, [the regulators participating in the Global Symposium for Regulators], believe that establishing an integrated legal system for effectively protecting personal data and information is paramount for the digital world to thrive.

Holistic and balanced privacy and data protection legal frameworks need to be enacted, in accordance with internationally-agreed core principles. In order to enhance trust in new financial digital services, it is equally important to broaden the enforcement powers of the ICT regulator and strengthen sanctions in the case of fault, fraud or abuse.

Revisiting and reviewing, where necessary, current government policies to make sure that they are still valid and appropriate for the new environment and ensuring privacy and security of government, business and consumer data may be necessary while open and collaborative regulatory frameworks are needed to promote the development of cross-cutting services such as m-commerce, m-banking and mobile money, and m-health.

We recommend that OTTs, and social media providers in particular, engage in more transparent procedures for data processing, obtain the consent of their customers through opt-in before sharing their data and provide users with the option to clearly choose the status of their communications, between private or public. Users should be able to make informed decisions about the degree to which their data can be accessed by others and the usage that third parties may make of it.

In addition, we recommend the adoption of a privacy policy with enhanced measures to alert users and give them control over data practices that are not related to the app's basic functionality or that involve sensitive information.

The online world exposes children and youth to specific risks, notably in terms of adult-only content and sexual predation. We acknowledge the importance of supplementing legal tools with a series of measures that include public advocacy, content alerts and industry self-regulation initiatives while engaging further efforts in consumer education for targeted groups, such as children, youth, parents and teachers.

We believe that establishing a Computer Emergency Response Team (CERT) can yield multiple benefits to consumers in terms of providing, inter alia, an early warning service on threats and possible cyberattacks to both the general public and government agencies.

Source: [GSR Best Practice Guidelines 2014, 2015 and 2016](#)

yet to emerge. In the meantime, the majority of national legislation adopts a consumer-centred approach built on universal human rights, although conceptual differences persist between States on privacy in a narrow sense and data protection in a broad sense. Equally, there are different views on the application of the basic norms to non-nationals and to people outside a State's territory.¹¹⁵ New generations of applications, such as AR and AI, raise new challenges, too (see Box 22).

The existence of sound national frameworks for data privacy are good for both businesses and consumers. One analyst notes that strict data sovereignty laws and customer demand are pushing cloud service providers to build data centres in key markets, such as Germany, Canada, Japan, the UK, China and the Middle East, where storing of personal data is required in facilities physically located within the country. Expanding data centre locations across the world and into key economies has been critical in supporting multi-national customers in their digital transformation initiatives. These services are also providing digital platforms for businesses to access new markets and capitalize on new trade opportunities, such as Alibaba's Tmall Global.¹¹⁶

GSR Best Practice Guidelines on privacy and data protection are given in Box 23.

Cyber privacy potentially undermined by international trade agreements

The privacy discussion also illustrates the interdependence of regulatory issues. The lack of global cybersecurity frameworks hampers the development of a framework for global privacy and data protection. These are further undermined by the adoption of international trade agreements, unless they stipulate that restrictions on transborder data flows imposed to protect personal data are not seen as 'non-tariff barriers' to trade.¹¹⁷

International Mobile Roaming – Africa a pioneer, Europe coming to agreement at last

There have been different practices relating to international mobile roaming (IMR) in the different regions. Africa has been a pioneer in terms of offering travelers free roaming. First introduced in 2006 a borderless mobile phone network spans the network of several African and Middle-East regional operators, such as Cotel and Zain. Ten years on, One Network of the Zain Group enables customers to move freely between 11 African and seven Middle-East countries, including Tanzania, Kenya, Uganda, Nigeria, Jordan and Bahrain.¹¹⁸ Other operators such as Airtel,

115 ITU, [Regulating the App Economy, forthcoming in 2017](#)

116 [Canalys](#)

117 ITU, [GSR-16 Discussion Paper, Maintaining trust in a digital connected society](#)

118 [Zain Group](#)

Wataniya and MTN also provide free voice roaming as well as no/low-cost data roaming to subscribers. In EU, roaming rates regulation has been debated for over a decade. As a result, cross-border calls and texts were 92 per cent cheaper in 2016 than in 2007. The EU roaming fair-use policy was formally adopted in December 2016 after several revisions, mainly related to avoiding abuse of free roaming. While roaming charges will effectively be abolished from June 2017, further consensus among EU Member States is still required to create an effective wholesale roaming regime that can support the removal of retail roaming surcharges.

The regulatory treatment of roaming alternatives such as OTT services raises issues – such services enable more affordable access to communication, while raising regulatory challenges such as quality of service, quality of experience (QoE), availability of free Wi-Fi, network performance, etc. IoT and M2M roaming also differs from traditional consumer voice and data roaming and raises particular regulatory issues.¹¹⁹ Internationally harmonized principles and guidelines – or ‘building blocks’ – can help foster innovative roaming solutions at global, regional and national level and bring direct benefits to customers as well as businesses. The aim of the Building Blocks for Strategic Guidelines (see Box 24) is to provide a basis for discussion for stakeholders actively involved in the regulation and provision of IMR services, with the aim of improving the delivery of these services for the

benefit of consumers and to reduce what is generally perceived as high mobile roaming retail prices, while enhancing efficiency and transparency.

*Spectrum harmonization*¹²⁰

As radio systems are used globally, it is desirable to harmonize existing and newly allocated spectrum. The benefits of spectrum harmonization include: facilitating economies of scale, enabling global roaming, reducing equipment design complexity, preserving battery life, improving spectrum efficiency and reducing cross-border interference.

Mobile devices typically contain multiple antennas and associated radio frequency front-ends to enable operation in multiple bands to facilitate roaming. While mobile devices can benefit from common chipsets, variances in frequency arrangements necessitate different components to accommodate these differences, which leads to higher equipment design complexity.

Consequently, harmonization of spectrum for international mobile telecommunication (IMT) – and especially 5G – will lead to simplification and commonality of equipment, which is desirable for achieving economies of scale and affordability of equipment.

¹¹⁹ ITU, International Mobile Roaming Building Blocks for Strategic Guidelines, 2017 (upcoming)

¹²⁰ This section is adapted from ITU, François Rancy, IMT for 2020 and beyond.

Box 24:

GUIDELINES FOR MOBILE NETWORK OPERATORS/PROVIDERS (MNO)

Some of the main principles include:

- MNO should maintain the quality of service (QoS) parameters and standards for roaming services at least equivalent to those prescribed by their national regulatory authority (NRA);
- MNO should follow network neutrality principles by not blocking the use of VoIP and other messaging applications on smartphones.
- MNO should maintain as possible transparency of Inter Operators Tariffs (IOTs) and commercial agreements;
- MNO are encouraged to implement solutions for the provision of Internet of Things (IoT) services, including specific wholesale roaming charges and conditions;
- MNO are recommended to develop packages integrating competitive national and international mobile roaming rates for voice and data services.
- MNOs are recommended to provide clear, accurate and easy to understand information on IMR services to customers, including by informing subscribers of different charging structures for IMR tariffs compared to national services;
- MNOs should facilitate a timely and easy to use settlement of consumer complaints free of charge. NRAs could have access to this data.

Source: ITU, International Mobile Roaming Building Blocks for Strategic Guidelines, 2017 (upcoming).

EMERGING ISSUES – BITCOIN, AUTOMATED ELECTRONIC TRADING BOTH POSE DAUNTING NEW CHALLENGES

A number of issues are positioned as potential, if not imminent, disrupters of the market order in ICTs. Once they acquire momentum, they become wildcards, posing significant and unpredictable challenges for regulators both in and beyond the ICT sector.

Digital currencies – on radar screen for financial regulators but as yet unnoticed by ICT regulators

At present, digital currencies are used as money to a limited extent and only for a relatively few people. However, the potential is enormous since such currencies could serve as money for anybody with an Internet-enabled device, such as a smartphone. Bitcoin was the first, and remains the largest, functioning digital currency. Launched in January 2009, it is a privately developed, Internet-based currency and payment system that requires no intermediaries (for example banks) for the processing of payments.¹²¹ Some analysts see that blockchain – the technology that powers Bitcoin – could decentralize record-keeping in the same

way that the Internet has decentralized data.¹²² What is more, the Bank of England argues that the distributed ledger technology behind blockchain could mark “a first attempt at an ‘internet of finance.’”¹²³

Some national central banks have begun developing their own digital currency. The People’s Bank of China (PBOC) has carried out trials of its prototype cryptocurrency to be used to buy anything from noodles to cars. For users, a PBOC-backed cryptocurrency wouldn’t appear very different from existing payment methods such as Alipay or WeChat – however, sellers receive digital payment directly from the buyer, thereby lowering transaction costs as the middleman is omitted from the process. While building its capabilities, the PBOC is increasing its scrutiny of bitcoin and other private digital tenders.¹²⁴

Electronic currencies are already on the radar of financial regulators, although no regulation has been enacted so far. They have been, however, largely unnoticed by ICT regulators. A number of issues such as the reliability and resilience of ICT networks are directly related to the adoption of and trust in online currencies. In particular, quality of service over ICT networks during online financial transactions, privacy and data protection, and interconnection are all crucial to make them possible. This area then presents an opportunity for collaborative regulation which

121 Bank of England, [The economics of digital currencies](#)

122 CEPA for Corporates, [6 Global Trends Financial Regulators Are Thinking About](#)

123 Bank of England, [Innovations in payment technologies and the emergence of digital currencies](#)

124 [Bloomberg](#)

can operate as a bridge between the financial and tech sectors, and work towards building the regulatory framework for online financial services.

Automated electronic trading

Automated electronic trading is a further financial issue breaking through in financial markets. Automated trading makes up 70 per cent of futures markets. With developments in technology, it is set to bring about lower transaction costs, and increases not only in the speed and efficiency of transactions but also in trader productivity.¹²⁵ Like electronic currencies and blockchain, automated trading will heavily rely on networks – including network capacity, quality and speed – as well as on the framework for online services – including privacy and data protection. Involving the ICT regulator in the discussion on possible regulations in this area would be important given the importance of physical networks in the future of Internet.

COLLABORATIVE REGULATION TO CHART WAY AHEAD IN VOLATILE FUTURE

Other as yet inconceivable innovations will surely be just around the corner. Existing regulation may be challenged and there will probably not be a clear, single regulatory pattern to follow going forward. Regulation in disrupted areas is likely to lead regulators off the beaten path. Regulators might well have no choice but learn by doing, since the pace of change will not allow time or opportunity for learning in advance. Tapping the network of regulators from different sectors and acquiring access to the broader regulatory talent – through collaborative regulation – will be the catalyst to chart the way ahead. (see Trend 7 here).

¹²⁵ CEPA for Corporates, [6 Global Trends Financial Regulators Are Thinking About](#)



TREND 6

GOOD REGULATION HAS IMPACT

CONTEXT: REGULATORS STANDING UP TO CHALLENGES, REINVENTING THE RULES

Expectations of ICT regulation have grown. In a world in which more than half the world's population is not using the Internet, according to the latest ITU estimates,¹²⁶ regulators have to reinvent the rules of the game to extend adoption and use of ICTs, align them with wider social and economic goals and set about connecting the unconnected. And this is not only possible; it is already happening. No fewer than 43 countries now conduct a Regulatory Impact Assessment (RIA) as a formal requirement before regulatory decisions are made. In some cases, incentive regulation is included to create an enabling environment for further investment, especially in infrastructure. Such developments are testament to the great scrutiny now brought to bear on the significant impact of the rules and regulations that govern ever more important ICT markets. Ex ante Regulatory Impact Assessment and evidence-based decision-making, more broadly, have become mainstream.

¹²⁶ ITU, *ICT Facts & Figures 2016*

GOOD REGULATION WORKS FOR MOBILE BROADBAND

Good regulation has impact – and this is clearly demonstrated by the ICT Regulatory Tracker in the adjacent chart which plots mobile-broadband penetration of countries by G1, G2, G3 and G4 and from years 2009 to 2015. The chart demonstrates just how crucial the role of good regulatory frameworks is. More specifically, it shows that:

- G4 peers outperform everyone else by far. Almost on a par with G3 in 2009, G4 countries reached penetration of almost 70 per cent in 2015 – a tremendous achievement.
- G3 peers perform slightly better than the world average throughout the period, accounting for a three-fold increase in mobile-broadband penetration in only six years.
- G1 and G2 countries are falling further behind both the world average for the whole period and G3 and G4 countries.
- In 2015, G1 and G2 countries had a mobile-broadband penetration of around 30 per cent compared to the world average of 44 per cent.

A HANDFUL OF KEY REGULATIONS CAN UNLEASH MARKET POTENTIAL

While there are many areas that require regulatory oversight, and there might be significant differences in their focus across countries, analysis based on the ICT Regulatory Tracker demonstrates that a handful of key regulations can unlock the potential of an ICT market and turn it into a mass market over a short period of time.

