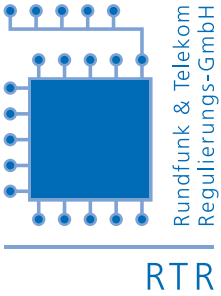
The Virtuous Circle

New Regulations, Innovation and Investment – How to bring Europe back to the Top



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What if:

- every European citizen had access to 100 Mbps?
- a single European digital market wasn't a dream, but reality?
- the "next Google" was founded in London, Berlin or Vienna and not in Silicon Valley?

To reach these goals, we need significant policy changes in the European Union. Telecommunications regulation should provide more flexibility and focus on dynamic efficiency. We need to attract new businesses and help them with financing, especially their early expenditures. And we have to make infrastructure investments much more attractive for institutional investors such as pension funds.

With this book, Georg Serentschy provides inputs to a European discussion on how telecoms regulation, innovation, and investment policies can foster the entire ICT sector and bring Europe back to the top again. The book includes the valuable insights of Bernstein Research analyst Robin Bienenstock and a review of the Austrian BEREC Chairmanship 2012.

Acknowledgements

I'm very grateful to Neelie Kroes, Vice-President of the European Commission, for inspiring and fruitful discussions. Furthermore, I would like to thank Klaus Friesenbichler, Eva Heil, Florian Schuhmacher, Andreas Tschas, and Markus Wagner for their valuable inputs to the text of Chapter "Innovation 2.0". Special gratitude goes to Robin Bienenstock, analyst at Bernstein Research, who volunteered to contribute a chapter to this publication. Last but not least, many thanks go to the co-authors of this book: Georg Ecker, Susanne Krieber, and Paul Pisjak, and to Daniela Andreasch, Wolfgang Feiel, Sven Gschweitl, Po-Wen Liu, Philipp Sandner and Nancy Perkus for valuable discussions and their support.

Vienna, July 2013

Georg Serentschy
CEO
RTR Telecommunications and Postal Services Division

To my colleagues at RTR

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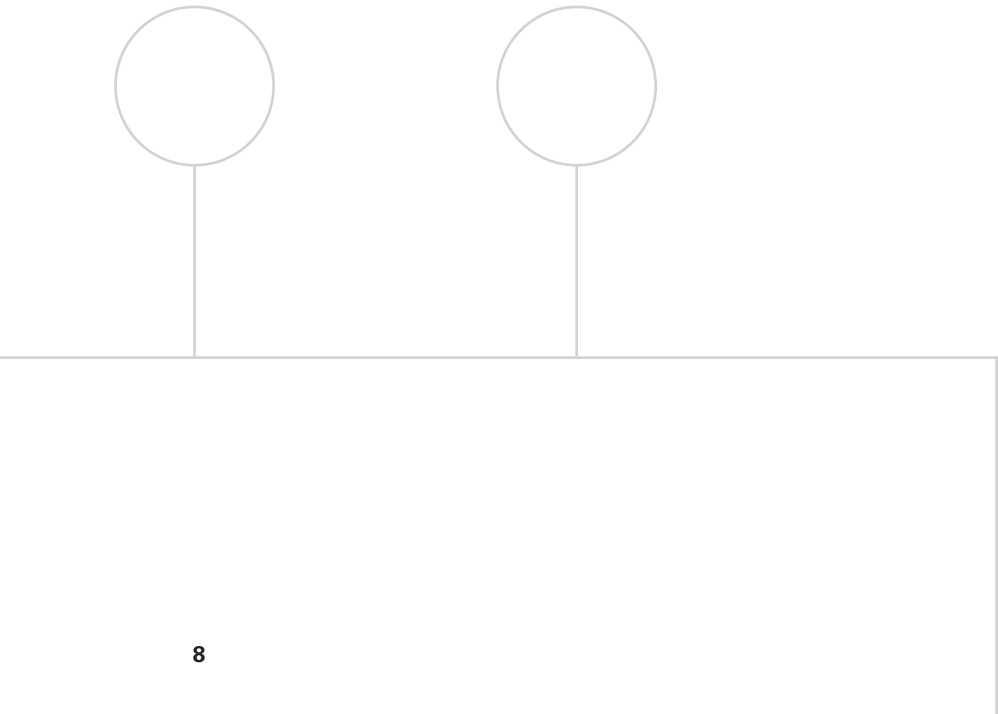


Preamble

There is a growing realisation that the EU´s electronic communications sector has a vital role to play in stimulating growth and competitiveness across the European economy. The availability of affordable and innovative broadband services that this sector has the potential to provide have the capacity to stimulate productivity in many sectors and help to create modern jobs in the digital economy.

But it is equally clear that there is significant fragmentation in the Single Market for telecommunications, and this is seriously hindering the development of such services. We must act urgently to overcome this problem.

At the same time, a lot is moving in this domain, and moving quickly. The huge changes to technology and the critical economic environment mean that any regulatory model has to be regularly adapted, and we should never think that we have found a permanent solution.

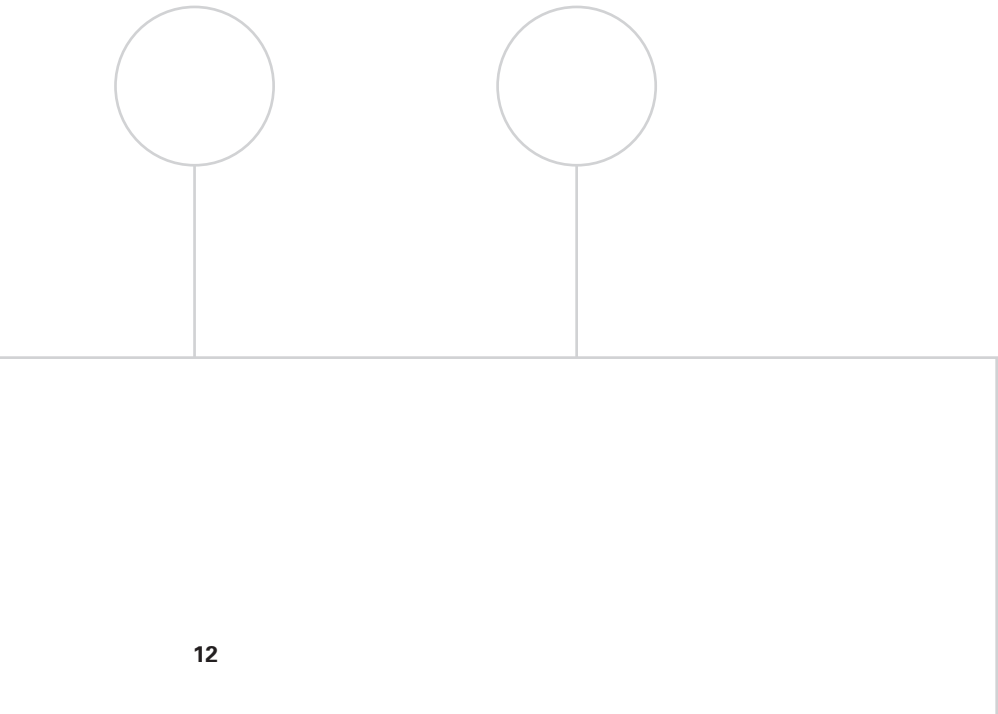
That is why the Commission has been striving since the Digital Agenda to create predictability in the regulatory environment and to ensure a pro-investment environment, culminating in the proposals that we are tabling for immediate action to complete the Telecoms Single Market. At the same time we must continue a wider debate on the future of Europe´s regulatory model for electronic communications.

It is good that many people, including informed stakeholders, set out their ideas in order to stimulate discussion. Hence I welcome this book as a contribution to the debate, and can only encourage others to make contributions in this way.

In this fast-moving sector it is essential to be looking to the future, while learning the lessons of the past. The EU regulatory framework has served Europe well, based on harmonisation and market liberalisation. While maintaining these fundamentals, we need a dynamic and evolutionary approach to prepare for the markets and technologies of the future.

I wish to thank Georg Serentschy and his co-authors for their contribution to this discussion, and I look forward to deepening the debate on the importance of connectivity for the economy and designing the most appropriate regulation.

Neelie Kroes
Vice-President of the European Commission
responsible for the Digital Agenda



Why this Book at this Time?

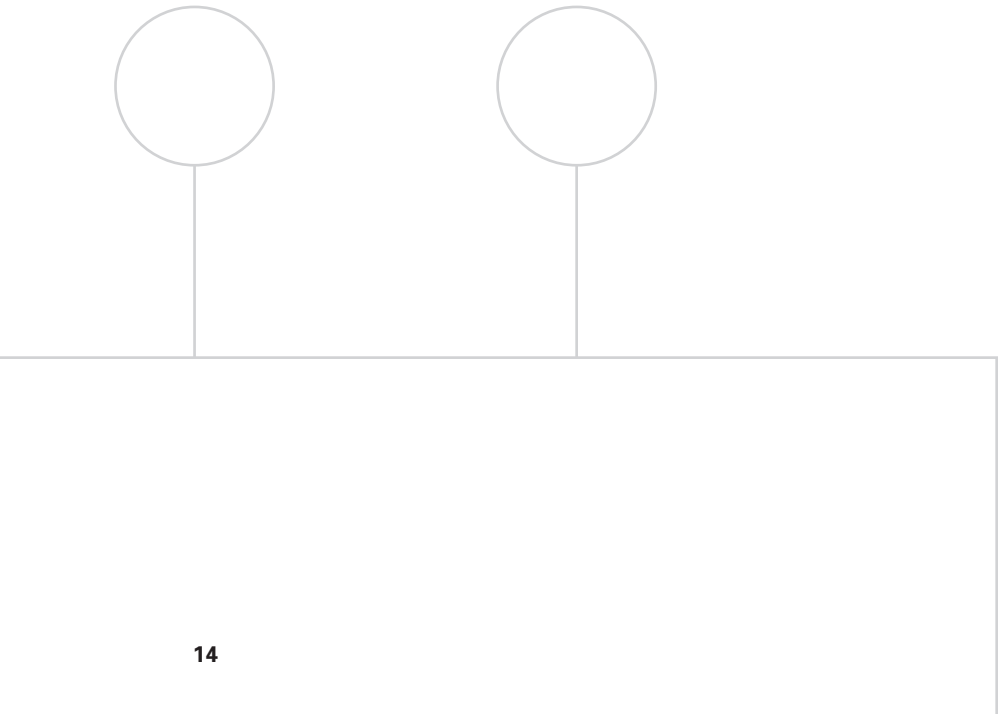
The idea for this book emerged from a Europe-wide discussion about an European Commission (EC) plan to lower the copper-access price, a move that was aimed to increase the level of investments in new electronic infrastructure like fibre. The trigger for me was my first discussion with VP Neelie Kroes in my capacity as the incoming BEREC Chair at the FT-ETNO conference, which took place in Brussels on 3 October 2011. Further discussions ensued and led more and more an ambition to contribute with others to creating a better environment in Europe for the telecommunications sector.

Following up on this ambition, I gathered a group of experts from in- and outside RTR to jointly write this book, based on our practical regulatory experience over the last 15 years and our strategic foresight. The second driver for this book was the ambition to describe what my team and I have achieved with our colleagues at BEREC during the year of our Chairmanship. I want to point out that there is a connection between these two parts in a sense that the work for BEREC gave me important insights for my ideas, which I have outlined in the remainder of this book. However, the BEREC mid-term strategy and the content presented especially in Chapter 3 differ in some parts. This is due to the fixed structure of BEREC with one-year work programmes on the one side and a dynamic development of the market on the other side, which needs a longer-term strategic focus.

I'm very grateful to my fellow authors for this joint effort. It marks the close of an exciting endeavour which started more than 10 years ago, when I became RTR's CEO for Telecommunications and Postal Services and which climaxed in 2012 when I had the honour to serve as Chairman of BEREC. We are all now heading toward an even more exciting journey – to implement the changes needed to make Europe a better place for investments.

Vienna, July 2013

Georg Serentschy
CEO
RTR Telecommunications and Postal Services Division



Introduction

The US has Google, Facebook, and Apple; Asia has Samsung and OEM manufacturing. But where is Europe? In May 2013, only one out of the biggest 25 Internet companies was labelled European.[1] Will the deindustrialisation of Europe continue at an even faster pace? Only 2% of the population in Europe, compared to 19% in the US, will use the new Long Term Evolution (LTE) mobile transmission standard by the end of 2013.[2]

And we are struggling not to fall further behind in the information and telecommunications technology (ICT) sector. European telecommunications companies have difficulties competing with Voice-over-IP (VoIP) and messaging services from around the world, and fear that their cheap shares will be sold out to North America and China. On the other hand, telecommunications markets have never been more important for economic development than they are today. Besides having a significant direct impact on growth, the Internet is a mediator for emergent new technologies, such as cloud computing, Internet of Things, automatic vehicles, or 3D printing, which could fundamentally change society and economy while increasing efficiency. Without infrastructure that is able to deliver the bandwidth necessary for these new services, Europe faces a significant uphill battle in world-wide competition.

With this book, we want to highlight the importance of ICT and the responsibility of sector-specific regulators. Therefore, one key issue is how regulatory policies can be shaped to react to the challenges. We as a regulatory authority deal with these issues daily. However, we are very much restricted by long-term policies designed on EU-wide and national scales. Consequently, approaches we would find optimal for fostering the ICT industry are often hampered by slow administrative and legal processes. In this book, we are proposing an idealistic solution: one, in which actual regulatory policies in the recent past and future do not reflect all necessary short-term changes.

[1] As shown in a presentation by KPCB. http://www.kpcb.com/insights/2013-internet-trends.
[2] According to estimates presented by GSMA.

When we designed the propositions described in "Regulation 2.0" – the core of this book – we took into account information and proposals from many stakeholders, including consumers, regulated and non-regulated market players and other industry experts. We decided that it would be very valuable to have such input included in this book. Bernstein Research analyst and telecommunications expert Robin Bienenstock agreed to contribute a section (Chapter 2) about how the financial world views current challenges and the future of the European telecommunications sector. Providing only the headline to her, we left it to Robin Bienenstock to describe her views of sector-specific regulation. Since a regulatory authority naturally has a different point of view than financial representatives (for instance, focussing more on consumers), we expected a good comparison between the two perspectives.

Still, we are in line with some of the findings provided by Bernstein Research, such as the general statement that there is clearly underinvestment in European telecommunications infrastructure. In other aspects, however, we arrived at slightly different conclusions, two of which we cite here:

First, at least in the short/medium term, as long as markets in the Member States remain in significantly different stages of development, we do not see a single European regulatory authority as a viable solution to "increase investment substantially." We fear that it is more difficult for a European regulator to take into account national or regional specifics, which range from language barriers to digging rights. A one-fits-all approach with regard to infrastructure regulation for different geographic markets might not yield the best results. However, we fully agree that in some areas, more harmonisation is necessary – that's what BEREC has been established for. In general, the step-by-step development of a single digital market should be pursued. With our short-term proposal of a permanent BEREC chair, we propose a step toward more uniform regulation.

Second, with regard to spectrum licensing, we note that in previous years, policies have changed and the state-of-the-art of 10 years ago significantly differs from today's. While we agree that there might be positive effects of longer-term licences on investment, we believe that disruptions in the markets could lead to inefficient outcomes from these longer licences (e.g. due to new technical requirements, as is the case for

LTE, or mergers). In Europe, the culture of disrupting such inefficient outcomes is not well established. This has recently been seen in the discussions regarding the digital dividend.

Moreover, it would be much more difficult to react to increasing concentration in a market, where significantly reduced competition might not only impede takeup by consumers because of higher prices, but also hamper innovation and investment. Empirical economics literature has shown that an inverted-U-shaped relation between investment/innovation and competition can be expected.[3]

While these are not the only differences between our perspectives, we point them out to show the reader that Robin Bienenstock´s contribution in Chapter 2 should be understood as valuable external input to the ongoing discussion – input that may not be in line what we as regulators expect from future regulatory policies.

The remaining chapters of the book are as follows:

In **Chapter 1**, we examine how regulation in European telecommunications markets has evolved over the last 20 years. Particularly, we focus on the role of the "Ladder of Investment" and outline the main changes that the industry has faced during this time. We also describe upcoming transformations in the telecommunications sector.

In **Chapter 2**, as noted, Robin Bienenstock provides her view on how regulatory policies may address some of the problems the European telecommunications industry is facing. She also approaches some delicate issues such as the possibility of a "European regulator."

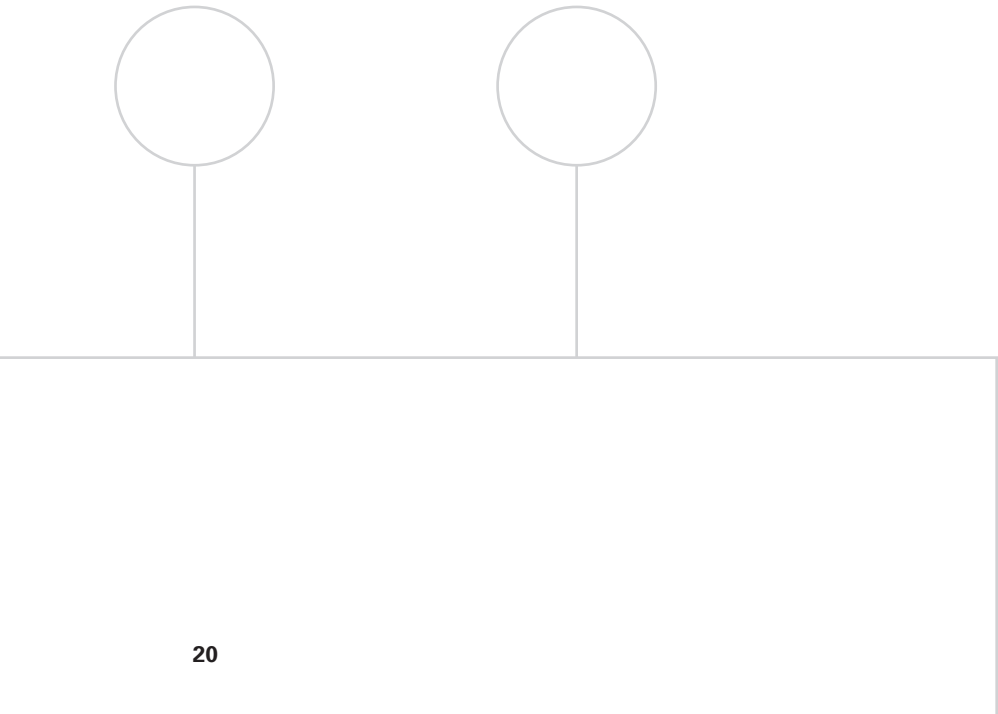
In **Chapter 3**, we share our view on what can be done to bring Europe back to the top in the information and communications industry. While we provide input to the discussion on how **regulatory policies** might take shape in the future, we also touch on issues that are usually not the main focus of regulators, such as **innovation** and **investment** policies.

[3] Aghion et al. (2002) outline that innovation measured by patenting activity is highest for average intensity of competition. With very intense and very low competition, innovation levels are lower.

However, these are essential, as new services and sufficient financial capital are important for the telecommunications sector to develop. Moreover, innovation will influence how regulatory policies need to be designed in the future. We argue that Regulation, Innovation and Investment work together as a "virtuous circle" that can boost the European ICT sector.

Finally, in **Chapter 4**, we look back on the 2012 BEREC Chairmanship and discuss its targets and achievements based on the BEREC Work Programme 2012.

In conclusion, we want to emphasise that this publication does not necessarily represent the official positions of BEREC or RTR, but rather the opinions of the authors. It is their intention to fuel a debate on how to improve the overall situation in Europe. This book therefore has no direct impact on proceedings governed by current legislation.



1. Sector-specific Regulation: History, Challenges and Upcoming Transformations

In this chapter, we outline how the regulatory framework that is currently in place in the European Union developed in the past (Chapter 1.1). Particularly, we will describe one of the major concepts in regulation in recent years, the "Ladder of Investment" and how recent changes in the market challenge this model (Chapter 1.2). Finally, we will describe recent and future transformations in the information and telecommunications sector (Chapter 1.3).

1.1. An Overview of Telecommunications Regulation in Europe

A Green Paper in 1987 marked the first major step toward the liberalisation of the telecommunications sector in Europe. The goal was to create "an open and dynamic market" by introducing "regulatory changes to improve the sector's environment," in which "... [i]n particular, national frontiers should not be allowed to hamper the development of a consistent communications system within the European Community" (EC, 1987, p. 2).

In the following decade, these principles were transformed into law with two main initiatives (EC 1997): (i) the liberalisation of areas under monopoly[4]; and (ii) the harmonisation of the European market with the ONP (Open Network Provision) Framework Directive.[5] Directives on the pro-

[4] Including – amongst others – the "Services Directive" (EC Directive 90/388/EEC, amended by Directive 96/19/EC).

[5] Council Directive on the establishment of the internal market for telecommunications services through the implementation of open network provision – Directive 90/387/EEC, amended by Directive 97/51/EC; the "framework" also included the "Directive on general authorisations and individual licenses" (Directive 97/13/EC), the "Directive on processing of personal data and the protection of privacy in the telecommunications sector" (Directive 97/66/EC) and the Directives on leased lines, voice telephony and interconnection as indicated below.

vision of leased lines[6], voice telephony[7], and interconnection[8] laid down guidelines for the definitions of the respective markets[9] with a threshold of 25% market share as an indicator of whether an operator would have significant market power and therefore be subject to sector-specific regulation (Koenig, 2002, p. 378). Based on these Directives, telecommunications markets had to be fully liberalised by 1 January 1998, in most EU countries.[10]

A key element of the liberalisation was voice telephony and the corresponding access to fixed public-telephone networks and interconnection obligations. By the end of 2000, all EU Member States (except Greece) had implemented call-by-call carrier selection (CS)[11] for long-distance and international calls, while in seven countries, this was also the case for local markets (OECD, 2001, pp.4-5). Similarly, carrier preselection (CPS) was available in eight Member States for all calls (including local calls) in 2000 based on the Numbering Directive 98/61/EC (OECD, 2001, p. 8).

