



# A new regulatory framework for the digital ecosystem



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# Foreword



The ingenuity shown by the digital ecosystem in responding to consumer demand, often in unpredictable ways, never ceases to amaze. New services, applications and technologies are stimulating markets, empowering small businesses and challenging the status quo.

The mobile industry contributes over \$3 trillion to the global economy annually, supporting 25 million jobs and enabling growth across all sectors of the economy. With 3.8 billion mobile users worldwide today – and 700 million more expected to connect by 2020 – one of our industry’s biggest challenges is fostering the investment needed to deliver high quality connections the world over.

This new report by NERA Economic Consulting makes clear that telecoms regulations drafted for a by-gone era have no place in today’s dynamic and converged digital ecosystem where consumers face an expanded array of competitive choice. Without reform, markets will become further distorted and investment will be put at risk.

The telecoms regulations in place today are largely the same as those used to regulate 20th Century technologies and markets. Our digital economy deserves better. Not only do legacy regulations impose costs on consumers and businesses, they often frustrate the very public interest goals they purport to address.

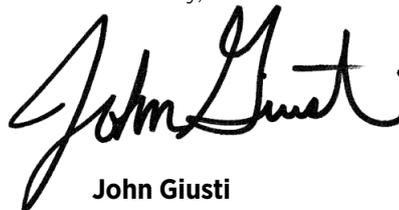
Now is the time for a regulatory reset. With 4G deployments expanding and 5G technology under development, governments and industry are already considering the shape of Smart Cities and the network-enabled Internet of Things. These new technologies will bring about vast complex networks, new service providers and innovative business models.

We cannot allow tomorrow’s technologies to be stifled by yesterday’s regulations. Policymakers need to take a fresh look at their regulatory approach to reflect changes in technologies and markets. The future will require a more technology-agnostic and flexible approach, where unnecessary legacy regulations are discarded and where everyone can compete on a level playing field.

Governments and the mobile industry have a shared interest in connecting everyone and everything to a better future. This will require continued investment and innovation from the private sector. This will also require a fundamentally new approach to regulation of the digital ecosystem by policymakers.

We hope the ideas in this report contribute to a constructive debate and serve as a call to action. We have little doubt that countries that choose to modernise regulations to reflect market and technology realities will reap real benefits in terms of increases in infrastructure investment, consumer choice and economic growth.

Sincerely,



**John Giusti**  
Chief Regulatory Officer, GSMA

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# Executive summary

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The GSMA commissioned this study to contribute to the current debate about the implications of technological and economic convergence for regulation of the digital ecosystem. It has three primary objectives: first, to describe the competitive dynamics of the modern digital ecosystem as they relate to public policy in general and government regulation in particular; second, to describe why these changes challenge existing regulatory frameworks and require significant reforms; third, to lay out a set of principles to guide policymakers and regulators as they adapt regulation to sweeping changes in the digital economy.

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Digitisation has created rapid technological progress and growth, which has generated tremendous benefits for consumers. Prices for digital services are falling rapidly, more than three billion people are now connected to the internet, and the mobile revolution is rapidly bringing connectivity to even the remotest areas. Three key characteristics of the digital ecosystem are responsible for this progress: modularity, economies of scale and scope, and dynamism.

- Modularity means that digital products and services are made up of complementary inputs (applications, communications, content and devices) that work together in many different combinations to produce value and give consumers an unprecedented array of choices.
- Economies of scale and scope (including network effects) allow new and improved products and services to be made available to consumers at constantly falling prices (or even for free).

Technological advances can also make their way into the marketplace extremely quickly, which constantly advances the pace of innovation.

- Digital markets are dynamic, which means that both new and existing companies have powerful incentives to invest and innovate, and therefore compete to create new products, enter new markets and apply new technologies to make existing services cheaper and better.

While digital convergence has benefited consumers, it also creates regulatory challenges. For example, the complexity of digital ecosystem markets increases regulatory uncertainty, and the rapid pace of change makes regulation become quickly obsolete. Growing innovation and rapid entry by new competitors in digital ecosystem markets increase the costs and likelihood of regulatory distortions by, for example, deterring entry or skewing the path of technological progress.

If regulatory policies and institutions fail to adapt to changing markets, markets can become distorted in ways that harm competition, slow innovation, and ultimately deprive consumers of the benefits of technological progress.

Today, outdated regulatory policies are creating harm in at least two specific ways:

- Discriminatory regulation. As technological and market convergence has accelerated in pace, broadened in scope and deepened in impact, market distortion is also increasing because of disparities in the way different sectors are regulated. In particular, legacy regulation of communications services and service providers is far more intrusive and prescriptive than regulation of other elements of the digital ecosystem. Regulatory discrimination takes two main forms,

substantive and procedural. Both forms can harm competition and reduce consumer welfare.

- Static regulation of dynamic markets. In general, prescriptive, ex ante regulatory regimes —like those traditionally governing communications markets—are no longer effective in the face of rapid innovation. In many cases, as competition increases, the need for such regulation has disappeared altogether. The persistence of such outdated rules not only harms competition and slows innovation, but also fails to achieve regulatory objectives.

Policymakers all over the world are now recognising these challenges and working to implement reforms that will protect competition and consumers without impeding social and economic progress.

In doing so, policymakers should apply three specific principles:

- First, regulation should be functionality-based rather than based on structure or technology. That is, regulation should be designed to achieve its objective in the most efficient way (i.e., to be ‘cost effective’), without regard to technologies, industry structures, or legacy regulatory regimes. Regulatory policies and institutions designed around obsolete definitions of products and markets need to be replaced with more holistic approaches and should be implemented by institutions with both the jurisdiction and expertise to consider all the alternatives.
- Second, because digital ecosystem markets are dynamic and complex, regulation also needs to be flexible. It needs to accommodate rapidly changing markets and technologies and create enough regulatory confidence for companies to take risks. In general, performance-based approaches are superior to prescriptive, ex ante rules. Simply put, static regulation needs to be replaced by dynamic regulation.
- Third, the profound and sweeping changes in the digital ecosystem imply that regulatory polices need to be rethought from the ground up. In many cases, intense competition in the digital ecosystem means that regulation is no longer needed, or can be significantly scaled back. In other areas, such as privacy and cyber security, new

regulatory challenges are emerging. Regulatory reform discussions should follow a bottom-up approach that takes entirely new approaches into consideration - and is willing, where appropriate, to jettison old ones.

A new regulatory framework based on these principles will be inherently market- and technology-neutral, because it will apply to all elements of the digital ecosystem. It will also be cost-effective, because it will achieve regulatory goals and objectives at the lowest possible cost. Finally, it will be flexible because it will allow markets and technologies to evolve while preserving and enhancing regulators’ ability to achieve their functional objectives. Most importantly, the new regulatory framework proposed here is designed to ensure that consumers can continue to enjoy the benefits of technological progress and be protected by well-designed regulation.

The study concludes by applying the above principles to six areas of regulation and regulatory policy that are actively being considered around the world: access regulation, removal of barriers to entry and exit, privacy and data protection, merger review, spectrum policy, and universal availability and affordability. The resulting recommendations, while necessarily general in nature, show that the challenges being faced by policymakers can be solved by developing pragmatic solutions based on the analytical framework and policy principles in this study.

# 1 Introduction

Convergence is hardly a new idea.<sup>1</sup> Academics, business leaders, and public authorities all accept that digitisation has integrated separate information technology markets, and also that the ways digital technologies interoperate can be compared to an ecosystem.

It is also widely accepted that convergence demands regulatory reform. Before convergence, different technologies operated largely independently of one another: telephones had one function, televisions another, radios a third; computers still another, and so on. It therefore made sense to regulate them separately, under different legal frameworks and regulatory institutions. But convergence requires a more homogenous, ‘horizontal’ approach to regulation. As the European Commission said in a 1999 Green Paper:

The convergence of the telecommunications, broadcasting and IT sectors is reshaping the communications market; in particular the convergence of fixed, mobile, terrestrial and satellite communications, and communication and positioning/location systems. From the point of view of communications infrastructure and related services, convergence makes the traditional separation of regulatory functions between these sectors increasingly inappropriate and calls for a coherent regulatory regime.<sup>2</sup>

For decades, legislators, regulators and courts around the globe have been reforming outdated laws, rules and institutions to accommodate convergence. A significant amount of this work has focused on reducing economic regulation in the traditionally heavily regulated communications sector. Most government-owned telecommunications carriers have been privatised,

and many countries have liberalised public utility-style price-entry regulation in favour of lowering barriers to entry and applying competition law. To a much lesser extent, some types of regulation traditionally applied to communications carriers have also been extended to internet companies providing the same kinds of communications services.<sup>3</sup>

1. The term was used by Alvin Toffler in 1970 (Future Shock), and by Ithiel de Sola Pool in 1983 (Technologies of Freedom). See Information Management Resources Association, 2014, Digital Arts and Entertainment: Concepts, Methodologies, Tools, and Applications, 28.  
2. European Commission, 1999, A New Framework for Electronic Communications Services COM, 539 final, 10.11.1999, <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV:l24216>.  
3. See e.g., Federal Communications Commission, In the Matter of Implementation of Sections 716 and 717 of the Communications Act of 1934, as Enacted by the Twenty-First Century Communications and Video Accessibility Act of 2010, Report and Order and Further Notice of Proposed Rulemaking, October 7, 2011, CG Docket 10-213 (requiring devices used for advanced communication services to be accessible to people with disabilities); see also European Commission, March 10, 2010, Directive 2010/13/EU of the European Parliament and of the Council (Audiovisual Media Services Directive) (imposing some requirements on “on-demand audio visual media service” providers previously limited to broadcasters).

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Despite these efforts, the pace of harmonisation has failed to match the speed of change. As broadband networks (initially fixed, but now, increasingly, mobile) have become more ubiquitous and their capacity has increased, there has been a dramatic growth in the flow of digital information over communications infrastructures. Both content and computing have also moved into ‘the cloud’. So-called over the top (OTT) services—software-defined digital applications that perform services and deliver content to end users over IP-enabled communications networks—are now competing directly with more traditional content and communications products. This shift is rapidly upending traditional market structures all over the globe, and putting unprecedented pressure on policymakers to react.

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Consider the following examples:

- In India, a March 2015 consultation document from the Telecom Regulatory Authority of India (TRAI) noted that “Telecom service providers (TSPs) offering fixed and mobile telephony are currently being overwhelmed by online content, known as over-the-top (OTT) applications and services.”<sup>4</sup> One of the regulatory changes being considered is to subject OTT providers to the same licensing regime that has traditionally been applied to traditional telecommunications service providers.<sup>5</sup>
- In May 2015, the European Commission stated in its Digital Single Market communication that “Telecoms operators compete with services which are increasingly used by end-users as substitutes for traditional electronic communications services such as voice telephony, but which are not subject to the same regulatory regime.”<sup>6</sup> In response, the Commission is re-examining a wide array of policies that affect the internet sector, including cable and broadcasting, privacy, cybersecurity, and the regulatory framework governing telecoms providers and internet platforms.
- In North America, more than 36% of all internet traffic at peak hours is from streaming movies delivered by Netflix. Many analysts see the increasing use of OTT video services as a serious threat to ISPs and the traditional pay TV delivery model. Despite the lack of compelling evidence indicating a competitive problem, in March 2015 the FCC adopted ‘net neutrality’ regulations. The rules, which apply ‘public utility’ regulation to both wireline and wireless broadband providers, constitute a dramatic reversal of the traditional ‘light touch’ U.S. approach to broadband regulation.<sup>7</sup>

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4. See Telecom Regulatory Authority of India, March 27, 2015, Consultation Paper on Regulatory Framework for Over-the-Top (OTT) Services (hereafter TRAI March 2015), <http://www.trai.gov.in/WriteReaddata/ConsultationPaper/Document/OTT-CP-27032015.pdf>.

5. TRAI, March 2015 consultation, 113.

6. European Commission, May 6, 2015, A Digital Single Market Strategy for Europe, Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (hereafter DSM Communication), COM(2015), 192 final, Brussels, 10.

7. Federal Communications Commission, March 12, 2015, In the Matter of Protecting and Promoting the Open Internet, Report and Order on Remand, Declaratory Ruling, and Order, GN Docket No. 14-28 (2015 Order), [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-15-24A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-24A1.pdf).

As these examples suggest, regulatory authorities around the world are struggling to confront the urgent need to reform policies and remake institutions in virtually every area of regulation, including consumer protection, competition, privacy and data protection, network security, taxation, and universal service and accessibility. The same questions arise in each case: should regulators try to achieve a level playing field by applying the same rules to entrants that were traditionally only applied to incumbents? Or should neutrality be achieved by reducing regulation on incumbents? Given the realities of the new market, how can regulatory goals and objectives best be achieved? How can policies and institutions be future-proofed so that they are flexible enough to accommodate continuing change? And to what extent has dynamic competition in the digital ecosystem reduced the need for regulation in the first place?

This paper presents a set of principles to guide current efforts in convergence-related regulatory reform.

We start from four premises.