Active mobile broadband subscriptions per 100, per generation of regulation, 2009-2015

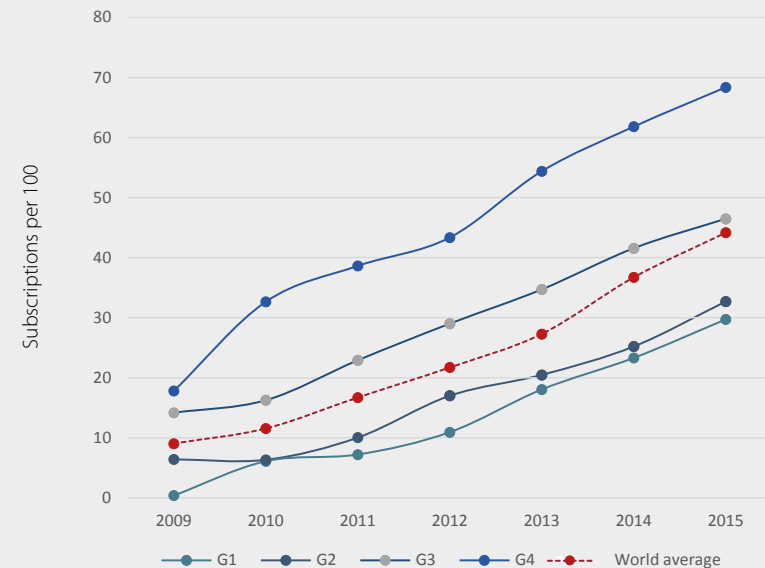


Figure 39:
**EVOLUTION OF MOBILE BROADBAND,
PER GENERATION OF REGULATION,
2009-2015**

Note: Values represent the average mobile broadband penetration of countries in the respective generation.

Source: ITU.

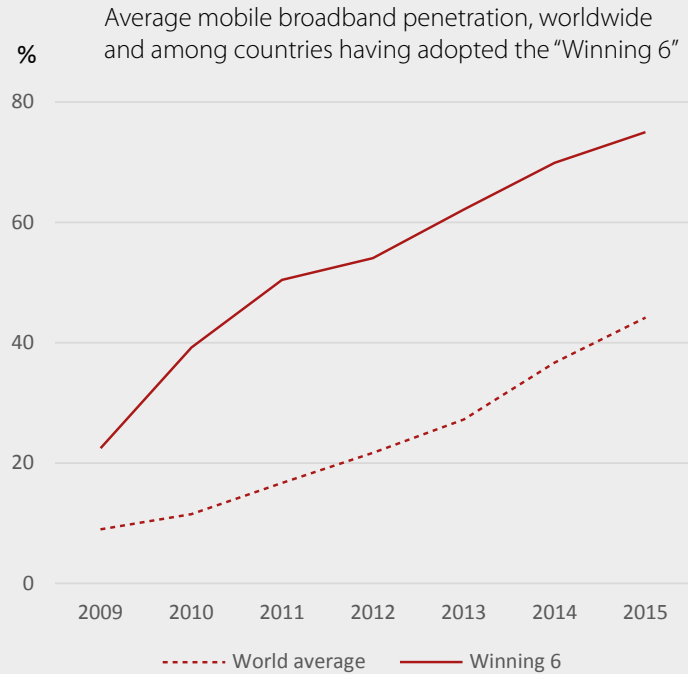


Figure 40:

THE WINNING SIX: A REGULATORY RECIPE FOR SUCCESSFUL MOBILE BROADBAND ADOPTION

Winning formula for mobile broadband

- Competition in mobile broadband
- Competition in international gateways
- Mobile number portability enabled (implemented, available to consumers)
- Band migration allowed
- Infrastructure sharing for mobile operators permitted, including MVNOs
- National broadband plan adopted

Source: ITU.

A 'RECIPE FOR SUCCESS' OF SIX REGULATORY MEASURES PROPELS MOBILE-BROADBAND PENETRATION

Our analysis shows that a 'recipe for success' of six policy and regulatory measures has helped 58 countries to achieve 75 per cent mobile-broadband penetration. Further, their markets have skyrocketed: penetration is 70 per cent higher than the world average in 2015, and is significantly outpacing most other countries (see Figure 40). Although there are multiple factors at work, for these countries regulation has made a significant difference.

The six measures for success range from the level of competition to spectrum regulations to the adoption of a national plan. They also include partial or full competition in mobile-broadband markets and international gateways, mobile number service provider portability, band migration and infrastructure sharing for mobile operators.

A 'RECIPE FOR SUCCESS' OF FIVE REGULATORY MEASURES PROPELS ADOPTION OF FIXED BROADBAND

Forty countries that have consistently adopted a 'recipe for success' of five measures often achieve a considerably higher level of fixed-broadband service adoption (see Figure 41).

This set of factors covers three measures related specifically to the fixed-broadband market and two broader framework regulations. These include the level of competition in the two main fixed-broadband segments – DSL and cable; fixed service provider number portability; infrastructure sharing; the existence of a converged licensing framework – either general authorization or class licences; and a national broadband plan.

Figure 41 shows that the average fixed-broadband penetration of countries deploying the 'recipe for success' was 26 per cent in 2015, 15 per cent higher than the global average of 11 per cent. Although causation is complex to establish statistically, the figures clearly imply that regulation facilitates market growth.

Over the past five years then the 'recipe for success' countries achieved only a modest rise in levels of penetration, which suggests that these fixed-broadband markets have reached saturation, or have reached the maturity phase of the current industry life cycle. This further suggests that

Average fixed broadband penetration, worldwide and among countries having adopted the "Winning 5"

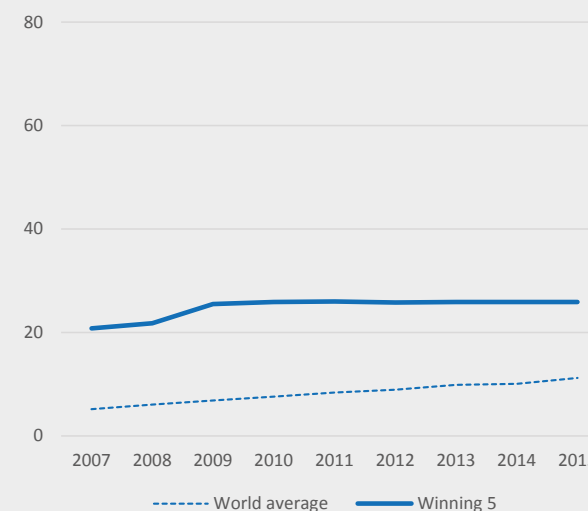


Figure 41:
THE WINNING FIVE: A REGULATORY RECIPE FOR SUCCESSFUL FIXED BROADBAND ADOPTION

Winning formula for fixed broadband

- Competition in DSL/cable
- Fixed number portability enabled (implemented, available to consumers)
- Infrastructure sharing/ co-location & site sharing for fixed mandated
- Converged licensing framework in place
- National broadband plan adopted

Source: ITU.



Figure 42:

GENERATIONS OF ICT REGULATION FROM OBLIGATIONS TO COLLABORATION

Source: ITU.

policy and regulatory goals should be revised to encourage further service-based competition and eventually, crowding-in.

Within reasonable limitations, this quantitative evidence suggests that best-practice regulation does matter and both the design and the effective enforcement of regulatory frameworks are essential for broadband markets to thrive.

STICK OR CARROT? THE MOVE TOWARDS INCENTIVE REGULATION AND RICH COLLABORATION

G4 and G5 ICT regulators have a large toolbox to deal with market conundrums and failures, either potential or real. In addition to the tools of obligation, an important lever in their toolbox is the power to create positive and negative incentives. Positive incentives are basically rights of all kinds, while negative incentives are those that dissuade market players from undertaking certain actions. Positive and negative incentives are equally important. They can be enacted either in licenses, regulations or decisions on disputes.

As a lighter alternative, incentive regulations have much in their favour:

- They are a win-win proposition, playing a key role in collaborative regulation and increasing the engagement of industry.

- They encourage opportunistic behaviors of businesses to promote their own objectives while effectively working towards achieving those of the regulator.
- They help build more balanced, less hierarchical and trusting relationships between market players and the ICT regulator.
- They foster learning and provide anecdotal evidence of model behaviors by market players.
- They can improve market outcomes with less regulatory effort.
- They motivate higher levels of performance and create a positive market dynamic.

There is a clear shift from obligation to incentive as we move through regulatory generations 1 to 4 (see Figure 42). G1 and G4 regulation are opposites of one another, illustrating the contrast between ex ante regulation primarily based on obligations (G1) and ex post regulation largely based on incentives (G4). The intermediate generations – G2 and G3 – are somewhere in the middle, offering fewer incentives than G4 while building up momentum around them. While both obligations and incentives are often set into ex ante regulation, the impact of incentives is effectively monitored and measured ex post. There is no ex ante compliance involved and eventual remedies are also applied ex post. In this sense, incentives are part of the ex post regulatory toolkit.

G5 regulation breaks with the established matrix for generations one to four. G5 expands the regulatory canvas, taking ICT regulation to the next level: enhanced collaboration in an ex post environment. Collaboration here is the natural evolution of incentives into a richer, more interactive set of regulatory two-sided practices that directly involve market players – alongside other sectors' regulators. Incentive regulation can create a competitive advantage for national digital markets through the combination of a proportionate G4 regulatory framework, increased support through the regulator's collaborative engagement strategy and wider measures to protect consumers' interests.

We cannot predict everything the future has in store; however, unlike the previous generations, the next generation of regulation, GX, will likely rely on a more ubiquitous interplay between regulators and market players. Regulation will not be put in place before or after, but rather when time is right – and this can be at any time, from the player's market entry and throughout the operational life cycle.

THE ROLE OF INCENTIVES IN THE G5 TOOLKIT

Incentive regulation is not a silver bullet solution. Incentive schemes need to be forward-looking and open to innovation. They need to be carefully configured according to market needs and national policy priorities, and requires regular review in order to work. However, we can draw inspiration from practices and tools

Box 25:

NEW GENERATION OF INCENTIVE REGULATORY MODEL IN THE ENERGY SECTOR

Ofgem, the UK energy regulator, has implemented a new framework for setting price controls for network companies. Over the next decade these companies face an unprecedented challenge of securing significant investment to maintain a reliable and secure network, while dealing with changes in demand and generation that will occur in a low-carbon future. Such a statement can sound rather familiar to ICT regulators.

RIIO (Revenue = Incentives + Innovation + Outputs) is a new performance-based model that sets the network companies' price controls for a period of eight years, starting in 2013. This model provides a more balanced approach to cost reduction. The regulator's goal is to offer companies a fair return on investment while ensuring that financial objectives do not harm the overall quality of operations.

The RIIO price control framework incentivizes regulated utilities through quality and performance indicators focused on six outputs listed in the table below. To illustrate the usefulness of the model for the ICT sector, we have matched energy sector topics with those on the G4 and G5 regulators' agenda:

RIIO for network operators – Energy		Possible RIIO for network operators – ICT
1	Safety	Cybersecurity, including data protection
2	Environment	Infrastructure sharing options & practices
3	Customer service	Customer service
4	Connecting customers	Coverage & subscriptions to services
5	Social obligation, in particular to vulnerable customers	Options available for vulnerable customers (e.g., low-income, youth/elderly, disabled)
6	Reliability of the network	Quality of service & experience/ CIIP

RIIO is one example of how regulatory patterns can evolve in the future. Similar models can be usefully applied to ICT regulation, providing two-in-one – an incentive package for network providers and an enhanced consumer-protection framework for ICT consumers.

Source: [Based on Ofgem](#).

from other sectors, learning a great deal from peer regulators as technologies and business models converge, and as momentum of collaborative ICT regulation grows. Ultimately, the harmonization of regulatory practices across the board could unleash innovation and growth, with incentives playing a powerful role in the G5 toolkit:

- They can be – and are being – repurposed to fit the new environment with new players and patterns. Established practices in transparent regulatory decision-making and quality of service have their place.
- They can support regulatory goals in key areas of intervention including infrastructure buildout, diversification of service and content offers and affordability.

- They can trigger co- and self-regulatory practices among market players through targeting issues like cybersecurity, data protection and privacy – issues that have not, to date, been successfully regulated through obligation.
- A non-exhaustive set of regulatory incentives under G5 regulations is outlined in Table 18. They are not all new; however, in G4 and G5 they are likely to be preferred to existing alternatives leaning heavily on obligations. Incentives are generally more easily implemented and have more chances to succeed.

In the spirit of collaborative regulation, it can be useful to learn lessons from regulatory practices of other sectors of the economy. An example of an incentive regulatory model from the energy sector, featured in Box 25, provides insight.