By introducing CS and CPS, the opening of former monopolist markets took a decisive step. As a consequence, prices for long-distance calls decreased by 45% between 1998 and 2001, while prices of long-distance and local calls converged, and new entrants gained market shares of up to 40% for the time being (EC, 2001, pp. 11,12). After the first regulatory measures became effective in 1999, telecommunications markets as a whole took off, with around 7% growth in the total sector, including a 16% increase in the value of mobile services (EC, 1999, p. 1).

[6] Directive 92/44/EEC.
[7] Directive 95/51/EC as amended by Directive 98/10/EC.
[8] Directive 97/33/EC as amended by 98/61/EEC.
[9] Besides the three markets mentioned, the market for mobile public telephone services completed the list of relevant markets under the ONP Framework.
[10] Some countries (Spain, Ireland, Greece, Portugal and Luxembourg) were granted transition periods of up to five years. In former years, some markets, such as the terminal equipment sector in 1988, had been liberalised (Kiessling and Blondeel, 1998, p. 577).
[11] With call-by-call carrier selection, end users can choose the fixed-line carrier they want to use for each call. Carrier preselection was a further step, in which consumers could choose their telephone service provider in advance.

While entrants´ services were established as a consequence of CS and CPS provisions, local access markets were typically still monopolistic at the beginning of the last decade. Against the market trend of falling prices, those for consumer line rentals increased 20% between 1998 and 2002 (EC, 2002a, p. 41), partially because of rebalancing and partially because of a lack of competition. Introducing competition also in local-access networks was therefore a decisive next step. Besides wholesale line rental, designed to enforce competition in access markets, although not successful in all Member States, local loop unbundling became obligatory for all EU Member States. This happened through a regulation[12] that enabled entrants to offer "high bitrate data transmission services for continuous Internet access [...] based on digital subscriber line (DSL) technology as well as voice telephony services" (EP and European Council, 2000, (7)). By 2000, entrants were able to offer bit-stream services in eight European countries (EC, 2000, pp. 19, 20). Internet usage encompassed a quarter of the total EU population, with an average 40% market share for alternative ISPs compared to the incumbents in 2000 (EC, 2000, p. 38).

In 2002, the regulatory framework was significantly amended with a more economics-oriented approach to market definition and determination of significant market power, which then aligned more closely with competition law; the Framework Directive[13] (Directive 2002/21/EC) is – with some adjustments[14] – still in place today and provides the foundation for regulatory policies.

[12] See EP and European Council (2000) - Regulation (EC) No 2887/2000.

[13] The "framework" consists of four sub-Directives: the Authorisation Directive (Directive 2002/20/EC), the Access Directive (Directive 2002/19/EC), the Universal service Directive (Directive 2002/22/EC), and the Privacy and Electronic Communications Directive (Directive 2002/58/EC).

[14] I.e. Regulation (EC) No. 717/2007, Directive 2009/140/EC and Regulation (EC) No. 544/2009.

National Regulatory Authorities (NRAs) since then have had to define markets based on an economic analysis with a Hypothetical Monopolist test[15] as had been established in competition law. To guide the NRAs, the Commission also published a list of relevant markets in a Commission Recommendation, in which seven retail and 11 wholesale markets were identified (EC, 2003). The NRAs since then have had to justify market definitions different from those prescribed by the Recommendation. The number of relevant markets was reduced to seven in 2007 (EC, 2007), whereas mostly retail markets were identified as competitive in most Member States (on the basis of underlying wholesale regulation) and therefore were excluded from the list. Another review of the list of relevant markets is in progress at the time of writing.

To assess the degree of effective competition in the respective relevant markets, an economic analysis must be conducted, as outlined in the "Commission Guidelines on market analysis and the assessment of significant market power" (EC, 2002b). These guidelines are geared to general competition law; however, unlike in competition law, an abuse of significant market power is not required to impose regulatory measures. Prior to this requirement, a 25% threshold[16] had been the main criterion, whether or not an operator was expected to have significant market power.

In addition to the changed framework, several soft-law initiatives and Commission Communications further shaped regulatory policies in Europe, among which the "Recommendation on the provision of leased lines" (EC 2005a, 2005b), the "Recommendation on accounting separation and cost accounting systems" (EC 2005c), and the "Recommen-

[15] A Hypothetical Monopolist (HM) test, also called SSNIP (Small, but significant non-transitory increase in prices), tests whether a price increase of typically 5% or 10% for a product would be profitable for a hypothetical monopolist. If the increase is profitable, the product(s) in question defines the relevant market; if not, one has to include the closest substitutes, one at a time, and repeat the test until the increase is profitable and, therefore, the relevant market is found.

[16] Article 2 (3) of amended Directive 92/44/EEC; Article 4 (3) of amended Directive 97/33/EC; Article 2 (2) (i) of Directive 98/10/EC.

dation on regulated access to Next Generation Access Networks" (EC, 2010a) are worth mentioning. The "Recommendation on non-discrimination and costing methodologies" is upcoming (a draft was published in 2012 (EC, 2012d) but not finalized until the deadline for this book). We will discuss possible implications of the new Recommendation in Chapter 3.2.3.

Today, regulatory policies in most countries still rely on access regulation designed at the beginning of the century. Moreover, the Next Generation Access (NGA) Recommendation featured policies focused on passive access (including dark fibre and duct access), which also explicitly acknowledged the "Ladder of Investment" principle for NGA (EC, 2010a, (3)). For this reason, the "Ladder of Investment" deserves special consideration.

1.2. "Ladders and Snakes"[17]: Rise and Fall of the "Ladder of Investment"

In this section, we describe how the "Ladder of Investment" principle evolved in Europe ("The Ladder and its Implications", 1.2.1) and how recent technological developments question the concept ("The Snakes: Technological Developments", 1.2.2).

1.2.1. The "Ladder" and its Implications

As described, telecommunications regulation in Europe during the past decade has been characterised by the initiation of service competition through access and interconnection regulation, in which alternative operators were granted (mostly cost-based) access to incumbents´ infrastructure. Especially in the beginning, static efficiency[18] was implicitly the normative concept. CS and CPS were designed primarily to reduce end-user prices by introducing competition in retail markets.

[17] With reference to a paper published by Martin Cave: "Snakes and ladders: Unbundling in a next-generation world."

[18] In economic terms, static efficiency combines productive efficiency (i.e. producing the highest output given existing factor inputs) and allocative efficiency (i.e. the best distribution of scarce resources). It determines the market equilibrium in a static environment.

With the obligation to introduce local-loop unbundling (LLU) in 2000 and the new regulatory framework adopted in 2002, this approach changed somewhat to more dynamic-oriented (but still intramodal) policies, in which entrants were expected to climb a "Ladder of Investment"[19], starting from using simple (first of all, broadband) resale services to bitstream and unbundling of the local loop to, finally, investing in their own local-loop infrastructure (This last "rung" of the ladder was rather seen as duplication of an "essential facility", and therefore not efficient in most cases). In this concept, bitstream services are an intermediate step between resale and unbundling, in which entrants have to deploy at least some own infrastructure. Local-loop unbundling, on the other hand, enables the entrant to invest in their own lines to reach the main distribution frames or serving-area interfaces, where only the local (sub)loop is rented from the incumbent at usually regulated, cost-oriented prices. The main idea was to enable the entrant to enter the market on a level of the value chain in which investment expenses were still low (resale), and work their way toward own infrastructure, where they were no longer dependent on the incumbent.

During the last decade, the "ladder" worked in some countries to the extent that entrants that started as resellers or bitstream providers indeed often climbed up to becoming local-loop unbundlers. The share of LLU (including shared access) among entrants´ DSL lines therefore rose steadily during the last decade, to 78.9% in 2012, whereas bitstream and resale services decreased again after a peak. Overall, the share of entrants´ DSL lines increased to about 45% in January 2011 (EU-27 average) and has remained almost constant since then. However, there are significant differences among Member States, with entrants´ market shares ranging from 26% (Luxembourg) to 70% (Romania) (EC, 2012f, pp. 60, 61). A lack of economies of scale and density often prohibit entrants from climbing up the ladder to sub-loop unbundling or even own infrastructure deployment.

[19] Cave & Vogelsang (2003), Cave (2004).

1.2.2. The "Snakes": Technological Developments

In recent years, technological developments have changed the market in two ways, challenging the "Ladder of Investment" approach:

(1) First, other infrastructures besides copper-legacy networks became capable of delivering broadband Internet. On the one hand, cable companies were able to upgrade their networks to DOCSIS 3.0[20] to deliver high bandwidths to their former TV-only customers. This created pressure on copper networks mainly in urban areas. On the other hand, mobile networks spread and, with new technologies such as High-Speed Packet Access (HSPA), were capable of delivering copper-like Internet speeds as well. Hence, mobile Internet became the second serious challenger of copper networks. In the meantime, technology upgrades are in the pipeline, like DOCSIS 3.1., LTE advanced and – in the future – 5G mobile technologies. Able to deliver Gbit-speed to their customers, these technologies will strengthen facility-based competition even more. In some countries, entrants and/or public utilities have had the capability to deploy fibre networks to the homes (FTTH), which is the third technology that threatens traditional copper networks. These developments have managed to bypass the former "essential facility" – the last mile – of the incumbent and placed the focus on intermodal competition as the main competitive force. Intramodal competition, as expressed by the "Ladder of Investment", might not be as important in such a context. Moreover, the threat of upgraded cable and mobile networks forces the incumbents to upgrade their networks with further implications on the "Ladder of Investment", as described in the following point.

(2) Technological advancements within copper or copper-fibre hybrid networks make LLU increasingly unattractive from a commercial standpoint. First, when incumbents deploy fibre technology closer to the customer, entrants need access points for LLU that are placed closer to the customer as well. For entrants this means that they would reach a significantly smaller number of end users with one

[20] Previously, DOCSYS 1.x and DOCSYS 2.0 were already capable of delivering DSL-like speeds.

access point and, in many cases, this development made unbundling unprofitable (due to the lack of economies of scale and density). As a consequence, entrants had to step back on the "Ladder of Investment" and to accept an intermediate step between LLU and bitstream, often referred to as "virtual unbundling". Second, with the deployment of Gigabit Passive Optical Network (GPON) FTTx technology, several users share their traffic over one fibre, making it technologically impossible to unbundle the data stream. Third is a development referred to as the "second life of copper". With new technologies such as Vectoring, Phantoming, and G.Fast, data rates over traditional copper wires (often hybrid with FTTC) can be boosted, at least for short ranges. The disadvantage, however, is that all copper wires within the local loop have to be managed by one operator to achieve the best bandwidth results. This also implies that LLU is not possible anymore, and that some kind of virtual unbundling is inevitable.

These developments have significant implications for the "Ladder of Investment" theory and regulatory policies. It is not fixed-line entrants that are exerting competitive pressure on their partly own-built, partly rented infrastructure anymore. Rather, different infrastructures are already competing, and too-harsh regulation focused on the "Ladder of Investment" (i.e. intramodal competition) may sharply weaken investment incentives for fixed-line firms and even competitors.[21] On the other hand, as shown, technological developments simply make traditional LLU infeasible and, therefore, infrastructure competition is less likely to happen within legacy networks, but rather between (then upgraded) legacy networks and alternative infrastructures.

We will discuss how regulatory policies can be designed to manage the consequences of these developments in the future in Chapter 3.

[21] This argument was underlined by several recent studies – e.g. Grajek & Röller (2012); Briglauer, Ecker & Gugler (2013).

1.3. Upcoming Transformations in the Telecommunications Sector

In the past, major technological changes drove the communications markets. Besides the developments and their implications on broadband markets that have already been outlined, the sector has experienced downright revolutions in recent years, and major transformations are still ahead of us.

The first revolution in telecommunications markets during and after liberalisation was the development of mobile carriers. With the GSM (Groupe Spécial Mobile) standard as the first digital mobile transmission technology, mobile telephony and short message services (SMS) became popular among large parts of the population, at least in the developed world. Mobile telephony posed a first threat to fixed-line technologies, which barely managed to compete with the new reachability feature. Fixed-mobile substitution for voice calls was one of the hottest regulatory topics at the beginning of the last decade in part because, with this development, regulation could be removed from several retail markets according to the 2007 relevant market recommendation.

The second revolution was the implementation of broadband services by DSL technology and cable networks. While most users only had dial-up access to the Internet via 56 Kbps modems in the late 1990s, modern cable technologies and, later, DSL enabled significantly increased transmission rates and always-on services. With higher broadband coverage, new services emerged which started to threaten traditional (fixed-line) voice services – a trend that amplified over time and is increasingly important today: Back then, DSL services enabled Voice-over-IP (e.g. Skype) and reliable text messaging services (e.g. ICQ) and therefore started the revolution of communication over the Internet.

The third big revolution was the emergence of mobile high-speed Internet, promoted by UMTS and, later, HSPA technologies combined with a handheld revolution (smart phones and tablets), which transformed telephony-only cell phones into mini-computers. This enabled a range of new services, some of which threaten traditional telecommunications services more than ever. “Chat apps have overtaken

SMS globally. The cash cow is dying,"[22] twittered EC Vice-President Neelie Kroes on 29 April 2013. Her comment underscores the fact that mobile operators are losing revenues to all-over-IP services such as What's App and Viber. While this trend is expected to amplify, it raises new regulatory issues such as net neutrality concerns.[23] These developments also changed the power structure in mobile communications markets. Since the introduction of the iPhone, some end-device manufacturers can almost dictate the terms and conditions for mobile carriers.

These technological revolutions are the basis for wider transformations that are going on right now in the telecommunications and information sector.

- A transformation to an all-IP world, where, ultimately, all communications services are run over IP networks, including voice and video telephony, messaging, etc. As a consequence, the number of relevant markets will likely be further reduced (e.g. call origination/termination regulation might not be necessary in an all-IP world).

- Technologies and services will converge. Similar to messaging and telephony services, other communications services (such as broadcasting) will become IP-based. Similarly, devices can perform an increasing number of tasks (e.g. Smart TV; mobile phones as GPS devices, digital cameras and MP3 players, etc.).

In 2013, the consultancy McKinsey & Company concluded that Mobile Internet will have the most extensive impact by far on economic development and society among new technologies in the future. Other technologies with high impact in the McKinsey study are automation of knowledge work, Internet of Things, Cloud technology, and Advanced Robotics. Indeed, machine-to-machine communication and the Internet of Things will be the main enhancements of the 2010s. Increased automation (including 3D printers) may even lead to a new economic order.[24]

[22] https://twitter.com/NeelieKroesEU, accessed on 29 April 2013.

[23] When messaging and VOIP services appeared, mobile carriers started to block their services, which contradicts net neutrality principles.

[24] Proponents of the "Maker Movement" (see, for instance, Anderson, 2012) even proclaim the third industrial revolution going hand-in-hand with these developments.

The "Shareconomy" becomes increasingly important. Cloud-based services are one facet of this development. You do not own your hardware anymore, but share it with many users from around the world. The Internet makes sharing much more efficient: the allocation of resources is managed according to people's needs by intelligent software.

In Chapter 3, we discuss the transformation to an all-IP world in more detail, as it is most closely linked to the telecommunications industry and regulation. However, one has to bear in mind that (ultra) high-speed Internet connections are a precondition for all these transformations going on.

2. An analyst's view on regulation – by Robin Bienenstock*

Europe's largest telecoms companies have suffered a flight of capital investment relative to other sectors and to the telecoms companies of other countries. In particular, the regulated companies of Europe that own and operate the vast majority of telecoms infrastructure have underperformed versus a class of infrastructure-renting companies ("alternative operators"), that was invented by the European regulatory regime, and a class of unregulated infrastructure owners (cable companies).

The creation of these classes of companies can be said to have achieved its regulatory aims: The European regulatory regime has successfully reduced the prices of many consumer services (wireless, wireless voice, and broadband) and, hence, increased penetration of those services. But as the infrastructure renters have not moved up the "Ladder of Investment" (see Chapter 2) as hoped, this policy has resulted in the relative underinvestment in European telecoms infrastructure. The policy of favouring infrastructure renters over builders and owners can be seen to have outlived its useful life.

Telecoms infrastructure has a particularly long life while the scale of investment is large. The long payback periods before breakeven require a great deal of confidence in the stability and fairness of the regulatory regime. If the regime is not changed materially, transparently, and with guarantees of future stability for a set time period, capital inflows to the sector will not materialise.

In this case, Europeans should expect to experience (1) continued decline in telecoms infrastructure quality relative to other countries; (2) continued job losses in the sector; (3) lack of the sort of Internet and technology expertise that other, better-equipped countries enjoy; and (4) continued weakening of telecoms companies leading to the eventual closure or takeover of these companies by other companies. These outcomes would be negative not just for the European telecoms sector but for the broader European economies.

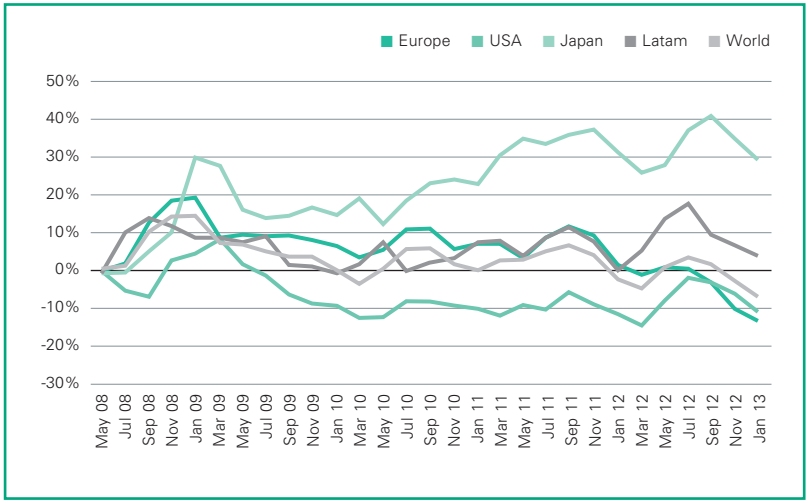
* Robin Bienenstock has worked in the Telecom industry as a consultant and analyst for over 15 years. She is currently the Senior Analyst for European and Latin American Telecommunications at Sanford C Bernstein.

If, on the other hand, the regulatory regime can provide transparency, certainty, and the possibility of improving returns for infrastructure investors, the sector would see meaningful capital inflows, increased investment in infrastructure, and, hence, more jobs. Further, this route would create more competition of infrastructure platforms and intermodal competition, which would be more sustainable.

2.1. European Telecoms, especially the incumbents, have suffered capital flight relative to other investments in Europe and to other telecoms companies

Europe's telecoms industry has suffered a flight of capital relative to other sectors in Europe as profits have declined, balance sheets deteriorated, and dividends been cut. Exhibit 1 shows the underperformance of Europe's telecoms sector versus telecoms sectors in other regions (relative to the local MSCI index). Importantly, Europe's relative telecoms weakness is not a reflection of the region´s overall weakness.

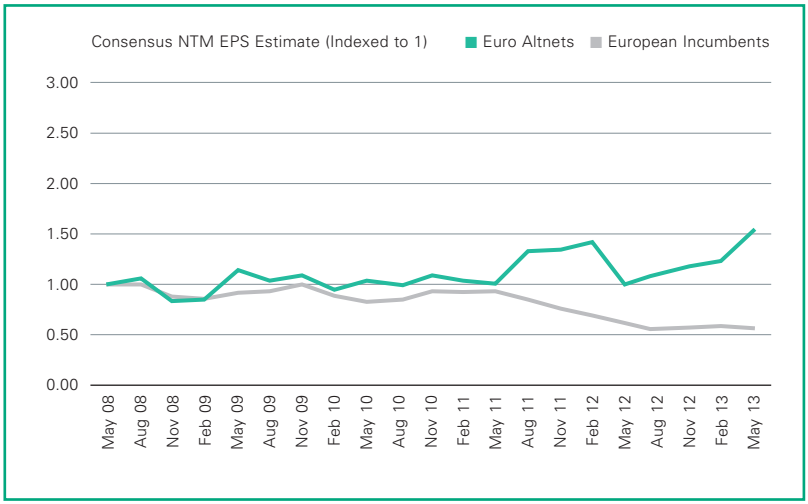
Exhibit 1: European Telecoms have underperformed global peers over the last five years



Sources: Capital IQ, Bernstein analysis

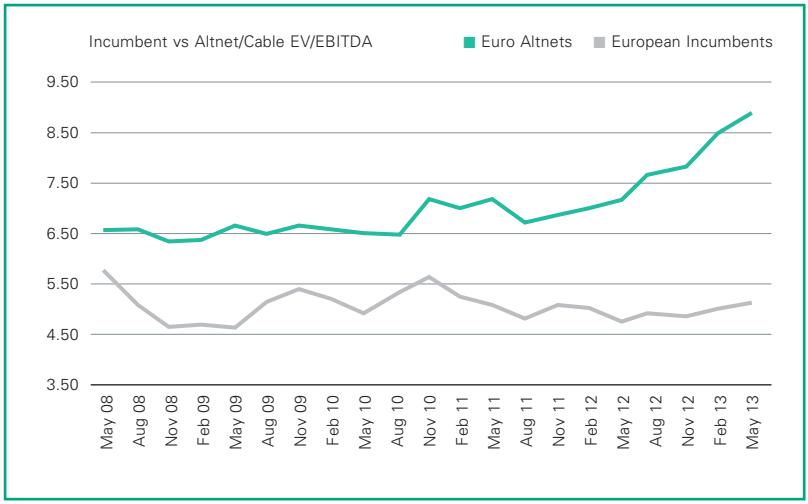
The main driver of this weakness is the very poor performance of the largest incumbent telecoms companies in Europe, which have suffered from significant declines in profit and Earnings Before Interest, Depreciation and Amortisation (EBITDA). Exhibit 2 shows the change in Earnings per Share (EPS) of the domestic businesses of the major European incumbents versus infrastructure renters and cable companies. Exhibit 3 shows the change in multiple of those companies. Together, these figures show that the market is not punishing European incumbents for making less money by reducing what they are willing to pay per Euro of profit, but rather that these companies are becoming significantly less profitable. The market does, on the other hand, reward the alternative operators for their growth with a higher multiple per Euro of profit (multiple expansion).