**I:** While markets are generally the most effective way to foster innovation, enhance prosperity, and promote consumer welfare, they do not always deliver optimal outcomes at every moment in time. In cases of sustained monopoly power, externalities, public goods, and asymmetric information,<sup>8</sup> government intervention has the potential to increase overall welfare. If market conduct is harming consumer welfare and regulatory intervention would create a net benefit, then regulations should be designed to achieve the greatest possible benefit at the lowest possible cost. That is, they should be cost-effective.

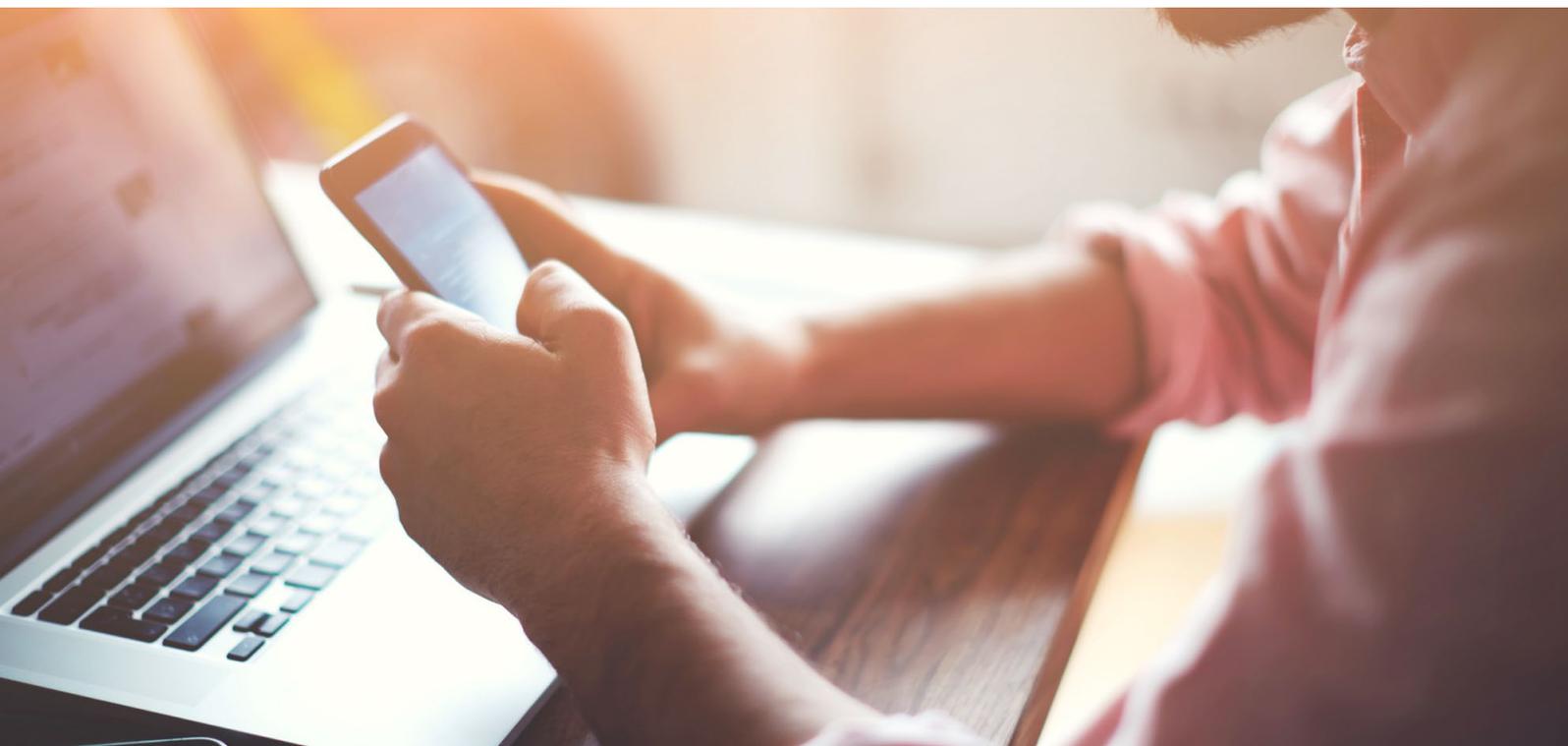
**II:** A direct corollary of the cost-effectiveness principle is that regulatory policy should be functionality-based, rather than structure- or

technology-based. By this we mean that regulatory policy should be designed to achieve the desired objective (e.g., protecting privacy, promoting universal adoption, providing incentive for investment and innovation) in the most efficient way, regardless of the technology, industry structure, or legacy regulatory regime.

**III:** Information technology markets are characterised by dynamic competition, meaning that companies largely compete through innovation, rather than price. This competition leads to rapid changes in markets and technologies, so regulation must be flexible enough to accommodate these changes while creating the regulatory certainty and predictability that companies need to take risks<sup>9</sup> We refer to this kind of regulation as dynamic regulation.

8. These are the generally accepted categories of market imperfections that may justify regulatory intervention in the economy. See e.g., U.S. Office of Management and Budget, Circular A-4, 2003, Regulatory Analysis.

9. See Erik Bohlin, Kevin W. Caves and Jeffrey A. Eisenach, 2014, "Mobile Wireless Performance in the EU and the US: Implications for Policy", *Communications and Strategies*, 52. ("[E]ffective regulation of dynamic markets requires regulatory certainty; thus, regulations should be designed to be durable and consistent over time in order to enhance the ability of market players to engage in long-term and risky investments.") See also Johannes M. Bauer and Erik Bohlin, January/February 2008, "From Static to Dynamic Regulation," *Intereconomics*, 38-50.



**IV:** These sweeping changes in the digital ecosystem mean that even when the goals for regulatory policies and institutions remain unchanged, it is necessary to rethink how to achieve these goals from the ground up.<sup>10</sup> We therefore propose that policymakers take a bottom-up approach to regulatory reform discussions, which will encourage them to consider entirely new approaches—and be willing, where appropriate, to jettison old ones.

A new regulatory framework based on these principles will be inherently market- and technology neutral, because it will apply to all elements of the digital ecosystem. It will be cost-effective, because it will achieve regulatory goals and objectives at the lowest possible cost. It will also be flexible, because it will allow markets and technologies to evolve while preserving and enhancing regulators' ability to achieve the functional objectives of regulation.

The remainder of this paper explains the underlying rationale for these recommendations and provides specific examples of how they can improve regulatory policy. Section II begins by explaining the competitive dynamics of the digital ecosystem, including the role of platform competition and choice, dynamic competition, and the importance of economies of scale and scope. Section III discusses in more detail the challenges that digital convergence poses for existing regulatory structures and lays out the key principles of a new regulatory framework. Section IV presents specific examples of how applying these principles would lead to improved regulatory structures and, ultimately, to superior outcomes. Section V offers some conclusions and recommends next steps.

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10. As discussed below, convergence leads to increased competition in many cases, and may eliminate the need for regulation altogether.

## 2 Competitive dynamics of the digital ecosystem

In this section, we discuss the three characteristics that distinguish information technology markets from more commoditised, traditional markets featured in elementary economics textbooks: modularity, economies of scale and scope, and dynamism. These characteristics have important implications for regulatory policy.<sup>11</sup> For example:

- Modularity (i.e., how complementary inputs must combine to make digital technologies work and create value for consumers) implies that a variety of different types of companies and technologies are involved in providing similar or identical services, and that consumers' needs are being met in a variety of different ways. Thus, effective regulation requires a holistic approach that addresses the diversity of all of the relevant platforms.

- Economies of scale and scope, including network effects, imply that one or a few companies are likely to have high market shares for particular products at any given time, even as they compete across multiple platforms, and also that beneficial new technologies can spread extremely rapidly. Therefore, regulation should enable, not discourage, the realisation of economies of scale and scope that represent real savings for consumers.
- Dynamic competition in digital ecosystem markets means that companies compete on the basis of their ability to create new products, enter new markets, and apply new technologies to provide existing services at much lower cost. Therefore, regulation should avoid creating artificial barriers to entry or raising the costs of innovation.

The sections below discuss each of these market characteristics in greater detail and explain their implications for regulation.

<sup>11</sup> For a recent discussion of some of these principles, see Nicolai Van Gorp and Olga Batura, July 2015, Challenge for Competition Policy in a Digitalised Economy, European Parliament, Directorate General for Internal Policies. See also Jeffrey A. Eisenach and Ilene Knable Gotts, "In Search of a Competition Doctrine for Information Technology Markets: Recent Antitrust Developments in the Online Sector," in Fabrizio Cugia di Sant'Orsola, 2014, et al, eds, Competition and Communications Law: Key Issues in the Telecoms, Media and Technology Sectors, Kluwer Law International, 69-90.

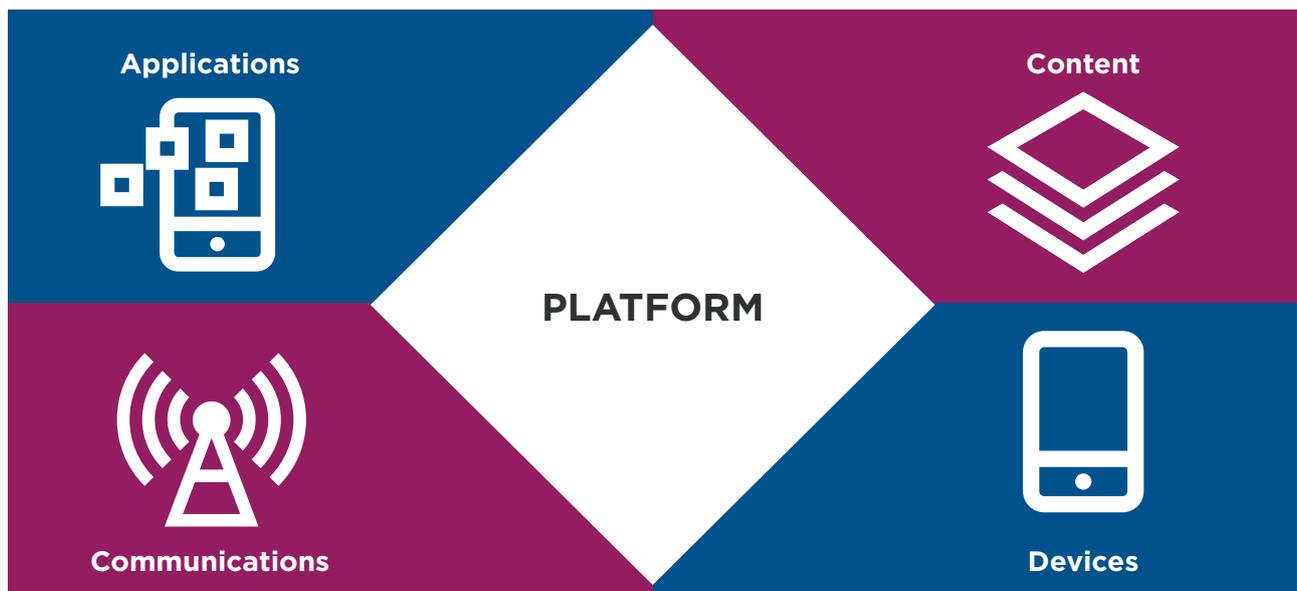
## 2.1 Modularity and platform competition

The digital ecosystem is made up of complementary information technologies assembled into platforms that perform useful functions and create economic value. Examples include cloud services that make electronic commerce and financial services possible, Internet of Things applications that facilitate systems control and logistics, video game platforms that allow people to play in real time, and

wireless and wireline communications platforms (including one-way and two-way voice, video and data applications). All of these platforms have one characteristic in common: modularity. They all rely on some combination of hardware, applications, content, and communications technologies in order to function.

Figure 1

### MODULES IN AN INTERNET ECOSYSTEM PLATFORM



As technologies and markets evolve, new platforms emerge with different combinations of capabilities. Today's internet-driven mobile devices, for example, perform dozens of functions that used to be handled by single-purpose tools (e.g., cameras, dictation machines, e-readers, GPS mapping and location services, heart-rate monitors, video displays, wrist-watches, etc.). Similarly, voice telephony and instant messaging, which were once provided by single-purpose technologies in communications networks, are sometimes now provided by OTT software packages riding on the IP layer of the internet.

Modularity has profound implications for regulatory policy. On the demand side, it implies that consumers can use different combinations of products and services to achieve the same functional objective. On the supply side, it implies that companies usually thought of as occupying different sectors (thus, not in the same market) are, in fact, offering products that satisfy the same or similar consumer needs. The first section below discusses the implications of modularity on the demand side; the second focuses on the supply side.