Table 18:

REGULATORY INCENTIVES TOOLKIT FOR THE FIFTH GENERATION OF ICT REGULATION

Source: ITU, based on the ITU-infoDev ICT Regulation Toolkit, www.ictregulationtoolkit.org

Main areas of intervention	Incentives	Description / Advantages	+ / -	Market impact/ Regulatory impact	Country examples
Infrastructure & network expansion	Simplification of licensing regime and procedures, especially ex ante	Ensures flexibility to accommodate future technological and market changes and reduce administrative burdens and fees on market players.	+	Facilitated entry of new market players Enhanced competition	EU Singapore Tanzania Trinidad & Tobago Uganda
	Administrative incentive prices (AIPs)	'Administrative' because prices are set by the regulator reflecting the opportunity cost of spectrum while incorporating potential 'incentive' properties: prices are thereby set at a level to encourage efficient use reflecting spectrum scarcity. There is strong evidence that AIPs, which are intended to be set at a level reflecting spectrum scarcity in particular bands, can encourage efficiency and economy in spectrum use.	+	Improved economic efficiency	Australia New Zealand UK
	Smart subsidies (UAS)	An initial subsidy (usually one-off) that is designed to kick-start service provision in rural or high-cost areas, and low-income population groups that will not be reached by the market alone, even if it is an efficient market, or at least not for a long time to come. Although the number of countries applying it has decreased recently, smart subsidies has its place in the regulatory incentives toolbox.	+	Minimizing network buildout cost Market growth	Mongolia Nepal Uganda
	Reduced regulatory fees (recurring or for licences, etc.)	Levying proportionate, justified fees is considered best regulatory practice, however the amount of fees for licences, spectrum, numbers and other resources should be regularly reviewed and can be reduced, with proper justification.	+	Facilitated entry of new market players Enhanced competition	Argentina Brazil Ecuador Venezuela
	Tax holidays (also include tax credits, accelerated depreciation on assets, and export subsidies and import entitlements)	Tax reduction or elimination that is offered to new markets entrants, especially foreign.	+	Higher FDI Increased GDP in ICTs	Brazil Guatemala

Main areas of intervention	Incentives	Description / Advantages	+ / -	Market impact/ Regulatory impact	Country examples
	Broadband plan: various regulatory & financial incentives	Examples include measures to unbundle and co-locate services, opening the Universal Services Programme for broadband initiatives, and allowing for broadband service delivery through multiple technologies, including wireless solutions.	+	Increased penetration Connecting the unconnected	Bulgaria Ghana Honduras Malaysia Thailand US
Diversification of services	Infrastructure sharing (permitted or mandated at different layers – MVNOs, bitstream, cable/fibre collocation)	Lowers the cost of deploying broadband networks. Certain sharing options could also pose risks, in particular by reducing competition. Access to non-telecom infrastructure becomes more common.	+/-	Increased coverage Increased affordability of services Enhanced service-based competition	Brazil Dominican Republic Georgia Jordan Pakistan Portugal
	Spectrum sharing (or spectrum commons) and secondary trading	Can be accomplished through licensing and/or commercial arrangements involving spectrum leases and spectrum trading. Spectrum can also be shared in several dimensions; time, space and geography. In the spectrum commons, low-power devices operate on the basis of signal propagation, which takes advantage of power and interference reduction techniques.	+	Improve market efficiency Facilitated access to spectrum by new players	Cape Verde EU (some countries) Guatemala India Turkey US
Affordability	Price caps –access and/or retail pricing	If price caps must be applied, it should be in a justified situation and in a proportionate manner. Caps must be consistent and non-discriminatory based on costing methodologies to promote competition and enhance infrastructure investment. The regulator defines a main price cap formula to calculate maximum prices of services. If the operator achieves greater efficiencies than required by the regulator (allowed RoI), it can retain the difference as increased profits.	-	Increased economic efficiency Price reduction	Australia Barbados EU
	Deregulation of retail pricing caps	After reaching market maturity, retail pricing is generally deregulated.	+	Price reduction	Hong Kong, China UK

Main areas of intervention	Incentives	Description / Advantages	+ / -	Market impact/ Regulatory impact	Country examples
Content	Light-touch regulation on OTTs/OSPs	In the case of VoIP, a number of policy and regulations have classified it as a telecom/ICT service or explicitly legalized VoIP services.	+	Usage stimulation	Bangladesh Bahamas EU Indonesia Iran Malawi
Cybersecurity, privacy & data protection	Adoption of basic technical controls & standards for cybersecurity	Incentivize market players to level up their cybersecurity readiness while encouraging manufacturers to deploy more 'privacy-by-design' solutions.	+	Better consumer protection Improved network resilience	UK
Quality of service & experience (QoSE)	Monitoring the implementation of licence conditions/ measurement targets, etc.	Is necessary to ensure consumer rights are met and where they are not, follow up with the available regulatory enforcement tools or remedies.	-	Enhanced consumer information Better user experience	China Colombia Rwanda Switzerland Tunisia Ukraine
	Publishing QoSE measurements	Publishing at least some measurements is central to helping consumers make informed choices. In addition, it is often the main technique for encouraging compliance with QoSE norms and creating a positive competitive dynamic among service providers.	+	Enhanced consumer ability to make informed choices	Australia Canada Chile Colombia Singapore
Transparency	Open consultations	Consultation with ICT sector stakeholders reinforces the perception of a transparent regulatory process. Consultation also allows the regulator to directly receive the views of consumers, existing service providers and prospective players on a proposed regulatory initiative. Receiving feedback from these stakeholders assists the regulator to fine-tune the proposal and come closer to the demands of both service providers and consumers.	+	Market-wise regulation Increased confidence of service providers and investors in regulation Reduced investment risk	Armenia Benin EU India Jamaica Saudi Arabia



TREND 7

COLLABORATIVE REGULATION

CONTEXT: COLLABORATION – FAST-TRACKING THE PROMISE OF THE DIGITAL ECONOMY

With the growing economic confidence of ICTs and related markets – driven by innovation and technological transformation – has come a new regulatory assertiveness. Over the past 20 years, ICT regulators have stepped up to the challenges the sector has gone through. Today, they have built sound expertise and power over the markets – they are in control. New disruption vectors, however, put pressure on established frameworks and regulators' relationships with the other stakeholders in the digital economy.

Collaborative regulation is built on hard work, an open attitude and team play. G5 regulation builds upon the solid foundation of G3 and G4 regulation. At its core are principles of strengthening institutional capacity and the legal mandate of the regulator, sound regulatory regimes and enhanced competition frameworks. G5 does not involve greater volumes of regulation, but rather more hands-on, inclusive regulation and decision-making. Tools and processes set G5 apart from previous generations, not the nature of its regulation.

We argue that collaboration is the way forward for regulation in the ICT sector and beyond – and there is a growing consensus around this direction. To attain moving regulatory targets today, the immediate questions are *how* to collaborate and *with whom*. The collaborative approach is about what you are regulating and how, as opposed to what your role is in the market.

Increasing numbers of ICT regulators are now teaming with regulators from other sectors to address multi-sector issues. Such collaborative regulation brings all parties to the table to share their sector-specific expertise, but also responsibility for decision-making. Transparent and practical cooperation, coupled with communication across sectors and key players – regulators and policy-makers and other stakeholders – are essential to regulation that responds to market realities, players' needs and consumer demand. Equipped with this collaborative, problem-solving attitude, regulators can better harness and maintain the buoyant growth of ICT markets.



ROLES AND GOALS

A recent ITU discussion paper characterizes G5 collaborative regulation as having the right tools for effective cross-sector collaboration which in turn includes and empowers citizens through ICTs.¹²⁷ Policy-makers and regulators should work together to provide people with access to technologies, the digital skills to use them, and trust in using ICTs. In consequence, the ICT regulator must not only take on a number of roles and functions, but be prepared to deliver on them (see Figure 43). ‘Business as usual’ is not good enough – collaborative regulation *federates* regulators, industry and consumers to engage and empower users in the digital economy. Digital Financial Inclusion and the interplay between financial

sector and telecommunication/ICT regulators is an illustration of such an evolution (see Box 27).

THE WHEEL OF COLLABORATIVE REGULATION: FIVE ROLES FOR ICT REGULATORS

Regulate:

ICT regulators should adopt practices that are more open, share information better and keep abreast of what is happening beyond its purview – from ex ante regulation to dispute resolution. Core regulatory functions need to be discharged

127 ITU, *GSR-16 Discussion Paper : Building Blocks for Smart Societies in a Connected World: A Regulatory Perspective on Fifth Generation Collaborative Regulation*

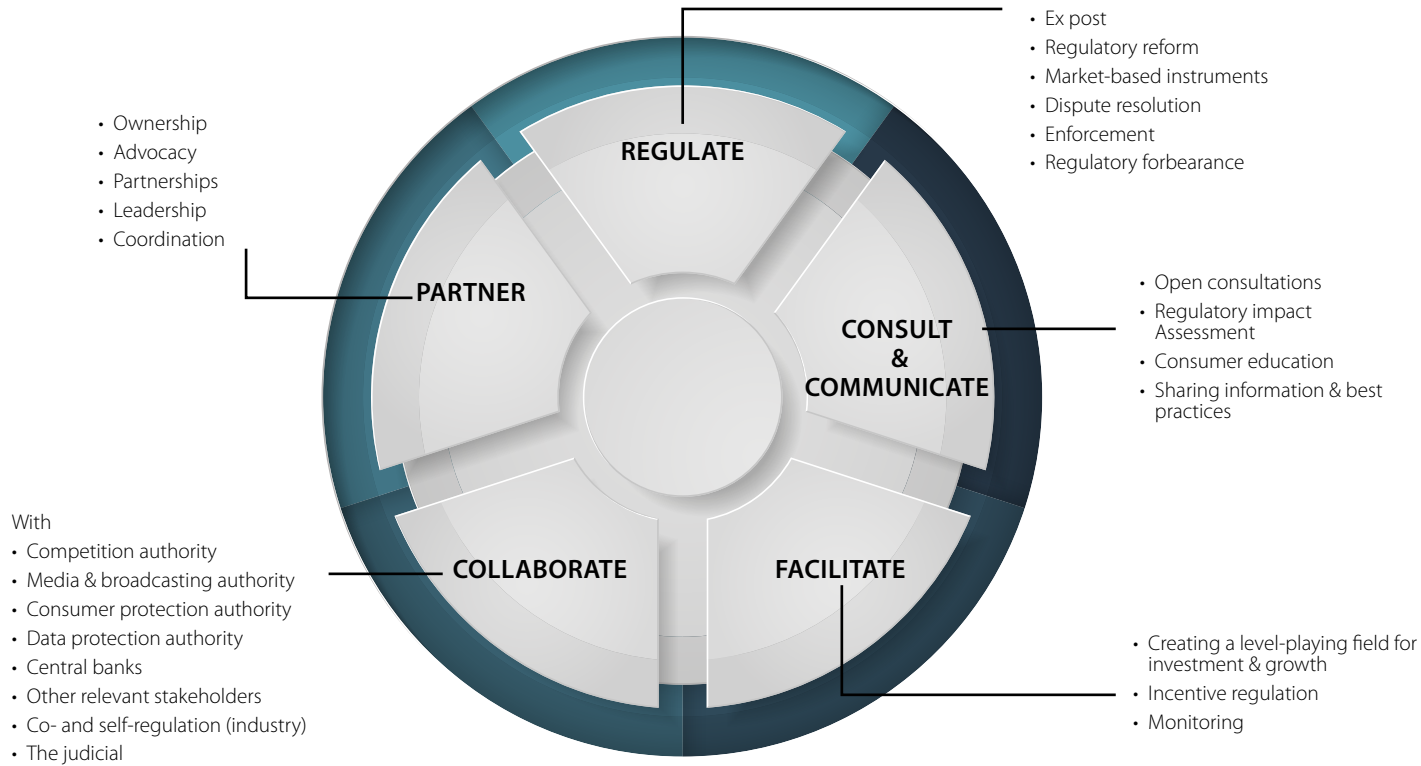


Figure 43:
**THE WHEEL OF
COLLABORATIVE REGULATION**

Source: ITU.

in close interaction with key stakeholders while reconciling all goals (these may point in different directions).

Consult & communicate:

Public consultations and consumer education ventures though not new, must continue to critique and feed ideas back into the regulation-making process. This helps ensure regulators remain grounded.

Facilitate:

The facilitation role is not new but becomes even more central: a pillar of G3 and G4, the role of effective market facilitation remains bedrock for boosting private initiative and connecting more people, levelling the playing field in ICT markets and providing the right incentives for doing business. Nothing less than the future of new services and products is at stake – their availability, affordability and reliability.

Collaborate:

ICT regulators now need to take collaboration to the next level through:

- intensifying collaborative efforts on a growing number of issues;

- securing a legal mandate for cross-sector collaboration;
- determining, documenting and communicating the mechanics of collaboration; and
- integrating collaboration into their regulatory mindset.

Partner:

The collaborative regulator is a partner – and a doer and leader. Neither vigilante nor middleman, the regulator reaches out pro-actively to all stakeholders offering help or asking for advice. The collaborative regulator advocates for ICTs and ICT market players, and leads the way towards holistic and future-proof market standards.

WHO ARE THE STAKEHOLDERS?

Collaborative regulation aims to find workable solutions around common issues. Potential counterparts can vary from policy-makers to separate government agencies such as other sectors' industry regulators.

Interlocutors in collaborative regulation from adjacent sectors include (when they exist at the national level) the competition authority, the media and broadcasting authority, the consumer protection authority, the data protection authority and financial regulators including central banks. Partners will differ from one country

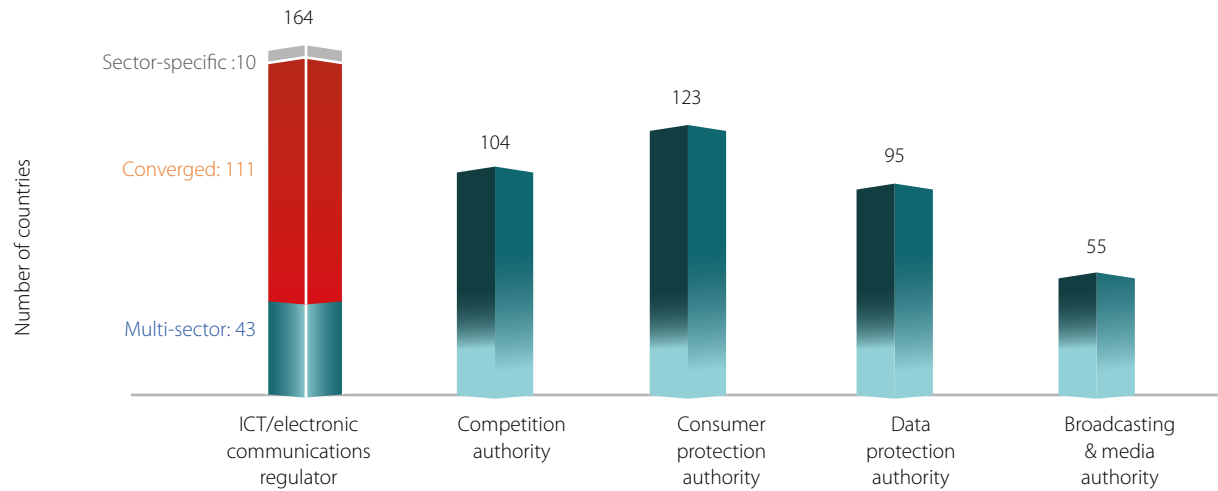


Figure 44:
MAIN INTERLOCUTORS IN COLLABORATIVE REGULATION WORLDWIDE, 2015

Source: ITU.

to another – not all countries have established separate agencies in all areas (see Figure 44). ITU data shows a majority of countries with a competition authority and consumer protection authority. Roughly one-third have a data protection agency and separate broadcasting and media authorities.