Exhibit 2: EPS growth at Altnets/cable has outpaced incumbents



Sources: Factset estimates, Bernstein analysis and estimates

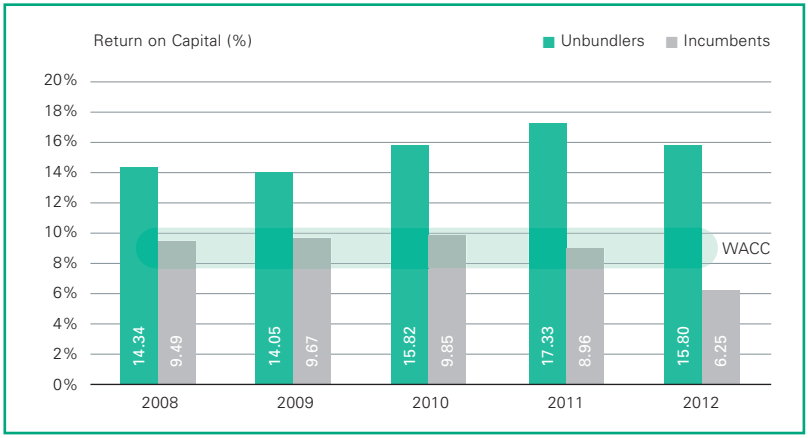
Exhibit 3: Multiples have diverged



Sources: Factset estimates, Bernstein analysis and estimates

Investors award higher multiples to alternative operators not just because they are growing more quickly, but also because they are making higher returns on their invested capital. In the end, share prices reflect a company´s or sector's ability to earn returns above their cost of capital. As we see in Exhibit 4, alternative operators are earning returns well above their cost of capital, while the incumbent telecoms in general are not.

Exhibit 4: European alternative operators have consistently made much higher returns than incumbents over the past five years



Sources: Capital IQ, Bernstein analysis

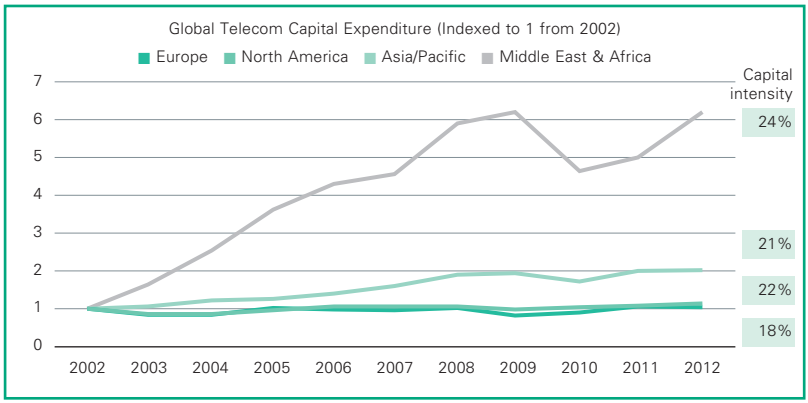
2.2. The decline in capital inflows coincides with a decline in relative infrastructure investment

During a period of astonishing technology change and an extraordinary boom in the consumption of telecoms bandwidth by consumers and businesses, most countries have invested more in their infrastructure to keep up. European telecoms companies have invested less on average (just 18% of revenues versus a global average of 21%) and have not increased their spending on new technologies and upkeep (see Exhibit 5).

- In the last decade, we have seen widespread introduction of new 3G and 4G wireless standards, new wireline signalling standards, and techniques like DOCSIS 3.0, phantoming, vectoring, and, more recently, G.Fast.

- Cisco estimates that the amount of data flowing across telecommunications networks has risen ~100 times in Europe in the last decade. They forecast IP traffic will grow at a CAGR of 18% over the next five years and mobile traffic, 66%, over the same period.

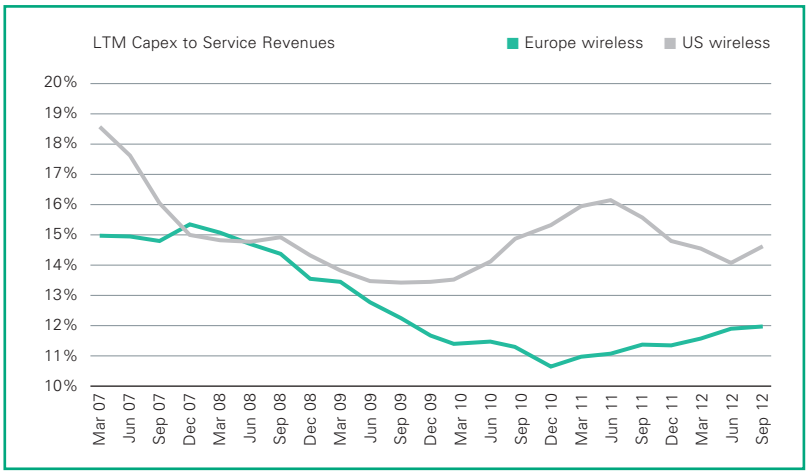
Exhibit 5: European telecoms capital expenditure has been flat-to-down over the last decade, while all other regions have increased spending; Europe has the lowest capital expenditures (CAPEX) intensity of any telecoms sector globally



Sources: Bloomberg Industries, Bernstein analysis

The underinvestment in wireless infrastructure in Europe is particularly stark when compared to the US over the past several years, as illustrated in Exhibit 6.

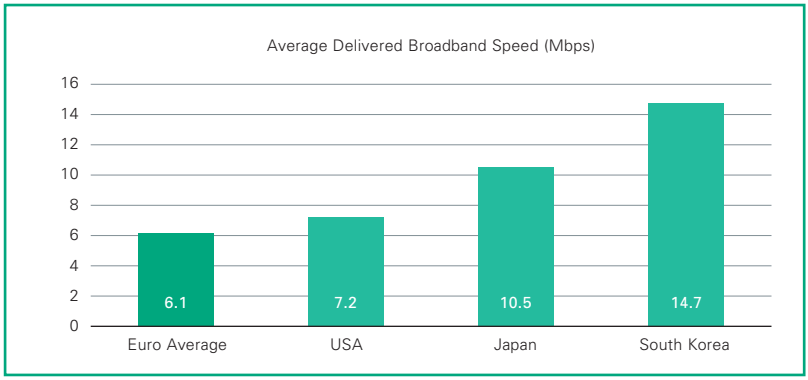
Exhibit 6: US companies have invested more



Sources: Company reports, Bernstein estimates and analysis

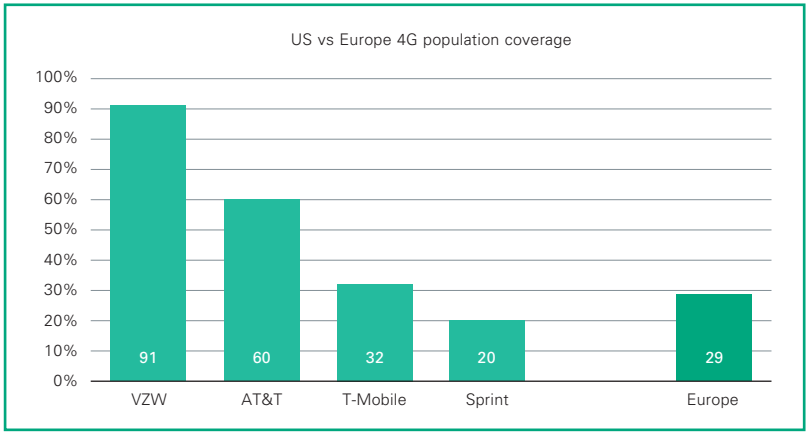
The result is that European infrastructure quality has fallen behind that of peers. As we can see in Exhibits 7 and 8, Europe has slower broadband speeds on average than global peers and less 4G coverage than the US. There appear to be no plans for Europe to catch up soon, with only meagre fibre plans in countries except the UK and Germany, and very modest plans for 4G overall. A telling example is Vodafone, Europe's largest mobile operator, which plans to cover just 40% of Europe with 4G services by the end of 2015.

Exhibit 7: Europe has a lower average broadband speed than other developed countries



Sources: ITU, Bernstein Analysis

Exhibit 8: Europe has less 4G coverage than the USA



Sources: Company reports, Eurostat, US Census Bureau, Bernstein analysis

2.3. The European regulatory regime reduces investment in European telecoms companies and their investment in infrastructure

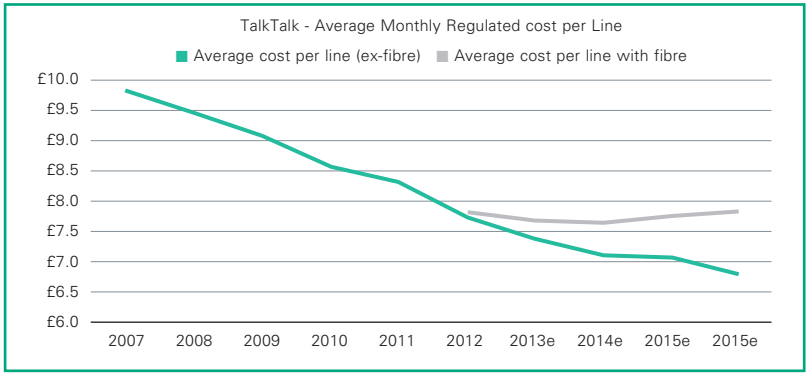
In our view, it is not the antitrust environment that is holding back the European market. The European anti-trust environment is in fact not materially different from those in the USA, Japan, or other developed jurisdictions. What is different is the European communications regulatory framework. From an investor´s point of view, the principal defining and differentiating characteristics of this regime are:

- Creation of a class of infrastructure renters with mandatory wholesaling;
- Creation of new, artificially low-cost entrants through selective attention to facts (ie a lack of regulatory fairness);
- Weak regulatory processes that are fragmented, ambiguous, and subjective.

Creation of a class of infrastructure renters with mandatory wholesaling. The creation of a class of infrastructure renters through an unbundling regime that has rewarded them with constant declines in regulated prices, in spite of their failure to invest in their own infrastructure, has discouraged the owners of the most extensive infrastructure from investing further. The protection of this class of companies, in combination with the rise of competitive cable infrastructure, limits the returns incumbents can make on investments and reduces the amount of fibre that can be profitably built.

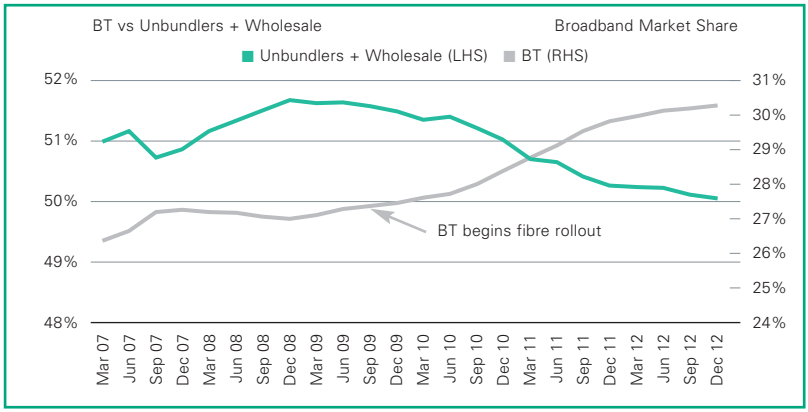
The unbundling regime has reduced the returns of infrastructure builders, as consistently lower regulated prices have facilitated economies of scale for infrastructure renters and, in turn, lowered market share for incumbents and prices overall. In Exhibit 9 we see that as TalkTalk's cost to unbundle a line fell, so did retail prices in the UK. British incumbent BT began losing market share during this period (see Exhibit 10), and an unregulated cable operator with no obligation to wholesale its services gained 25% market share (or 50% within its footprint).

Exhibit 9: TalkTalk's unbundling costs



Sources: Company reports, Bernstein estimates and analysis

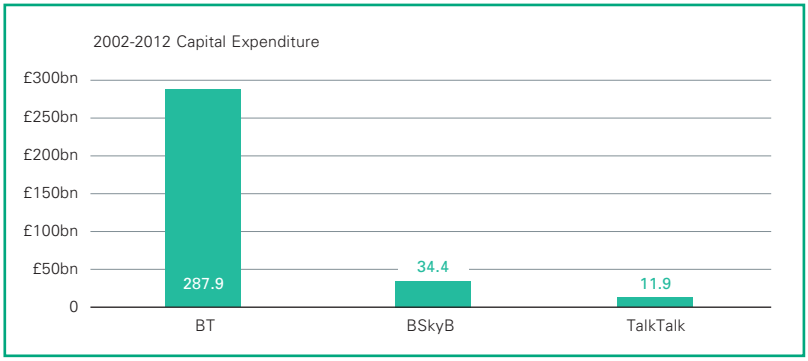
Exhibit 10: Fibre has enabled BT to recapture some share



Sources: Company reports, Eurostat, US Census Bureau, Bernstein analysis

The "Ladder of Investment" theory, which argued that unbundlers given an economic foothold would eventually build their own networks, has been roundly disproven. Apart from Iliad and Jazztel, almost none of the several hundred unbundlers in Europe have laid fibre. Instead, unbundlers have filled a useful political role in bringing down retail prices. As illustrated in Exhibit 11, BT has spent some £ 288 billion on improving its infrastructure since unbundling began and before fibre build, while TalkTalk and BSkyB have spent just £ 46 billion combined. And yet the regulatory regime ensured that TalkTalk and BSkyB enjoyed higher returns.

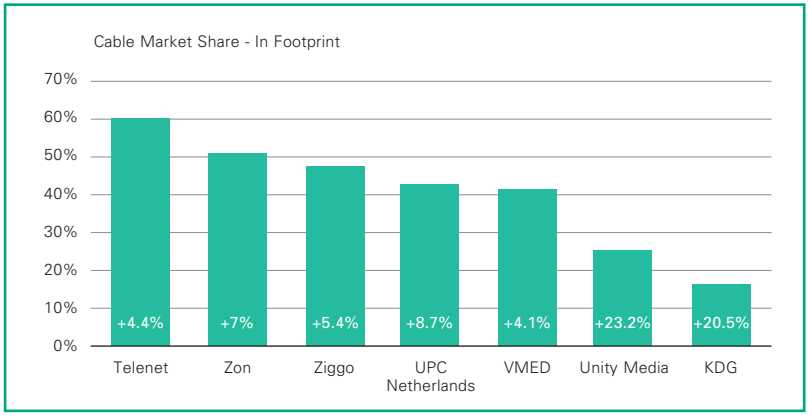
Exhibit 11: BT has significantly outspent the unbundlers



Sources: Company reports, Bernstein estimates and analysis

Cable companies now cover 50% of Europe, have no obligation to wholesale infrastructure to other companies and, as shown in Exhibit 12, enjoy share gains on average of 200bps a year in broadband. *The regulatory regime has not changed to acknowledge this competition.*

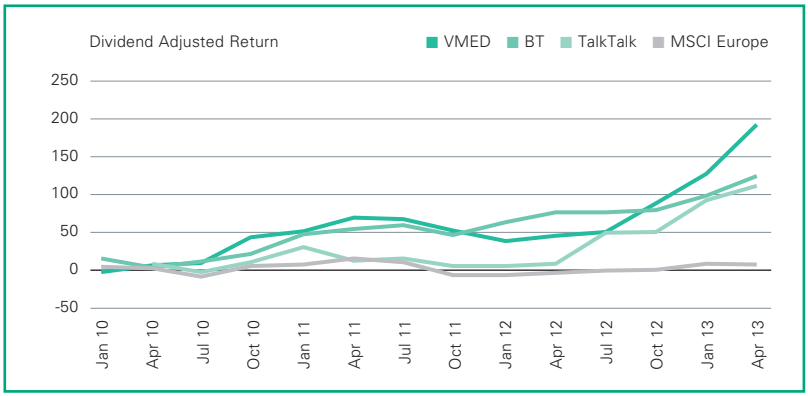
Exhibit 12: Cable companies enjoy a high (and growing) market share in broadband



Sources: Company reports, Bernstein estimates and analysis

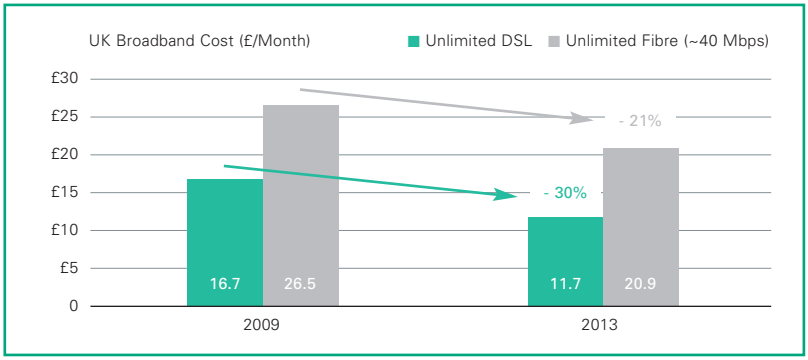
Under this regime, incumbents cannot justify investment in competitive fibre infrastructure nor create sustainable long-term competition. It was not until fibre pricing was deregulated in the UK that we started to see fibre builds in Europe. Since this deregulation of fibre pricing, the UK wire line market has enjoyed significant inflows of capital from the market (Exhibit 13), a great extension of fibre infrastructure (to roughly 50% of the UK and planned extension to 90%), and much lower consumer prices for broadband in general and faster broadband in particular (Exhibit 14).

Exhibit 13: BT, TalkTalk, and VMED share prices have all benefitted



Sources: Company reports, Bernstein estimates and analysis

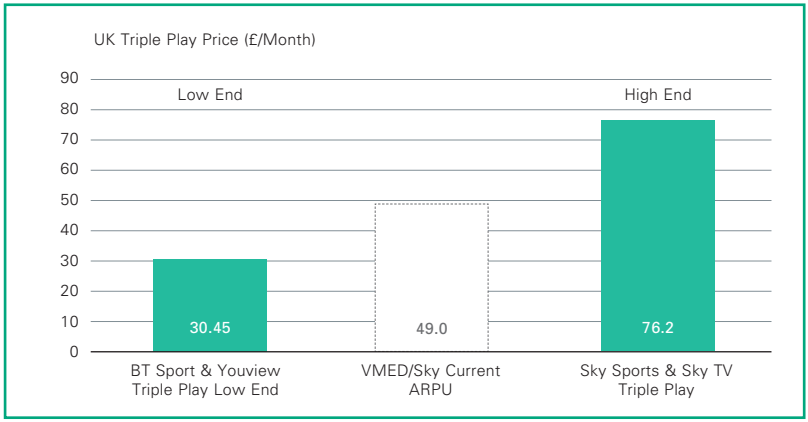
Exhibit 14: Broadand prices in the UK have fallen



Sources: Company reports, Eurostat, US Census Bureau, Bernstein analysis

BT has won market share back from the unbundlers since this process began, but those smaller players have also worked harder to create internal efficiencies and improve their economics. In addition, the provision of faster networks and better economics in broadband have led to the provision of much-lower-cost Pay TV products to UK consumers (see Exhibit 15).

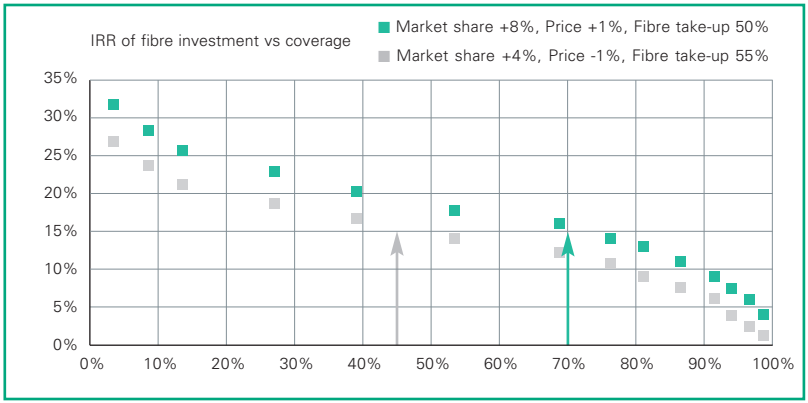
Exhibit 15: BT have created a new low-end triple play package



Sources: Company reports, Bernstein estimates and analysis

Where pricing has not been deregulated, the builds have not been forthcoming. The deregulation of fibre pricing not only creates better returns and more investment for European telecoms companies; it also extends the area in which fibre build can be profitable. We estimate that the deregulation of fibre will make it profitable for privately-funded incumbents to build to an incremental 20%-30% of each country in Europe, thus reducing the need for expensive subsidies from governments (see Exhibit 16). The farthest reaches of Europe cannot be covered without subsidies, but many innovative companies are proposing ways to defray the cost of even these most far-flung builds.

Exhibit 16: Tougher de-regulation would lead to deeper fibre builds



Source: Bernstein estimates

Therefore, we conclude that *the deregulation of fibre pricing is critical to increasing fibre investment and improving the returns of European telecoms incumbents. In turn, these companies will deliver lower broadband prices overall and for faster speeds in particular, as well as deeper, faster infrastructure builds and lower government subsidy requirements. The combination of stronger, more valuable companies with lower prices for consumers and better infrastructure should work for regulators, consumers, companies, and investors.*

(1) **Creation of new, artificially low-cost entrants through selective attention to facts (ie a lack of regulatory fairness).** European Wireless policies (in particular, spectrum and termination rate accounting) have focussed on the creation of excess platform competition by fabricating the conditions for lower-cost build, which has encouraged the proliferation of infrastructure renters (in this case, MVNOs). Fragmented spectrum policy has allowed countries to use auctions to create new wireless competitors at an artificially low cost while extracting huge, repeated rents from incumbent operators. As a result, most European operators make returns below their cost of

capital and cannot justify further investment. The consequence has been many relatively poor-quality networks – something we have called the "quarter-size train problem". It has also resulted in a poorer world for consumers who cannot afford to to use data services outside their home countries without facing eye-popping bills.