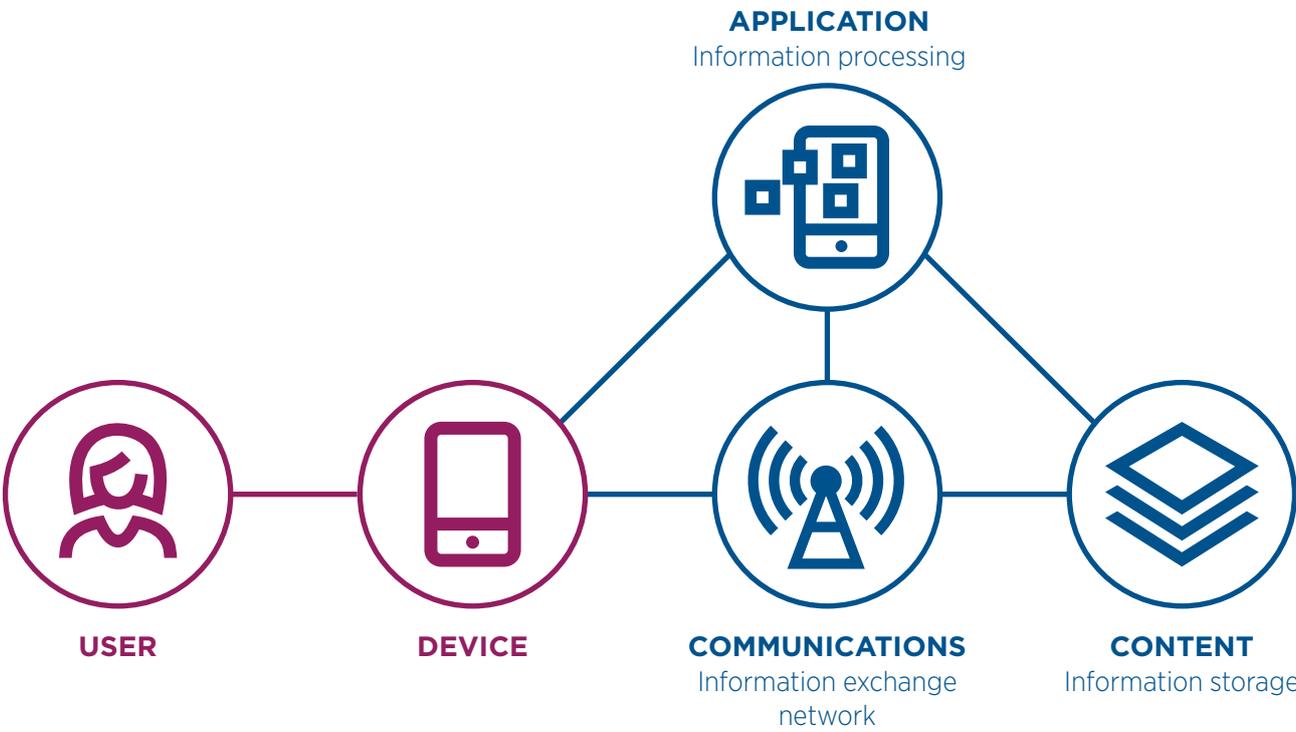
# I. Demand-side economics of digital services

As noted above and depicted in figure 2, the value consumers derive from the digital ecosystem depends on four distinct types of products and services: (1) a device that acts as interface with the digital ecosystem; (2) a digital application (e.g., an operating system, web browser or mobile

app) that modifies the information and mediates the interaction; (3) a communications service to exchange information across the ecosystem; and, (4) digital content that can be consumed or exchanged, either in its original form or as modified by the application.

Figure 2

## MODULES IN A DIGITAL SERVICE





For consumers, modularity in the digital ecosystem presents a challenge and an opportunity: a challenge, because they sometimes need to integrate multiple products to achieve the desired functionality, and an opportunity, because the ability to combine multiple product offerings in different ways gives them almost limitless variety and choice.

For regulators, the increasing number of ways for digital consumers to achieve the same function presents a tremendous challenge. For example, less than a decade ago, the only practical way to watch video content was to use a television connected to a broadcast network, a cable network, or a video playback device like a DVD player—or to go to a movie theater. Today, video can be watched via any internet-connected device. For example, half of UK

households and over 42% of French households watch online video on their TV sets and 46% of French adults watch video on digital devices other than televisions. Seven percent never watch traditional TV on a TV set.<sup>12</sup> Video is increasingly mobile, and Ericsson projects that by 2020, over 60% of all mobile data traffic will be from online video.<sup>13</sup>

Regulators around the globe are struggling with the policy implications of this transformation, including the best way to encourage local video content,<sup>14</sup> whether copyright policies need to be adapted to allow universal content availability across geographies,<sup>15</sup> and whether existing rules governing content acquisition by cable operators need to be extended to OTT providers.<sup>16</sup>

12. SNL Kagan, January 2015, United Kingdom Consumer Survey Summary Report, CRÉDOC, La diffusion des technologies de l'information et de la communication dans la société française (2014).

13. Ericsson Mobility Report, June 2015, 3, <http://www.ericsson.com/res/docs/2015/ericsson-mobility-report-june-2015.pdf>.

14. See Canadian Radio-television and Telecommunications Commission, 12 March 2015, Broadcasting Regulatory Policy CRTC 2015-86, <http://www.crtc.gc.ca/eng/archive/2015/2015-86.htm>.

15. DSM Communication, section 2.4.

16. See Federal Communications Commission, 19 December 2014, In the Matter of Promoting Innovation and Competition in the Provision of Multichannel Video Programming Distribution Services, Notice of Proposed Rulemaking, MB Docket No. 14-261.

## II. Supply-side economics of digital services

Modularity also has several important implications from a supply-side perspective. First, the same task can be accomplished by bundling different technologies together in different ways. For instance, audio and video content can be delivered by download services, which require devices with significant storage and processing capacity, or by streaming services, where these functions occur further up the technology stack. Because of this, companies with diverse capabilities can succeed in the marketplace by offering products that rely on very different combinations of technologies. For example, VoIP providers such as Vonage and Skype can compete with cable operators, wireline telcos, and wireless providers to provide voice services—with each provider using a different combination of inputs and technologies.

Second, companies can specialise in a particular platform component—for example, they could make the best smartphone, but rely on third-party operating systems and content. Alternatively, they can provide an entire array of offerings, à la Apple. Companies therefore compete both to produce the best individual products and services and to combine them in unique ways that will attract more consumers. The history of the digital ecosystem shows that market and technological changes can rapidly overturn dominant combinations: Apple, for example, once dominated the online music market with its iTunes download service (a bundle of device, application and content), but now finds itself playing catchup against startups like Pandora and Spotify

(which provide only the applications and content). By the same token, a company that dominates one platform or platform component will not necessarily successfully enter another, as Microsoft has demonstrated with its efforts in the mobile market.

Third, because no single company—not even Apple or Google—is able to provide all of the complementary inputs that make up a digital platform, companies need to cooperate so their products can have value to consumers. This collaboration can take the form of bilateral contracts (such as between content owners and distributors or between device vendors and network operators) or multilateral arrangements (such as industry standard-setting bodies, e.g., the IETF). At the consumer level, people may act as integrators by purchasing different products (e.g., access and content, or devices and applications) from different vendors. Therefore, digital platforms for different activities compete and cooperate with each other, and play several simultaneous roles: suppliers of substitute and complementary services, wholesale suppliers and wholesale customers.

While products and business models can be combined to a potentially limitless degree, in Appendix A we discuss four generic models typical in modern platform markets: device-based, network-based, edge-based, and management-based. Table 1 shows some examples of how these business models are implemented to provide different types of services.

Table 1

## EXAMPLES OF BUSINESS MODELS USED TO DELIVER DIGITAL SERVICES

SERVICE	Device-based	Network-based	Edge-based	Management-based
<b>BANKING</b>	Google Wallet	Vodafone M-Pesa	Bank Websites; PayPal	VISA
<b>MUSIC</b>	iTunes	Ambiance music (onthespot); Radio broadcasting	Spotify, Pandora	/
<b>PRODUCTIVITY SOFTWARE</b>	Microsoft Office	/	Google Docs 2010	Google Docs 2012
<b>INTERPERSONAL COMMUNICATION</b>	FaceTime	PSTN/GSM	Skype	Cisco Telepresence
<b>VIDEO CONTENT</b>	Tivo	VoD	Netflix	Akamai

## 2.2 Economies of scale and scope

A second distinguishing characteristic of digital ecosystem markets is the presence of strong economies of scale and scope on both the demand and supply sides of the market. It is important to understand the distinctions between these phenomena and how they affect the economics of digital markets.

Supply-side economies of scale occur when the average total cost of production falls over the relevant range of output. Virtually all digital information goods are subject to economies of scale in this sense, in that it is very costly to produce the first copy of a product (such as a movie or a software application) and relatively inexpensive (often, essentially zero) to duplicate it. Physical digital activities, like device manufacturing and communications infrastructures, also experience economies of scale. For example, the fixed costs of building and operating a communications infrastructure are large compared with the incremental cost of adding an additional user or conveying an additional unit of traffic (at least until the system reaches capacity).

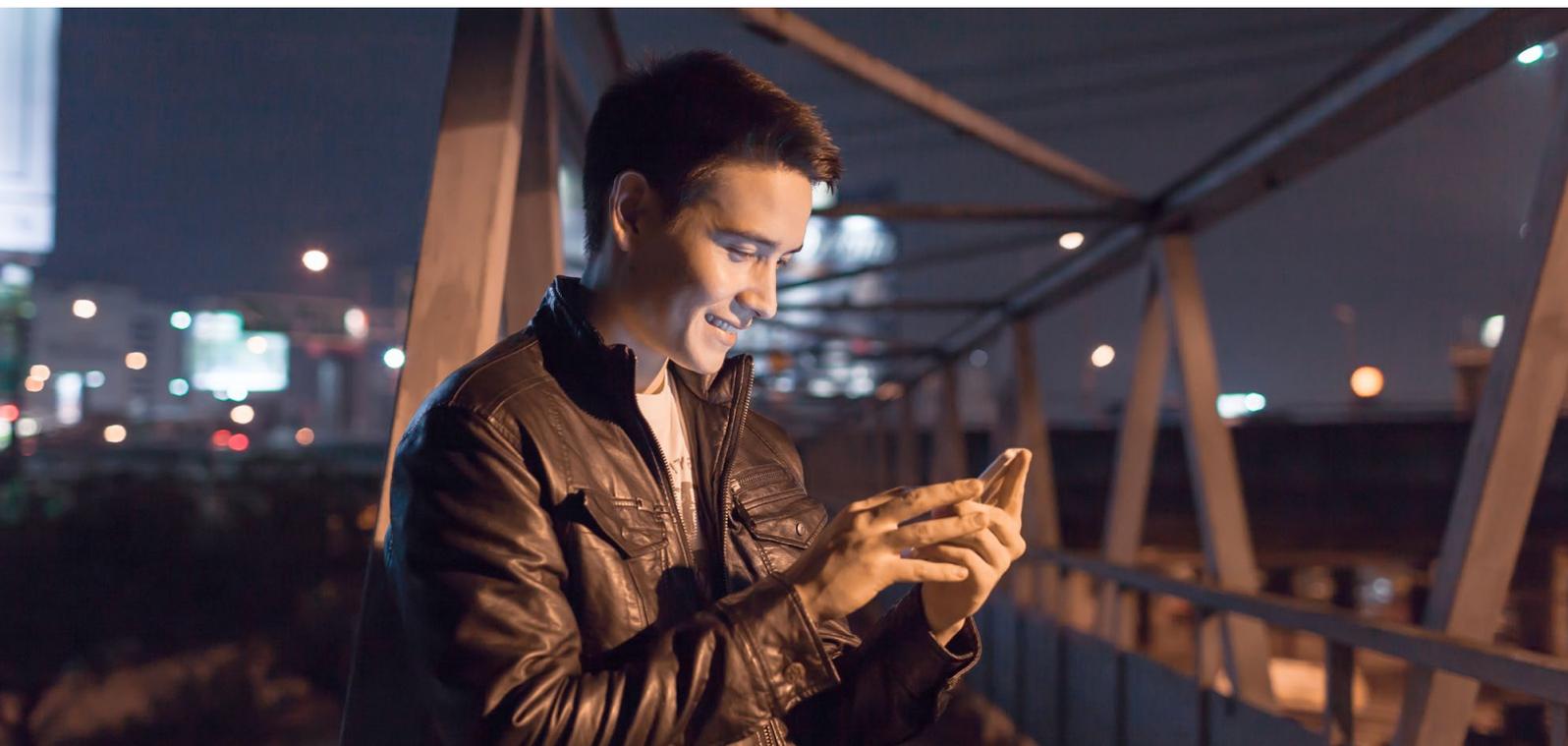
Supply-side economies of scope depend on complementarity production—it is cheaper, for example, to produce cars and trucks in the same factory than to build separate ones. Many products and services in the digital ecosystem are subject to economies of scale and scope. For example, the

skills used to produce one type of product, like an online retail platform, may be similar to the skills used to produce others, like an online movie delivery service. Producing multiple products could also allow companies to produce compatible products more easily (e.g., smartphones and smart watches). Economies of scope in production are closely related to vertical integration, which occurs when production of multiple complementary goods takes place within a single company.

Demand-side economies of scale (also called direct network effects) occur when a network becomes more valuable to people as the number of users grows. Telephones, fax machines, emails, SMS messaging, and the internet itself are all classic examples of networks that grow more valuable as more people join. Network effects occur at the global level, but can also occur within specialised groups: a service specially tailored for a specific user group may reach scale if most people in the group connect, irrespective of the overall size of the service. This allows niche providers to consolidate strong positions at relatively smaller sizes.<sup>17</sup>

Demand-side economies of scope (also called indirect network effects) arise when a network's value increases with the presence of different types of users of the same network. For example, the value of eBay's online marketplace to vendors increases with the number of shoppers, and vice versa.