Some countries have created the role of converged ICT regulator. This avoids the overlapping of separate regulators and enables better efficiencies for private and public sectors. Where the mandate is clearly specified and sufficient resources are available, the combination of expertise can allow the effective handling of issues relating to emerging technologies, and issues such as telecommunication and/

or media and broadcasting licensing issues where new models of delivery are replacing old ones.¹²⁸

At least ten countries have developed a multi-sector regulatory model. Sectors that come together include utilities (water, electricity and rail) as well as spectrum. One advantage of this model is that it creates more precedents, and therefore less uncertainty for investors. A decision by a multi-sector regulator in relation to one sector on a regulatory issue common to other sectors (e.g., the application of price cap regulation or cost accounting rules) will set a precedent that is valuable to potential investors in the other sectors. The risk, however, is that such a precedent

¹²⁸ ITU, *GSR-16 Discussion Paper : Building Blocks for Smart Societies in a Connected World: A Regulatory Perspective on Fifth Generation Collaborative Regulation*

could be applied inappropriately across other sectors. Experience shows that establishing the legal framework for the multi-sector regulator is often complex – for example the level of independence and the allocation of functions between the Minister and the regulator.¹²⁹

WHAT IS THE END GAME?

Like regulation, collaboration is not a goal in itself. The goal is to create a win-win situation for all market players and for consumers.

Competition: How does collaboration play?

Competition lends itself to collaboration and collaborative regulation. With ICTs underpinning many of the sectors of the economy, competition issues cut potentially across those sectors and are likely to keep the respective sector regulators busy. It makes sense to combine forces and expertise, assessing possible scenarios together, and choosing the most viable solution. A collaborative approach can deliver a more coherent and holistic outcome than a silo sector approach, and increases its lifespan. Is collaboration only positive? In this case, it does no harm. The only major risk is not reaching agreement and putting forward a single-sector solution.

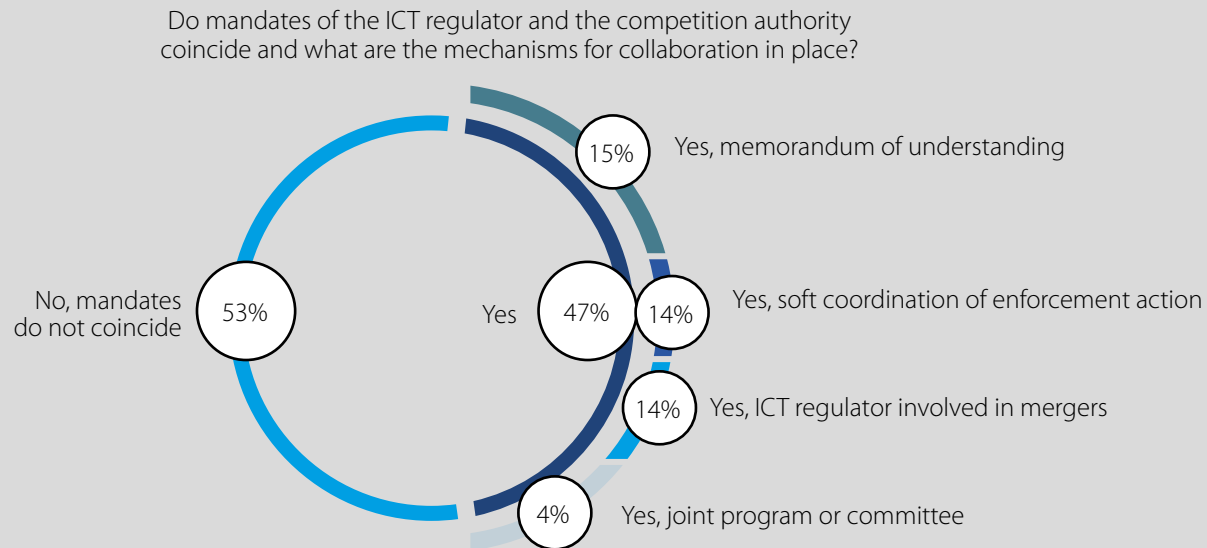
A snapshot of the current status of collaboration between the ICT regulator and the competition authority is provided in Box 26.

129 ITU-infoDev ICT Regulatory Toolkit

Box 26:

COLLABORATION BETWEEN THE ICT REGULATOR AND THE COMPETITION AUTHORITY, WORLDWIDE, 2016

- About half of countries worldwide – from all regions – have legal ground for collaboration between the ICT regulator and the competition authority
- The big picture:
 - roughly 15 per cent of ICT regulators have signed a memorandum of understanding with the competition authority
 - some 14 per cent of ICT regulators are involved in approving mergers
 - a further 14 per cent are engaged in soft coordination of their enforcement action
 - 4 per cent have established a joint programme or committee to tackle competition issues in the ICT sector
 - over half of all countries currently do not have a formal framework for collaboration between the ICT regulator and the competition authority.
- The majority of countries having established collaborative mechanisms are in G3 and G4; however some G2 countries have also moved towards establishing a sound basis for joint action.



Note: The graph reflects what is legally permissible and does not account for the actual implementation.

Source: ITU.

Collaborative regulation can also greatly benefit the major area of consumer protection. Our research shows that practices in this area are at a similar stage as those in the area of competition. In 23 per cent of countries, the mandates of the ICT regulator and the consumer protection authority coincide (see Figure 45) and in further 19 per cent concrete mechanisms for collaboration are in place. Around 60 per cent of countries have not yet engaged in collaborative regulation – which leaves plenty of room for expansion in the near future.

Collaborative regulation – not a silver bullet solution

We should recognize that collaborative regulation is not a regulatory super model – or super regulation – it isn't. As ICT and new digital markets forge ahead, G5

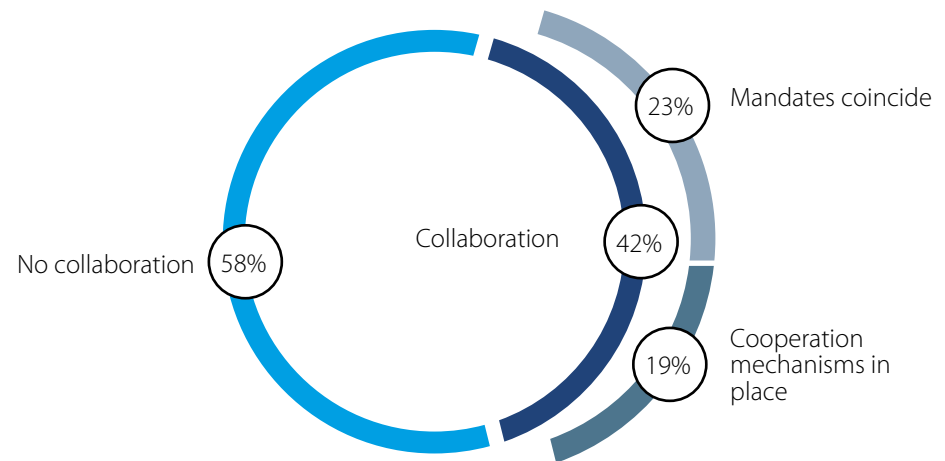
regulation may also hit roadblocks. Take for example the case of enforcing privacy norms and countering abuse of dominance by global players. In other cases, like Airbnb and Uber, regulatory responses are more about existing regulators coming to terms with a new kind of activity that goes outside their mandate and powers than about collaborative regulation. What collaborative regulation does offer is a blending of expertise, a merging of perspectives and the creation of synergies. It is likely to be worth a try.

ITU is working on a collaborative regulation project and new tools will be released at the [Global Symposium for Regulators 2017 \(GSR-17\)](#) and the [World Telecommunication Development Conference 2017 \(WTDC-17\)](#).

Figure 45:
**COLLABORATION
 BETWEEN THE ICT
 REGULATOR AND THE
 CONSUMER PROTECTION
 AUTHORITY,
 WORLDWIDE, 2016**

Source: ITU.

Collaboration between ICT regulator and consumer protection authority, worldwide, 2016



Box 27:**GSR16 BEST PRACTICE GUIDELINES ON DIGITAL FINANCIAL INCLUSION**

Regulators at the 2016 ITU Global Symposium for Regulators (GSR16) called for such collaboration and adopted the following Best Practice Guidelines:

We, the regulators participating in the 2016 Global Symposium for Regulators, recognize that there is no single, comprehensive blueprint for best practice, but agree that country experiences can be enlightening and guide us towards regulatory excellence. In the increasingly complex and dynamic ICT ecosystem, it is important to agree on common principles and put forward clear and simple rules.

We have, therefore, identified and endorsed these regulatory best practice guidelines to facilitate access to and the development of digital financial services for everyone.

Unleashing the potential of two-sided markets

- We recognize that the introduction of m-payments creates a significant opportunity to spread useful and responsible services for the unbanked or underbanked people. Innovative two-sided platforms enable digital financial services such as mobile banking, mobile money micro finance, mobile commerce and international remittance services. While regulation is not a goal in itself, various regulatory measures can be considered to leverage the potential of such platforms for digital financial inclusion.
- Holistic and balanced privacy and data protection legal frameworks need to be enacted, in accordance with internationally-agreed core principles. In order to enhance trust in new financial digital services, it is equally important to broaden the enforcement powers of the ICT regulator and strengthen sanctions in the case of fault, fraud or abuse.
- Clear and straightforward rules and procedures for consumer protection of users of digital financial services should be implemented, in particular for terms and conditions of online contracts, the use of personal data by service providers, tariffs for services and quality of service. Transparent, fast and effective mechanisms for handling consumer complaints should be made available and enforced.

- Interoperability among operators and service providers is essential for reaping the benefits of digital financial services. Regulatory measures geared towards interconnection, unstructured supplementary service data (USSD) access and tariff issues related to digital finance could enable interoperable services at the national level and globally.
- Regulatory measures for reducing the cost of digital transactions and mobile payments can be put in place.
- In view of weighing the impact of current regulations and revising them accordingly, we consider that ongoing monitoring and periodic assessment of the state of digital financial services are needed. Likewise, the views and experiences of all stakeholders should be taken into account and assessed. Adequate revision of regulatory policies should then be carried out.

Coining new regulatory approaches

- We believe that adopting suitable regulatory framework and policies related to digital financial services will encourage services providers to reach out to the unserved and underserved.
- New regulations for digital financial services should be based on a functional approach. The regulatory agencies involved in the various aspects of such services need to reassess their regulatory objectives and examine how they can best be achieved, regardless of technology or legacy market structures.
- Furthermore, regulations shouldn't allow different regulatory treatment or a two-track regulatory approach for incumbents and new players, both from the ICT and the finance sector.
- A lighter licensing regime may be generally appropriate to allow digital financial services to thrive. Innovative licensing schemes for market entry, including provisional and temporary licences, can be envisaged.
- We reiterate that all regulators should consider transposing international best practices and guidelines for digital financial inclusion at the national level.

Addressing overlaps between sectors

- We believe that the various regulators need to collaborate to tackle issues related to digital financial inclusion, from their inception to adoption to ensuring consumer redress. The ICT regulator and the authorities regulating financial services as well as the dedicated competition and consumer protection authorities should know and fulfill their respective powers and responsibilities. Where their mandates overlap, specific mechanisms could be considered to ensure the interplay (such as memoranda of understanding or less formal agreements). Good governance principles and practical solutions should be leveraged for a truly collaborative approach to regulation.
- A sound national framework for collaborative regulation goes a long way towards creating working synergies and effectively enabling new services. Such a framework could include:
 - Harmonization of the Telecommunications/ICT Act with the relevant financial legislation and regulatory policies as well as with those in critical cross-cutting areas such as consumer protection, cybersecurity, privacy and data protection.
 - Ongoing dialogue and regulatory cooperation regarding competition between financial and telecom service providers as well as over-the-top players.
 - Periodic open consultations and meetings with stakeholders, public and private, to monitor policy implementation.
- A harmonization of legal and regulatory requirements for digital financial services at the regional or sub-regional level can have a multiplier effect on innovation and investment in national markets. The issue needs to be brought to the agenda of Regulatory Associations and Regional Economic Communities in view of facilitating the spread and benefits of digital financial inclusion in developing regions.

Source: ITU, [GSR-16 Best Practice Guidelines](#).

FORECAST

From increased risks to flamboyant opportunities, the year ahead is likely to herald a number of sea-changes for ICT markets and regulation. This report identifies seven trends that will underwrite change in the regulatory landscape in the years ahead.