We estimate that few European wireless operators make their cost of capital in their core European markets. The unattractiveness of European wireless relative to the US is driven by the latter´s higher population density, which improves the economics of networks, and the presence of cheap Chinese equipment manufacturers, which reduces the cost to build networks. But the single biggest factor in creating what appears to be unfair new competition is the selective allocation of spectrum.

From an investor´s point of view, wireless networks consist of two simple elements – a network of infrastructure and a spectrum across which signals are sent. The ambiguity of spectrum ownership rules, the fluctuation of auction rules, and the use of ad hoc auction rules that change the competitive balance of a market (rather than selling on a competitive basis) reinforce the view that the returns of telecoms companies are driven by the whims of regulators rather than fair competition. This has been exacerbated by many cost calculations used in regulation that exclude the cost of spectrum from the cost of providing wireless. It seems like telecoms companies are caught in "double jeopardy": they must buy exorbitantly-priced spectrum and then have the fact of their purchase denied or the value of the spectrum diminished by changes to the rules.

It also appears that the "Ladder of Investment" for companies given access to cheap spectrum has not worked particularly well. If we look at companies that were given "new entrant spectrum set asides", we find that they have generally built fewer base stations and less infrastructure than their incumbent competitors. These "wireless light" companies have driven the cost of poor-quality wireless services down but have not driven an increase in wireless investment overall.

Lastly, the variation in rules regarding radiation limits in Europe makes it difficult for some national carriers to build full 4G networks. These rules should be harmonised across Europe so that no one country suffers extraordinarily high radiation or extraordinarily low 4G coverage as a result of national differences.

In conclusion, the only way to generate more investment in wireless infrastructure is to create enough stability such that operators can make a compelling case of their return on investment. As it usually takes 8-10 years to make a return on telecoms infrastructure investments, regulators need to provide a long-term spectrum road map that includes what will be free when and under what conditions it will be sold. Given Europe´s poor track record vis-à-vis spectrum "double jeopardy", this will require hard rules rather than vague promises. This leads to the third change required to make European telecoms more investable.

Weak regulatory processes that are fragmented, ambiguous, and subjective. The regulatory processes of Europe are fragmented, ambiguous, short-lived and subjective. This combination creates such uncertainty that rational investors must apply a high discount to any investment plan. Certainty, even if it is unfair or unambiguously tilted in favour of or against one or another player, is a much better environment for investment. The European incumbent telecoms companies trade at a 45% discount to large regulated companies such as US utilities to account for the very high level of regulatory uncertainty.

Today investors must wade through many layers of decision making (DG Connect, DG Competition, BEREC, NRAs across many jurisdictions) to understand how a particular regulation impacts a company in which they want to invest. EU recommendations are powerful but not binding, and the language of recommendations is often so ambiguous that it leaves room for very wide interpretation. Unbundling fees, for example, which in theory are based on the same methodology across Europe, result in very different prices country by country, not just because those countries are different, but also because different regulators make different assumptions about inputs. Furthermore, those inputs and assumptions can change as the interests of regulators do or as the head of a unit changes.

In short, the regulatory process does not deliver clarity or certainty but a miasma of interpretation. Given that different interpretations of the same rules can make the difference between a positive or negative return on investment, this problem, combined with a history of highly disruptive price focus and much chopping and changing of rules, is one of the largest impediments to investment in Europe.

In conclusion, a simpler regulatory regime (with one central regulator, as per the FCC in the US), and rules that allow for significantly less local interpretation are likely to increase investment substantially. To be clear this type of approach would also be likely to have negative unintended consequences in many countries. Europe's telecommunications landscape is very different country to country – cable infrastructure ranges from zero to nearly 100%; spectrum allocation varies widely – making the outcome of regulation equally divergent. It is quite possible that the likely "collateral" damage of some markets makes the centralised regulation of this critical sector politically impossible. In this case, the best alternative would be to set clear principles centrally (deregulation of fibre pricing, clearer and more harmonised spectrum rules) and allow more freedom to national regulators to ensure local competition. Whatever the outcome, we believe that the average level of investment and average outcome would be improved by clearer, more uniform rules.

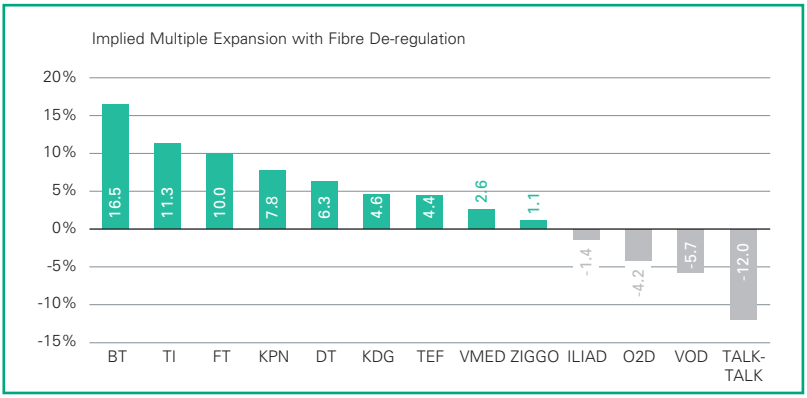
2.4. A better telecoms environment with more robust infrastructure, lower prices, and stronger companies is within the reach of European regulators

European incumbents have for the past several years represented one of the least attractive equity investments worldwide. Returns have been low (often lower than their cost of capital), their regulatory environments uncertain (though tending to be negative for returns), and investment in infrastructure has flatlined, while around the world it has risen. We think that three initiatives can materially improve the outlook for investment in these companies and their investment in own infrastructure:

- Deregulation of fibre;
- Creation of a long-term spectrum plan with clear rules and dates and, the harmonisation of radiation limits;
- Tightening of the regulatory process such that either fewer participants are involved or decisions are binding enough to remove ambiguity of outcome.

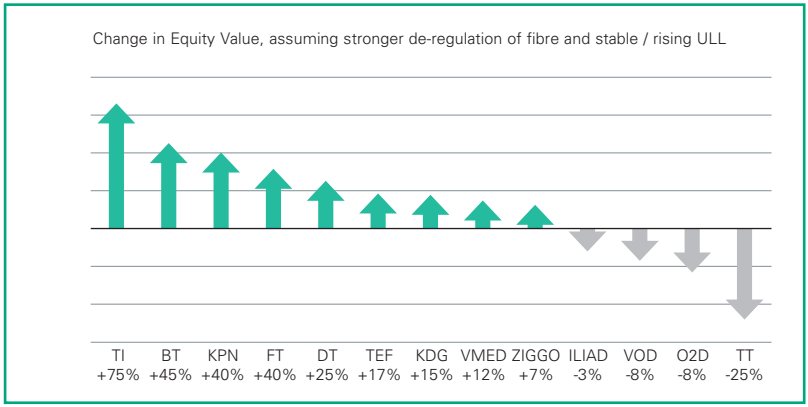
Were these reforms undertaken, we estimate that the share prices of these companies would rise by an average of 30% (see Exhibits 17 and 18); that 20%-30% more fibre would be built in Europe; and that 4G coverage would be extended 20%-50%. Without these changes, or with a muddied partial change, investors are unlikely to flock to the sector, and major new infrastructure investments will increasingly need to be subsidized by governments and taxes.

Exhibit 17: Better EBITDA growth should translate into multiple expansion



Sources: Company reports, Bernstein estimates and analysis

Exhibit 18: The combined effect could considerably push up the value of stodgy incumbents in our sector



Source: Bernstein analysis and estimates

3. The Future of the Telecommunications and Information Sector

As this book shows so far, many issues are linked in the ICT world. With the complexity of any one of these issues in mind, it is necessary to concentrate on some main points when searching for possible solutions to the current challenges. Therefore, this chapter should not be read as all-embracing accumulation of details related to our main topic; rather, we focus here on some ideas which we believe will have a far-ranging impact on the future of Europe´s ICT industry.

One of our goals is to provide some insights into how different policy areas are related. The advantage of examining this issue from the perspective of an independent regulatory authority is that we can look at all these issues at the same time while examining some intensely debated topics from an outside view. Also, our focus is on economic reasoning, which may not take into account all stakeholders' interests.

An important disclaimer in this regard is that our proposals should be seen as contributions to a wider debate that is happening on many levels, from stakeholder forums and national politics to the European Commission or even worldwide forums. Therefore, we concentrate mainly on high-level proposals, which leave room for further discussions on a more detailed level. Some proposals might also not be fully addressable by EU initiatives in the short term; rather, national policies, which have to take their respective national political environments into account, need to step in to some degree for more immediate results.

Another reason for us as a sector-specific regulator to treat all the subjects outlined (besides the legal foundation that enables us to deal with issues related to content and innovation policies[25]) is the interplay between different fields of interest, which may in the end have a significant impact on future regulatory policies.

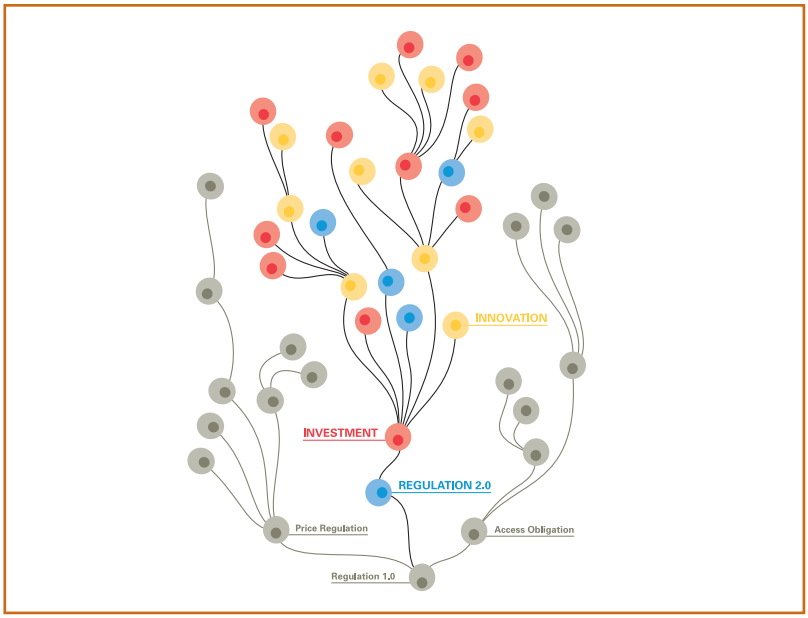
[25] Cf. Austrian telecoms act [TKG] (2003), §1.

In this chapter, we identify areas where Europe is lagging behind (Chapter 3.1). We further outline that sector-specific regulation is important for the ICT sector, but only one piece of the puzzle; rather, a more general framework has to be set which combines regulatory policies with investment and innovation issues. A general concept for new policies is therefore composed of more than just sector-specific regulation ("Regulation 2.0", Chapter 3.2) – we need additional new ideas to ensure the competitiveness of European markets ("Innovation 2.0", Chapter 3.3) and to establish a framework to activate private and public investment in new infrastructure ("Investment 2.0", Chapter 3.4). These form a "magic triangle", in which innovation and regulation, while interacting with each other, should serve the goal of efficient investment and, in the end, lead to a positive effect of reducing or amending sector-specific ex ante regulation in the long run.

In more detail, these concepts show interdependencies: Increased innovation leading to a higher level of competitiveness, as well as a sound risk capital system, trigger a boost in the provision of new services. As these developments are accepted by consumers, the resulting demand in new services will increase consumers' willingness to pay for broadband access and higher bandwidth. Together with future-proof regulatory policies, which will likely be influenced by a very innovative, competitive, and investment-friendly environment, this should provide investors with positive business cases for their infrastructure investment and therefore result in increased investment in high-speed broadband. Higher bandwidth, in turn, is a precondition for new services that remain to be developed. This process can be seen as a "virtuous circle" (see Exhibit 19) where all three areas, regulation, innovation and investment are fostering the whole European ICT sector.[26]

[26] A similar concept was also identified by the EC – c.f. Europa.eu (2013a) – "Digital Agenda: Commission outlines action plan to boost Europe's prosperity and well-being."

Exhibit 19: The Virtuous Circle



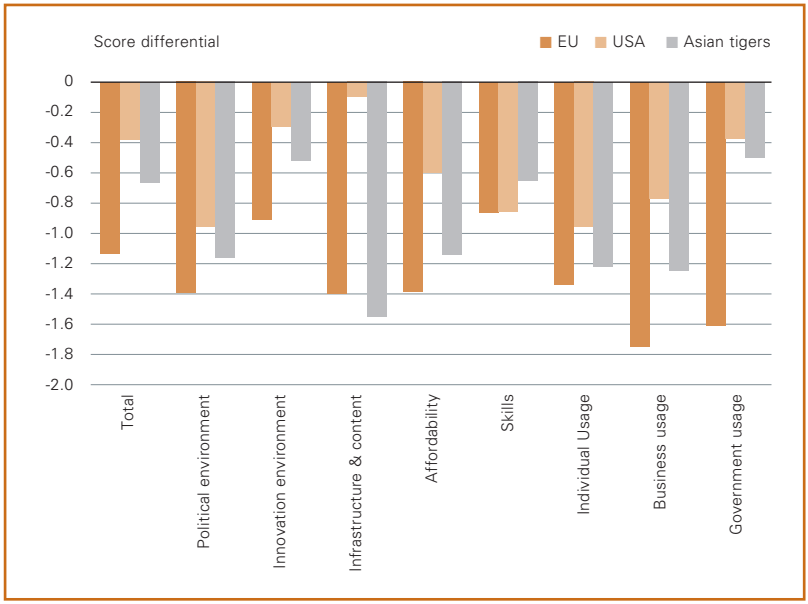
Source: RTR

3.1. Europe is lagging behind

Considering the developments in the telecommunications sector outlined in Chapter 1 and the challenges that emerge for regulators, policymakers, investors, and (regulated) companies, we believe it is wise to rethink relevant parts of the policy framework in place. In the last chapter, Robin Bienenstock outlined her view as an analyst on how to alter regulatory policies in Europe. As a national regulatory authority, we naturally argue from a slightly different point of view in regard to some issues, with consumers being important stakeholders in the telecommunications markets. In this chapter, we not only present our view of the regulatory system, but also extend our view to other areas that likely influence regulation and telecommunications markets.

In the ICT world, recent developments do not speak in favour of the European continent. North America and parts of Asia are currently in the lead in many areas of ICT. Taking the Networked Readiness Index into account (see Exhibit 20, which provides a score differential of main regions against the respective world leader) as a measure for the prosperity of ICT, the EU-27 are currently significantly behind the US and leading Asian countries (World Economic Forum 2012). Whereas the US is very close to world leaders in many areas, in Europe, only Sweden and Finland are amongst the top performers.[27]

Exhibit 20: NRI Score differential to world leader



Source: Own calculations, based on World Economic Forum (2012).

[27] Sweden is leading in the total NRI, as well as in four more sub-indices (infrastructure & content, individual usage, business usage, economic impact [not in graph]). Singapore leads in political environment and innovation environment. Korea is the leader in government usage and social impact; India is top in affordability; and Finland is the leader in the skills-index.

Exhibit 20. According to the Networked Readiness Index with an ascending scale from 1 to 7, Europe is lagging behind in almost all telecoms-related areas against the USA and Asian tigers (Hong Kong, Singapore, South Korea and Taiwan) plus China.

A study by strategy and technology consultancy Arthur D Little (2012) supports these data. Between 2007 and 2011, the digital ecosystem in Europe shrank 8% in terms of revenues, while at the same time, it grew elsewhere between 28% and 67% (in North and South America, respectively).

The study also shows that in 2011, European revenues in the areas of Internet, content, IT services & software and devices lagged far behind Asia and North America. For instance, European firms´ devices revenue was €33 billion, compared to €345 billion for US-based companies and €908 billion for Asian. Network operators earned almost the same (in absolute terms), with €447 billion in Europe and €409 and €459 billion in North America and Asia, respectively.

Other studies have shown that the impact of ICT on economic growth is much lower in most European countries than in the US. OECD (2011a) concludes that technology acceleration and, particularly, ICT, explains the differential between US and EU productivity growth from 1995 onward. Hence, ICT is the area that will determine future economic and social development in Europe and the entire region´s position in the global economy.

At present, Europe is losing ground in the ICT sector in:

- **Infrastructure roll-out:** While in countries such as Japan or South Korea, NGA networks already serve a majority of the population and in the US, LTE reached more than two-thirds of the population by the end of 2012,[28] most European countries are at least one step behind in these developments. Positive examples, such as Lithuania, with almost full FTTx coverage, and Sweden, with 93% LTE population coverage by 2012, cannot discount shortages in most Member States.[29] Investors complain about adverse regulatory conditions in Europe, i.e. lack of sufficient returns and long-term stability for investments, and therefore focus on activities outside the region.[30]

- **Innovation potential:** Both in service and devices, the US and some Asian countries are leading in technological developments. Be it Apple, with their recently announced iWatch; Samsung, with significant software improvements in the smart phone and tablets world; or Google, with their glasses, Europe as a whole does not seem to offer the right environment for outstanding technological and procedural development. Moreover, highly developed tech-clusters in the US make it very hard for Europe to catch up. While some important innovations have been born in the EU (such as Skype), they went or were sold to the US at a later stage.

[28] Verizonwireless.com (2013) – "Coverage"; AT&T invests $ 20 billion per year in VDSL2, FTTH/B and Mobile – ATT.com (2013) – "AT&T Investment Drives Service Improvements."

[29] Telegeography.com (2013) – "53% covered by 100Mbps-plus broadband; take-up rate 27%."

[30] A hot topic in this regard is the dedication of spectrum for mobile networks. While in the US, licences for mobile spectrum are granted at high prices for an unlimited time, European frequencies are usually re-auctioned in shorter periods. While an eternal dedication of spectrum on the one hand ensures predictability for investment, it restricts on the other hand the flexibility to adjust to new market developments, new technologies, mergers, etc. Whether the whole effect of such a measure was positive would require a more detailed analysis, which also needs to take into account legal and institutional aspects.

- **Service Providers and Start-ups:** Like What's App or services from Google and Apple, most successful service providers today are US-based. Often European start-ups want to sell to the US or base their activities in the first place in Silicon Valley or New York. European-based services such as Spotify face strong headwinds because of unnecessarily complicated regulations (such as specifics in copyright law).

As a result of these issues, financial capital, human capital, and ideas that might initially have emerged in Europe come upon more conducive conditions in the US or Asia. Within Europe, only Scandinavia remains amongst the most innovative regions in the world. However, the downturn of Nokia shows that such advantage in very innovative industries may be lost in the blink of an eye. "Top Talents" are strongly attracted to working in the US compared to Europe because of a significantly better working environment and better individual compensation. Europe needs to preserve technical advantage where it still exists and reestablish it where it has been lost to other regions of the world.

3.2. "Regulation 2.0"

This section outlines a proposal for a future design of regulatory policies in Europe, "Regulation 2.0", which should help build the framework for the Virtuous Circle outlined above.[31] The need for changes in regulation policies and practice arises from quick technological progress and significant changes in the structure of telecommunications markets, as outlined in Chapter 1. The goal is to find new approaches that improve investment activities and provide more flexibility while maintaining and even fostering competition. "Regulation 2.0", therefore, is a more dynamic regulatory framework based on:

- Creating a more flexible environment;
- Promoting an integrated market;
- Granting network access and designing clear net neutrality rules;
- Shifting the focus of national regulators to new challenges (such as quality monitoring);
- Establishing dynamic efficiency and intermodal competition as the centrepieces of regulatory policies;
- Strengthening technological neutrality as a basic principle.

3.2.1. General Structure of the Regulatory Framework

> *"There is nothing more difficult to plan, more doubtful of success, more dangerous to manage than the creation of a new system. The innovator has the enmity of all who profit by the preservation of the old system and only lukewarm defenders by those who would gain by the new system." (Niccolo Machiavelli)*

[31] A similar text on "Regulation 2.0" was published by RTR in July 2012.

What Niccolo Machiavelli stated about changes in existing systems some 500 years ago is equally applicable to today´s intractable systems. Also regarding regulatory policies in Europe, orthodoxy is fighting change and, consequently, telecommunications regulation is in some respects very static. Compared to the industry which has changed significantly, especially regarding technological progress, EU-wide regulatory policies were amended only gradually with respect to directives, and mostly "reinterpreted" on the basis of soft law (recommendations, guidelines, etc.), which inherently bears more uncertainty as a result of being less predictable and not strictly binding on NRAs. In the past, these changes also did not seem to fit in a coherent strategy.

For a new regulatory concept, which we call "Regulation 2.0", a more flexible approach must be developed, with tools that enable the regulator to react faster to changes in the ecosystem (market conditions, technological development, etc.). This does not necessarily imply that the regulatory framework as a whole must be redesigned. Rather, a more pragmatic model is needed: if a concept (for instance, the NGA recommendation focussed on passive infrastructure) does not successfully deliver proof-of-concept or if it is not economically viable, it needs to be revisited. Waiting until the next review of the EU framework might require too much time in such situations. Hence, there should be the potential to give new approaches a chance, evaluate them and, in the case of success, harmonise them across Europe with the tools available. To guarantee legal certainty and minimise investment risk, this has to happen within clearly defined boundaries.

Sometimes there is a conflict between the different targets of harmonisation (across Europe) and deregulation. Harmonisation just for the sake of trans-European offers, economies of scale, or a less-fragmented regulatory landscape is not worthwhile as long as markets are national and NRAs are bound to proportionality and the current interpretation of the existing framework and competition law principles.

While general competition law might be sufficient for some markets (with the focus on passive infrastructure access) and, therefore, sector-specific competition regulation can be withdrawn, it would be preferable

if the close monitoring of these markets remained in the hands of the NRAs, because they already have the required know-how to fulfil this task.