17. For further discussion of network effects among communities of interest, see Jeffrey A. Eisenach, March 2015, *The Economics of Zero-Rating*, NERA Economic Consulting, <http://www.nera.com/content/dam/nera/publications/2015/EconomicsofZeroRating.pdf>.



There is an extensive literature on each of these economic phenomena, and a complete discussion of their implications for regulatory policy is well beyond the scope of this paper. For our current purposes, two consequences are especially important:

- First, economies of scale and scope result in lower costs and increased value to consumers. Therefore, regulatory impediments that limit the scope of the market (either horizontally or vertically) and prevent economies of scale and scope will result in higher costs and less valuable products. When these impediments apply to some industry sectors or technologies but not to others, competition is harmed by raising the costs (and reducing the value) of some competitors relative to others.
- Second, market-driven efforts to capture economies of scale and scope often lead to diverse, complex, and constantly changing business arrangements. The market has produced a variety of ways for smaller suppliers to benefit from economies of scale and scope, such as purchasing cooperatives for content, internet exchange points operated by third parties, and content delivery networks that aggregate internet traffic. Companies have also come up with creative ways to expand the size of the market. Zero rating, for example, appears to be mainly designed to attract new users to various internet applications to increase the value of these applications for consumers and advertisers.<sup>18</sup> Again, regulatory interventions that frustrate such efforts ultimately result in higher costs and less valuable products.

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18. See e.g., Jeffrey A. Eisenach, March 2015, *The Economics of Zero Rating*, NERA Economic Consulting.

## 2.3 Dynamic competition

The third distinguishing characteristic of digital ecosystem markets is dynamism, or ‘dynamic competition’. The first section below explains how dynamic markets work in general, while the second discusses the implications of dynamism in the converged digital ecosystem.

### I. Dynamic markets and competition

In dynamic markets, suppliers primarily compete by offering new and better products and services, or by introducing new technologies that dramatically increase capabilities and lower costs. Rather than simply cutting costs incrementally, they invest in innovation to create new differentiated products that at least some consumers regard as more valuable than what came before, or radically reduce their costs to win a decisive competitive advantage over incumbents.

Dynamically competitive markets place suppliers and customers in ever-changing relationships. Entrepreneurial suppliers succeed by finding new and better ways to serve customer needs and bringing them to market.<sup>19</sup> These innovations may involve launching entirely new products or services, adding or removing some features to existing offers, changing prices or price structures, changing the terms on which products are offered, offering new packages and bundles of service, dramatically lowering costs and prices for some services

or customer segments, and so on. Consumers can express their desire for new products and product characteristics through their choices in the marketplace—and they adapt their behaviour accordingly. Partly because of network effects, which we described above, these changes can occur very rapidly—indeed, so rapidly that dynamic markets may never achieve what economics textbooks refer to as ‘competitive equilibrium’.<sup>20</sup>

Dynamism has profound implications for regulation. First and foremost, dynamic markets generate benefits by creating new and better products or services that displace inferior ones and challenge the dominance of incumbent suppliers. Conventional competition analysis concludes that a company that has a sizable cost advantage over its competitors because of economies of scale must have sustainable market power because other players are unable to produce at a comparable cost. In most competition regimes, such companies are said to have significant market power or ‘dominance’.

19. See e.g., Kenichi Ohmae, 1982, *The mind of the Strategist—The Art of Japanese Business* (McGraw-Hill, New York), 38-40. “Basically, there are four ways of strengthening a company’s position relative to that of its competitors [...] In each of these four methods the principal concern is to avoid doing the same thing, on the same battleground, as the competition.”

20. See, e.g. Bruno Soria & Fernando Herrera-González, 22 March 2013, *A Quantitative Approach to Include Time and Innovation in Traditional Market Analysis*, TPRC 41: The 41st Research Conference on Communication, Information and Internet Policy, <http://ssrn.com/abstract=2238201>.

In dynamic markets, competitors can successfully compete with dominant companies by introducing new technologies or business models that offset, or even eliminate, the competitive advantages enjoyed by the statically-dominant incumbent. Recent examples include:

- Introducing new generations of technology with improved cost structures that result in dramatically lower average costs (e.g., ebooks versus paper books; 4G wireless versus 3G wireless);
- Introducing new business models that result in lower costs or improved functionality for targeted customer groups (e.g. prepaid mobile offers for low traffic PSTN users);
- Designing new products or services that bundle the functions that previous incumbents had an advantage in (e.g. Apple challenging dominance

by Microsoft in PC operating systems and Nokia in mobile phones by bundling computing and communications in iPhones and iPads versus formerly dominant Windows laptops and Symbian feature phones).

Incumbents do not actually need to be replaced for dynamic competition to produce its benefits: it is enough that they fear it. Expectations of future competitive innovation challenges can drive incumbents to behave as if they faced actual competition right now.<sup>21</sup> As Intel's Andy Grove famously put it, "Only the paranoid survive." The rational behaviour of a leading player in a dynamically contestable market is to assume that the market is becoming competitive and to anticipate challenges from competitors by out-innovating them and keeping prices at competitive levels.

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21. William J. Baumol, John C. Panzar & Robert D. Willig, 1982, *Contestable Markets and the Theory of Industry Structure*, Harcourt Brace Johanovic, New York.

## II. Dynamic competition in the digital ecosystem

Digital ecosystem markets are defined by dynamic competition. Each new technology or platform that successfully emerges in the marketplace does so by presenting consumers with choices they believe are superior to the ones previously available. The internet ecosystem, with its strong economies of scale and powerful network effects, allows innovative products to proliferate rapidly. Companies that supply complements to successful platforms will also thrive (e.g., video-based web services after the deployment of broadband networks), and often evolve into platforms of their own. Innovation therefore intensifies competition.

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Innovation rates throughout the digital ecosystem are extremely high, and disruptive innovations usually occur every two or three years.<sup>22</sup> Experience curves driven by cumulative incremental innovations often have steep slopes as well, so that the cumulated effect of incremental innovations can also have a disruptive effect. Moore's Law is the best known case of this, but similar improvements happen across the whole ecosystem.

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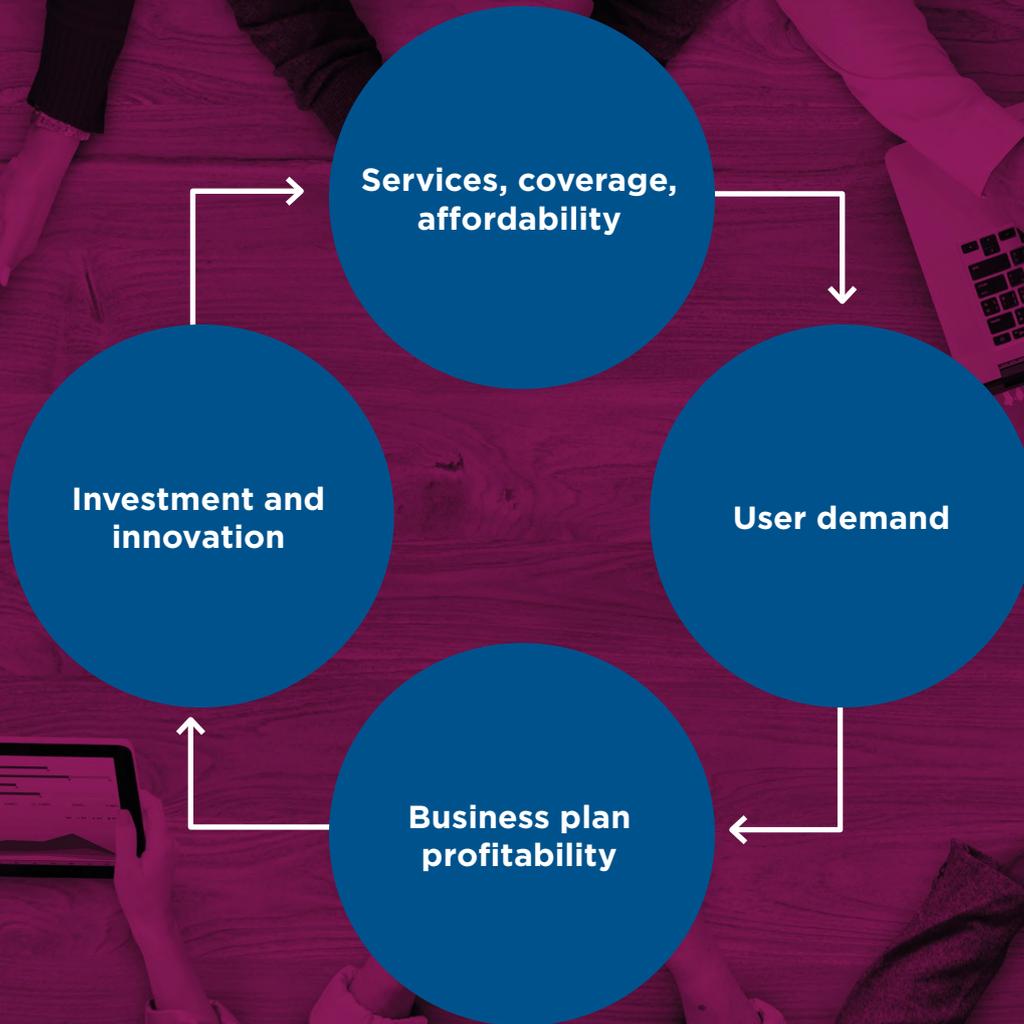
One reason for the rapid progress is what is referred to as a dynamic feedback loop or 'virtuous circle', as depicted in figure 3 below. Companies compete by innovating, and to innovate they must invest. Successful innovations are rewarded with customers—and profits—which provide incentives for still more investment in innovation.

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22. For example, Soria and Herrera-González, op. cit., found that after liberalisation, radical innovations had been introduced in fixed telephony on average every 2.8 years, every 3.1 years in mobile communications, and every 2.2 years in data communications.

Figure 3

## DYNAMIC EFFICIENCY FEEDBACK LOOP



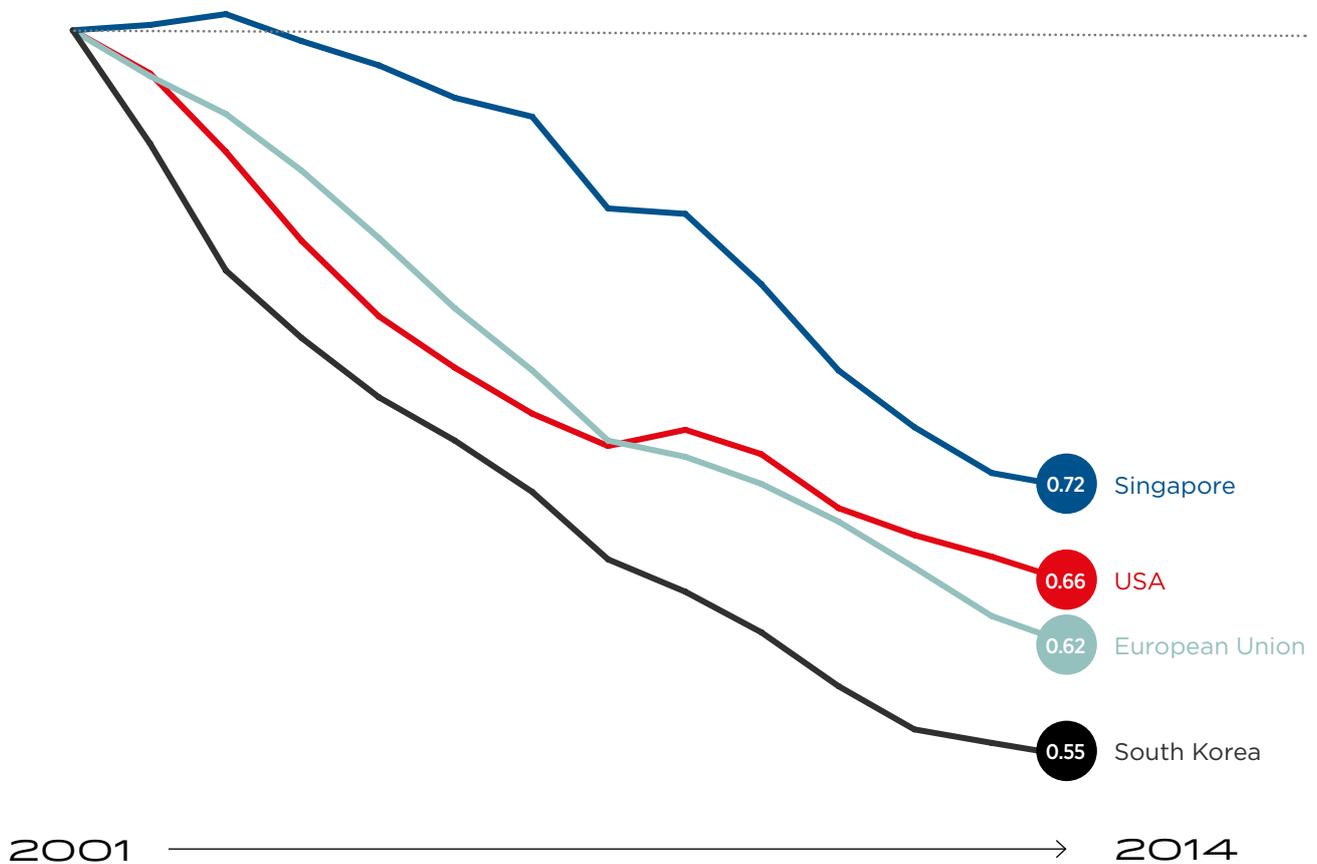
This cycle has been remarkably active over the past decades. For example, the number of internet users grew from 400 million in 2000 to more than 3.2 billion in 2015.<sup>23</sup> At the same time, prices have continuously decreased as a result of dramatic improvements in technology that created lower costs.<sup>24</sup> Telecommunications prices, for instance,

have sharply decreased in real terms in the largest OECD countries in the last decade, while service performance greatly increased, and they are likely to continue this trend in the foreseeable future. The same phenomenon can be seen throughout the application, device, and content sectors.