FORECAST 1: PARTNERSHIP & COLLABORATION WILL INCREASE

There is much work to be done and regulators across all sectors must rise to the challenge: 3.9 billion remain unconnected to the Internet,¹³⁰ 2 billion are unbanked,¹³¹ 400 million are unable to access essential health services¹³² and 775 million adults lack basic literacy.¹³³ To help meet such challenges, collaborative regulation is

130 ITU, [ICT Facts & Figures 2016](#)

131 World Bank, 2014 [Global Findex](#)

132 World Health Organization (WHO) and the World Bank, [Tracking universal health coverage: First global monitoring report, 2015](#)

133 UNESCO, [Statistics on Literacy](#)

indisputably the way forward. Collaborative G5 regulation harnesses regulatory coherence and power to improve markets. It involves hard work. Functioning as a single machine does not go without institutional challenges and governance issues. But there is much to recommend it. G5 collaborative regulation extends beyond differences and enables regulators to determine the greatest – not the least – common denominator. Collaborative G5 regulation is based on the sharing and recognition of strengths, the reconciliation of differences and a coming together to speak with one voice.

There is momentum now behind the move towards G4 and G5 ICT regulation: Albania, Bahrain, Botswana, Egypt, and Trinidad and Tobago are set to become G4 regulators, while more and more countries and national agencies will move to G5 collaborative regulation – sharing expertise across sectors to better address common challenges and determine shared objectives rather than struggling on as stand-alone authorities.

Box 28:

REGULATORY SANDBOXES FOR FINTECH INNOVATION

A regulatory sandbox is a safe environment in which businesses test new ideas with a small number of customers. Firms in the sandbox can operate without running afoul of normal regulatory requirements. Firms are selected based on potential benefits to customers and market participants, greater competition, increased transparency or reduced cost.

The first regulatory sandbox for fintech was designed by the UK Financial Conduct Authority (FCA), the UK financial regulator. The first cohort of the regulatory sandbox received 69 applications, from which 24 applications were deemed to meet sandbox eligibility criteria and were accepted to develop towards testing, including early stage start-ups, challengers and incumbent firms. The second cohort of the regulatory sandbox is ongoing as this report goes to publication. FCA signed cooperation agreements with the Australian Securities and Investments Commission (ASIC) and the Monetary Authority of Singapore (MAS), the respective national financial regulators. For the first time, financial regulators have agreed to make it potentially easier for innovative firms to access new markets by providing information to one another. In 2016, the Innovation Hub of the U.S. Commodity Futures Trading Commission also featured a regulatory sandbox.

Source: Adapted from [UK Financial Conduct Authority](#) and [US Commodity Futures Trading Commission](#).

FORECAST 2:

REGULATION WILL DRIVE INNOVATION

Regulation needs to lead through volatility sparked by market convergence and disruption. Regulation that aids innovation will help developing countries to power ahead – checking inequality of ICT access and use, as well as of products and services. The Kenya Central Bank, a pioneer of regulatory innovation, has triggered a tsunami across both the financial and the telecom sectors by allowing M-Pesa to deliver digital financial inclusion to millions of the ‘unbanked’. How regulation can power innovation is a key consideration for ICT regulators in their pivotal role of shaping the digital economy of the future.

How best to explore possibilities that regulation opens up – for example consumer demand for new services and social needs at large? ‘Regulatory sandboxes’ is one way (see Box 28). Twenty countries are currently looking into a regulatory sandbox, mainly in the area of fintech. Their wider adoption for ICT-related and OTT-related issues may prove useful in testing and tuning a new generation of regulator-to-business (R2B) and business-to-regulator (B2R) relationships. This will in turn lead to a new era of collaboration and innovation. Regulation for our digital future will however need some ‘out-of-the-sandbox’ thinking too.

FORECAST 3:

THE ICT REGULATOR MEETS THE FINANCIAL REGULATOR

Both ICT regulators and financial regulators recognize common interests and the potential of cooperation. As yet however, there is no model for collaboration that has won confidence from both sides. Closer collaboration will come – but not quite yet.

And yet there is a host of issues clamouring for such collaboration, ranging from e-commerce to mobile money to monetizing customers' data – and between them, they must get it right. The challenge is far from simple: the sheer number and variety of players in digital markets hugely complicate matters, ranging from local fintech start-ups to global behemoths with a full online footprint. Some fall under at least one regulator while others are subject to both – and in all probability with unequal regulatory treatment. Others may be out of the reach of any agency, thriving in a regulation-free paradise. Inequality or unfair regulatory treatment can quickly translate into competitive advantages for some and disadvantages for others.

Regulators from both sides agree that together they can better address consumer protection while giving businesses the space to innovate and grow. In reality however, they often appear to be moving in opposite directions. The failure to embed baseline ICT protection regulation into digital financial services regulation undermines the take-up and reliability of such services. The failure of network infrastructure and service not only damages the quality of digital financial services but makes them unavailable or incur financial loss to consumers and businesses.

Sitting around the table sooner rather than later will make a huge difference; our forecast is that regulators will increasingly do exactly that.

FORECAST 4:

MORE REGULATORY OVERSIGHT FOR OTTs WHILE TELCOS STILL WAIT FOR LESS

Creating a level-playing field for telcos and OTTs/OSPs will involve leveling down regulatory requirements for telcos while levelling up for OTTs. A number of low-risk regulatory moves are expected. In competitive markets, quality of service obligations are good candidates for removal as traditional players often address these to cope with increased retail competition – although transparency obligations should remain. On the other hand, some global OTTs are already a tax target for governments and will become more so.

Regulatory intervention on core issues such as competition and market dominance remains a testing area within the ICT sector and beyond. Clear regulatory rules are yet to emerge. In the EU several court cases address unfair promotion of own content or services of high-profile OTTs. Other sensitive issues include mergers and acquisitions, customer data privacy and use, and traditional economic sectors facing competition from digital platforms – such as Uber and Airbnb.

One thing is sure – new digital market segments need a more nuanced approach to competition policy. Striking the right balance between hands-on and hands-off regulation is likely to take more than another year. However, regulators in many countries are already rolling up their sleeves to redraw competition frameworks.

For the moment, OTTs remain centre-stage for regulators as they consider how best to move forward – all eyes are on them as they seek to establish a new order which will integrate them into the regulatory fold.

FORECAST 5:

NET NEUTRALITY DEBATE REPEATING AND UNWINDING

Net neutrality will remain a central topic over coming years. As 2017 unwinds, the debate is headed in opposite directions across the world:

- In the US: One of the first and most liberal net neutrality regulatory models, the US is being shaken up with new regulation and legislation in sight. Dismantling Title II regulations of Internet services will allow service providers to tier-price Internet bandwidth. In the flux, Verizon has announced that wireless customers on unlimited data plans will experience reduced data speeds as it migrates users to tiered tariffs.¹³⁴
- In India: After banning price discrimination for Internet services, the Telecom Regulatory Authority of India (TRAI) has conducted a public consultation on net neutrality. This is based on recommendations made in a consultation paper by the High Level Committee constituted under the Department of Telecom, notably on proposed regulation of domestic calls on Internet-based apps like Skype, WhatsApp and Viber by placing them on a par with services offered by telecom operators.¹³⁵ Based on the results of the public consultation, the Regulatory Authority may decide to revise its position and regulatory practice on net neutrality.
- In Europe: The Body of European Regulators for Electronic Communications (BEREC) will adopt a common toolkit on how regulators are to monitor net neutrality (network congestion and quality of service). Regulators will adopt a national report in 2017 on implementation of net neutrality; this will then feed into the global report before the end of the year, giving an overall view of implementation by all ICT regulators.

Approaches to net neutrality rules will continue to diverge. Many countries without regulations in place are likely to plough ahead and choose their model for pricing Internet services. Network optimization, traffic management, whatever it is called – net neutrality will be high on the regulatory agenda in 2017.

134 [Telecom TV](#)

135 [The Economic Times of India](#)

FORECAST 6:

PRIVACY & DATA PROTECTION REQUIRE URGENT ACTION

Cyber threats continue to cast a dark shadow over the future of ICTs. The time has come to do more to address such threats, with actions addressing pressing issues such as data privacy and infrastructure protection and of course cyberattacks on payment systems, health records or other personal information.

Trust underpins the growth of many digital services, including information services, hybrid services and products such as mobile money. While these are global in nature, what we consider to be good practice for their operation in the digital world may vary according to individual taste or culture.

Most of the world is not covered either by regional directives or treaties. The only binding international legal instrument in the field is the Council of Europe's "Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data". While it has potential for worldwide application, it is now thirty years old. In the APEC region, the Asia-Pacific Economic Cooperation (APEC) Privacy Framework has since 2005 been the main legal instrument for dealing with barriers to information flows that facilitate trade and economic activity.

Progress is in prospect in the EU over the coming two years. New EU data protection rules came into force in 2016 and will apply from May 2018 after EU Member States have enacted them into national legislation. In 2017-2018 then, we will see movement and discussion on many cybersecurity topics and data privacy across the 27 EU countries. This development will likely accelerate moves in other regions as countries seek to build a more predictable, privacy-friendly environment for businesses and consumers. Specific rules for personal data in regard to children, youth and other vulnerable groups will enjoy wider adoption. Internationally, efforts will continue to determine the right forum for discussion and what common ground can be built around digital identity and data privacy.

FORECAST 7:

HARMONIZATION ACROSS REGIONS ACCELERATES

Regional policy and regulatory frameworks are based on best national, regional and international practices. The trend towards regional harmonization is not new. Multiple organizations have led targeted projects in various regions. From 2008 to 2013, ITU and the EU championed a large-scale joint project for harmonizing policies on competition, licencing and e-commerce in sub-Saharan Africa, the Caribbean and Pacific Islands. The project was well supported regionally and has had an overwhelmingly positive impact,¹³⁶ demonstrating how harmonized regulation can help develop competitive regional markets for ICT services. Harmonization within a region enables vibrant competition – global or regional players can compete with local players in areas like payment, entertainment, cloud services and in the deployment of big data-enabled business models.

Harmonization does not translate to the same solution being imposed on all countries. It does translate to similar responses to similar issues and varied responses to different problems.

The focus of thinking on harmonization has shifted more recently to the need for broader policies across all economic sectors – including at the regional level. There is a clear opportunity for marshalling regional approaches, enabling multiple sector regulations to benefit all citizens – especially the bottom of the pyramid. Such a move might provide at least part of a solution to some of the more pressing issues in digital markets. Such efforts can be effectively led by international donor agencies and UN organizations in the direct implementation of the Sustainable Development Goals (SDGs), many of which rely directly on ICTs to promote sustainability.

136 ITU-EU-ACP Project

CLOSING:

WHAT REGULATION IS AND ISN'T

How can we best characterize modern regulation?

- **Constant change:** Regulation is subject to constant change, opening up new avenues for tech innovation, creating business opportunity and providing safe harbor for consumers. As markets become more complex and their interplay with regulation more candid, regulators need to stay pro-active, to demonstrate leadership, skill-up and reach out to new actors.
- **No single model:** Doing nothing is not an option. And while no single regulatory model is perfect, the guiding imperative is to integrate ICT regulation with other sectors. Otherwise, the next billion to be connected will be left waiting.
- **Regulation is both science and art:** Regulation is increasingly a science, with regulators more mindful of evidence and the implications of regulatory rules on the digital ecosystem. Regulation is increasingly an art – the art of convening, leading and ensuring that collaboration delivers. It's become the art of making everyone happy – including consumers, businesses and governments.

Regulation is not an end in itself, but about achieving a maximum with existing resources – about weighing regulatory intervention and its impact. Political agendas or immediate business interests have no place in regulatory decision-making. The driver for regulation is how best to extend the benefits of innovation and economic growth to the greatest number of citizens.

Figure 46:

WHAT REGULATION IS AND ISN'T

GOOD REGULATION IS	REGULATION IS NOT
Positive goodwill	A Goal or A Must
Leadership	A Setback
Ahead of the curve	Backwards-looking
Open	Self-sufficient, a silo
Adaptive	Set in stone
Agile	There forever
Evidence-based	One-size-fit-all

NOTE ON METHODOLOGY – ICT REGULATORY TRACKER

WHAT IS THE ICT REGULATORY TRACKER?

The ICT Regulatory Tracker is an evidence-based tool to help decision-makers and regulators make sense of the rapid evolution of ICT regulation. The Tracker enables various analytical features to pinpoint the changes taking place in the CT regulatory environment. Using both quantitative and qualitative data, the Tracker makes possible benchmarking and the identification of trends in ICT legal and regulatory frameworks. It likewise helps identify the gaps in existing regulatory frameworks, making the case for further regulatory reform towards achieving a vibrant and inclusive ICT sector.

SCOPE

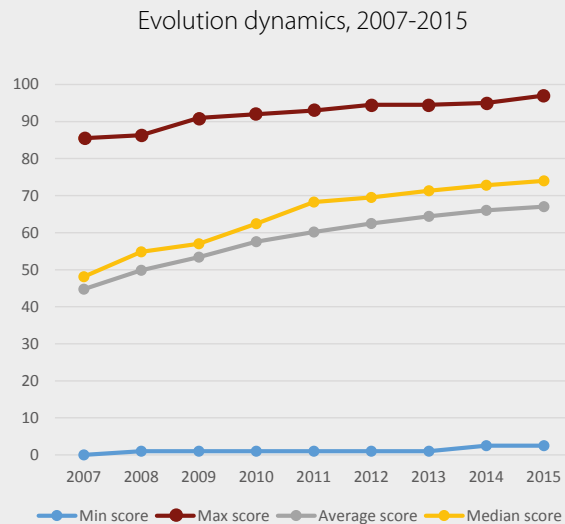
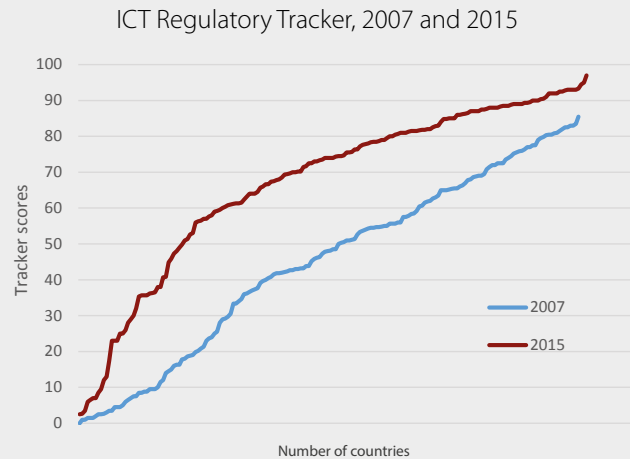
The ICT Regulatory Tracker is composed of a total of 50 indicators (11 composite, see full list below) grouped into four clusters:

- 1) the regulatory authority (focusing on the functioning of the separate regulator),
- 2) regulatory mandates (who regulates what),
- 3) the regulatory regime (what regulation exists in major areas) and
- 4) the competition framework in the ICT sector (level of competition in the main market segments).