In the following paragraphs, we discuss the main issues we have identified based on our expertise as well as in discussions with stakeholders such as investors, operators, and other NRAs.

Promoting an integrated market. The formation of a single European telecommunications market is at an early stage or as Neelie Kroes said, "The EU is still essentially a collection of 27 distinct national telecoms markets".[32] However, the structure of the industry is "harmonised" increasingly with respect to transnational companies and standardisation issues. For instance, around 80% of all European mobile customers fall within the four largest mobile operators.[33]

In general, there are two opposing developments in place today: service markets are becoming more international or, to some extent, even global; but network infrastructure markets are becoming more and more regionally fragmented with the roll-out of new infrastructure, to which a different set of regulation applies. "Regulation 2.0" takes these developments into account.

To address the first development, several discussions are in progress in the European Union. One involves more harmonisation in regulatory policies throughout Europe (e.g. universal service, numbering, spectrum management, authorisation, end-user provisions, etc.). Enabling a one-stop-shopping principle in certain areas would enable telecommunications companies to exploit economies of scale more easily.

Similarly, harmonisation of spectrum policy is seen as enabling a higher degree of market integration: Spectrum that is not yet assigned to telecommunications/mobile operators, but is likely to be in the future

[32] Europe.eu (2013b) – "A single market in ICT: What the European Council means for you."
[33] Bloomberg.com (2013) – "Phone mergers can't mean higher price, less competition, EU says."

(such as the second digital dividend – the 700MHz spectrum), might be auctioned under the same conditions and timeframes throughout the European Union. This would be a decisive step toward a more uniform mobile market where operators can exploit economies of scale.

Another recent discussion has considered easier opening of national roaming agreements to foreign providers. The intention is to ease services across Europe for currently national or multinational (but not Europe-wide) operators. While this would certainly increase competition in most markets, it might also (depending on the actual design) be an impediment to investment and innovation, because infrastructure operators´ returns could be decreased artificially. In addition, it would extend regulation to areas which until now have been left to the market.

Such supply-side measures may help with the creation of a single market in Europe. However, just as important would be auxiliary measures for the demand side. For instance, an obligatory standardisation of general terms and conditions would give users more certainty when closing a contract in other than the home country within the EU. Similarly, enabling operators to act across the EU once they have received an authorisation in a single Member State would ease market entry.[34] Cultural and linguistic differences between EU countries must be addressed, since they are a major obstacle to an integrated digital market. However, this is a very long-term issue; therefore, corresponding demand will be inert to a significant extent.

It is noteworthy that the creation of a single digital market will also have implications on the organisational structure of telecommunications regulation. One view in this discussion is that a single European regulator was needed to create a single market in the first place.[35] Another view is that in the current state of European telecommunications, in which cross-border markets are rudimentary, a European regulator might be overburdened in its task, since national specifics still play a major role.

[34] This was recently referred to as “EU passport” by Neelie Kroes.

[35] This view is supported by industry proponents, as mentioned in press articles (for instance, Reuters (2013) – “Europe to take first step toward telecoms reform”.)

What might help in some areas is a more concerted international regulatory policy by NRAs. One intention of the creation of BEREC was to induce more collaboration between NRAs, and, indeed, there are impressive steps in this direction, such as the BEREC Common Positions. However, the fact that the BEREC Chairs change every year and are sourced from national regulators may imply a lack of a long-term, all-embracing view on the digital market in Europe. A delegate acting within BEREC over a longer time-frame, but not necessarily representing of national regulators, might step in here to keep track over all European markets to create a long-term strategy in collaboration with NRAs and the EC. This representative should examine Europe and the working of the regulatory framework from an outside perspective and make proposals for developing the system further.

Fulfilling the need for IP access and net neutrality rules. "Skype" and "WhatsApp", et al, are only the first envoys of an all-IP based future. These service providers[36] are creating a more clear-cut industry structure, in which vertically integrated firms participating in the entire value chain will be the exception rather than the rule: Network operators will focus on network operations (of different qualities), and service providers will – based only on broadband interconnection – connect end-users with messaging and telephony services. What is needed for service providers is a basic standardised IP access product designed as close as possible to LLU, and not a multitude of service-specific access products. Private users, on the other hand, need open access to the Internet and an underlying infrastructure with appropriate quality characteristics which could be defined (if needed) by a single regulatory/political approach instead of approaches from different areas (universal service, net neutrality/minimum quality, etc.). In this context, net neutrality rules should also guarantee service suppliers provision of their offers under non-discriminatory terms.

[36] In the telecommunications industries, these are often referred to as "Over-the-top players", because they are in turn using IP-services provided by telecommunications companies. However, this term is considered controversial amongst service providers (cf. Wikipedia (2013) – "Over-the-top Content").

Shifting the focus of national regulators. While some tasks will not be necessary anymore under a new framework, national regulators will not shed their full range of duties. The main tasks will still be the regulation of physical access to network infrastructure and spectrum allocation (where this is within the remit of the NRA). However, as service providers take over, NRAs will no longer be required to concentrate on traditional voice and interconnection issues. At the same time, new challenges for NRAs will emerge:

(I) Providing end users with sufficient information about the quality characteristics of their broadband connections (demand-oriented regulations);
(II) Spurring investments on a national scale while not obliged to grant fullest possible access;
(III) New requirements of interoperability in the face of the rising importance of service providers – this might be an issue better covered by competition law, as it might focus on structural measures, and on a European scale, as service providers tend to be multinational;
(IV) A shift in the general focus (for example, toward supporting the goals of the digital agenda while maintaining technological neutrality).

3.2.2. Concrete Challenges for Regulation

Dynamic efficiency should become increasingly important. Despite recent small advances,[37] European telecommunications regulation is still focussed on promoting static efficiency. Low prices for consumers are widely seen as the ultimate goal. However, a few drawbacks result from this approach. The main downside is that firms – especially incumbents – can hardly earn the profits needed for broad investment in new infrastructure. The entrants, on the other hand, have few incentives to invest in their own infrastructure, because they can easily access the incumbents´ networks (option value). The "Ladder of Investment"

[37] Such as the Recommendation on non-discrimination and costing methodologies as described at the end of this chapter.

concept, which tries to combine static and dynamic efficiency, failed in many respects. Due to insufficient economies of scale, entrants could not step up the ladder from resellers or service providers based on bitstream to local loop/sub-loop unbundlers or infrastructure providers in many regions. Particularly with regard to the last rung of the ladder, where entrants were expected to invest in their own local loop or sub-loop infrastructure, the "Ladder of Investment" concept did not deliver the expected results in many regions. Additionally, as outlined, new technological developments such as vectoring will render local loop unbundling infeasible. Entrants might in these cases step back on the ladder and return to bitstream or newly created services such as virtual unbundling.

Today, it seems necessary that competitors have a less deep but broader footprint when customers' demand moves toward quadruple-play offers and one-stop-shopping for electronic services.[38] In contrast to the EU, the US abandoned their "stepping stone" hypothesis, which is similar to the European "Ladder of Investment", years ago.

One needs to realise that the ultimate goal of regulation – to favour end-users – depends not only on prices, but also on higher quality in the long term and, thus, on investment. Therefore, the focus of regulation has to shift from static efficiency towards a more dynamic approach, which should also be reflected in the toolbox at hand, which, in the end, might conflict to some extent with harmonisation goals. A step in this direction would also be to concentrate on intermodal competition, as described below.

Setting the focus on intermodal competition. Mobile operators have increasingly competed with fixed-line services; cable companies, which concentrate more and more on digitalisation and the provision of highspeed broadband, have become the most impulsive competitive force in telecommunications markets in recent years.[39] Especially when it

[38] It is worth noting that the concept of the "Ladder of Investment" was instrumental for opening the market. However, it became obsolete when it comes to fostering investments in new infrastructure.

[39] According to Cable Europe (2012), already in 2013, one out of two European households has access to a 100+Mbps cable broadband connection.

comes to highspeed broadband services, the current implementation of LTE and full adoption of DOCSIS 3.0 as well as new developments such as LTE advanced, 5G and DOCSIS 3.1, will further increase the competitive pressure from mobile and cable networks.

On the other hand, alternative network operators using incumbents´ legacy networks through regulated access have been able (or willing) only to an extent to deploy their own infrastructure to the end-user and therefore to climb the "Ladder of Investment" to the top. To achieve the goal of sustainable effective competition, the focus of every regulatory policy should therefore clearly be broadened and shifted from an intramodal to a more intermodal holistic approach.[40] Competitive forces stemming from developments in the mobile and cable industries should be promoted and considered in market analyses. It has to be borne in mind that regulatory measures for legacy networks might also have effects on other infrastructures. For example, lower copper-access charges might reduce incentives to invest in cable or mobile broadband, because of a lower overall level of broadband prices. Similarly, stricter non-discrimination rules for access to the incumbent's infrastructure might accelerate intramodal competition (while intermodal competition is the actual competitive force) and, therefore, unnecessarily increase the regulatory burden.

In this regard, it should be highlighted that, today, regulation often seems to focus too much on details ("regulatory micro-management"), such as on ensuring consistency between different access products in the value chain, or on how costs should be calculated, etc. This creates insecurity and high regulatory costs because of high complexity. Rather, regulatory policy should develop further sound fundamentals of intermodal competition.

[40] However, in some areas, the full range of access regulation will remain important, for example, for transnational business service providers and their customers.

Ensuring technological neutrality. The focus on technological neutrality, which is somewhat thrown into doubt in the context of Digital Agenda targets (by one-sided favouring of fibre deployment), is closely related to the fact that intermodal competition plays an increasingly important role. For the end-user it does not matter over which platform a service is provided. Hence, for the definition of end-user markets, the underlying infrastructure of service provision should not matter. Similarly, for granting public subsidies, technology should not play a role as, from the demand side and the customer's valuation, it is not at all clear that an enforced move to a particular technology meets current and near-term requirements. Focusing on demand-side measures rather than supply-side aid for network deployment would also guarantee more technological neutrality.

Quality monitoring and net neutrality. Bandwidth promised in advertisements often does not reflect real bandwidth as observed by the end-user. A primary task for regulatory authorities will be to monitor the quality of services provided by network operators. This is particularly important with regard to the net neutrality debate. Without net neutrality rules, services can be blocked, or at least the bandwidth for these services can be reduced. This might have negative impacts on investment and innovation in the services industry and ultimately on the end-user. Therefore, clear net neutrality rules, which facilitate innovation on the service level (both for managed services and for best-effort Internet), have to be developed and need to be ensured.[41]

3.2.3. The Impact of "Regulation 2.0" and Recent Developments

A similar paper on "Regulation 2.0" was published by RTR in late July 2012. Heated discussions about regulatory policies in Europe and the debate about the "paradigm change" announced by Vice-President Neelie Kroes on 12 July 2012 took place at the same time. One outcome

[41] RTR recently published a paper on Net Neutrality, available at http://www.rtr.at/netneutrality.

of this paradigm change, which included a deviation from former plans to artificially lower copper prices, was planned to be a Recommendation on non-discrimination and costing methodologies. A first draft for this Recommendation was published by the Commission on 12 December 2012 (EC 2012d). It concentrated on three major issues:

- Stricter non-discrimination rules clearly in favour of Equivalence of Inputs (EoI) as the central non-discrimination concept
- A detailed costing methodology with the intention to lead to copper prices between €8 and €10 on average in Europe
- A link created between non-discrimination rules (EoI) and the removal of cost-oriented price control obligations for NGA networks (while maintaining access obligations) in the case of a competitive safeguard (such as alternative infrastructure or copper legacy infrastructure with access based on cost-oriented prices). In particular, NRAs were asked to remove cost orientation for active NGA wholesale inputs, when EoI, technical replicability, and economic replicability were ensured.

At first glance, the possibility to abandon cost-orientation under certain circumstances seemed to be a change in regulatory policies, one that heads to some extent in the direction that Regulation 2.0 proposes. However, the linkage with EoI as a very strict non-discrimination remedy lowered the impact of the proposed measure. In particular, this proposition would mean that a very strict feature of intramodal competition (EoI) has to be introduced in a setting where intermodal competition is already the driving force. This could increase the regulatory burden on the regulated firm in comparison to other infrastructures such as mobile, cable, or fibre networks.[42]

[42] A more recent version of the Recommendation submitted to the Communications Committee on 28 May, 2013, includes a provision that "there may be additional scenarios where the imposition of regulated wholesale access prices is not warranted". This would mean that EoI was not a necessary precondition for deviating from cost orientation. Since the final version of the Recommendation was not published before the deadline to this book, a final evaluation of the Recommendation remains to be made.

To follow the principles outlined in "Regulation 2.0", competitive safeguards reflecting some kind of intermodal competition should, together with a non-discrimination standard less intrusive than EoI (e.g. EoO), as well as economic and technical replicability, be sufficient to remove cost-oriented price obligations.

The adherence to EoI in the Commission's draft also shows that static efficiency and intramodal competition still are central concepts in the EC's view. While the strict propositions on how to calculate copper prices are intended to harmonise access prices across Member States, these intentions might not be sufficiently reflected in the proposed measures, as BEREC stated in its opinion on the document (BEREC 2013). In summary, the published version of the Recommendation of December 2012 does not in its entirety support the principles outlined in "Regulation 2.0".

3.3. "Innovation 2.0"

> *"The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the [...] process of industrial mutation [...] that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one [...]" (Schumpeter 1942, p. 83)*

The description of the US steel industry in the early 1940s by Joseph A. Schumpeter, an Austrian economist, supporting his concept of "creative destruction" is more than ever true for ICT over recent decades. After electricity revolutionized the world's economies in the late 19th century, it fell on the ICT industry to offer another game-changing General Purpose Technology (GPT).[43] The consequences were not only new products and services, as they appear in various sectors, but an overall and long-lasting change in how firms and individuals communicate and interact.

[43] As defined as such, for instance, in OECD (2007).

As history indicates, the best part of the story may lie ahead. The steam engine, for example, was invented by James Watt in 1769. However, it took around 70 years for water to be replaced by steam as the most important source of power (Kanefsky 1979, p. 338). In the beginning, steam contributed less than 0.05% to the growth of labour productivity, while in the middle of the 19th century, this value was around 0.4% per year.[44]

The same is true for electricity. The biggest impact on American productivity happened 40 years after Edison's invention, in the 1920s (David, 1991). Indeed, the patterns of the impact of electricity and ICT on US labour productivity are similar in the first 40 years of their existence.[45] If history repeats itself, ICT will impact economic growth in the future more than ever.

However, the "greater [North] American success in exploiting the productivity potential of information and communications technologies" (Crafts, 2004, p.131) so far leads us to the conclusion that the US will claim the biggest piece of the "ICT cake". In Europe, a statement by Norman Mailer, American novelist, applies – "The mark of mediocrity is to look for precedent". Only a lively future environment clearly focussed on innovation, implementing and living the concept of creative destruction and, in particular, not disturbing this process, can bring Europe to the top with regard to ICT and economic development as a whole.

The scope of a discussion of ICT and how to promote an innovation-friendly environment is far-reaching. It is therefore useful to concentrate analysis on those areas that are expected to have the most extensive impact on the economy.

[44] Crafts (2004), including railway, steamships and steam engines.
[45] Cf. Economist.com (2013) – "Has the ideas machine broken down?"

The first step in such an analysis is to create a list of possibly relevant issues. The second step should narrow these issues to those areas where shortcomings are the most impeding and expected to have the most extensive impact on ICT. In addition to this overall impact, further determinants could be:

- The time frame of a measure's effectiveness;
- Stakeholders involved and likelihood of policies to be implemented;
- Blind spots within topics or in the interplay between topics;
- Controversial intensity of an issue.

After consideration of such a process, we decided to concentrate on three policy initiatives with exceptional influence on the overall European ICT sector:

(1) Promoting digital skills and education (Chapter 3.3.1), which are decisive factors for the success of the Internet economy. First, without sufficient digital literacy, there won't be a critical mass of ability to use new innovative services. Second, highly elaborated know-how will provide the labour force necessary to establish innovation in start-ups and existing firms. To reach these goals, we need to open educational resources and apply best-practice examples.

(2) Facilitating new business models (Chapter 3.3.2) is a prerequisite for innovative services and products. With the fragmented and retro-oriented copyright law in place and data protection provisions that treat firms differently depending on their origin, innovators in Europe cannot exploit the advantages of the continent. Furthermore, we need to ensure that innovative services are not hampered by monopolistic infrastructure. This can be addressed by net neutrality rules, as outlined in Chapter 3.2, "Regulation 2.0".

(3) Fostering entrepreneurship (Chapter 3.3.3), which is not considered as significant in (continental) Europe[46] as in other parts of the world.

[46] While acknowledging that especially Great Britain has a different history of entrepreneurship and other issues than continental Europe, we will use the term "Europe" to mean the entire EU throughout this chapter, because our focus is on the European Union, not on single positive or negative outliers.

> This is a major drawback for many industries and particularly for an innovative field such as the ICT sector. We need to establish a "licence to fail" to give innovators the chance to try out unconventional ideas without being earmarked as "losers" if the idea is unsuccessful. We have to create "ecosystems of excellence" that ensure vivid innovative structures. Finally, it is critical to consider venture funding as it is one of the hottest topics for entrepreneurs, especially in times of financial crisis.

These policy areas build on one another. Improving digital skills and know-how is the ultimate prerequisite for new services to emerge and, therefore, the most long-term area.[47] The legal issues involved in facilitating new business models provide a basis for entrepreneurship.

3.3.1. Digital Skills and Education

Increasing digital literacy skills probably has the most significant long-term impact on the ICT economy. Without people who understand how to use the Internet and the services it provides, there is no need for such services. Similarly, skills such as programming or web designing are necessary for the creation of new services. We need to advance both areas in Europe.

One step that is of the utmost importance is to teach the handling of new technologies in the right way. As Eric Schmidt, Chairman of Google, said in an interview about British schools: "[…] your IT curriculum focusses on teaching how to use software, but it doesn't teach people how it's made".[48] While a few schools have adopted this approach, there is too little action on an EU level to date.[49]

[47] However, Europe is currently at a stage where many citizens are already heavy Internet users; still, the reach to the world's top has to be our goal.

[48] Gigacom.com (2013) – "Eric Schmidt challenges teachers: get with the program."

[49] Recently, however, the EC launched the "Grand Coalition on Digital Jobs", in which private firms and organisations are expected to collaborate in fostering ICT education and training (https://ec.europa.eu/digital-agenda/en/first-pledges). Still, we only see this as a first step towards an educated ICT society.

In the following, we present some proposals for changing the European education environment so that we will see both a skilled workforce and literate end-users in the future.

Opening up educational resources. While the Internet provides children and students with a plethora of unstructured information, their biggest challenge is to validate the trustworthiness of this information. By providing certified and easily accessible educational content, users would have a credible reference point for their education and research. A fast certification process should ensure the timely availability of such content, especially in quickly developing sciences. Such resources may also be used by teachers and adults complementary to services such as Wikipedia.

Fostering online courses and freely accessible e-learning resources is the first step to an open education system; however, comprehensive guidance on different initiatives is required. Governments, in collaboration with NGOs and the EU, should have sufficient capabilities to implement open educational resources. Similarly, guaranteeing secondary publishing rights for authors of educational materials (including scientific articles) could be a supplementary measure promoting an open knowledge economy.

Establishing new standards for online education. The European Computer Driving Licence (ECDL) is one amongst many examples of a Europe-wide standard for the knowledge of basic computer skills (such as text processing or spread sheet analysis). A certificate system for online courses with transparent minimum requirements should be established in the European Union, so that users understand what the requirements for such online courses are. Human resources departments will then have a clear indication of the knowledge that people who pass such courses have in their portfolios.

Creating incentives in firms for adult education. Lifelong learning will increase innovation potential. Tax deductions for employers who offer skill upgrading in fields for which there is such demand, and rewards for companies that contribute to the knowledge economy by providing public access to their knowledge are viable incentives for lifelong learning.

Spreading role models. Many countries, regions, and schools have their own best practices of how to teach students digital skills and computer science basics. An example is the programme of the "Tiger Leap Foundation" in Estonia. It aims to teach primary school children the basics in programming with learning materials specifically prepared for children. The initiative not only sharpens children´s sense of troubleshooting, but also increases their awareness that machines are not only there to be used but to be conducted. Such role models should be spread and promoted throughout Europe – as was Sheeplive.[50] Policy makers may foster free provision of such learning materials and encourage governments, schools, and teachers to adopt these best-practice examples in their educational systems.

3.3.2. Facilitating New Business Models

Compared to the US, in Europe, some business models are difficult to implement, because of different legislation among Member States. In the following paragraphs, we identify two policy areas which have a significant impact on the ICT sector: Copyright (3.3.2.1) and Data Protection (3.3.2.2). We argue that harmonisation across Europe will help new businesses to utilise economies of scale more easily.

3.3.2.1. Copyright and innovation

During the last decade, the debate about intellectual property rights, particularly copyright, has been extensive. Only when Napster appeared in 1999 and established the first big filesharing platform did the industry recognize the potentially enormous impact of new Internet achievements on media industries.

[50] Sheeplive is an initially Slovakian initiative to sensitise children and young adults to security issues on the Internet and with mobile phones. The contents (short animated clips) were translated and distributed in many EU Member States (http://www.sheeplive.eu).

More recently, the convergence of networks and terminals, the change to IP-based services, and the transition from an owner to a user society have created vast opportunities for new services, as well as the need for a modern copyright law. Since most copyright provisions are regulated nationally, the market for services including music, audio-visuals and literature is rather fragmented within Europe. Spotify, a Swedish start-up that was founded in 2006, for instance, is still not available in all EU countries seven years later.[51] Similarly, there is as yet no European counterpart to US-based video-on-demand provider Netflix.