Figure 4

## PRICE INDICES FOR TELECOMMUNICATIONS SERVICES (CPI, 2001=1)

(Selected countries; 2001-2014)



Source: Eurostat, National Statistic Institutes

One implication of dynamic competition in the digital ecosystem is that dominant market positions may actually be more fragile than they appear. Perhaps the best example is internet browsers,

where Microsoft had a global market share of over 65% as recently as six years ago, but was surpassed by Google's Chrome browser three years later.

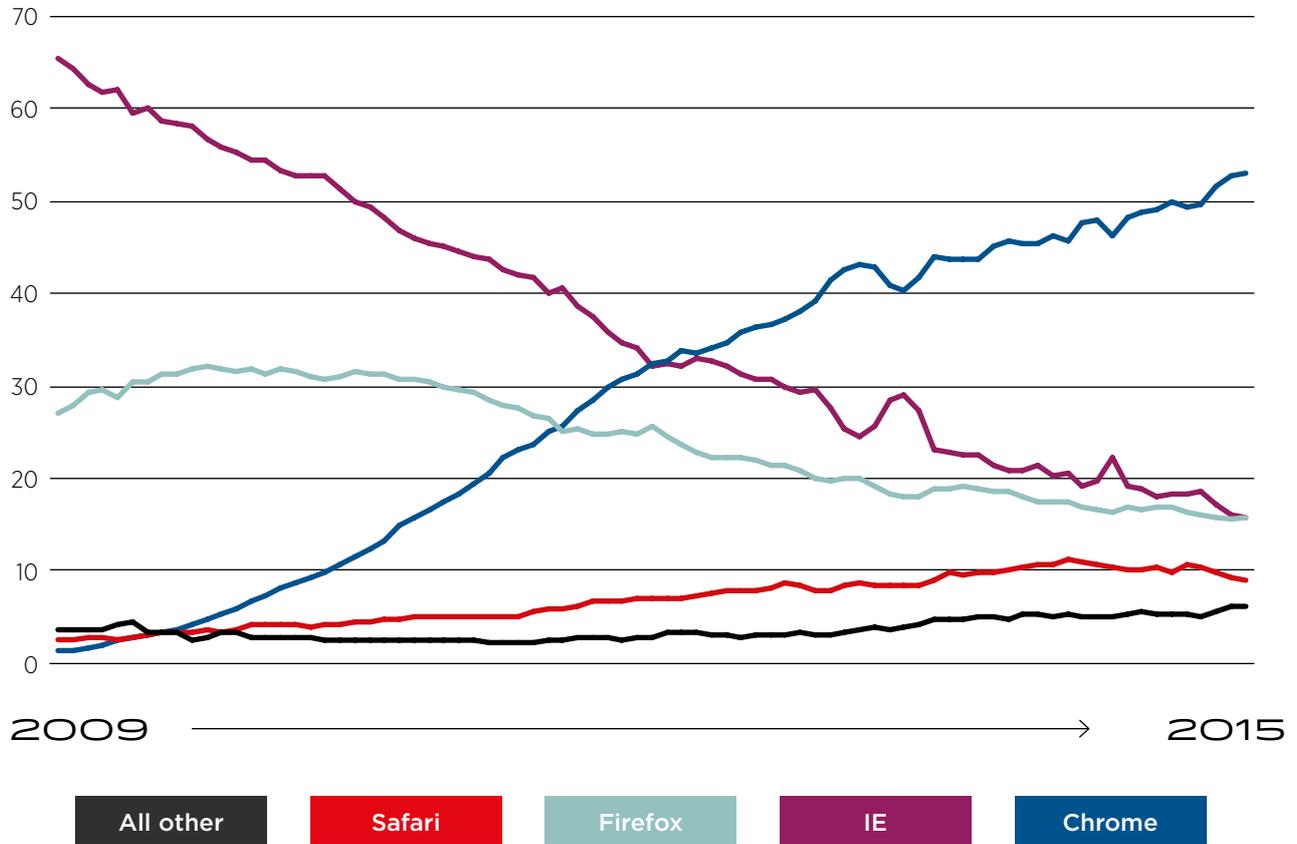
23. See International Telecommunications Union, ICT Facts and Figures: The World in 2015, at <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>.

24. See, e.g. HSBC Global Research, February 2014, Supercollider. European mobile consolidation is win-win for operators and citizens alike, for an analysis on how dynamic efficiencies are much larger than static ones in European mobile markets.

Figure 5

## BROWSER MARKET SHARES

(Desktop, tablet and console; 2009-2015)



Source: Statcounter.com

Microsoft is far from alone. The rapid transformation of the mobile messaging market has arguably been even more dramatic than the browser market, as OTT messaging services—led by WhatsApp—went from a standing start in 2010 to a majority share of the market in less than four years.<sup>25</sup> Similar examples can be found in market after market, where seemingly unassailable companies and technologies have been successfully challenged by disruptive technologies and unexpected entrants.

Telecommunications networks have also experienced dynamic contestability. In the late 1990s, a number

of broadband technologies (e.g., cable modem, PLC,<sup>26</sup> Wi-Fi, LMDS) were launched that allowed new entrants to capture market share from incumbent telephone companies. Most incumbents reacted quickly by launching their own ADSL services and cable operators were usually the only competitors to capture significant share. But this was not a predetermined outcome. The Czech Republic is an interesting counter-example. ADSL was not launched there until 2003, which allowed Wi-Fi operators to build a strong business and become the leading fixed broadband platform in 2009, a position they still hold.<sup>27</sup>

25. See e.g., Stephen Sale, 28 January 2014, "OTT Messaging Volumes Will More Than Double in 2014", Analysys Mason, <http://www.analysismason.com/About-Us/News/Insight/OTT-messaging-volumes-Jan2014-RDMVO/>.

26. PLC: Power Line Communications; broadband transmission over electricity networks.

27. See Appendix B for a more detailed description of the evolution of the Czech market.

Figure 6

## FIXED BROADBAND MARKET SHARES, CZECH REPUBLIC

(By technology 2004-2009)



Source: ECTA Broadband Scorecard

Keep in mind that the rapid changes in digital ecosystem markets are consumer driven—they represent the cumulative choices of consumers who change their purchasing decisions because they have decided the new product is somehow superior to the old one. Thus, while the consumer benefits resulting

from such rapid innovation may be impossible to quantify with precision, they are unquestionably very large.<sup>28</sup> Accordingly, a central objective of regulatory policy should be to promote (or at least not significantly hinder) innovation-driven dynamic competition in the digital ecosystem.

28. A recent study from the Atlantic Council estimates that information and communications technologies add about 1% to global economic growth each year, approximately a third of which is accounted for by increasing consumer surplus. See Atlantic Council, September 2015, Risk Nexus, 6, <http://www.atlanticcouncil.org/images/publications/risk-nexus-september-2015-overcome-by-cyber-risks.pdf>.

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# 3 Designing a new regulatory framework

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The changes described in Section III create serious challenges for existing regulatory frameworks. First, the emergence of OTT services in competition with traditional communications and content services has led to discriminatory regulation of similar services and competing companies. Second, the legacy ex ante regulatory regimes traditionally governing communications markets are no longer effective in the face of rapid innovation—and in many cases, are no longer necessary, given the emergence of dynamic competition. The first section below discusses the costs and consequences of failing to address these challenges and explains the case for reform.

The second section lays out three key principles for creating a new regulatory framework:

- (1) Regulations and regulatory institutions should be redesigned around the concept of functionality, rather than legacy technologies or industry sectors;
- (2) Regulation should be dynamic rather than static, focusing on ex post enforcement of broad rules rather than detailed ex ante prescriptions;
- (3) Reform efforts should be broad-based and bottom-up in the sense of re-evaluating from a clean slate the need for regulation, its goals, and the means by which those goals are accomplished.<sup>29</sup>

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29. The criticisms of existing regimes and proposed principles for reform described in this chapter are by necessity put forward in broad terms, and apply to different degrees and in different ways depending on the specific policy or market involved. In the next chapter, we provide case study examples which demonstrate how these concepts apply to specific regulatory issues.

## 3.1 The need for reform: costs and consequences of legacy regulation

As in other areas of the economy, regulation in the digital ecosystem is intended to address market imperfections, including inefficiencies associated with monopoly power, externalities and public goods, and information asymmetries. Note that the existence of a market imperfection is not by itself a justification for government intervention: for regulation to improve welfare, intervention must create benefits greater than the costs.<sup>30</sup>

Just as there is no such thing as a perfect market, there is no such thing as perfect regulation. All regulatory efforts to improve market outcomes face significant challenges. First, regulators have imperfect information about the nature of the markets they are trying to improve and the consequences of potential actions. The diagnosis of market failures is subject to both Type I and Type II errors,<sup>31</sup> and the effects of regulatory interventions are subject to the Law of Unintended Consequences.<sup>32</sup> Poorly designed regulations can cause misallocation of economic resources and can reduce economic welfare.

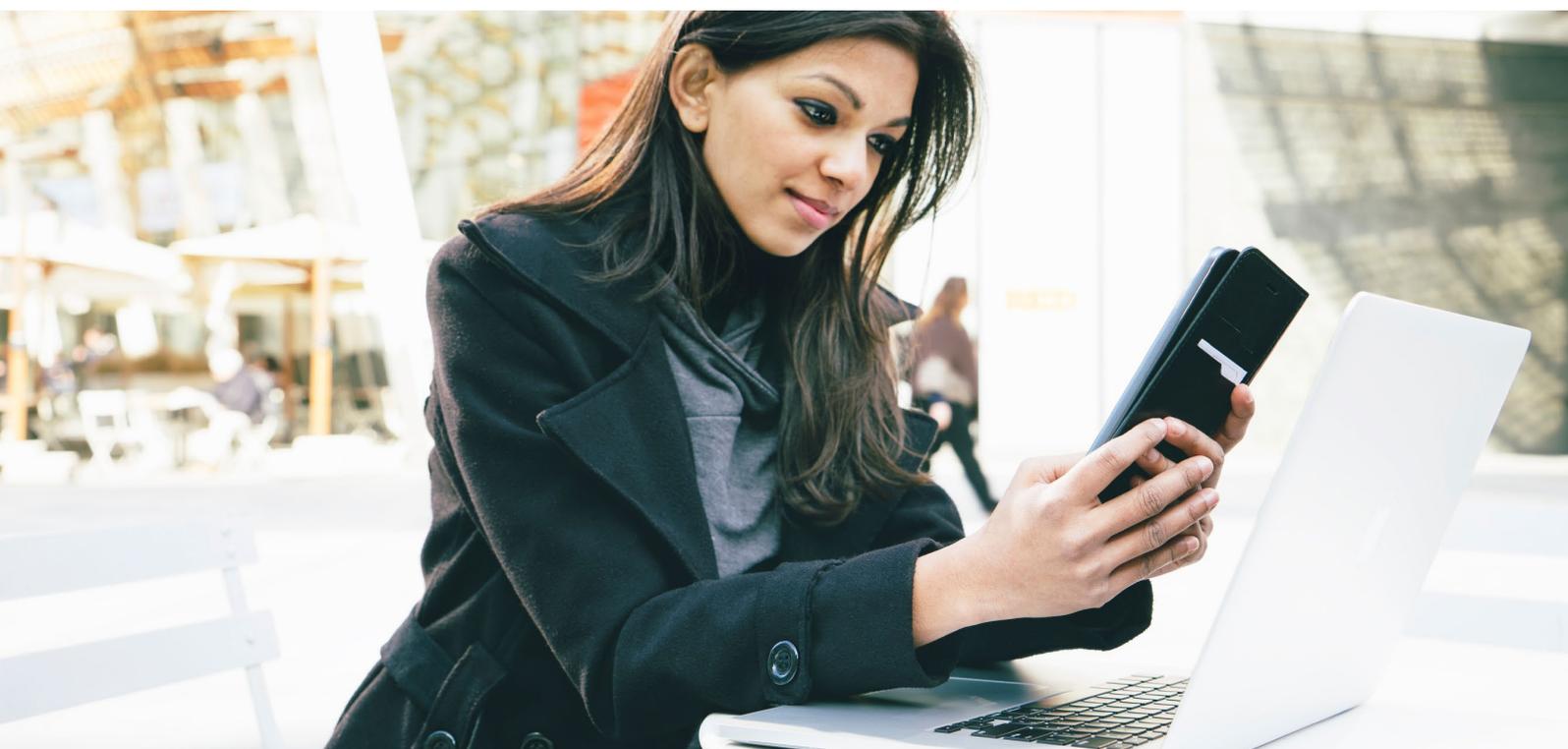
Second, market conditions and technologies are constantly changing in ways that are difficult or impossible to predict, meaning that regulations imposed today may no longer be appropriate

tomorrow, or next year. Thus, even when regulators can accurately diagnose a market failure and identify a welfare-enhancing intervention, the resulting rules may soon be obsolete.