The Tracker covers 185 ITU Member States and Hong Kong, China over the period 2007 – 2013, 187 countries and economies in 2014 (adding Nauru) and 189 countries economies in 2015 (adding Solomon Islands and Somalia). The full list of countries is available in Annex 1.

EVOLUTION DYNAMICS OF THE ICT REGULATORY TRACKER, 2007–2015

Note:
 2007: 186 countries
 2015: 189 countries
 Source: ITU



DATA MECHANICS: CODING & SCORES

After coding the originally qualitative information, all indicators are given a score between 0 and 2. The benchmark for the scoring is what is considered the best possible scenario based on the internationally recognized regulatory best practices that were adopted by the global community of regulators at the [annual ITU Global Symposiums for Regulators](#).

The dynamics of the evolution of the ICT Regulatory Tracker scores of the countries and economies covered are reflected in the two figures on the left.

SOURCE OF DATA

The Tracker is based on self-reported information gathered yearly via the [ITU's World Telecommunication Regulatory Survey](#) and desktop research. For years when questions were left blank or when the survey was not answered by a country, the latest available data for the indicator is retrieved.

STRUCTURE & INDICATORS

The structure of the ICT Regulatory Tracker and the full set of indicators are shown in the following two tables.

DETAILED METHODOLOGY

The matrix with the detailed methodology of the ICT Regulatory Tracker is provided in Annex 2. It can be downloaded online www.itu.int/go/tracker. It provides detailed information on the choice, composition and scoring of each indicator.

ICT REGULATORY TRACKER STRUCTURE, 2007-2015

Cluster	Name	Number of indicators	Max score	Min number of indicators for countries to be ranked
1	Regulatory authority	10	20	3
2	Regulatory mandates	11	22	3
3	Regulatory regime	15	30	4
4	Competition framework	14	28	4
	ICT Regulatory Tracker	50	100	14

Source: ITU.

INDICATORS INCLUDED IN THE ICT REGULATORY TRACKER, BY CLUSTER

Cluster 1:

REGULATORY AUTHORITY

1. Separate telecom/ICT regulator
2. Autonomy in decision-making
3. Accountability
4. Percentage of diversified funding
5. Public consultations mandatory before decisions
6. Enforcement power
7. Sanctions or penalties imposed by regulator
8. Dispute resolution mechanism
9. Appeals to decisions
10. Existence of competition authority

Cluster 2:

REGULATORY MANDATE

Who is in charge of regulating the following?

11. Quality of Service (QoS) obligations measures and service quality monitoring
12. Licensing
13. Interconnection rates and price regulation
14. Radio frequency allocation and assignment
15. Spectrum monitoring and enforcement
16. Universal service/access
17. Broadcasting (radio and TV transmission)
18. Broadcasting content
19. Internet content
20. IT
21. Consumer issues

Cluster 3:

REGULATORY REGIME

- 22. Types of licences
- 23. License exempt
- 24. Operators required to publish Reference Interconnection Offer
- 25. Interconnection prices made public
- 26. Quality of Service monitoring required
- 27. Infrastructure sharing for mobile operators permitted
- 28. Infrastructure sharing mandated
- 29. Co-location/site sharing mandated
- 30. Unbundled access to the local loop required
- 31. Secondary spectrum trading allowed
- 32. Band migration allowed
- 33. Number portability required from fixed-line operators
- 34. Number portability required from mobile operators
- 35. Individual users allowed to use VoIP
- 36. National plan that involves broadband

Cluster 4:

COMPETITION FRAMEWORK

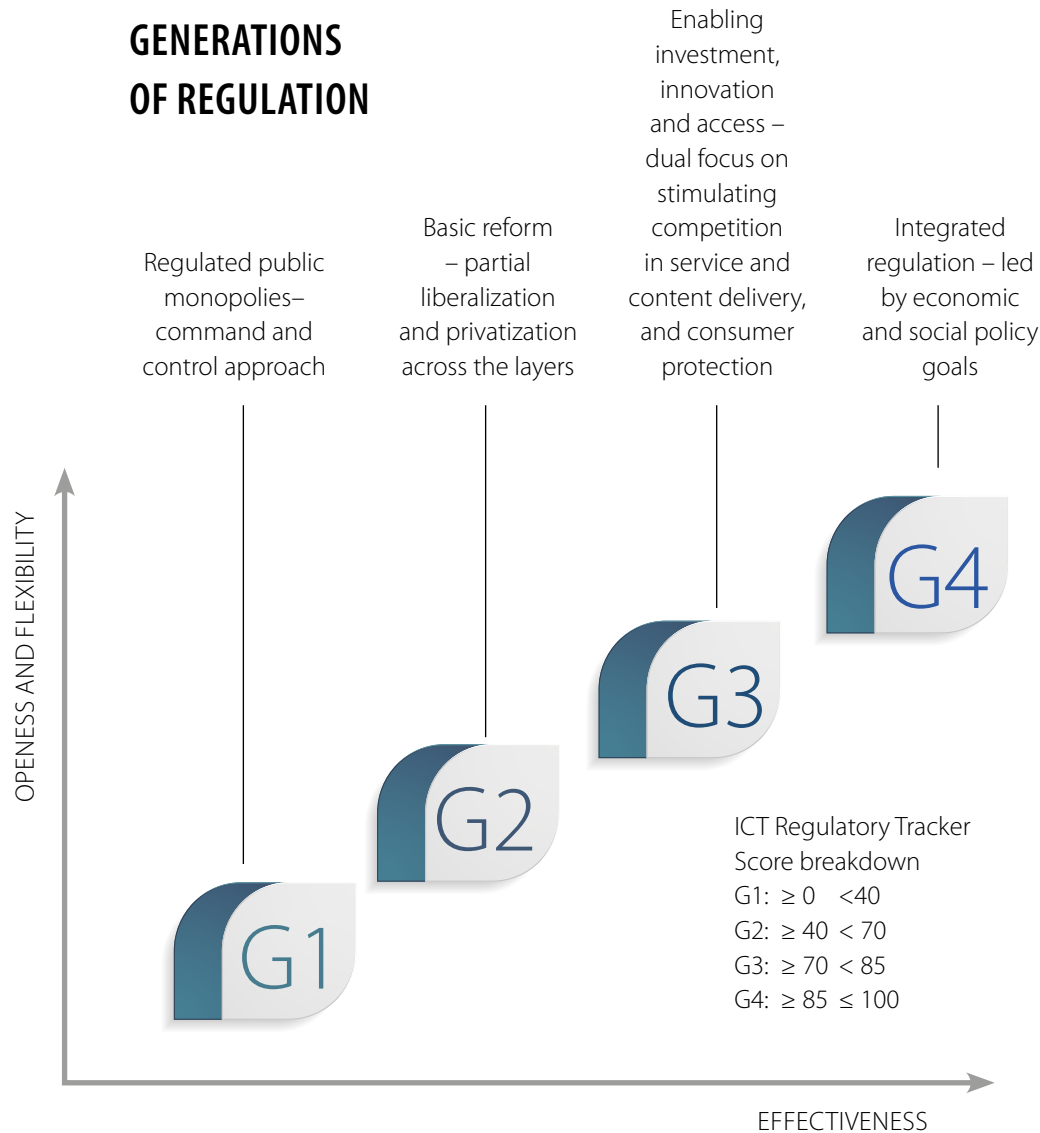
Competition exists in the following market segments:

- 37. Local and long distance (domestic and international) fixed line services
- 38. IMT (3G, 4G, etc.) services
- 39. Cable modem, DSL, fixed wireless broadband
- 40. Leased lines
- 41. International Gateways
- 42. Status of the main fixed line operator (public, partially or fully private)
- 43. Legal concept of dominance or SMP
- 44. Criteria used in determining dominance or SMP

Foreign participation/ownership in:

- 45. Facilities-based operators
- 46. Spectrum-based operators
- 47. Local service operators/long-distance service operators
- 48. International service operators
- 49. Internet Service Providers (ISPs)
- 50. Value-added service providers

GENERATIONS OF REGULATION



GENERATIONS OF REGULATION

To help analyze the evolution of ICT regulation worldwide, identify progress areas as well as gaps and measure those, the countries included in the Tracker are split into score thresholds that relate to generations of regulation, for any given year.

Using the concept of generations of regulation, the Tracker can be used to showcase progress within the same country over time, compare between countries and regions or track the ICT regulatory trends in specific areas at the national, regional and global level.

FEEDBACK & CONTACT

If you are an ITU Member State Administration and you wish to provide recent or historic data for your country's ICT regulation, please write to us at treg@itu.int

If you would like to know more about the tracker or have queries or suggestions, please get back to us at treg@itu.int

ANNEX 1

LIST OF COUNTRIES

Afghanistan	Belize	Chile	El Salvador	Guatemala
Albania	Benin	China	Equatorial Guinea	Guinea
Algeria	Bermuda	Colombia	Eritrea	Guinea-Bissau
American Samoa	Bhutan	Comoros	Estonia	Guyana
Andorra	Bolivia	Congo (Dem. Rep.)	Ethiopia	Haiti
Angola	Bosnia and Herzegovina	Congo (Rep.)	Faroe Islands	Honduras
Antigua & Barbuda	Botswana	Costa Rica	Fiji	Hong Kong, China
Argentina	Brazil	Côte d'Ivoire	Finland	Hungary
Armenia	Brunei Darussalam	Croatia	France	Iceland
Aruba	Bulgaria	Cuba	French Polynesia	India
Australia	Burkina Faso	Cyprus	Gabon	Indonesia
Austria	Burundi	Czech Republic	Gambia	Iran (I.R.)
Azerbaijan	Cambodia	D.P.R. Korea	Georgia	Iraq
Bahamas	Cameroon	Denmark	Germany	Ireland
Bahrain	Canada	Djibouti	Ghana	Israel
Bangladesh	Cape Verde	Dominica	Greece	Italy
Barbados	Cayman Islands	Dominican Rep.	Greenland	Jamaica
Belarus	Central African Rep.	Ecuador	Grenada	Japan
Belgium	Chad	Egypt	Guam	Jordan

Kazakhstan	Micronesia	Philippines	St. Lucia	Uruguay
Kenya	Moldova	Poland	St. Vincent and the Grenadines	Uzbekistan
Kiribati	Monaco	Portugal	Sudan	Vanuatu
Korea (Rep.)	Mongolia	Puerto Rico	Suriname	Venezuela
Kuwait	Montenegro	Qatar	Swaziland	Viet Nam
Kyrgyzstan	Morocco	Romania	Sweden	Virgin Islands (US)
Lao P.D.R.	Mozambique	Russian Federation	Switzerland	Yemen
Latvia	Myanmar	Rwanda	Syria	Zambia
Lebanon	Namibia	S. Tomé & Príncipe	Tajikistan	Zimbabwe
Lesotho	Nauru (since 2014)	Samoa	Tanzania	
Liberia	Nepal	San Marino	TFYR Macedonia	
Libya	Netherlands	Saudi Arabia	Thailand	
Liechtenstein	New Caledonia	Senegal	Timor-Leste	
Lithuania	New Zealand	Serbia	Togo	
Luxembourg	Nicaragua	Seychelles	Tonga	
Macao, China	Niger	Sierra Leone	Trinidad & Tobago	
Madagascar	Nigeria	Singapore	Tunisia	
Malawi	Northern Marianas	Slovakia	Turkey	
Malaysia	Norway	Slovenia	Turkmenistan	
Maldives	Oman	Solomon Islands (since 2015)	Tuvalu	
Mali	Pakistan	Somalia (since 2015)	Uganda	
Malta	Palau	South Africa	Ukraine	
Marshall Islands	Panama	South Sudan	United Arab Emirates	
Mauritania	Papua New Guinea	Spain	United Kingdom	
Mauritius	Paraguay	Sri Lanka	United States	
Mexico	Peru	St. Kitts and Nevis		

ANNEX 2

DETAILED METHODOLOGY OF THE ICT REGULATORY TRACKER

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts		
1. Regulatory authority	1	Does a separate (independent in terms of finance, structure, and decision making from the operator(s) and the sector Ministry) Regulatory Authority exist for Telecommunication or Information and Communication Technology (ICT) in your country?	Separate telecom/ICT regulator	Having a separate Regulatory Authority (i.e. independent in terms of finance, structure, and decision-making from the operator(s) and the sector Ministry) is in line with international best practices. Independence heightens the effectiveness of a regulator, with regards to both procedural matters and easier maneuver of funding and actions to achieve the desired social and economic goals. Separation from other governmental agencies/ministries and service providers is generally seen as a factor that enables decisions to be taken in an impartial, fair and transparent manner. This does not negate, however, that in particular circumstances regulators that are not separate may be effective.	"Yes"; "No"	-	2	No	-	Yes
	2	Is the Regulatory Authority autonomous in decision-making?	Autonomy in decision making	Autonomy is relevant to both the accountability and independence of the regulatory authority. It ensures that decisions are made consciously and with impartiality. As the specialized body with knowledge of the market, autonomy grants the regulatory authority with the tools to increase its efficiency and serve as a neutral broker in the market.	"Yes"; "No"	-	2	No	-	Yes