What should a new copyright framework that provides the most incentives for innovation and maximizes overall welfare look like? First, it must be acknowledged that a trade-off is inevitable between strong copyright protection and the provision of services or, to put it another way, between the creation of content and weak copyright protection. If original material were not protected by copyright law, incentives to create it would be tremendously reduced. This is especially true for professional content that requires large investments, such as films.

On the other hand, when strict copyright laws prevent service providers from distributing content easily among end-users, new services can be prohibited and (European) service providers are forced to act on national levels only, where they cannot create business models for world-wide activities. In the end, total utility for (European) end-users is reduced significantly, because they are not able to watch their favourite movies without significant obstacles. However, when access to content is simplified, the effects are positive for creators as well, since they can reach a bigger audience and eventually increase their revenues. Therefore, to foster content creation and distribution, we need to strengthen content creators and consumers:

Creating a single European collecting society. An important step to a more innovation-friendly copyright environment in Europe would be to make it easier in the first place for service providers to offer their services. Today, the main obstacle is that they have to negotiate with collecting societies, most of which stipulating different rules and conditions, in 27 Member States.

[51] As indicated on spotify.com (accessed on 28 May 2013).

A central goal is to establish a single European collecting society, where a Europe-wide exploitation right is granted to service providers through a one-stop-shop approach. This would not only help establish new services, but also give existing services the opportunity to exploit economies of scale by reaching more than 500 million people at once.

By providing these economies of scale from scratch, the best among these services will manage to become world-wide competitors. To limit the monopoly power of this European collecting society, an effective regulator that ensures transparency and efficiency of the collecting society should be created on an EU-scale. If Member States cannot agree on this concept, a more competitive environment among different national collecting societies could be created as an intermediate goal.

Such measures can strengthen and motivate creators, service providers and, in the end, consumers. Furthermore, they will fully exploit the benefits of the Internet and foster innovation in Europe.

Harmonising copyright law across Europe. A second step that may be even more difficult to implement is to fully harmonise copyright law across Europe. While some initiatives in this direction have been undertaken recently,[52] a comprehensive and binding policy covering all relevant fields is still missing. The European Commission has announced it will amend the EU copyright framework in 2014 (EC, 2012g, p.5). However, it is not clear if all negotiating parties will find a solution by then. In terms of innovation, a harmonised copyright framework would enable the creation of new services across the continent even more effectively than the establishment of a single collecting society only.

Creating a future-proof copyright law standard. Given current technological possibilities, we must be aware that a significant number of those who are connected to the Internet are providers of content in some way. Every text, from the travel blog to the online newspaper; every picture uploaded to Instagram; every home video is content which in most countries is automatically protected by copyright provisions. It is not clear how this content should be treated – especially on a European or even global level.

[42] For instance, the EC launched a Directive on orphan works (EC 2012e).

Among legal experts, it is largely agreed that the current interpretation of copyright law is too vague for the individual customer. If you share a photo on Facebook that you did not take, you may be breaking copyright law. If Google allows universal access to text excerpts, they might be breaking copyright law. If you find a poem or lyrics somewhere on the Internet and want to share it on your blog, you may be breaking copyright law.[53]

As these potential breaches of law happen all the time, and as such behaviour has become natural for an entire generation, we can´t label the entire society of Internet users "criminals". We need to find a solution in which creators get a fair share, if their content is exploited commercially, and, at the same time, users are not punished for sharing content on a non-commercial basis. What we need is a "fair-use" principle with clear rules, such as non-commerciality and identification of the original author, which are understood by everyone and which provide certainty for Internet users.

Reinforcing the difficulty of resolving these issues, Vice-President Neelie Kroes recently stated "We were not able to tackle [the dossier] so far".[54]

3.3.2.2. Data Protection

Another highly relevant issue concerning the foundation of new enterprises is data protection. Dublin, Ireland became the first landing place in Europe for US Internet companies due to its relatively low standards of data protection (other reasons were language and low corporate taxes[55]).

[53] Due to the fact that copyright provisions are not yet harmonised across Europe, whether these actions are actually breaches of copyright law in different EU countries depends on the respective national formulations of copyright law and the jurisdiction.

[54] Mlex.com (2013a) – "Kroes regrets lack of progress on EU copyright revision."

[55] However, as Google pays most of their taxes in Bermuda, taxation may not be the main argument; c.f. Guardian.co.uk (2013) – "If Google is in Ireland for tax reasons, why are most of its profits in Bermuda?"

In comparison to the EU, US-based Internet firms are used to relatively low standards of data protection. In the US, "The private sector should lead," and it does.[56] There, government intervention applies only to established general rules. This liberal approach could account for the fact that free-of-charge services, financed only by advertising revenues, were founded in the US in the first place and that, today, most of Internet content is accessible without payment. This is probably the most important reason for the success of US-based service providers.

There is an inherent trade-off between high data protection standards and innovation. While low standards enable firms to maximise profits through advertising and therefore provide new services free-of-charge, it is unclear if end users will accept such services without knowing how their private data is treated. This might be especially true for new services such as cloud storage which consumers won't use in case of low certainty. Therefore, stricter data protection can increase innovation, as consumers will adapt new services when they feel that their data is well protected and, by including more consumers, increase the overall Internet market.

It is even more important to harmonise data protection standards throughout Europe to enable firms distribute their activities further. Discussions on data protection rules are currently taking place at several levels, including the European Parliament. However, current competition among Member States in terms of tax burden, working standards, data-protection, and privacy rules is counter-productive when seeking a single digital market in Europe.

[56] Cf. William J. Clinton & Albert Gore, Jr., A Framework for Global Electronic Commerce, 1 July 1997.

3.3.3. A Cultural Change in Entrepreneurship

Europe has great history and one of the most impressive cultural heritages in the world. And Europe is home to firms with long traditions and strengths – think of Volkswagen, BP, Royal Dutch Shell, et al. With respect to entrepreneurship, however, Europe is falling behind. The newcomers among the world's big businesses do not originate in Europe. Facebook, Amazon, Google, Apple, Microsoft – the five big players in the Internet business – are based in the US. China´s telecommunications vendor HUAWEI recently surpassed the former world market leader, Sweden´s Ericsson, in total revenues;[57] and the biggest telecommunications service providers, besides Britain´s Vodafone, are US-based AT&T and Verizon and China Mobile.[58] According to The Economist, in the last 25 years, only three major companies have emerged in Europe, compared to around 25 in the US.[59] The Innovation Union Competitiveness Report (EC 2011a, p. 368) reported that, in 2011, only 13% of EU citizens were engaged in entrepreneurial activities, compared to China, with 27%, and the US, with 21%. Start-ups in the United States created 40 million jobs during the last three decades, equal to net job creation (Feld 2012, p. ix).

In contrast to the US, where the "Start-up America Initiative" of President Obama[60] is intended to create millions of jobs in the upcoming years, Europe is seen as, "Deeply inhospitable to entrepreneurs; wanting to grow a start-up into a behemoth is quite as countercultural as piercings and performance art," according to The Economist.[61]

[57] DW.de (2013) – "China's Huawei catches up with Ericsson."
[58] As measured by market value according to the Financial Times in March 2012 – FT.com (2012), "FT Global 500 2012."
[59] Economist.com (2012) – "Les misérables."
[60] Whitehouse.gov (2013) – "Fact Sheet: White House Launches "Startup America" Initiative."
[61] Economist.com (2012) – "Les misérables."

The Innovation Union Competitiveness Report suggests that the lack of financial support and complex, bureaucratic administrative procedures are the biggest barriers to entrepreneurship (EC 2011a, p.373). Europe must provide the environment in which small enterprises, taking high risks to create new business models, can thrive. Therefore, a change in entrepreneurial culture in Europe is a critical step in ensuring Europe's competitive future.

The problem is not that Europeans have fewer or worse ideas than US citizens. Initiatives like the Campus Party, Telefónica's WAYRA business accelerator program,[62] or the Pioneers Festival[63] reflect the EU´s entrepreneurial potential. Instead, it is the lower prestige of entrepreneurship in Europe, which hampers rather than facilitates new firms and innovation.

While there are some political initiatives in favour of a new entrepreneurial culture, such as the European Commission´s "Entrepreneurship action plan 2020",[64] decision makers need to sharpen their focus, specifically, in three areas:

- Foster start-up ecosystems (3.3.3.1);
- Ease the foundation of new businesses (3.3.3.2);
- Create a sufficient financing environment, in particular for start-ups (3.3.3.3).

[62] Wayra.org (2013).
[63] Pioneersfestival.com (2013).
[64] Europa.eu (2012a) – "Consultation on Entrepreneurship 2020 Action Plan."

3.3.3.1. Fostering start-up ecosystems

One of the main questions that are broadly discussed in Europe is why firms such as Google and Apple have been established in Silicon Valley and not in Europe? Indeed, it provided some good preconditions: an excellent educational environment, led by Stanford University;[65] a geological abundance of silicon, the main ingredient of electronic semi-conductors; and a pioneering spirit personified by William Hewlett and Dave Packard, among others. Over the last 60 years, a "knowledge ecology"[66] including, in addition to the above, technology, venture capital, marketing professionals, and law firms has been established in the region. This outstanding environment seeded Google or Apple,[67] which are, in turn, attracting expertise and innovation.

But Silicon Valley is not unique. Berlin, London, and the Øresund cluster, which combines IT technologies with life sciences and clean technologies, are viable locations for Europe´s "start-up ecosystems".

Berlin shows how the important "first step" of a successful innovative firm leads to a virtuous circle that can change an entire city and deliver a significant impact for Europe as well. Approximately 55 years after Hewlett-Packard was founded in Silicon Valley, Rocket Internet and others established an ecosystem of innovators that centred there from all over Europe. Today, expanding firms such as Soundcloud and Zalando show the importance of Berlin and even Google recognizes this as reflected in its investment in the start-up centre, "Factory".[68]

[65] Ranked number two university in a world-wide ranking; see Shanghairanking.com (2012) – "Academic Ranking of World Universities – 2012."

[66] Understanding Silicon Valley (2000), Foreword by John Seely-Brown, p. xiv.

[67] The fact that other big players such as Microsoft (Redmond) and Amazon (Seattle) are not based in Silicon Valley shows that similar history of success might also be possible elsewhere. However, Silicon Valley is the most outstanding area, as the number of excellent tech firms shows.

[68] Berlin.de (2012) – "Wirtschaftssenatorin begrüßt das Engagement von Google in Berlin."

However, as Stefan Glänzer, a London-based entrepreneur and investor from Germany, points out, Berlin does not fulfil all preconditions to become a "second Silicon Valley," and this is the problem with other entrepreneurial centres in Europe. The region´s start-up centres either have advantages in creativity, as does Berlin, or easy access to funding capacities, such as in London, but none meets all criteria, as a report by Telefónica shows.[69]

In the short run, it would help to promote established centres of innovation. It is easier to found new innovative businesses where Internet start-ups are success stories, since labour force, capital, and infrastructure are available. Connecting these centres could be the decisive step in creating "Googles" in Europe.

Concrete policy suggestions are:

Bringing ideas together. The EU as well as national and regional authorities should promote conferences and platforms that connect entrepreneurs trying to establish new innovative (IT-) start-ups, by providing financial support, locations, or workforce. Businessmen, technologists and IT-professionals need to be brought together to breathe new life into new ideas and ventures. Academic institutions may provide the environment for such initiatives.

Creating local clusters. Policies need to ease access to shared office spaces or studios that might be financed by local authorities at the start of the company's lifetime. The regional development fund (ERDF), one objective of which is to support SMEs,[70] should provide sufficient financial aid for this purpose, as it enables, together with universities and business schools, the establishment of regional and transborder clusters.

[69] Welt.de (2013) – "Berlin ist die kreativste Stadt für Start-ups". Telefónica (2012); Telefónica's report also points out that only three European cities are among the top 20 start-up ecosystems in the world: Berlin, London, and Paris.

[70] Europa.eu (2011) – "Cohesion Policy 2014 - 2020."

Facilitating the set-up of funding. If the access to funding opportunities is not sufficiently organised on a private basis, policies should aim to create national and international platforms to concentrate private- and public-funding initiatives. This would reduce search costs for new founders.

3.3.3.2. Easing the foundation of new businesses

What many founders and venture capitalists believe is needed in Europe is a "licence to fail". Both US start-up investors and innovators respect the fact that a business idea they support might not be accepted by the market: Failure is seen as part of the learning process. Especially in the Internet industries, failure is an important part of many later success stories. "We´re here trying to 'manufacture fail' on a regular basis, and we think that´s how you learn", says Dave McClure, a Silicon Valley-based founder of 500 start-ups.[71] A colleague, Dave Feinleib, describes this mentality as, "If you look at the [Silicon] Valley – certainly now – it´s like: Try it. If it works, great; and if it doesn't, no problem."

However, such a culture is missing in most parts of Europe. Failure often means that the founders do not get a second chance due to legal restrictions or lost trust.

According to a survey published in the Innovation Union Competitiveness Report, fear of failure plays a significantly weaker role in the US than in most EU countries (EC 2011a, p. 370). The overall conclusion of another EC report from 2011 stated, "Most national legislations and the absence of proactive governmental policies do not facilitate second chance for restarters" (EC 2011b). The Eurobarometer study (EC 2012b) shows that the biggest fear of Europeans in becoming entrepreneurs is the possibility of going bankrupt and losing property. In this environment, it is not surprising that self-employment has become even less attractive in recent years. The percentage of people who wanted to be self-employed decreased from 45% in 2009 to 37% in 2012.

[71] Inc.com (2012a) – "Why Silicon Valley Loves Failures."

The implication of these results is that there is a need in Europe for policies that reduce the fear of starting an own business while establishing a second chance if a business fails and easing the foundation of new businesses:

Implementing a "licence to fail". One step in this direction would be to ease insolvency law. While financial investors must be protected against fraud,[72] a second chance after "honest bankruptcy" should be possible without constraints. Venture capitalists are well informed about the risk they take when investing in new ICT start-ups. Separate liquidation proceedings for fraudulent bankruptcies and fast-track liquidations for honest bankruptcies are not yet possible throughout the EU, but they might help overcome the barriers that are created artificially after business failures (EC 2011a). Similar to "Chapter 11" in the US, insolvency law in all European Member States should include clauses that enable the unimpaired continuation of companies.

Creating new, easy-to-use legal forms of organisations. While in some European countries it is easy to found companies with limited liabilities,[73] other countries still burden founders. According to the Networked Readiness Index (WEF 2012, Indicator 2.04), the average number of days to establish a business is on average twice as high in the EU as in the US. National governments should ease the foundation of new businesses; the European Union can provide a recommended best practice. Also on a Europe-wide level, enabling a simpler form of the Societas Europaea (SE)[74] with lower obligatory registered capital could help founders of Internet businesses often focussed on the entirety of Europe.

[72] Whereas only 4-6% of all business failures are fraudulent (EC 2011b).

[73] Such as the "Ltd." in the UK or the "UG" ("1 Euro GmbH") in Germany and the "GmbH Neu" in Austria, both also legal forms with limited liabilities.

[74] The Societas Europaea (SE) is a body with limited liabilities that may act European-wide. However, with registered capital of €120.000, this structure can hardly be used by start-ups.

Anchoring entrepreneurship in education. While EU business schools rate only slightly lower than those in the US,[75] 76% of the EU population has not learned about running a business in their schools or universities (EC 2012b). Entrepreneurship, therefore, should not only be taught in business schools. The founders of Google, Larry Page and Sergey Brin, were not businessmen in the first place; they were computer scientists and engineers. What Europe needs is to instill the connection between excellent science and entrepreneurial spirit. Therefore, education policies should aim to establish entrepreneurship as part of any university education. Similarly, projects started in secondary school, where students get an impression of how entrepreneurship works, should be facilitated.

3.3.3.3. Creating a sufficient financing environment, in particular for start-ups

The availability of capital is another decisive factor in the success of start-ups. Three stages of investment are distinguished:[76]

- Discovery – Seed funding (up to €100.000): The main goal is to create a prototype of one's product. Financing is usually provided by family and friends, crowd financing or business angels.
- Validation – Early-stage capital/Start-up stage (up to €1 million): The product is ready for launch; financing for early sales and manufacturing is needed. Investment requirements typically exceed the funds of family and friends, though business angels and crowd financing might remain in the mix. Venture capital might be an additional source.
- Efficiency – Development and expansion capital (€1 to 5 million): As the product proves itself and the start-up becomes profitable, more capital is needed for expansion. Venture capitalists, VC funds, and especially private equity will be important sources. If expansion into a global company is planned, other, more traditional forms of financing will complement private equity.

[75] US management schools scored 5.4 in the NRI compared to a score of 4.7 for European schools (WEF 2012).

[76] Based on various sources such as Telefónica (2012), personal interviews with experts.

The main instruments of start-up financing – venture capital and business angels – are key to European discussions about and policies covering entrepreneurial culture and the need for clusters of excellence. With the right preconditions in place, most financing opportunities will be based on private initiatives.

Policy change should also be implemented in the provision of crowd financing, especially important in the first two stages of investment. Today, the environment for conventional financial institutions such as banks in regard to equity obligations and low returns on traditional investment opportunities raises the importance of alternative financing/investment possibilities, of which crowd funding could be the one with the highest potential impact on the real economy. The time has come for this innovative financing tool, as it incorporates all the advantages the Internet offers.

Crowd financing is defined as a "collective effort by consumers who network and pool their money together."[77] Crowd funding was initially used on early platforms such as Kickstarter and Indiegogo, where creators presented their product or project, and people provided money without gaining a share of a company or making claims for interest payments. They then usually receive a non-financial benefit for their investment – such as a special or personalised version of the product.[78] With the rising popularity of such crowd funding platforms, another concept became familiar: crowd investment. Crowd investment is comparable to gaining shares (equity) or bonds (debt), depending on how the offer is designed, for investment. In both cases, donors provide money to gain a share of the company or to receive a fixed interest rate on their loan.

[77] Definition provided by Ordanini et al. (2011). While the most popular term, "crowd funding", was coined recently, the concept dates back centuries. Did you know, for example, that the pedestal of the Statue of Liberty was financed by crowd funding (Crowdfunduk.org, 2012)? Cooperative societies can also be considered a form of crowd funding – and were a major driver for economic growth in many European countries in the past.

[78] See, for instance, http://www.kickstarter.com/projects/1499165518/ukiyo-e-heroes.

Crowd investment is the most interesting tool for investors as they not only get their favourite product on the market, but also – if it´s successful – get their money back with a return. For entrepreneurs, this makes financing their early-stage investments possible without the need for securities or help from their social network.

In the past, crowd investment (as in the case of co-operative societies) was used mainly on a local level, where people could build the trust needed to pool their money in an investment. The Internet, however, created new opportunities. Nowadays, it is not personal knowledge among locals but a world-wide Internet community that ensures a good assessment of the value of a project. Crowd investment ensures that a project is only implemented when a certain amount of money is reached. Therefore, even if a single investor misjudges a project's ability to succeed, it is the mass of people who decide in the end where the money flows. The Internet ensures that sufficient information about a product or project is published and that this information is discussed and valued.

With the JOBS Act, the Obama administration legalised crowd investment under certain conditions in 2012.[79] In most European countries, crowd investment was already possible; however, from a certain amount of funds raised, security prospectus requirements had to be met, which creates significant compliance costs for the issuer. European legislation was partly eased by a regulation, which increased the minimum amount for the provision of security prospectus requirements from € 50.000 to € 100.000 in 2012;[80] two years before, the prospectus Directive[81] provided more flexibility for national legislation.

[79] Inc.com (2012b) – "Why the JOBS Act is a Win for Entrepreneurs and Investors."
[80] Regulation (EC) 486/2012, amending Regulation (EC) 809/2004.
[81] EP and European Council (2010).

Easing crowd investments. As € 100.000 often is not a sufficient investment amount for most start-ups, and national governments haven´t utilised their flexibility to amend this amount in the past, this threshold should be increased by EU legislation. At the same time, some safeguards might have to be implemented to protect investors. These may consist of maximum investment limits for each single investor; transparency rules; and clear provisions included in the contract that the capital might be lost and is not secured by deposit guarantees.

3.4. "Investment 2.0"

The last cornerstone in the puzzle of promoting the telecommunications sector in Europe is the question of how actual investment in new telecommunications infrastructure can be assisted most effectively and efficiently. The overall framework for such investment should be provided by sound regulatory policies and an innovative environment as described.

However, even given these improvements, it is still not clear that investment in the core infrastructure, namely fixed and mobile access, would happen. The European Commission names high risks, longer payback periods, and insufficient experience of financial institutions as the main reasons why, "The private sector is reluctant to invest in the deployment of broadband networks."[82] Furthermore, telecommunications companies currently face high debts and a downturn in revenues and, therefore, lack the financial capabilities to invest major amounts. Therefore, new investment models and financing utilities need to be found to ensure that new infrastructure is actually deployed.

[82] Europa.eu. "Action 43: Funding for high-speed broadband."

The European Commission has tried to design policies to overcome the investment gap in broadband infrastructure. However, the central proposition – dedicating a large part of the Connecting Europe Facility (CEF) for broadband – was significantly amended, with funding reduced from a proposed € 8.2 billion to only € 1 billion (for ICT services only), due to budget negotiations in February 2012.[83] On the other hand, the EU-27 Member States decided on a € 10 billion capital increase for the European Investment Bank (EIB) in January 2012 as part of a "European Growth Pact." It is most likely that only a small share of this money will be used for telecommunications infrastructure.[84]

Given the above, it is clear that private initiatives will be needed even more than public funding for broadband. This is confirmed by Vice-President Neelie Kroes, who said, "The real heavy lifting must be done by private investment."[85]

In the following paragraphs, we highlight the most important actual and potential investing bodies (besides telecommunications companies), and if and how policy measures can direct them toward more telecommunications investment. We examine how infrastructure funds (3.4.1) and pension funds (3.4.2) can be incentivised to more telecommunications investment and elaborate how cooperation models and public financing can help (3.4.3).