Third, because markets are complex and rules must be written while anticipating alternative future outcomes, regulations are often complex and ambiguous. This means they can impose substantial compliance burdens on regulated industries. Compliance costs tend to be fixed costs, so they place disproportionate burden on small businesses and potential entrants. Complexity and ambiguity also lead to regulatory uncertainty (or ‘regulatory risk’), which lowers the risk-adjusted rate of return on investments in regulated industries.

Finally, some interests inevitably benefit more than others when regulatory power is exercised, meaning that private actors have strong incentives to engage in rent-seeking—that is, to attempt to influence regulatory outcomes to impose costs on competitors and achieve advantages for themselves. Furthermore, regulatory institutions have interests of their own, including preserving and expanding their reach and authority.<sup>33</sup>

30. See generally W. Kip Viscusi, Joseph E. Harrington, Jr. and John M. Vernon, MIT Press, 2005, *Economics of Regulation and Antitrust*; see also Susan E. Dudley and Jerry Brito, 2012, *Regulation: A Primer*, 11-13.  
 31. Type I error is the failure to identify a market failure; Type II error refers to identifying market failure when in fact no market failure exists. For a useful discussion, see Geoffrey A. Manne and Joshua D. Wright, “Innovation and the Limits of Antitrust,” *Journal of Competition Law & Economics* 6:1 (2010) 153-202.  
 32. See Rob Norton, *Concise Encyclopedia of Economics*, 2008, “The Law of Unintended Consequences”, <http://www.econlib.org/library/Enc/UnintendedConsequences.html>.  
 33. A seminal discussion of this issue may be found in Ronald H. Coase, October 1959, *The Federal Communications Commission*, *Journal of Law & Economics* 2, 1-40.



The characteristics of the converged digital ecosystem exacerbate each of these problems:

- Digital ecosystem markets are especially complex, increasing regulatory uncertainty and making it more difficult for regulators to assess market performance and come up with solutions.
- The rapid pace of market change makes regulations obsolete faster, resulting in regulatory structures and policies that are mismatched to market realities.
- The distortions caused by fixed compliance costs and regulatory delay are magnified in digital markets because they harm new entrants and hamper the ability to innovate and introduce new products.
- The enhanced potential for regulations to distort markets (e.g., by deterring entry or skewing the path of technological progress) increases the likelihood that special interests will seek to influence the regulatory process to their own benefit.

These generic challenges to effective regulation have manifested themselves in two concrete and increasingly harmful ways. First, convergence has led to discriminatory regulation because similar services are subject to different regulatory regimes based on the type of company offering the product or the type of technology used, and because companies regulated by different regimes have entered each other's markets. Second, regulators have not moved quickly enough to adopt a dynamic ex post approach in place of prescriptive, ex ante rules, which are often too complex, inflexible and static to be effective in digital ecosystems.



## I. Discriminatory regulation

The main challenge facing digital ecosystem regulation today is the entry of ‘edge’ providers (suppliers of applications, content and devices) into markets previously served by vertically integrated infrastructure-based communications providers. Services provided by companies like Amazon, Facebook, Google, Microsoft, and Netflix are directly competing successfully with services provided by companies like AT&T, Comcast, Bharti Airtel, CBS, Fox, NTT, Sky, Telstra, and Vodafone. The first group of companies and the services they provide are typically regulated under general antitrust and consumer protection regimes, while the second

group of companies and their offerings are generally still subject to industry-specific rules and institutions. Thus, telecommunications carriers (but not other voice and data communications providers) are still subject to rules designed for telephone companies; traditional audio and video distributors (but not OTT providers) are still subject to rules designed for ‘broadcasters’; mobile carriers and their services face many of the same rules as wireline telephone companies (and often even more that come attached to their spectrum licences), while other wireless ecosystem participants face much lower burdens.

Table 2

## EXAMPLES OF DISCRIMINATORY REGULATION

Issue	Applications	Communications	Content	Devices
<b>Consumer Protection</b>	General CP law.	Specific regulation: portability, opt-in services, specific consumer protection offices	Age-related, violence, sex; otherwise general CP law	General CP law
<b>Competition Enforcement and Economic Regulation</b>	General competition law	Industry specific obligations and regulatory institutions Asymmetric access regulation to SMP operators Retail price regulation and tariffing	Compulsory licensing for some content; otherwise general competition law Restrictions on advertising time Restrictions on foreign ownership	General competition law
<b>Intellectual Property</b>	General IP/competition law	General IP law	Mandated licensing of some content Specific regulation of IP rights management	General IP law Mandated licensing for IP included in some standards Compulsory levies to content rights owners
<b>Privacy and Data Protection</b>	General privacy regulation	Industry specific regulation (e.g., “CPNI”); license conditions	Specific regulation (e.g. images of minors; “right to be forgotten”)	General privacy regulation
<b>Resource Management</b>	None	Regulated allocation of spectrum, numbering and access to property (rights of way), regulation of technology transitions	Regulated allocation of spectrum for broadcasters	None
<b>Security</b>	Data requests by authorities	Legal interception of communications Retention of call data records Interoperability with military networks	State secrets regulation	Little or no regulation Current battle over encryption
<b>Taxes</b>	Sales tax with potential for jurisdiction shopping	Sales tax Spectrum charges Sector specific taxes Luxury taxes	Sales tax Levies to fund local production and public television	Sales tax Import duties
<b>Universal Access/ Universal Service</b>	No regulation. No obligations to contribute to funds	Obligation to provide basic set of services at affordable prices and wide coverage (“carrier of last resort”)  Contribution by telcos to universal service fund. Included as license obligation for mobile operators	Included as license obligation for broadcasters. No obligations for others	No regulation

Source: NERA Economic Consulting

Discriminatory regulatory treatment of traditional communications companies is not limited to ‘economic’ regulation of prices and entry (i.e., what is generally thought of as ‘public utility’ regulation). Table 2 shows that sector-specific regulation of communications providers—and the resulting disparity in treatment—extends across the entire scope of regulatory issues, including consumer protection, competition regulation, privacy and data protection, security and law enforcement, and even taxation.<sup>34</sup>

In all of these areas, regulation is ‘structure-based’—it is determined by the nature of the company supplying the product or the technology being used. Structure-based regulation is inherently discriminatory. It harms both competition and consumers, and makes it more difficult and costly to achieve legitimate public interest objectives. It distorts economic incentives, causing economic resources to flow away from their highest valued uses, harms competition by raising barriers to entry for some types of companies but not others, slows innovation by limiting the ability to create new products and platforms, creates consumer confusion about what types of protections apply to which products, and raises the costs of regulation by distributing regulatory burdens in an inefficient way.

Regulatory discrimination takes two main forms: substantive and procedural.

- Substantive discrimination occurs when specific regulatory mandates are applied differently, such as when infrastructure-based communications providers face mandates for universal service that are not imposed on OTT competitors, or are subjected to different privacy and data protection regulations.
- Procedural discrimination occurs when different market sectors or technologies have different degrees of freedom to innovate or adjust their business models without having to seek approval or incur other kinds of regulatory risk. In markets where competitive success is determined by the speed of innovation, procedural discrimination may be even more distorting than substantive discrimination.

The marketplace effects of discriminatory regulation can be usefully categorised as horizontal or vertical.

- Horizontal effects occur when actual or potential suppliers of competing services are subjected to differential regulation, limiting the ability of the more heavily regulated sector to enter or compete in the market. This reduces competition, slowing innovation and raising prices. Consumers suffer directly from horizontal effects because they create confusion about which rules apply to which services.
- Vertical effects occur when companies that provide complementary products for a digital ecosystem platform are subjected to differential regulation. This can lead to an inefficient mix of complementary inputs in digital platforms, and distorts rates of innovation by allowing some types of technologies to evolve more rapidly than others.

Structure-based regulation not only imposes costs on consumers and the economy—it frustrates public interest objectives by creating a bias in favour of some types of interventions over others. While it is understandable that regulators tend to look first at markets they are familiar with (and where regulatory institutions are already in place) during the decision-making process, this approach can artificially limit regulatory options in ways that raise costs or even prevent them from achieving their regulatory goals altogether.<sup>35</sup>

34. See e.g., Bernard Amory and Laurent De Muyter, January 2015, “A New EU Commission for the Digital Single Market: Time for a Legislative Rethink?” Who’s Who Legal, <http://whoswholegal.com/news/features/article/31969/a-new-eu-commission-digital-single-market-time-legislative-rethink>.  
 35. The ability to regulate effectively is also affected by underlying statutes and—because the digital ecosystem operates on a global scale—by international law. For example, Microsoft is currently in litigation with the U.S. government over the government’s ability to subpoena information stored in Microsoft servers located outside the U.S. See See Doneld G. Shelkey and Christopher C. Archer, National Law Review, 11 June 2015, “Microsoft Ireland Case—Status and What’s to Come”, <http://www.natlawreview.com/article/microsoft-ireland-case-status-and-what-s-to-come>. Similar issues are in play with France’s efforts to extend European privacy rights beyond national borders by imposing requirements on search companies like Google. See Peter Sayer, 21 September 2015, “France tells Google to Remove ‘Right to be Forgotten’ Search Results Worldwide”, PC World, <http://www.pcworld.com/article/2984524/privacy/france-rejects-googles-appeal-on-right-to-be-forgotten.html>. Unlike Google and Microsoft, communications carriers have substantial tangible assets in the jurisdictions where they operate.

## II. Static regulation of dynamic markets

The second primary challenge facing regulation of the digital ecosystem is the inability of prescriptive, ex ante regulatory regimes to keep pace with the dynamism of digital products and markets.

Traditional ex ante regulatory approaches typically seek to specify not just the objectives being sought, but the means by which they are to be achieved. For example, environmental regulations may specify the particular technology used to reduce emissions, workplace safety regulations may impose detailed engineering specifications, or consumer protection rules may specify the use of a specific type of safety device. In the telecommunications arena, regulations often specify the technology that must be used for particular wireless services, describe in detail how infrastructure providers satisfy 'open access' requirements to make their systems available to competitors, or identify categories of business conduct that may be considered discriminatory in advance.

The downsides of such prescriptive approaches are well documented, including regulatory complexity, inflexibility in the face of diverse circumstances (i.e., forcing a 'one-size-fits-all' solution) and lack of adaptability over time.<sup>36</sup> As noted above, all of these effects are exacerbated in digital ecosystem markets.

The traditional regulatory process has been unable to keep pace with market developments in the digital ecosystem on numerous occasions:

- In the U.S., uncertainty about whether and how the FCC would intervene in relations between OTT providers and ISPs has persisted for more than a decade. The Commission's prior efforts to regulate have twice been overturned by the courts. There is a significant possibility the new rules, issued in March 2015, will also be overturned by the courts – but not until at least 2016.<sup>37</sup>
- In the European Union, regulations mandating SMS roaming came into effect at a time when mobile operators were on the brink of losing a third (or more) of the market for out-of-state services to a combination of OTT providers (like WhatsApp) and public Wi-Fi—that is, when the rationale for such regulations was about to evaporate.<sup>38</sup>
- Throughout the world, efforts to promote universal internet access have lagged behind technological change. Regulators continue to subsidise outdated technologies and incumbent providers while underemphasising or ignoring new approaches, including wireless.<sup>39</sup>

These examples are not intended to suggest that it is always unnecessary or inappropriate to regulate the digital ecosystem, or even that ex ante rules are never optimal. But the evidence suggests that regulatory intervention should move away from prescriptive, ex ante rules wherever possible.

36. See e.g., Roger Sherman, 2008, *Market Regulation*, Pearson, 686. See also U.S. Office of Management and Budget, Circular A-4, 2003, *Regulatory Analysis*, [https://www.whitehouse.gov/sites/default/files/omb/assets/regulatory\\_matters\\_pdf/a-4.pdf](https://www.whitehouse.gov/sites/default/files/omb/assets/regulatory_matters_pdf/a-4.pdf). ("Performance standards ... are generally superior to engineering or design standards because performance standards give the regulated parties the flexibility to achieve regulatory objectives in the most cost-effective way.")