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
3	<p>What are the reporting requirements of the Regulatory Authority?</p> <p>Who is responsible for approving the budget of the regulator?</p> <p>Who appoints the Members and the Head?</p>	Accountability	<p>Notwithstanding the need of independence, the regulatory authorities should be accountable for their actions to ensure effectiveness in legislation and enforcement of rules as well as impartiality in decision making. Having different governmental bodies deciding over the regulatory authority's structure and funding, in addition to the Head or the Board of the regulatory authority, avoids concentration of power and influence from one of the branches of the government over the regulatory decision. Particularly with regard to financial resources, appointment of the head of the regulator and reporting requirements, it is important to have another branch of the government reviewing the regulator's decisions. By doing so, the government will be implementing a system of checks and balances that is likely to prevent a regulator from, on one hand, over-spending (or over-charging the regulated entities) as well as, on the other hand, from conflicts of interest and lack of accountability. Although such controls may be seen as diminishing the regulator's ability to independently make decisions, it will result in the regulator implementing policies and programs needed by the telecommunications sectors and regulated entities are likely to feel a sense of regulatory security and transparency.</p>	<p>"Report to legislature";</p> <p>"Report to Government (or Prime minister)";</p> <p>"Report to other ministry";</p> <p>"Annual report to the sector Ministry";</p> <p>"No reporting requirements";</p> <p>"Other" // "Parliament";</p> <p>"Government";</p> <p>"Head of government";</p> <p>"Sector minister";</p> <p>"Head of the regulator";</p> <p>"Other, please specify" // "Head of state";</p> <p>"Government Head of government";</p> <p>"Sector minister";</p> <p>"Parliament";</p> <p>"Other, please specify"</p>	<p>Pre-coding: (In each sub-indicator): for "Report to legislature" or "Parliament", code as "P"; "Report to Government (or Prime Minister)", "Report to sector Ministry", "Government", "Head of Government", "Head of Government" or "Sector Minister", code as "G"; "No reporting" or "Head of regulator", code as "NR".</p> <p>Coding: 3 different answers = 2; 2 different answers = 1; 3 identical answers = 0. Note: "Government" and "Head of Government" can be considered as the same</p>	2	Coding in all sub-indicators is identical	Coding in two sub-indicators is different	Coding in all three sub-indicators is different

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
4	With regards to the last financial year, please indicate the sources of the Regulator's annual budget and the percentage of annual budget financed from each source	Percentage of diversified funding	The funding sources can directly impact the regulator's independence and political influence should be minimized to the extent possible. Having multiple sources of funding and not just financial sources from government appropriations is in line with international best practices. The funding sources and budgeting processes of regulators (i) may impact on independence, efficiency and cost of regulation and (ii) may directly impact the degree of a regulator's autonomy and competence when carrying out its responsibilities. Multiple sources of funding are generally associated with providing the regulator with more financial independence and greater autonomy in decision-making.	"Percentage of Award/auction of mobile license"; "Percentage of Award/auction of other license"; "Percentage of License fees"; "Percentage of Government appropriation"; "Percentage of Numbering fees"; "Percentage of Spectrum fees"	Consider only the percentage of government appropriation. If it represents between 0 and 33% of the annual budget, classify as "minimal influence" = 2; If it represents between 34 and 66% of the annual budget, classify as "moderate influence" = 1; If it represents more than 66% of the authority's annual budget, classify it as "strong influence" = 0.	2	Strong influence	Moderate influence	Minimal influence

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
5	Are public consultations mandatory before regulatory decisions are made?	Public consultations mandatory before decisions	It is in line with international best practices for the law or regulation to generally require the regulator to conduct public consultations before issuing regulatory decisions. This requirement may specify that consultations are required for regulatory decisions likely to have a significant impact on the market and/or on end users. Public consultations allow for a democratic environment that takes into account in the decision-making process the opinions of consumer associations and individual consumers, the views of established or potential investors as well as other interested parties. They also increase the transparency of the regulatory authority's actions and decisions, and allow for a buy-in from all parties involved in the market.	"Yes"; "In certain cases"; "No"	-	2	No	In certain cases	Yes

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts
6	Does the Regulatory Authority have enforcement power?	Enforcement power	Granting the regulator sufficient enforcement powers under the law is in line with best regulatory practice. To avoid political interference and ambiguous decisions influenced by the interests of market players, the regulatory authority should be empowered to enforce its decisions and regulations and thus ensure compliance with the rules set, improve the predictability of the regulatory frameworks in place and grow a level-playing field. Particularly, regulators should have sufficient powers to (i) enforce procedures in place; (ii) enforce regulations and licence conditions; and (iii) issue orders, directions to operators to carry out or cease certain activities, and (iv) impose sanctions, fines and other penalties for breach of legal/regulatory obligations.	"Yes"; "No"	-	2	No	-	Yes
7	What sanctions or penalties can the Regulatory Authority impose?	Sanctions or penalties imposed by regulator	Empowering the regulator to enforce punitive measures, regulations or licence conditions by imposing penalties or sanctions for violations is in line with international best practices. Providing the regulator with sufficient legal grounding to exercise its enforcement functions is a key factor to ensure the legality/validity of the regulator's actions and decisions and to provide legal certainty to the sector.	"Monetary fines"; "Additional licence obligations"; "Modification of licence"; "Licence suspension"; "Licence revocation"	Sub-group "No sanction"; Sub-group "Moderate sanction" ("Monetary fines"; "Additional licence obligations"; "Modification of licence"); Sub-group "Strong sanction" ("Licence suspension"; "Licence revocation")	2	No sanction	Moderate sanction	Strong sanction

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
8	Does the regulatory framework set up a clear dispute resolution mechanism(s) to resolve disputes (e.g. on interconnection issues, customer complaints, etc.)?	Dispute resolution mechanism	As the ICT sector continues to evolve and become increasingly competitive, it is necessary to establish an effective dispute resolution system. Failure to resolve disputes can quickly limit competition, cause delays in the introduction of new services and technologies, block or reduce investment in the sector, and impede liberalization and development of the sector. Establishing clear dispute resolution mechanisms is in line with international practice. These procedures are critical to guarantee timely and effective intervention from regulators and contribute to the efficient functioning of competitive ICT markets as well as to the protection of consumers' rights.	"Yes"; "No"	-	2	No	-	Yes
9	Are appeals to the decision of the Regulatory Authority (entity in charge of regulation) allowed?	Appeals to decisions	Establishing clear and detailed procedures for appealing the regulator's major dispute resolution and enforcement decisions is consistent with good regulatory practices and is an important part of a comprehensive and effective regulatory framework. Allowing interested parties to appeal the regulator's decisions helps to ensure that the regulator is sufficiently accountable to stakeholders, including the state, service providers and consumers and affirms its credibility while providing the market players with the assurance of fairness and rule of law throughout the process.	"Yes"; "No"	-	2	No	-	Yes

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
	10	Does your country have a Competition Authority?	Existence of Competition authority	Competition authorities overlook multiple market segments in order to avoid anticompetitive actions taken by operators with significant market power, actions which would harm other market players, potential new entrants as well as consumers.	"Yes"; "No"	-	2	No	-	Yes
CLUSTER 1: REGULATORY AUTHORITY						20				
2. Regulatory mandate	11	Please indicate below which entities have responsibility for: - Enforcement of quality of service obligations measures - Service quality monitoring	Traditional mandate: entity in charge of quality of service obligations measures and service quality monitoring	Service quality monitoring is a tool to aid in decisions in order to help customers make informed choices, to understand the state of the market (and help operators achieve fair competition), to maintain or improve quality in presence or absence of competition, and also to make interconnected networks work well together. It is equally as important to establish measures for controlling/monitoring quality of service to set achievable and appropriate targets. We consider that an unbiased and independent regulatory authority is the most capable body to be in charge of service quality monitoring.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Combined and cumulative. Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 0.5 and "Regulatory Authority" scores 1	2	According to sub-groups cumulative answer		

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts
12	Please indicate below which entities have responsibility for licensing	Traditional mandate: entity in charge of licensing	Development and implementation of authorization policies determine the structure, adaptability and level of competition of ICT services. We consider that an unbiased and independent regulatory authority has the knowledge and tools to best allocate authorizations with the goal of maximizing market productivity and efficiency.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 1 and "Regulatory Authority" scores 2	2	Sub-group "Not regulated"	Sub-group "Government"	"Regulatory Authority"
13	Please indicate below which entities have responsibility for: - Interconnection rates - Price regulation	Traditional mandate: entity in charge of interconnection rates and price regulation	There is a consensus among economists and regulators that interconnection prices should promote economic efficiency, actively promoting competition, and additionally help achieve universal service. In the presence of market failures, price regulation is also important to avoid the exercise of market power, promote economic efficiency and competition and ensure that the prices are fair given the quality of service provided. We consider that an unbiased and independent regulatory authority is the most capable body to be in charge of interconnection rates and price regulation.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Combined and cumulative. Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 0.5 and "Regulatory Authority" scores 1	2	According to sub-groups cumulative answer		

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
14	Please indicate below which entities have responsibility for: Spectrum Management – Radio frequency allocation and assignment (licensing)	Spectrum: Entity in charge of radio frequency allocation and assignment	Spectrum is a scarce resource and its efficient use can make an impact upon economic prosperity. Specific technical and service rules govern spectrum allocations and, as a result, they are a crucial determinant of the structure and performance of industry and of institutions devoted to ensuring public safety, security and national defense. We consider that an unbiased and independent regulatory authority has the knowledge to best allocate spectrum authorizations	“Sector Ministry”; “Other Ministry or Government body”; “Regulatory Authority”; “Operator”; “Not regulated”	Sub-group “Not regulated” (“Operator, “Not regulated”) scores 0, Sub-group Government (“Sector Ministry”, “Other Ministry or Government”) scores 1 and “Regulatory Authority” scores 2	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority
15	Please indicate below which entities have responsibility for the functions listed: Spectrum Management – Monitoring and Enforcement	Entity in charge of Spectrum Monitoring and Enforcement	Spectrum monitoring aids spectrum managers to plan and use frequencies, avoids incompatible usage and identifies sources of harmful interference. Spectrum use planning and resolution of spectrum scarcity issues can be accomplished through study and analysis of spectrum occupancy data. We consider the regulatory authority to be the best suited body to deal with compliance regarding rules and regulations, interference issues, frequency use and occupancy.	“Sector Ministry”; “Other Ministry or Government body”; “Regulatory Authority”; “Operator”; “Not regulated”	Sub-group “Not regulated” (“Operator, “Not regulated”) scores 0, Sub-group Government (“Sector Ministry”, “Other Ministry or Government”) scores 1 and “Regulatory Authority” scores 2	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
16	Please indicate below which entities have responsibility for: Universal Service/Access	Entity in charge of universal service/access	Telecommunications markets are dynamic, new technologies are constantly emerging and new services rapidly become popular and then indispensable. Thus, UAS aspirations rise over time and effective regulation could help fulfilling some of these aspirations. We consider the regulatory authority the body most suitable to be responsible for UAS for its industry sector expertise and skilled technical, economic and financial staff; moreover it has a degree of independence perceived to be one step removed from politics and also holds credibility with the industry (the main partner in the implementation of UAS policy).	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 1 and "Regulatory Authority" scores 2	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority
17	Please indicate below which entities have responsibility for: Entity in charge of broadcasting (radio and TV transmission)	New mandate: entity in charge of broadcasting (radio and TV transmission)	Having a converged regulator with authority over ICT and media/broadcasting is in line with international best practices. Since a single authority is charged with regulating these services, the need for formal coordination processes between agencies/authorities is no longer present, often allowing for more efficiency at planning and introducing converged technologies and services to the market. Because of this, converged regulators are conducive to enabling market integration in a converged environment.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 1 and "Regulatory Authority" scores 2	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts
18	Please indicate below which entities have responsibility for the functions listed: Entity in charge of broadcasting content	New mandate: entity in charge of broadcasting content	Cf. description of question 17.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 1 and "Regulatory Authority" scores 2	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority
19	Please indicate below which entities have responsibility for: Internet content	New mandate: entity in charge of Internet content	Cf. description of question 17.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 1 and "Regulatory Authority" scores 2	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority
20	Please indicate below which entities have responsibility for: Information Technology	New mandate: entity in charge of IT	Cf. description of question 17.	"Sector Ministry"; "Other Ministry or Government body"; "Regulatory Authority"; "Operator"; "Not regulated"	Sub-group "Not regulated" ("Operator, "Not regulated") scores 0, Sub-group Government ("Sector Ministry", "Other Ministry or Government") scores 1 and "Regulatory Authority" scores 2.	2	Sub-group Not regulated	Sub-group Government	Regulatory Authority