[83] Zdnet.com (2013) – "No cash for broadband: Europe´s super-fast future torpedoed by budget cuts". The final decision for the EU budget and the funding for the CEF has not been made before the deadline to this book. However, as an informal agreement of end June 2013 showed, there was still hope for the CEF to be fully funded (Europarl.eu, 2013, "MEPs reach informal deal on EU funding for infrastructure projects").

[84] Euractiv.com (2013) – "Member states approve € 10 billion capital increase for EIB."

[85] Europa.eu (2012b) – "Enhancing the broadband investment environment – policy statement by Vice-President Kroes."

3.4.1. Infrastructure Funds

Funds that concentrate on infrastructure investments have become increasingly important in recent years. In contrast to traditional equity funds, they comprise shares in specific infrastructure projects instead of shares in companies. Infrastructure funds typically bring about relatively secure, stable, and inflation-proof returns (OECD 2011b, p.16). The rise of such funds is expected to grow, since other forms of investments, including government bonds, deliver either significantly higher risks than in former times or marginal returns.

Moreover, as infrastructure funds invest mainly in regulated industries (e.g. energy, water, railways, telecommunications), they can profit from protected market positions. As a downturn, this means that they are dependent on political and regulatory stability. Also, such investments typically bear a large share of sunk costs, where early exits are typically possible only with high costs.

With regard to investments in telecommunications infrastructure, more specific risks appear to decrease engagement of investment activities in this area:

(I) Compared to other infrastructures, future demand for high-speed broadband is uncertain. While traffic on roads or electricity transfers may be predicted comparatively well, it is still not clear when highspeed broadband services will attract a larger audience across Europe. So far, traditional, narrow-band broadband technologies are sufficient for large parts of the customer base, as low take-up rates of fibre connections show.

(II) With regard to fixed fibre technologies (FTTx), the technological development of rival infrastructures plays a major role. Upcoming technologies, such as LTE advanced with shared transmission speeds of 1 Gbit/s and more, and the second life of copper (Vectoring, Phantoming), may frustrate investments in the fibre local loop. As

> Michael Wilkins from Standard & Poor's has pointed out, investors perceive the sector as changing too quickly, presenting an obsolescence risk for typical long-term investors.[86]

While the first issue may be addressed by demand-side measures and stimulation of the development of new services (as touched on in "Regulation 2.0" and "Innovation 2.0", respectively), the second point of technological uncertainty can be seen as exogenous and therefore minimally addressed by investment policies.

3.4.2. Pension Plans

The shift of pension schemes from mainly pure unfunded, pay-as-you-go systems to private, funded, defined contribution (DC) or defined benefit (DB) systems in many European countries has given rise to pension funds responsible for investing enormous amounts of money for their clients. Pension funds' assets grew steadily from 2001 to 2009 (OECD, 2011b, p. 127), providing evidence that an increasing amount of capital is stored in retirement provisions. However, these funds are invested mainly in equity and bonds. Low shares of pension funds' assets are invested in infrastructure, and only a share of this amount is used to finance telecommunications infrastructure.[87]

There are various general barriers to infrastructure investment by pension funds, including a lack of political commitment over the long term (OECD, 2011b, p. 23). One of the most severe problems, however, is the relatively small scale of most pension funds. Due to fragmentation within and among countries, there are only few pension funds of a magnitude that enables them to invest directly in infrastructure projects.

[86] MIex (2013b) – "EU telecoms networks present 'obsolescence risk' for investors, S&P says."

[87] A survey published in Della Croce (2012, p. 20) shows that less than 1% of pension funds' assets are invested in infrastructure.

Moreover, direct infrastructure investment involves a steep learning curve, thus creating an obstacle for pension fund managers to engage in direct investment. If at all, smaller pension funds would typically have to invest indirectly via infrastructure funds; in this case, the substantial additional management costs involved[88] usually make the pension funds' investments unprofitable in relation to other forms.

On the other hand, there are examples of significant activities by pension funds that engage in infrastructure projects. The second-largest state-owned fund in the world, the Norway Government Pension Fund (NGPF), invests in infrastructure "... such as electricity, gas and water supply, toll-financed roads, airports and telecommunications."[89] Their main reason to engage in such investments is, "Economies of scale in asset management ensure that the Fund can maintain a low level of costs compared to other investors. As a result, the Fund can secure profitability in investments which are not profitable for others."[90]

As argued, it is the size of the fund that makes direct investments profitable. With an amount of around € 550 billion in early 2013,[91] the Norwegian fund is significantly bigger than any other pension fund in Europe. Similarly, two other large funds, the Canadian Ontario Teachers' Pension Plan and "Australian Super", invested around 10% of their assets in infrastructure by the end of 2010,[92] and Korea's National Pension Service allocated 32.4% of its alternative funds to infrastructure investment with a focus on domestic projects such as highways, airports, and social infrastructure in 2009 (OECD, 2011b, pp. 52, 152).

[88] For example, Macquarie, one of the largest infrastructure fund companies in the world, typically charges a premium of around 5% (cf. Fondsprofessionell.de, 2013 – "Infrastrukturinvestitionen im Überblick"). This amount can be assumed to be slightly lower for pension funds due to their high investment volumes.

[89] Regjeringen.no (2011) – "The Management of the Government Pension Fund in 2010."

[90] Regjeringen.no (2011) – "The Management of the Government Pension Fund in 2010."

[91] Nbim.no (2013) – "Government Pension Fund Global - Market value", 27 March 2013, with an exchange rate of 1 EUR = 7,46 NOK.

[92] Otpp.com– "Teachers' Pension plan".Australiansuper.com (2013) – "Our share holdings."

Conversely, most pension funds within the European Union that invest in infrastructure, "Utilise the indirect market route to benefit from the experience and expertise offered by infrastructure fund managers" (OECD, 2011b, p. 130). This again implies significant external management costs, which reduce the incentives to invest in infrastructure.

We suggest three initiatives to encourage infrastructure investment on an EU level:

Establishing pension fund partnerships. To overcome the problem of the small size of many pension funds, Great Britain recently came up with a possible solution, called the Pension Infrastructure Platform (PIP). This vehicle consists of 10 pension funds, each committed to £ 100 million for infrastructure investment in a first step, with a final target of £ 2 billion total investment capital.[93] The platform is organised by the National Association of Pension Funds, the Treasury, and the Pension Protection Fund. Similar initiatives should be facilitated in other European countries or even Europe-wide. European institutions such as the EIB may incur guarantees or create bodies for such investment vehicles.

Creating incentives for pension funds' infrastructure engagement. According to Directive 2003/41/EC on the activities and supervision of institutions for occupational retirement provision, "Member States should be given some discretion on the precise investment rules that they wish to impose on the institutions located in their territories." This may be done by setting limits and ceilings for specific asset classes, as various other countries do (according to OECD, 2012). A Communication or Recommendation by the EC could direct the Member States to commit their pension funds to infrastructure investment.

[93] Theactuary.com (2013) – "Ten pension funds signed up to infrastructure platform."

Aligning pension funds rules with infrastructure needs. Member States should be aware that the design of superannuation schemes has a direct impact on how the capital may be invested. To foster infrastructure investment by pension funds, it has to be ensured that such superannuation products match infrastructure's revenue and risk profiles. The ultimate goal of pension funds is to deliver adequate pay-outs for their customers. Therefore, there should be incentives to invest in assets that provide stable and transparent incomes – such as infrastructure.

3.4.3. Co-operation Models and Public Financing

One of the most severe impediments to fibre deployment is the inherent risk of such projects. If not one but several bodies participate in such investment projects, the risks are shared among them and each faces only a fraction of total uncertainty. Hence, co-operation models could deliver NGA, even in rural areas, where uncertainties about demand are higher. When backed with public funding, incentives could be increased further.

A well-known form of such collaborations is Public-Private-Partnerships (PPPs), which are already used widely for infrastructure projects and broadly discussed as a solution for bridging the digital gap in rural areas. In some regions, PPPs have helped deploy fibre technologies further to the customers, as for example Metroweb in Italy and Superfast Cornwall in the UK (EPEC 2012, p.6). Similarly, state aid can be granted to broadband in rural areas according to specific rules set out by the EU.[94] While PPPs and traditional state aid will play a role in future telecommunications infrastructure investment, they are not the only form of collaboration possible among different stakeholders and public initiatives.

[94] EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks (2013/C 25/01).

Fostering community financing. An innovative form of infrastructure financing is by involving residents in the infrastructure projects they use. One upside of such projects is that locals that invest in their own telecommunications infrastructure are more likely to use it. The project Google Fiber, undertaken for instance in Kansas City, Missouri, and Austin, Texas,[95] shows how this can be implemented in practice: Google rolled out their fibre-access networks only, where a sufficient number of people committed to sign up for a defined period or to at least pay a one-time connection fee. While this is not "investment" by the residents in the classical sense, where providers of capital gain a return, these customers get free basic Internet as a benefit. Such projects could be extended so that people are able not only to invest in their personal last mile, but also in those of others – and gain a return on the income generated by these connections. Municipalities can act as organisers of such projects, as some do already, creating a special form of PPP. Houseowners have the additional benefit that the value of their property could rise with adequate Internet access. In Sweden, for instance, homes with fibre connection, "... sell at a 5% to 10% premium."[96]

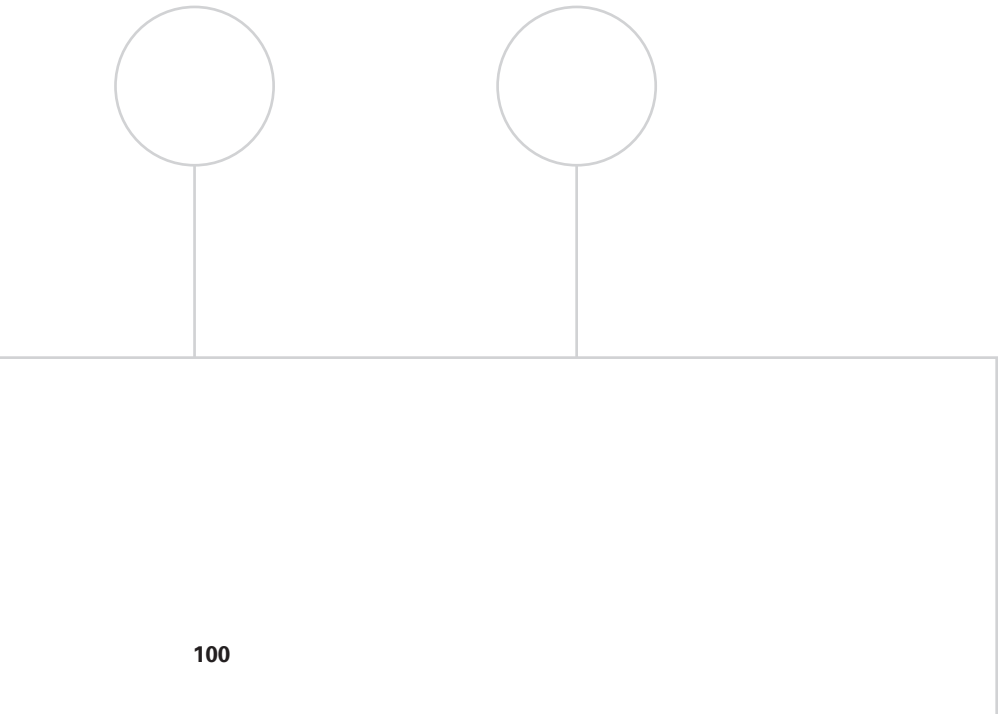
Establishing an alternative to the CEF for broadband. As mentioned, initial plans of the European Commission for the 2014-2020 EU budget – to dedicate €8.2 billion for broadband deployment and ICT services – were cut during debates to €1 billion, which is now allocated for services only. The CEF could have had a significant positive effect on investment, and the Commission could have sent a clear signal of its seriousness about reaching Digital Agenda goals for broadband coverage and take-up. To regain positive momentum, the Commission needs to find an alternative to the CEF. For instance, the Commission could, in collaboration with the EIB, ensure that substantial shares of the European Growth Pact will be dedicated to broadband investments.

[95] Fiber.google.com (2013) – "A different kind of internet."
[96] Its-technology.net (2012) – "Benefits of ftth."

Creating a Marguerite-like telecommunications fund. The EIB already acts as a main body and sponsor for specified infrastructure investment through the Marguerite fund.[97] Sponsored not only by the EIB, but also the European Commission and several private financing institutions, the Fund aims to invest around € 700 million in (mainly) energy infrastructure and renewables. A similar body specialised in telecommunications networks could be created to facilitate infrastructure investment.

Reducing digging costs. Another form of cooperation was recently put on paper by the EU Commission. With the Draft Regulation on measures to reduce the cost of deploying high-speed electronic communications networks (EC 2013), infrastructure deployment could cost 20%-30% less (Analysis Mason & Tech 4i2, 2013). The main proposition to this is an obligatory collaboration in infrastructure deployment of not only telecommunications, but also sewage, electricity, and gas networks. As a starting point, all Member States should establish infrastructure registers to plan infrastructure deployment.

[97] Eib.org (2010) – "Q&A 2020 European Fund for Energy, Climate Change and Infrastructure (Marguerite Fund)."



4. BEREC

In 2012, RTR took over the chairmanship of BEREC from Chris Fonteijn, CEO of the Dutch regulatory authority. Georg Serentschy, the new Chairman, set very ambitious goals for BEREC and its Work Programme for 2012. This chapter of the book reflects on the year and the Work Programme, notably its targets, developments, and results achieved during a very active year.

BEREC is producing high quality work since its establishment, but due to the rigid European Framework is not able to act immediately according to the needs of the market. In order to push ideas for the development of the sector forward, Georg Serentschy decided to initiate a stakeholder engagement programme during his BEREC Chairmanship, the so called "Strategic Dialogue" (see 4.10) The fruitful discussions at the strategic dialogue with the CEOs from some of Europe´s largest operators inspired Georg Serentschy – in his private capacity after his mandate as BEREC Chairman was fulfilled – to develop ideas to bring Europe back to the top. This book was developed to popularise this discussion and reach a broader audience.

Moreover, one has to note that the BEREC mid-term strategy and the strategic outline of this book – as laid down at the beginning – may differ in some parts. The reason behind this lies in the structure of BEREC on the one side and the dynamic development of the market on the other side. Where BEREC has to set up a work programme for every year right in advance it does not have too much flexibility in adjusting this throughout the year whereas the European Commission's initiatives may be more flexible in this respect.

4.1. BEREC Meetings and Board Composition

In 2010, Georg Serentschy was elected the new BEREC Chair for 2012 by the Board of Regulators (BoR) and the Management Committee (MC).

Supporting the BEREC Chair 2012, the following persons were elected as Vice-Chairs:

- Leonidas Kanellos, EETT, Vice-Chair 2012, to act as Chair 2013;
- Göran Marby, PTS, Vice Chair 2012;
- Catalin Marinescu, ANCOM, Vice Chair 2012;
- Ed Richards, OFCOM, Vice Chair 2012.

The Board of Regulators and the Management Committee met four times in plenary during 2012. One of those meetings was hosted by RTR in Vienna. In addition to these plenary meetings, a number of public hearings, as well as debriefings following each plenary meeting, took place in Brussels in 2012 to supplement public consultations.

Prior to the plenary meetings, the "Contact Network" (CN) met on four occasions to make the necessary preparations for the regular meetings of the Board of Regulators and the Management Committee.

In order to carry out the 2012 Work Programme, the Board of Regulators decided to maintain previously-adopted practice and allocated individual elements of the Work Programme to the following Expert Working Groups (EWG):

- Benchmarking;
- BEREC Office Evaluation;
- BEREC-RSPG Cooperation;
- Convergence and Economic Analysis;
- Framework Implementation;
- End-User;
- International Roaming;
- Net Neutrality;
- Next Generation Networks;
- Remedies Monitoring;
- Regulatory Accounting;
- Termination Rates.

BEREC has identified the need for a presence in Brussels, in addition to the seat of the BEREC Office in Riga, for practical reasons, such as for Expert Working Group meetings and to ensure its effective interaction with the EU Institutions and other stakeholders. BEREC took the decision under RTR's chairmanship to create a "Bureau de passage" in Brussels.

4.2. Work Programme 2012

The main targets of the 2012 Work Programme during RTR's chairmanship were to continue ongoing work and to focus on the development and continuous improved functioning of the internal market for electronic communications networks and services.

The Work Programme had two main streams:

Defined core topics:

- International roaming;
- Net neutrality;
- Consumer empowerment;
- Next Generation Networks – Access;
- Review and update of BEREC Common Positions.

Defined additional topics:

- Consistency of remedies;
- Recommendation on termination rates;
- Promotion of broadband;
- Regulatory accounting.

In addition to these major work streams, the Art 7/7a procedures and organisational issues have been included in BEREC's Work Programme.

As a result of BEREC´s work in 2012, significant progress was made in all of these defined areas. The BEREC Board of Regulators, chaired by Georg Serentschy, published a number of 96 documents, of which 11 went into public consultation. An impressive 221 contributions from stakeholders were received and taken into account as far as possible. The BEREC Management Committee, also chaired by Georg Serentschy, adopted 27 documents crucial to the functioning of the BEREC Office.

4.3. Medium-term Strategy

BEREC's task is to promote the consistent application of the European Regulatory Framework and thereby contribute to the development of the internal market for electronic communications. In doing so, BEREC plays its part in the promotion of growth and innovation in the EU. BEREC can also provide considerable expertise and professional advice to European institutions on policy initiatives and related debates in the electronic communications sector. To do so, BEREC recognises that the development and implementation of medium-term strategic goals will help to further enhance its effectiveness, providing the activities with overall strategic context and clear direction. Therefore, BEREC agreed on a medium-term strategy for the upcoming three to five years.

Communication services are increasingly reliant on wireless and IP technologies and are rapidly converging with media services. Therefore, it is important for BEREC to maintain a strong focus on the protection and empowerment of consumers, including business consumers. Europe is not isolated. BEREC recognises the global nature of these developments and the need for a global approach to promote the interests of EU citizens. Therefore, BEREC decided to focus strategically on the following main themes:

- Infrastructure: boosting the roll-out of next generation networks;
- Consumers: boosting empowerment and protection;
- Services: boosting the internal market;
- Quality: the level of ambition;
- Efficiency.

4.4. Core Topics

The regulatory framework for electronic communications recognizes BEREC's important role in developing consistent regulatory practice. This shall safeguard a consistent and harmonized application of the regulatory framework for protection of end-users and fair competition for market players in the respective fields as follows.

4.4.1. International Roaming

International Roaming was one of the core topics during RTR's chairmanship. As the Roaming Regulation came to an end in June 2012, the European Commission started to plan a successor regulation for Roaming within the European Union. BEREC had already given advice to the European Institutions in December 2010 through analysis of the different forms the regulation could take; its advantages and disadvantages for consumers; the effects on the competitive landscape; and the spill-over effects into national markets.

To assist in the determination of respective benchmarks for the new roaming regulation, BEREC gave advice to the European Council, the European Parliament, and the European Commission by estimating wholesale roaming costs. It was understood that if retail price caps were reduced, there needed to be a suitable reduction of wholesale caps to maintain an adequate margin, although the wholesale caps had not be below the cost of the provision of an efficient MNO. The wholesale costs for outgoing calls, SMS, and Data were calculated to set new price caps.

4.4.1.1. Guidelines on wholesale roaming access

Furthermore, the new Roaming Regulation set out an obligation for mobile network operators to meet all reasonable requests for wholesale roaming access, comprising direct access (e.g. an arrangement with a foreign network, along the lines of classical wholesale roaming agreements) and resale access, requiring the mobile network operators to publish a reference offer for such access by 1 January 2013.

Since the legislation was drafted in very general terms, BEREC set up guidelines aiming to support the market significantly to make the

legislation work well in practice. These guidelines solved some major problems on the implementation time scale as well as on access limitation. The guidelines were published in the second half of RTR's Chairmanship.

4.4.1.2. Technical solution decoupling

Since the Roaming Regulation provides from 1 July 2014 a right to all end-users to choose a provider of international roaming services different from the provider of domestic services and its contracting partners while abroad within the EU (decoupling), a technical solution to make this work was needed. BEREC came to the conclusion that the socalled local break-out and single IMSI solutions are those most technically feasible to implement, taking into account reasonable costs and fit with the given time scale.

4.4.1.3. Roaming data reports

BEREC also continued monitoring the evolution of wholesale and retail prices for voice, SMS, and data roaming services. The delivered Reports were intended to provide a sound evidential basis for the legislative process involved in the Commission's proposal of a new Regulation. Further, as they are an ongoing exercise, the Reports assure constant monitoring of the Roaming market.

4.4.2. Network Neutrality

Network neutrality is based on the principle that all electronic communications passing through a network are treated equally, independent of content, application, service, device, sender address, and receiver address. To assess whether deviations from this principle may be justified and in the interest of the end-user and if other forms may cause concern for competition and society, BEREC has strengthened efforts to consider a set of principles and regulatory objectives. These efforts were carried out in the following areas.

4.4.2.1. Competition issues related to Network Neutrality

BEREC also investigated differentiation practices and related competition issues in the context of Net Neutrality to analyse the effects of differentiation practices, such as blocking or prioritisation of traffic, on competition, and innovation.

These efforts led to a Report which examined various differentiation practices applied to Internet access services and considered how these might, in principle, harm the interests of end-users and have a negative impact both on electronic communications markets and content application and services markets. A public consultation gave further stakeholder input to the report.

4.4.2.2. IP-Interconnection in the context of Network Neutrality

The focus here was on the wholesale level of interconnection between ISPs and other intermediaries in the Internet value chain. BEREC analysed how deviations from Net Neutrality may or may not be reflected at the level of interconnection governing transmission of packets across the Internet as a collection of different networks.

4.4.2.3. Transparency guidelines

Transparency is a necessary condition for end-users to exercise freedom of choice, since it enables them to compare offers and hence strengthen the demand side of the market. It is therefore an important tool to address net neutrality-related concerns. In 2011 BEREC had already produced Guidelines on how transparency obligations would work in practice. Based on these Guidelines, BEREC continued to monitor developments in the markets and situations in the Member States, and consulted with stakeholders to broaden the view on Net Neutrality Transparency issues from a practical angle.