37. See Bret Kendall, 4 August 2015, "Appeals Court to Hear Arguments over FCC's Net Neutrality Rules", *Wall Street Journal*.

38. See Appendix C.

39. See e.g., International Telecommunications Union, Broadband Commission, September 2013, *The State of Broadband 2013: Universalizing Broadband*, 60-62, <http://www.broadbandcommission.org/documents/bb-annualreport2013.pdf> (hereafter *Broadband Commission 2013*).

## 3.2 Elements of a new regulatory framework

A new regulatory framework for the internet ecosystem should incorporate three main principles. First, it should be functionality-based, rather than structure-based. Second, it should recognise that the dynamism of the digital ecosystem demands that regulation also be dynamic and flexible. Often, ex post enforcement of broadly defined regulatory structures will prove to be more flexible

than prescriptive, ex ante regimes. Third, it should recognise that many of today's legacy regulatory structures are outdated, and take a bottom-up or 'clean-slate' approach by assessing both current and potential new regulations, and regulating only when it can be demonstrated that the benefits will exceed the costs.

### I. Functionality-based regulation

A functionality-based approach begins by assessing the regulatory objectives being pursued and examines how those objectives can best be achieved, regardless of technology or legacy market structures. For example, if the objective is to preserve the privacy of consumer calling data, regulation would look at all modalities and platform elements that provide such services and collect such data. To be clear, a functionality-based approach does not preclude sector- or technology-specific regulation, but instead provides an analytical framework to determine when regulation is appropriate by considering all of the available regulatory options, rather than being constrained by existing paradigms.

- Assume the goal is to expand the availability of high definition video services delivered over the internet. A structure-based approach might

consider that communications networks are already regulated, and simply mandate (or subsidise) an increase in the bandwidth of access networks,<sup>40</sup> perhaps even choosing a particular technology such as FTTP. A functionality-based approach would focus on the ultimate policy objective—enhancing access to HD video—without regard to technology or industry, recognising that the objective might in principle be achieved through a variety of means. This could include more powerful compression techniques to allow HD services to run over existing (DSL) networks, alternative network infrastructures that rely more heavily on local storage, more advanced wireless networks, development of new software protocols to reduce packet retransmissions (and thereby lower bandwidth requirements)—or some combination of all of the above.

40. This seems to be, for instance, the approach of the European Commission, which has set a target of 50% of Europeans connected through 100 Mbps connections by 2020, and perhaps the FCC, which has redefined broadband services as those delivering at least 25 Mbps download at the user interface. Similar steps are under consideration in Canada. See Canadian Radio-television and Telecommunications Commission, Telecom Notice of Consultation 2015-134, 9 April 2015, Review of Basic Telecommunications Services.



Functionality-based regulation is related to policy criteria like technological neutrality or ‘same service, same rules’, but goes beyond them. First, it is technology-agnostic rather than technology-neutral, since it calls for all technological means for achieving the desired objective to be examined, but does not demand that each technology be regulated identically. Indeed, a functionality-based approach recognises that differences in technology may require different regulatory treatment to achieve a common objective.

- For instance, if the regulatory objective is to increase network coverage in a rural area and the policy is providing subsidies to operators, then subsidies should be technology-neutral—that is, available to all suppliers, regardless of the technology employed. However, if the policy choice is to lower deployment costs, then authorities may decide to grant spectrum licences in low frequency bands, which would benefit wireless operators but not wireline. They might also relax urban planning rules to allow fibre cables to be deployed on poles instead of underground ducts, which would benefit fixed operators but not mobile ones. The governing principle is that the regulatory objective should be achieved in the most cost-effective way, without regard to industry sector or technology.

A functionality-based approach is also consistent with ‘same service, same rules’ in the sense that the purpose or ‘function’ of regulations is to protect consumers from potential harms associated with a particular service regardless of the type of firm or technology used to provide it.

- Consumers should be able to expect the same level of privacy protection, or public safety functionality, regardless of whether they choose a VoIP or PSTN-based voice service. A functionality-based policy, however, goes further by considering how different services may carry out the same public function: for example, a voice call to the 911 or 112 emergency number and an SMS from a push-button emergency device for elderly people are both mechanisms that ensure that people can communicate with emergency services providers.

## II. Dynamic regulation and flexibility

The second principle of the new regulatory framework is the need to promote dynamism and innovation by favouring flexible, performance-based approaches over command-and-control prescriptive standards.

A competitive market is, of course, the most dynamic governor of marketplace conduct, and there is a broad consensus that the competitiveness, dynamism and complexity of the digital ecosystem increasingly requires that decision-making be shifted from regulatory agencies to the marketplace wherever possible.<sup>41</sup> When intervention is required, however, regulators should seek to embody regulatory objectives in performance standards that can be enforced after the fact rather than through engineering specifications or prescriptive rules specifying particular conduct or procedures.<sup>42</sup>

The central argument in favor of the ex post approach is flexibility. As current FCC General Counsel Jonathan Sallet explained in a 2011 paper:

Because rulemaking is necessarily based on a current state of understanding about the market, it is ill-equipped to deal flexibly with the rapidly changing and ever-evolving nature of competition in the Internet marketplace. Regulators (like the rest of us) cannot be expected to forecast the future trajectory of innovation with precision. In today's dynamic and complex Internet market, regulators thus run the risk of inadvertently stifling innovation and competition by incorrectly predicting sources of competition or economic incentives that favor new value propositions.<sup>43</sup>

A dynamic model focusing on predictable ex post enforcement of clearly defined performance standards (rather than ex ante prescriptive regulations) can recognise and embrace the pace of

technological and market innovation. This allows the approach taken to achieve regulatory objectives to evolve over time, even when the objectives remain mostly stable.<sup>44</sup>

41. See Jonathan E. Nuechterlein and Philip J. Weiser, 2013, *Digital Crossroads*, MIT Press, Chapter 10. "The ultimate end game in telecommunications regulation ... should be a deregulatory environment...."  
 42. See OMB Circular A-4 at 8 ("Market-oriented approaches that use economic incentives should be explored. These alternatives include fees, penalties, subsidies, marketable permits or offsets, changes in liability or property rights (including policies that alter the incentives of insurers and insured parties), and required bonds, insurance or warranties."); see also President Barack Obama, Executive Order 13563, *Improving Regulation and Regulatory Review*, <http://www.gpo.gov/fdsys/pkg/FR-2011-01-21/pdf/2011-1385.pdf> (requiring that regulations "to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public.");  
 43. Jonathan Sallet, November 2011, *The Internet Ecosystem and Legal Regimes: Economic Regulation Supporting Innovation Dynamism*, 3, available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1957715](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1957715). Sallet does not entirely reject the use of rulemaking, but argues that it should be limited.  
 44. It is sometimes offered that an ex post approach is "too slow" to correct harmful conduct when compared to ex ante rules that prohibit such conduct outright. The main problem with this argument in the rapidly changing digital ecosystem is that it ignores the time it takes to put in place ex ante rules in the first place. Further, having ex ante rules does not eliminate the need for—and delays associated with—adjudication of alleged violations.

### III. Taking a bottom-up approach

Taking a bottom-up approach means identifying the best way of achieving regulatory objectives regardless of legacy regulatory regimes and approaches, and recognising that changes in technologies and markets have likely altered the need for regulation as well as its optimal form and focus. It therefore seeks to apply a consistent set of criteria to assess market power throughout the internet ecosystem and focus regulatory attention on areas where it currently exists or is likely to exist in the future, rather than where it may have existed in the past.

A bottom-up approach does not imply that policymakers should ignore existing rules and institutions and ‘start over’ from scratch. It simply means that current regulatory regimes should be taken into account in the implementation phase of policy making, rather than in the design stage. There are usually many regulatory tools available to address a policy issue. Discarding some of them at the beginning because they do not conform to the current regime runs the risk of leaving out the best solutions before the discussion has even begun. Only after the full set of potential solutions has been identified should the additional criterion of

practicality—including the time, transition costs and political capital needed to implement each choice—be applied to the problem at hand. In some cases, a solution that simply requires a regulator’s order to be implemented may turn out to be preferable to another that would yield higher social benefits, but would require constitutional reform.

The benefits of a bottom-up approach include:

- Forcing a reassessment of existing regulations to determine if they are still justified by market failures and removing regulations and regulatory institutions that are no longer needed.
- Identifying and addressing new regulatory challenges and objectives, such as those associated with the extra-territorial nature of many internet-based enterprises.
- Making it possible to achieve the most efficient regulatory outcomes by examining all available options.
- Creating streamlined regulatory institutions and mandates that are better suited to the converged digital ecosystem than the legacy institutions of the 20th century.

A new regulatory framework based on these principles will be inherently market- and technology neutral, in that it will apply to all elements of the internet ecosystem; cost-effective, in that it will achieve regulatory goals and objectives at the lowest possible cost; and flexible, in that it will allow markets and technologies to evolve while preserving and enhancing regulators’ ability to achieve their functional regulatory objectives.

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# 4 Applications

Adoption of a new regulatory framework based on the above principles would have broad and profound implications for regulation of the digital ecosystem. It would achieve important regulatory objectives more efficiently, while at the same time reducing the costs and distortions caused by today's legacy regulatory regimes. The sections below explain how these principles would affect six key areas of regulatory policy: access regulation, barriers to entry and exit, privacy and data protection, merger review, spectrum management, and universal availability and access.



## 4.1 Access regulation

Mandated access regulation exists in one form or another throughout the digital ecosystem. The broadest and most extensive requirements apply to communications carriers, which are required to interconnect with other carriers in most countries. In many countries, they are also required to lease their infrastructures or offer their services to competitors at mandated prices, generally under the auspices of complex regulatory price control regimes.<sup>45</sup> However, these kinds of mandates are also present in other digital ecosystem markets. For example, in markets for digital content, audio and video copyright holders are sometimes subject to statutory licensing schemes that require them to make their content available to distributors either for free (as in the case of sound performances over terrestrial radio stations in the U.S.) or for a fee set by a copyright royalty board. In other parts of the digital ecosystem, antitrust authorities may require patent holders to license their products under terms determined to be “fair, reasonable and non-discriminatory” (FRAND), or impose licensing or other open access mandates as a merger condition or as a remedy in cases of alleged monopolistic conduct (as in the case of Google’s acquisitions of Motorola and ITA, and the Microsoft antitrust litigation).

These mandates reflect regulators’ efforts to balance the pursuit of static efficiencies against dynamic efficiencies, given the competitive dynamics of the digital ecosystem. The fact that these mandates are distributed unequally across the various sectors—in ways that are difficult to explain on the basis of economic analysis—suggests that their use needs to be re-examined.

Adopting a new regulatory framework would mean taking a fresh look at the economic and institutional conditions under which mandates could improve or harm economic welfare, acknowledging that there is a tradeoff between forced sharing of unique assets and ‘essential facilities’ on the one hand, and incentives to invest and innovate on the other. This assessment would also take the horizontal and vertical distortions caused by discriminatory regulation into account, and recognise that in the case of access mandates, the effects are both procedural and substantive. That is, access mandates will affect a regulated company both because it is required to sell its services at below-market prices and because of the costs and complexities inherent in such regulatory systems.

In this context, regulators should seek to create and apply a consistent standard across the entire ecosystem so that the same criteria could be applied when evaluating the benefits and costs of open access mandates, regardless of sector or technology. The available evidence suggests that the best practice would be to limit them to cases of sustainable, long-term control over assets for which there are no (and are not likely to be) effective substitutes.<sup>46</sup> The evidence also suggests that in the digital ecosystem, there are relatively few instances of such long-run ‘bottlenecks’.

45. An extreme form of access regulation involves structural separation of wholesale and retail functions. See e.g., Robert W. Crandall, Jeffrey A. Eisenach and Robert E. Litan, 2010, “Vertical Separation of Telecommunications Networks: Evidence from Five Countries”, *Federal Communications Law Journal* 62:3, 493-539.

46. See e.g., Robert Crandall, Jeffrey A. Eisenach and Allan T. Ingraham, 2013, “The Long-Run Effects of Copper-Loop Unbundling and the Implications for Fiber”, *Telecommunications Policy* 37, 262-281. Other possible exceptions include limited use of access requirements as remedies in mergers, where temporary mandates may serve to reduce or eliminate potential anticompetitive effects or in cases where information costs may justify joint action (as with some copyrights).

## 4.2 Barriers to entry and exit

Much of the success of the digital economy is credited to the concept of ‘permission-less innovation’—the ability of internet companies to create new products and abandon old ones, without being required to seek permission from regulators.<sup>47</sup> For the most part, communications carriers are not beneficiaries of permission-less innovation, but instead are bound by legacy regulations that force them to seek approval before introducing new products or (to an even greater extent) retiring old ones. Such mandates take many forms, including (in some countries) explicit licensing requirements for telecommunications carriers,<sup>48</sup> licence conditions embedded in spectrum licences, and limitations on companies’ abilities to replace older technologies with newer ones.