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
21	Is the Regulatory Authority responsible for: 1a. Providing comparative tariff information 1b. Informing consumers of their rights (consumer education) 2. Handling consumer complaints	Consumer issues: entity responsible for comparative tariff information, consumer education and handling consumer complaints	If the regulator does not have the ability to demand information from operators, particularly incumbent operators, to assess overall market performance and/or investigate alleged violations, then service providers can engage in anti-competitive practices to the detriment of consumers. As a result, the entire regulatory system can be undermined, thus creating uncertainty and constraining market development. Regulators that have the ability to address consumer complaints, allowing consumers another avenue of redress for complaints that are not resolved directly with the operators, ensure transparency and increased social welfare.	"Yes"; "No"	Combined and cumulative: - for questions 1a and 1b, "Yes" scores 0.5 and "No" scores 0 - for question 2, "Yes" scores 1 and "No" scores 0	2	According to cumulative score.		
CLUSTER 2. REGULATORY MANDATE						22			

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts		
3. Regulatory regime	22	What types of licences are provided in your country	Types of licences provided	Issuing service-specific licences, which refer to a particular type of service over a specific type of network, is a customized and lengthy process that does not keep up with the innovations and developments of the ICT sector. Multi-service individual licenses represent a further, although not optimal, step into dropping the barriers for service innovations. General, unified/global licenses stand for increased market liberalization and the application of equal conditions to all service providers, enabling a more competitive environment. It should be noted that issuing individual licences for the radio spectrum authorizations remains a common practice throughout the world, particularly where the demand for the use of a particular frequency band exceeds availability.	"Service-specific individual licences"; "Multi-service individual licenses"; "Unified/global licences"; "General authorizations"; "Simple notification"; "Licence exempt"	Although the question allows multiple answers, the scoring is not cumulative, the highest score (1 or 2) is taken only once.	2	Only Service-specific individual licenses	Only Multi-service individual licenses	Unified/global licences, General authorizations or Simple notification
	23	What types of licences are provided in your country	License exempt	An open entry market allows for competitive behaviour and self-regulating, thus ever-adapting, market conditions. Without the licensing barrier to overcome, service providers can focus their investment into infrastructure building, innovation and competitive services.	Service-specific individual licences; "Multi-service individual licenses"; "Unified/global licences"; "General authorizations"; "Simple notification"; "Licence exempt"	Only the option "Licence exempt" was taken into account; all other answers were considered as blank.	2	-	-	Licence exempt

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
24	Do you require any operators to publish Reference Interconnection Offer (RIO)?	Operators required to publish Reference Interconnection Offer (RIO)	When operators are required to publish RIO, new entrants have sufficient information about the network to allow for decision-making, thus reducing entry time, and to provide a baseline for negotiation. The publication of a standard offer, in the form of a RIO, narrows the scope for a dominant operator to discriminate among applicants for interconnection.	"Yes"; "No"	-	2	No	-	Yes
25	Are interconnection prices made public?	Interconnection prices made public	Making interconnection agreements public opens the discussion to other parties that might have issues at stake, it also ensures transparency for both the population and other market players about the interconnection environment.	"Yes"; "No"	-	2	No	-	Yes
26	Is quality of service monitoring required?	Quality of service monitoring required	Measuring the quality of service of operators helps consumers make their choices considering not only pricing but also the service standards provided by the operator. Moreover, QoS monitoring helps portray the market standards in a realistic way and assists operators in achieving fair competition, especially in the case of secondary trading and infrastructure sharing.	"Yes"; "No"		2	No	-	Yes

Cluster	Indicator	Area		Raw Values	Coding	Bench- mark	0 pts	1 pt	2 pts
27	Is infrastructure sharing for mobile operators permitted (e.g. Mobile Virtual Network Operators)?	Infrastructure sharing for mobile operators permitted	Network-sharing agreements can optimize the use of the coverage for operators, generally reducing costs, thus being beneficial for both the service providers and the consumers. It can also serve as incentive to network deployment. MVNOs allow for other market players – operators – to resell existing products and services from another provider or even bulk buying minutes and data, increasing the profitability of the market.	“Yes”;“No”	-	2	No	-	Yes
28	Is infrastructure sharing mandated (towers, base stations, posts, ducts, etc.)?	Infrastructure sharing mandated	Infrastructure sharing between market operators or with other industries can decrease expenditures by the joint deployment and maintenance of facilities as well as increase productivity of the usage of scarce resources.	“Yes”;“No”	-	2	No	-	Yes
29	Is co-location/site sharing mandated?	Co-location/site sharing mandated	Passive infrastructure sharing is aesthetically, environmentally and economically positive. It provides the opportunity for investment on the improvement of services, greater coverage and innovation due to reduced fixed costs.	“Yes”;“No”	-	2	No	-	Yes
30	Is unbundled access to the local loop required?	Unbundled access to the local loop required	Unbundling reduces infrastructure deployment costs and avoids unnecessary duplication of sections of the incumbent’s infrastructure. By reducing the amount of initial investment – fixed costs -, market entry is stimulated, driving competition forward.	“Yes”;“No”	-	2	No	-	Yes

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts
31	Is secondary spectrum trading allowed?	Secondary trading allowed	Secondary trading promotes optimal, thus more economically productive, use of spectrum. It also helps to create a self-regulating environment given the more effective usage of the frequency bands, both by the new entrant and the network operator who already possesses the rights.	"Yes"; "No"	-	2	No	-	Yes
32	Is band migration allowed?	Band migration allowed	If band migration is allowed, the market participants can provide new services within their existing license. This increases incentives for innovation and more efficient use of the networks, as well as decreasing the cost of a new license.	"Yes"; "No"	-	2	No	-	Yes
33	Is number portability required from: a) Fixed-line operators?/ If yes, is this service currently available to fixed subscribers?	Number portability available to consumers and required from fixed-line operators	Number portability increases competition and quality of services among service providers in order to retain their current clients (which are no longer held back by the imposition of a new telephone number).	"Yes"; "No" // "Yes"; "No"	If both answers are "No" or one is "No" and the other blank, code as "No"; if number portability is required but not available code as "Partial". Finally, if both answers are "Yes", code as "Yes".	2	No	Partial	Yes
34	Is number portability required from: b) Mobile operators?/ If yes, is this service currently available to subscribers?	Number portability available to consumers and required from mobile operators	Cf. description of question 33.	"Yes"; "No" // "Yes"; "No"	If both answers are "No" or one is "No" and the other blank, code as "No"; if number portability is required but not available code as "Partial". Finally, if both answers are "Yes", code as "Yes".	2	No	Partial	Yes

Cluster	Indicator	Area	Raw Values	Coding	Bench- mark	0 pts	1 pt	2 pts
35	Are individual users allowed to make voice over IP (VoIP) or Internet telephony phone calls?	Individual users allowed to use VoIP	As an option to the traditional telephony, the VoIP services represent a different way of placing calls that has been improving over time and imposing competition on the historical market players. It stimulates traditional business models to become more efficient, innovative and reduce costs in order to keep their places in the market.	"Yes"; "No"	2	No	-	Yes
36	Has your country adopted a national plan (initiative, policy, strategy, etc.) to promote broadband?	National plan that involves broadband	The adoption of a national plan that includes broadband reinforces the necessity of a consensus and coordination for both the infrastructure deployment and the regulation of the services to be provided. A more coordinated and accountable environment, in turn, accelerates innovation, boosts investment and raises productivity, all of which, along with the universal access goal of the broadband plan, contribute to higher penetration and competition levels.	"Yes"; "No"	2	No	-	Yes
CLUSTER 3. REGULATORY REGIME					30			

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
4. Competition framework	37	Level of competition: Basic services (Local fixed line services, Domestic fixed long distance, International fixed long distance)	Level of competition in local and long distance (domestic and international) fixed line services	International best practices favor competition over monopolies in the ICT market since competitive markets are known to increase consumer welfare by lowering prices, promoting innovation, improving consumer choice and raising the quality of services. Note: the question refers to what is legally permissible in each member state.	"Monopoly"; "Partial competition"; "Full competition" // "Monopoly"; "Partial competition"; "Full competition" // "Monopoly"; "Partial competition"; "Full competition"	For each sub-indicator, score 0 for "Monopoly"; 1 for "Partial competition"; and 2 for "Competition". Take average average of the three scorings.	2	Average score of the three sub-indicators		
	38	Level of competition: IMT (3G, 4G, etc.)	Level of competition in IMT (3G, 4G, etc.) services	Cf. description of question 37.	"Monopoly"; "Partial competition"; "Full competition"		2	Monopoly	Partial competition	Competition
	39	Level of competition: Broadband services (DSL, Cable modem, Fixed Wireless Broadband)	Level of competition in cable modem, DSL, fixed wireless broadband	Cf. description of question 37.	"Monopoly"; "Partial competition"; "Full competition" // "Monopoly"; "Partial competition"; "Full competition" // "Monopoly"; "Partial competition"; "Full competition" // "Monopoly"; "Partial competition"; "Full competition"	For each sub-indicator, score 0 for "Monopoly"; 1 for "Partial competition"; and 2 for "Competition". Take average average of the three scorings.	2	Average score of the four sub-indicators		
	40	Level of competition: Leased lines	Level of competition in leased lines	Cf. description of question 37.	"Monopoly"; "Partial competition"; "Full competition"		2	Monopoly	Partial competition	Competition
	41	Level of competition: International Gateways	Level of competition in International Gateways	Cf. description of question 37.	"Monopoly"; "Partial competition"; "Full competition"		2	Monopoly	Partial competition	Competition

Cluster	Indicator	Area	Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
42	Status of the main fixed line operator (public, partially privatized/partially private, fully privatized/private)	Status of the main fixed line operator	Both the regulatory authority and the incumbent being overseen by the same entity is not optimal as the decision-making process could be biased to lean towards the interests of the incumbent rather than promote market competition, quality of services and greater welfare for the population.	"State-owned"; "Partially privatized"; "Partially private"; "Fully privatized"; "Fully Private"		2	State-owned	Partially privatized/ Partially private	Fully privatized/Private
43	National anti-trust/competition law recognizes the concept of "dominance" or Significant Market Power (SMP)	Legal concept of dominance or SMP	Defining the concept of Significant Market Power (SMP) is an important step to avoid anticompetitive behaviour. When operators are classified as having significant market power, it is possible for the regulator to impose ex ante regulations (i.e. mandatory publication of Reference Interconnection Offers) to avoid erroneous use of this power.	"Yes"; "No"		2	No	-	Yes
44	Criteria used in determining "dominance" or SMP (geographical, market share, control of essential facilities, easy access to financial resources, strength of the countervailing power of consumers, economies of scale and scope)	Criteria used in determining dominance or SMP	Because market share by itself does not imply significant market power, it is important to have multiple criteria contributing to the definition of SMP – thus increasing the chances of recognizing those operators with power enough to impose anticompetitive environment to other market players.	"Geographical"; "Market share"; "Control of essential facilities"; "Easy access to financial resources"; "Strength of the countervailing power of consumers"; "Economies of scale and scope"		2	Blank	One of any answer or two different answers	Three or more different answers

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts
45	Restrictions to foreign participation/ ownership: Facilities-based operators	Foreign participation/ ownership in facilities-based operators	Foreign investment facilitates the growth and development of the telecommunications sector, increasing access to capital for network development and modernization, and allowing for the transfer of technology and know-how leading to increased productivity, innovation and competitiveness.	"No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed"	For "No restriction" or "Controlling interest" code as "Loose control"; for "50%" or "Minority Interest" code as "Moderate control"; and for "No foreign ownership allowed" code as "Full control".	2	Full control	Moderate control	Loose control
46	Restrictions to foreign participation/ ownership: Spectrum-based operators	Foreign participation/ ownership in spectrum-based operators	Cf. description of question 45.	"No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed"	For "No restriction" or "Controlling interest" code as "Loose control"; for "50%" or "Minority Interest" code as "Moderate control"; and for "No foreign ownership allowed" code as "Full control".	2	Full control	Moderate control	Loose control
47	Restrictions to foreign participation/ ownership: National service operators (Local service operators & Long-distance service operators)	Foreign participation/ ownership in local service operators/long-distance service operators	Cf. description of question 45.	"No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed" // "No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed"	For each sub-indicator, score 0 for "No restriction" or "Controlling interest"; score 1 for "50%" or "Minority Interest" score 1; and 2 for "No foreign ownership allowed". Take average average of the two scorings.	2	Average score of the two sub-indicators		

Cluster	Indicator	Area		Raw Values	Coding	Benchmark	0 pts	1 pt	2 pts	
	48	Restrictions to foreign participation/ ownership: International service operators	Foreign participation/ ownership in international service operators	Cf. description of question 45.	"No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed"	For "No restriction" or "Controlling interest" code as "Loose control"; for "50%" or "Minority Interest" code as "Moderate control"; and for "No foreign ownership allowed" code as "Full control".	2	Full control	Moderate control	Loose control
	49	Restrictions to foreign participation/ ownership: Internet Service Providers (ISP)	Foreign participation/ ownership in Internet Service Providers (ISPs)	Cf. description of question 45.	"No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed"	For "No restriction" or "Controlling interest" code as "Loose control"; for "50%" or "Minority Interest" code as "Moderate control"; and for "No foreign ownership allowed" code as "Full control".	2	Full control	Moderate control	Loose control
	50	Restrictions to foreign participation/ ownership: Value-added service providers	Foreign participation/ ownership in value-added service providers	Cf. description of question 45.	"No restriction"; "Controlling interest"; "50%"; "Minority interest"; "No foreign ownership allowed"	For "No restriction" or "Controlling interest" code as "Loose control"; for "50%" or "Minority Interest" code as "Moderate control"; and for "No foreign ownership allowed" code as "Full control".	2	Full control	Moderate control	Loose control
CLUSTER 4. COMPETITION FRAMEWORK							28			

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Telecommunication Development Bureau (BDT)

International Telecommunication Union

Place des Nations

CH-1211 GENEVA 20

Telephone : +4122 730 5447

Fax : +4122 730 5487



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