4.4.2.4. Quality of service guidelines

BEREC started the work on this topic in 2010 and published two Reports and Guidelines in 2011. It was decided that these Guidelines would benefit from further operational analysis to develop more specific and

detailed guidance, especially in detection of situations that would justify regulatory intervention and in determination of specific minimum quality requirements.

BEREC also elaborated methods and tools for measuring and assessing network and application performance in relation not only to detection of degradation, but also to verification of transparency. The possibility of achieving and promoting appropriate methods for NRAs and end-users to evaluate quality of service was also explored.

4.4.2.5. Traffic management investigation

In continuation of the 2011 investigation task regarding switching issues and traffic management practices implemented by operators, BEREC followed up in 2012 with a thorough investigation collecting inputs from the stakeholders to achieve some insight on the variety associated with traffic management in the markets, and how it affects end-users. The impressive result included input from more than 400 ISP´s all over Europe, serving some 430 million subscribers. This investigation was carried out in close cooperation with the European Commission.

4.4.3. Universal Service Provisions

Universal Service Provisions acts as a safety net to ensure social inclusion where normal market forces may not safeguard basic electronic communications services for all consumers. Art 15 of the Universal Service Directive requires the Commission to review the scope of Universal Service Provisions on a regular basis and, if necessary, revise it. This happened in 2010 and again in November 2011, when the commission issued a communication on the scope of Universal Service. BEREC delivered its opinion on this communication.

4.4.4. Consumer Empowerment

The market for electronic communications has been providing a steadily increasing number of offers, especially tariff-schemes that bundle different products, and practically replacing perminute tariffs with flatrate packages. Users find it increasingly difficult to compare and the performance parameters of the provided services. Special measurement tools can help create certainty about the offers and enable users to check

and compare what they pay for and what is delivered. These tools can be used by service providers to highlight the diversity of their products and clearly distinguish them from each other. This may be measured by actually delivered up- and download speeds. Specific tools for up- and download speeds have been installed in some Member States. BEREC has analysed these measurement tools further and supports the transparency of these tools, so that users may enjoy a variety of offers and greater choice.

4.4.5. Next-Generation Networks – Access

BEREC continued in 2012 to keep track of NGA roll-out and implementation in the Member States. The aim was to develop recommendations of best practice and guidelines for access procedures and models. BEREC conducted a detailed study on coinvestment as an important concept in rolling-out NGA networks. The study took into account the possibility that coinvestment is the only economically viable means for multiple players to obtain full long-term access to a physical access network in some areas or countries. The deployment of NGA networks raised new issues related to market definition; designation of operators with significant market power; and regulatory obligations. Taking into account the NGA Recommendation published in September 2010, some Member States proposed in their recent round of market analyses to exempt fibre-based networks from specific obligations due to their early stage of development. BEREC´s work in this area aimed to suggest elements to be examined and specific conditions and criteria to be considered as suitable indicators of effective competition with those national regulatory authorities that are facing NGA coinvestment agreements in their national markets and conducting their next round of market analyses for wholesale network infrastructure access (market 4) and wholesale broadband access (market 5).[98]

[98] The markets are defined by the European Union in the Recommendation 2007/879/EC (Recommendation on relevant markets) (EC 2007).

4.4.6. Review and Update of BEREC Common Positions

Thematically linked to Next Generation Networks is the review and update of the three BEREC Common Positions (wholesale broadband access, wholesale local access and wholesale leased lines). This review has also taken into account NGA deployment and regulatory developments (revisions to the European regulatory framework in 2009, and the EU Commission's NGA Recommendation). BEREC ensured that the Common Positions are clearer and stricter, especially with respect to the language used in describing the approach NRA´s should take. Where appropriate, the same best practice standards were used for all three revised and updated Common Positions. Furthermore, BEREC expanded its work in NGA to include remedies and non-discrimination, and identified best practice in the regulatory approaches of its members.

4.4.7. Study on the Evaluation of BEREC and the BEREC Office

The BEREC Regulation states in Article 25, Evaluation and review, that, "Within three years of the effective start of operations of BEREC and the Office, the Commission shall publish an evaluation report." Given that BEREC and the BEREC Office started their operations on 28 January, 2010, following the first meeting of the BoR and MC, the first Commission evaluation report was due by January 2013. After conducting a public tender, PricewaterhouseCoopers (PwC) was selected to conduct this study. The study evaluated in particular the governance of BEREC and the BEREC Office; their organisational structures and management; and the achievements and value-added of BEREC. The evaluation also took into account changes between European Regulators Group (ERG) and BEREC, as well as challenges resulting from the first year of effective operational existence of the BEREC Office.

In general PWC draws some very important conclusions for BEREC. Comparing BEREC with ERG and a theoretical more centralised EU-wide regulatory authority, the study found that BEREC is the most adapted and balanced organisational structure to regulate electronic communications in the EU. It also found that, considering the effectiveness of BEREC in achieving its requirements and objectives, BEREC has been a success.

4.5. Art 7/7a: Framework Directive Procedures

According to Art 7/7a of the Framework Directive, BEREC is entrusted with a specific advisory role. In cases where the European Commission expresses serious doubts about either market definition in regard to the assessment of significant market power (Art 7), or the intention of a NRA to impose an obligation on an operator with significant market power (Art 7a), BEREC must issue an opinion and cooperate with the Commission and the NRA involved. To ensure the development of consistent regulatory practice, BEREC keeps track of actual market developments. Further, as an organizational requirement, BEREC has set up a procedure for providing an opinion regarding any serious doubts expressed by the European Commission.

BEREC has fulfilled its new entrusted powers to contribute to the consistency of regulatory practice by issuing opinions. BEREC elaborated an impressive 16 opinions in 2012.

4.6. Further Topics

4.6.1. Non-discrimination

The European Commission announced in its Digital Agenda its intention to focus on key-remedies, namely, non-discrimination and regulatory accounting. In preparation for the Recommendation of the European Commission on non-discrimination, BEREC cooperated intensively with the Commission´s services to deliver its opinion. BEREC´s first steps in the review and update of the CPs were the publication, on 1 March 2012, of a consultation on the identified 12 high-level principles of non-discrimination and the convention of a public workshop with interested stakeholders on this theme.

4.6.2. Regulatory Accounting

BEREC continued to produce an annual report on regulatory accounting in practice to provide an overview and assess the level of harmonisation. The overall picture is relatively stable in comparison to 2011, with a small number of changes by NRAs since 2011. There were clear preferences for price-control (cost orientation alone or in combination

with price cap), cost base (current cost accounting, CCA), and accounting methodologies (mainly long-run incremental costs with fully distributed costs preferred only in a few markets, mainly the retail markets). The degree of harmonisation of methodologies remained high.

4.6.3. Recommendation on Termination Rates

BEREC continued its work on best practice in MTR and FTR and the issues related to transition to cost orientation in line with the LRIC methodology recommended in the Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU. BEREC's work includes the move toward symmetry and the definition of proper glide paths. The grade of implementation of the recommendation was reviewed and closely monitored.

4.6.4. Benchmarks

BEREC collected data in cooperation with the European Commission and COCOM to produce own benchmarks and to compare the evolution of markets in the various countries.

4.6.5. Promotion of Broadband

BEREC looked into the current state of broadband in Europe to highlight the key factors in the broadband promotion strategies of governments, NRAs, PPPs, and operators. The main supply-side and demand-side obstacles to broadband promotion, as identified by the NRAs in their replies to a Broadband Promotion Questionnaire were summarized in a report. Having considered the analyses that have been conducted by BEREC up to 2011 this report provided policy makers with advice focussed on the demand-side on measures that could effectively promote broadband adoption.

4.6.6. Access to Special Rate Services (SRS)

BEREC launched a consultation of a draft BEREC Report. The main objectives of this Report were to: a) analyse the characteristics of SRS in general and the problems and negative effects for consumers as they occur in a number of countries; and b) give guidance to NRAs on what can be done if problems occur on the national level.

4.6.7. Convergence

BEREC continued analysing the impact of fixed-mobile convergence, complementarity, and potential substitution and the effects on fixed and mobile communications markets in terms of voice and broadband. The purpose was to assist NRAs in their next round of market analysis.

4.6.8. Cross-border and Demand-side Issues

BEREC worked on producing Guidelines related to Article 28(2) of the Universal Service Directive (measures dealing with fraud and misuse of numbers), where there is a need for cooperation among Member States. Following public consultation, the Guidelines were published in March 2013. The two main requirements under Article 28(2) are to block numbers and withhold interconnection and service revenues. The effectiveness of these options depends on the circumstances of the incident. The high-level objective of the process published by BEREC was the protection of end-users, and stakeholders were encouraged to take further action which will assist in this aim. End-users should be made more aware of the risks of fraud and misuse through telecommunications services and networks and be encouraged to take appropriate actions such as ensuring their terminal equipment is secure.

4.6.9. Cooperation with RSPG and ENISA

The Joint BEREC/RSPG Working Group on competition issues was tasked to how the economic and social value of radio spectrum used for electronic communications services is determined in relation to authorisation and frequency assignment issues. BEREC/RSPG decided to collect views from Member States on the following WAPECS bands:

- 790-862 MHz (800 MHz);
- 880-915 MHz / 925-960 MHz (900 MHz);
- 1710-1785 MHz / 1805-1880 MHz (1800 MHz);
- 1900-1980 MHz / 2010-2025 MHz / 2110-2170 MHz (2 GHz);
- 2500-2690 MHz (2.6 GHz);
- 3.4-3.8 GHz (3.6 GHz band).

4.7. International Cooperation

As the electronic communications sector is a highly dynamic, global market, the international dimension needs to be attended to intensively. Recognizing the growing interest from non-Europeans in the European regulatory approaches, cooperation with other regulatory organisations and interest groups, in particular, Regulatel, EaP, EMERG, and the FCC, was a priority for the BEREC Chairman.

BEREC – Regulatel
The BEREC – Regulatel Summit Meeting took place in November 2012. The central topic of the Summit was, "INTERNET FOR ALL AND FOR EVERYTHING," alluding to the fact that in 2002, the NRAs of Latin America met in Mexico to discuss Internet access. The achievements of the intervening decade were discussed and an assessment was made on how future regulatory policies can promote Internet access.

BEREC – EaP
Cooperation with the Eastern Partnership Group of Regulators (EaP), representing Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine took a big step forward. In September 2012, the foundation act for the Group was signed by the European Commission in Chisinau, Republic of Moldova, in the presence of a number of BEREC Representatives.

BEREC – EMERG
Cooperation with Euro-Mediterranean countries in the neighbourhood of the EU continued with a number of workshops to exchange and share knowledge on topics of common interest.

BEREC – FCC
The global exchange of views with the United States of America was established on a new basis with the Memorandum of Understanding signed by BEREC and the Federal Communications Commission (FCC). At the plenary meeting in December 2012, FCC-Chairman Julius Genachowski spoke about developments and questions related to Net Neutrality in the United States.

4.8. Workshops

BEREC organized a number of public and closed workshops to exchange and broaden members´ views on themes of common interest.

BEREC hosted a public workshop on the proposed high-level principles relating to issues of non-discrimination for stakeholders on 15 March 2012.

On 20 June 2012 BEREC hosted a public expert workshop on IP-interconnection in cooperation with OECD in Brussels to bring together experts from the IP-interconnection community and experts on interconnection from national regulatory authorities. Participants discussed the BEREC consultation document, "An assessment of IP-interconnection in the context of Net Neutrality," as well as the upcoming review of the International Telecommunications Regulations (ITRs).

The first closed workshop took place in Vienna in February. Titled, "New players and business models - disruptive changes and new regulatory challenges?", it was aimed to enable the heads of European NRAs, BERECs experts, and the European Commission to discuss and analyse future developments in the telecoms sector at the intersection with the content and end device markets and their impact on regulatory practice. Amongst the speakers were Prof. Arnold Picot from Munich University, Simon Hampton from Google, and Stephen Collins from Skype.

The second closed workshop, covering the theme of telecoms-related fraud and security issues, took place at the third plenary meeting. The aim was to acquaint all BEREC participants with various kinds of security and fraud issues and to offer a platform for better understanding. Speakers were from GSMA, the Federal Criminal Police Office in Germany, the Swiss Internet Registry, ITU, and the Federal Bureau of Investigation in the USA.

Three additional closed workshops were held during 2012: two on BEREC´s Strategy and one on BEREC´s Internal Governance.

4.9. Activities of the BEREC Chairman

In addition to furthering BEREC´s international cooperation and organising workshops, BEREC Chairman Georg Serentschy represented BEREC at an impressive number of meetings, conferences and summits throughout Europe to promote BEREC and present BEREC's views to a broader audience.

4.10. BEREC Stakeholder Engagement Programme ("Strategic Dialogue")

Georg Serentschy announced a dedicated programme of engagement which complements BEREC´s regular meeting debriefings and informal exchanges with its stakeholders. The Chairman initiated a "Strategic Dialogue" with stakeholders which would proactively address the regulatory challenges of a fast-changing sector. On 3 May, BEREC hosted the first summit with CEOs from some of Europe's largest fixed, mobile, and cable operators, including both incumbents and alternative operators. Participants in this first summit discussed changing business models (as new players enter the market), the challenges of infrastructure investment in a slow-growing European economy, and the challenge of providing cross-border services. There was a collective call for greater regulatory certainty, echoing the findings of investment analysts.

This event was followed by several meetings with consumer and user groups, service providers, vendors and other sector innovators, and investment analysts.

Due to the success of the first "Strategic Dialogue", the BEREC Chair decided to host a second dialogue on 2 October, where the discussions from the first dialogue were continued. Due to the high level of participant interest, this stakeholder engagement programme is expected to become a permanent fixture of the BEREC calendar. The insights and understanding that BEREC expects to gain from these meetings will help to shape its annual Work Programmes, as well as its longer-term strategic thinking.

5. Summary

We have shown in this book that Europe is falling behind in key areas of the telecommunications sector and that policy and, often, cultural changes in these are needed to overcome the growing gap compared with other parts of the world.

This first conclusion was shared by our guest author from Bernstein Research who elaborated their view on telecommunications markets from the financial perspective. The author concluded that three initiatives would help foster investment in telecommunications infrastructure:

- De-regulation of fibre;
- Creation of a long-term spectrum plan with clear rules and dates, including the harmonisation of radiation limits;
- Tightening of the regulatory process such that either fewer participants are involved or that decisions are binding enough to remove ambiguity of outcome.

We also offered our approach to solving the identified problems, starting with a new set of regulatory policies ("Regulation 2.0"). We call for a more dynamic approach to regulation, with an emphasis on policies that foster intermodal competition. We also propose organisational reform with a strengthened BEREC Chair as a focal point. We think that changing regulatory policies in this direction will create the right frame for efficient investment in new infrastructure.

Another of our insights is that regulatory policies are not sufficient to foster the ICT sector. Regulation and other policy areas, such as innovation and investment, are interdependent. This interdependence creates a "virtuous circle", where innovative services are likely to increase demand for (high-speed) broadband; increased demand leads to more investment, as the willingness to pay rises, which, in turn, creates incentives for providing new bandwidth-intense services. Regulatory and investment policies should provide the right frame such that investment in new infrastructure naturally follows.

Hence, we propose concrete policy suggestions for innovation and investment. To foster new services, innovation in education, the facilitation of new business models and support for the start-up scene is critical. Our propositions in each of these areas, we believe, will go far in creating the best environment for new, innovative services.

In the area of investment policies, we call for pension funds to engage more in infrastructure competition and elaborate possibilities, how co-operation models and public financing can help. Finally, we have reflected on the activities and achievements of the Austrian chairmanship of BEREC in 2012.

We hope that this book will fuel the discussions that lead ultimately to putting Europe back on top.

6. Appendix

6.1. Literature

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6.3. Glossary

3D printers	are devices that can create three-dimensional figures from plastic or other sources.
5G technologies	(5th generation mobile networks) denote the next phase of wireless transmission standards beyond 4G (LTE, LTE advanced). 5G networks are expected to be introduced by 2020 and be able to deliver 1Gbps speed and more.
All-IP	refers to data transmission over the IP protocol.
BEREC	(Body of European Regulators of Electronic Communications) is an official regulatory institution of the European Union, in which NRAs and the European Commission collaborate.
BoR	Board of Regulators of BEREC.
CAGR	Compound Annual Growth Rate.
CAPEX	Capital Expenditures.
CEF	(Connecting Europe Facility) is an investment vehicle for transnational networks (mainly traffic, electricity, and telecommunications).
CN	The Contact Network (CN) comprises the experts of all the NRAs in BEREC and does the preparatory work (e.g. drafting of documents, report, common position etc.) for the BEREC plenary.
CPS	(Carrier Pre-Selection) enables consumers to choose their favourite provider of voice transmission in advance, so that they do not need to select it for every call.

CS	(Carrier Selection) in many European countries was a significant step in the liberalisation process of telecommunications networks. It enables end-users to choose their favourite provider of voice transmission by dialing a specific selected number
DA	(Digital Agenda): The Digital Agenda Europe is part of the Europe 2020 initiative; it provides measures and goals regarding the development of the digital society in the EU until 2020.
DB	(Defined Benefit Pension Plan): A pension plan in which the sponsor promises a certain pension payment depending on the life-time earnings of the employee.
DC	(Defined Contribution Pension Plan): A pension plan in which the sponsor determines only the payments made by the employee and pays off the entire amount plus additional investment earnings.
DOCSIS	(Data Over Cable Services Interface Specification) enables a network based on coaxial cables to deliver broadband services. DOCSIS 1.0 was specified in 1998. Today, DOCSIS 3.0 is the most common standard in cable networks (up to 200Mbps).
DSL	(Digital Subscriber Line) is a family of technologies that provides data transmission over copper lines.
EBITDA	Earnings before interest, taxes, depreciation and amortisation.
EC	(European Commission) is the executive body of the European Union.
ECDL	(European Computer Driving Licence) is a generally accepted certificate for basic computer skills.

EIB	(European Investment Bank) is the lending institution of the European Union, whose sponsors are the EU Member States.
ENISA	(European Network and Information Security Agency) is taking care of cyber security issues of the European Union
EoI	(Equivalence of Input) is a non-discrimination obligation in which alternative operators use the same systems and processes as the incumbent does.
EoO	(Equivalence of Output) is a non-discrimination obligation in which alternative operators deliver the same products as the incumbent, but usually using different systems and/or processes.
EPS	Earnings per Share.
EU-27	are all EU Member States as of June 2013 (in July 2013, Croatia became the 28th member).
FTTx	(Fibre To The x) is the term used for broadband network architecture that relies on optical fibre technology in any layer beyond the main distribution frame. The 'x' can be 'H' (FTTH – Fibre to the Home), 'B' (Fibre to the Building), 'C' (Fibre to the Curb) or 'N' (Fibre to the Node).
Gbit/Gbps	(Gigabit or Gigabit per second) is a measure for computer storage or information transmission (1Gbit = 1000 Mbit = 1000000 Kbit). Bit is a contraction of 'binary digit', whose value is either 0 or 1.
GPON	(Gigabit Passive Optical Network) is a technology for fibre networks in which different data streams can be bundled in one fibre using optical splitters.
GPS	(Global Positioning System) is a global navigation system using satellites.

GPT	(General Purpose Technology) is a technology with an outstanding impact on the economy and society, such as the steam engine, electricity, or the Internet.
GSM	(Groupe Spécial Mobile or Global System for Mobile Communications) is a standard for digital voice and data transmission over mobile networks.
HSPA	(High-Speed Package Access) is a mobile data transmission standard with high bandwidth. HSPA+ is the successor of HSPA.
ICT	(Information and Communications Technology) is a collective term for technologies for communications and information transmission and processing.
IP	(Internet Protocol) is a protocol for data transmission over the Internet.
ISP	(Internet Service Provider) is a provider of Internet access services.
Kbit/Kbps	(Kilobit/Kilobit per second) – see Gigabit.
LLU	(Local-Loop Unbundling) refers to a service in which alternative providers can rent the last mile of an incumbent's telephone network.
LTE	(Long-Term Evolution) is a state-of-the-art mobile data transmission standard.
Mbit/Mbps	(Megabit/Megabit per second) – see Gigabit.
MC	Management Committee of BEREC.
NGA	(Next-Generation Access) is a collective term for broadband technologies able to deliver high bandwidths in which traffic is provided by packet switching only.

NRA	(National Regulatory Authority) is a public authority with the regulatory oversight of a certain field.
NRI	(Networked Readiness Index) is a measure used to define how advanced a country is in the ICT sector.
P2P	(Point-to-Point) architecture is an optical fibre technology, in which every user is connected with a single optical fibre (in comparison to PON/GPON, where many users share one fibre).
PIP	(Pension Infrastructure Platform) is a joint venture of several pension funds in the United Kingdom.
PON	(Passive optical network) in general defines a point-to-multipoint fibre network.
PPP	(Public-Private-Partnership) is a joint venture of public institutions and private companies, usually created to implement large-scale projects.
RSPG	(Radio Spectrum Policy Group) is a high-level advisory group that assists the European Commission in the development of radio spectrum policy
SE	(Societas Europaea) is a legal form of a company acting in more than one European country.
SLU	(Sub-Loop Unbundling) is a form of local-loop unbundling in which only a part of the local loop is rented by alternative providers.
SMS	(Short Message Service) is a service for the transfer of messages with a maximum number of 160 characters.
VC	(Venture Capital) is risk capital provided to start-ups by investors in return for equity.
WAYRA	is a division of the Spanish telecommunications provider Telefónica for seed financing of start-up firms. The term means “changing wind” in the Quechua language.

6.4. Exhibits

Publishing information

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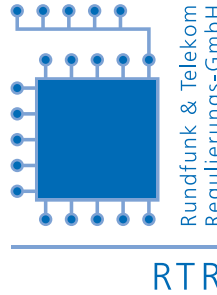
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