In Europe, for example, rules mandate that when incumbent telecommunications operators deploy fibre to the home in a central office, they must keep the legacy copper pair network in operation for a minimum of five years if some of the copper loops are unbundled.<sup>49</sup> Similar obligations were put in place for U.S. carriers in August 2015.<sup>50</sup> In contrast, internet companies routinely introduce and abandon products without regulatory oversight—even when such changes have the effect of ‘stranding’ users of the discontinued products.<sup>51</sup>

Adopting a new regulatory framework would imply a comprehensive re-examination of barriers to entry and exit that exist in legacy regulation of communications carriers, with a focus on enhancing consumer welfare and encouraging value-creating innovation, and a de-emphasis on protecting corporate interests that benefit from preservation of the status quo. Technological change invariably creates winners and losers, and reasonable measures to protect vulnerable consumers may be justified in some circumstances. But such efforts should not take the form of technology mandates or broad prohibitions on technological progress.

The costs imposed by regulatory barriers to entry and exit take both substantive and procedural forms. Substantive requirements for backwards compatibility or to maintain obsolete infrastructures are the most obvious costs, but procedural costs—which result from the need to seek and wait for approval—may, in the end, be the most harmful to innovation and competition. These costs include the regulatory uncertainty and delay associated with waiting for regulators to determine whether, and to what extent, legacy regulations will follow regulated companies into new markets.

47. See e.g., Adam Thierer, 2014, *Permissionless Innovation: The Continuing Case for Comprehensive Technological Freedom*, Mercatus Center, [http://mercatus.org/sites/default/files/Permissionless.Innovation.web\\_v2\\_0.pdf](http://mercatus.org/sites/default/files/Permissionless.Innovation.web_v2_0.pdf).  
 48. In 2002, the EU liberalised licensing so that only a general authorisation is needed. See Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive), <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:124164>.  
 49. Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU).  
 50. See Federal Communications Commission, 7 August 2015, *In the Matter of Technology Transitions, Report and Order, Order on Reconsideration, and Further Notice of Proposed Rulemaking*, GN Docket No. 13-5.  
 51. For example, Microsoft discontinued support for Windows XP in June 2015 when it was still running on nearly 200 million systems, representing 13% of all Windows PCs worldwide. See Gregg Keizer, 15 July 2015, “Microsoft kicks elderly Windows XP when it’s down”, *Computerworld*, <http://www.computerworld.com/article/2948460/security/microsoft-kicks-elderly-windows-xp-when-its-down.html>. Similarly, Apple does not provide backward compatibility for older iPhones and other iOS devices for new versions of iOS software.

## 4.3 Privacy and data protection

The ability to store, transmit, and use information is ultimately the source of the economic and social value created by the digital ecosystem. At the same time, concerned consumers want to be sure that their information is protected and that it is not used inappropriately. In many countries, these concerns have led regulators to put various privacy and data protection rules into place, and communications providers are often subject to sector-specific rules. For example, the European Commission states in the DSM Communication:

Special rules apply to electronic communications services (e-Privacy Directive) which may need to be reassessed once the general EU rules on data protection are agreed, particularly since most of the articles of the current e-Privacy Directive apply only to providers of electronic communications services, i.e. traditional telecoms companies. Information society service providers using the internet to provide communication services are thus generally excluded from its scope.<sup>52</sup>

In the U.S., communications providers are subject to specific rules under Section 222 of the Communications Act limiting the use of Customer Proprietary Network Information (CPNI), though broadband ISPs were effectively exempt from the rules until they were classified as common carriers in the Open Internet Order.<sup>53</sup> Subsequently, the FCC issued a two-page advisory that advises ISPs to “take reasonable and good-faith” steps to comply with the underlying statutory provisions, but did not issue specific rules, creating significant regulatory uncertainty.<sup>54</sup> Also in the U.S., the Federal Trade Commission—which has traditionally regulated

online privacy regulations—has considered whether ISPs should be subjected to more onerous rules than other online providers.<sup>55</sup> Other countries, such as Brazil, have also imposed sector-specific privacy regulation.<sup>56</sup>

These kinds of industry-specific rules can cause both horizontal and vertical distortions, preventing ISPs from entering data-dependent markets such as cloud services (thus protecting incumbents), and potentially stopping other companies from becoming involved in platform markets where ISPs operate. When regulators (like the FCC in the above case) fail to provide clear guidance on the scope and content of discriminatory rules, or force ISPs to seek advisory opinions to determine what types of activities are permitted, regulatory risk increases and innovation slows. At the same time, the absence of consistent standards harms consumers by causing uncertainty and confusion about which rules apply to which services or providers.

By contrast, the new regulatory framework principles argue in favor of a technology- and business model-agnostic approach to privacy regulation, which focuses on the ways in which data is collected and used. It would recognise the need to apply specific protections to certain data (e.g., financial and health data) and to certain uses of information (e.g., for credit, employment and insurance), regardless of the ‘sector’ occupied by the company collecting it or the technology by which it is gathered. Such an approach “allows consumers to form consistent expectations about how information is collected and used” and “promotes competition and consumer choice by providing a stable and level regulatory environment.”<sup>57</sup>

52. DSM Communication, page 13; see also Directive 2002/58/EC of the European Parliament and of the Council (e-Privacy Directive), 12 July 2002.

53. See Open Internet Order at ¶462 ff.

54. See Federal Communications Commission, 20 May 2015, Enforcement Bureau Guidance: Broadband Providers Should Take Reasonable, Good Faith Steps to Protect Consumer Privacy, [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-15-603A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-15-603A1.pdf). Some believe the Commission ultimately plans to extend its rules to cover edge providers. See e.g., F. Paul Pittman, 2 September 2015, “FCC Shows Hand on Regulation of Edge Providers”, <http://www.dataprivacymonitor.com/online-privacy/fcc-shows-hand-on-regulation-of-edge-providers>.

55. See Federal Trade Commission, March 2012, Protecting Consumer Privacy in an Era of Rapid Change, <https://www.ftc.gov/reports/protecting-consumer-privacy-era-rapid-change-recommendations-businesses-policy-makers>.

56. See ITU, Telecommunications Reform 2015, 126, <http://www.senado.gov.br/atividade/materia/getPDF.asp?t=147571&tp=1>.

57. See J. Howard Beales and Jeffrey A. Eisenach, January 2013, Putting Consumers First: A Functionality-Based Approach to Online Privacy, Navigant Economics, 1-2, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2211540](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2211540).

## 4.4 Merger review

Mergers and acquisitions are an essential way for digital ecosystem providers to adapt to constant, dynamic change. They allow companies to combine complementary technologies, capture economies of scale and scope, and bring together intellectual and other resources needed to speed innovation. While mergers in the digital ecosystem are capable of creating anticompetitive effects, just as in other industries, companies' ability to acquire sustainable market power is limited by the dynamism of the digital ecosystem.

While circumstances vary significantly by geography, communications carriers are generally subject to more extensive and burdensome merger review procedures than other digital ecosystem companies. In the U.S., for example, mergers between communications carriers are reviewed by both the FCC and the Department of Justice (DOJ), while other digital ecosystem mergers are reviewed by only a single agency (either the DOJ or the Federal Trade Commission (FTC)).<sup>58</sup> Moreover, while the DOJ

and FTC have the burden of proof in their reviews under the antitrust laws to show that the effect of a merger will be to substantially lessen competition, communications carriers must demonstrate to the FCC that their mergers generate positive public interest benefits. Procedures and standards vary from country to country, but it is commonplace for mergers between communications carriers to be subjected to this kind of duplicate review, or to higher standards.<sup>59</sup>

Even in the European Union, where merger reviews for all industries are performed by the European Commission's DG Competition,<sup>60</sup> telecommunications mergers experience longer review periods than mergers in other digital sectors. As shown in Table 3, the average time from notification to approval for telecommunications sector mergers over the past 25 years is more than a third longer (59 days versus 42) than for other digital sector mergers.

Table 3

### MERGER REVIEW PERIODS IN THE EUROPEAN UNION (1990-2015)

Sector	Time from Merger Notification to Final Decision (days)		
	Median	Average	Ten Longest Reviews (Average)
<b>Telecommunications</b> (218 cases)	35	59	436
<b>Other digital activities<sup>61</sup></b> (214 cases)	34	42	190

Source: European Commission <http://ec.europa.eu/competition/mergers/cases/>; NERA Economic Consulting

58. In addition, state regulatory authorities (and, for cable carriers, local franchising bodies) may also assert authority.

59. See Fabrizio Cugia di Sant'Orsola, et al, eds, 2014, *Competition and Communications Law: Key Issues in the Telecoms, Media and Technology Sectors*, Kluwer Law International, 3-61.

60. Mergers of companies of smaller size and confined to only one Member State may be reviewed by national competition authorities.



Even more striking is the difference in review times for the longest reviews: while the longest reviews of digital mergers took about half a year on average (190 days), telecommunications carriers risked delays more than twice as long (436 days, or 1.2 years). Thus, telecommunications mergers not only experience longer average reviews, but also face a much higher risk of a lengthy review that can freeze the strategic activity of the merging companies (and to some extent, the entire sector) for a year or more. There is a substantial literature on the delay and added cost effects of duplicative merger reviews, many of which are associated with rent-seeking behaviour by competitors who want to prevent the merging companies from becoming more effective competitors.<sup>62</sup>

The new regulatory framework has three main policy implications for merger reviews. First, the

framework's emphasis on the dynamic nature of digital ecosystem markets implies that traditional measures of market concentration are no longer effective in predicting the effects of mergers, and that more sophisticated analytical tools need to be put in place.<sup>63</sup> Second, its recognition of the importance of economies of scale and scope, and the need to encourage innovation by allowing productive assets to be rapidly deployed to their highest-valued use, suggests that the efficiency benefits of digital ecosystem mergers are greater than in traditional industries.<sup>64</sup> Third, whatever standards and processes are applied should be non-discriminatory, both in substance and procedurally—that is, communications providers should not be subjected to more onerous standards or more burdensome processes than other digital ecosystem companies.<sup>65</sup>

61. Software, device manufacturing, electronic services and applications. Does not include media companies.

62. See e.g., Jeffrey A. Eisenach and Hal J. Singer, 2013, "Avoiding Rent-Seeking in Secondary Market Spectrum Transactions", *Federal Communications Law Journal* 65:3, 261-296.

63. See generally Eisenach and Gotts, 71-76.

64. See Bohlin et al 49-51.

65. Indeed, the global nature of digital ecosystem markets, combined with the relatively limited geographic markets of most communications providers, suggests that there may be greater benefit from consolidation in the communications marketplace than in other markets.

## 4.5 Spectrum management

As noted above, the digital ecosystem is increasingly mobile. Mobile broadband is not only taking the lead for overall usage in developed countries but is also essential in providing universal access in developing nations. Spectrum is obviously an essential input into the provision of mobile broadband services.

While there is significant variation in national spectrum policies, nearly all countries use their control over spectrum licences and spectrum licence conditions to assert control over mobile broadband providers and broadcasters. These controls include content mandates (for broadcasters), imposing technology requirements (limiting licences to a particular technology), levying licence fees, mandating coverage, using discriminatory spectrum allocation policies to attempt to influence market structure, and simply failing to make available sufficient spectrum to allow carriers to meet growing demand.<sup>66</sup>

Looked at through the lens of the new regulatory framework, it is apparent that such policies discriminate against communications providers relative to other participants in the digital ecosystem, who face no comparable regulatory barriers to acquiring necessary inputs, and are therefore not subject to any of the regulatory conditions and interventions associated with spectrum licensing.

Adopting a new regulatory framework would help policymakers recognise the need to reduce spectrum scarcity and enhance flexibility, allowing spectrum rights to flow freely to their highest valued use. Just as governments are engaged in defining and protecting intellectual property rights, governments would continue to play an important role in spectrum management by defining and policing spectrum rights—but they would do so with the objective of facilitating market mechanisms, rather than replacing them.<sup>67</sup>

66. For a discussion of EU policies, see e.g., Bohlin et al at 47-49. For a discussion of U.S. policy, see Jeffrey A. Eisenach, 2011, "Spectrum Allocation and the National Broadband Plan," *Federal Communications Law Journal* 64:1, 87-135, [http://www.fclj.org/wp-content/uploads/2013/01/Vol.64-1\\_2011-Dec\\_Art.-03\\_Eisenach.pdf](http://www.fclj.org/wp-content/uploads/2013/01/Vol.64-1_2011-Dec_Art.-03_Eisenach.pdf). The costs of ineffective spectrum policies are currently very visible in India, where the government's failure to make adequate spectrum and other licensing policies available have helped cause severe congestion on the country's mobile wireless networks. See M.G. Arun and Shweta Punj, *Speak Uneasy*, 16 July 2015, *India Today*, <http://indiatoday.intoday.in/story/call-drops-airtel-vodafone-idea-trai/1/451901.html>; see also International Telecommunications Union, *Trends in Telecommunications Reform 2015* at 71 (hereafter *Trends in Telecommunications Reform 2015*).

67. See *Trends in Telecommunications Reform 2015*, 65. "[M]any licensing regimes now have more flexibility, because they provide for technology neutrality, service neutrality and unified licensing. Earlier, command-and-control licences prescribed exactly what service could be offered, using exactly which technology. As part of 'lighter touch' regulatory reforms, however, regulators now often refrain from such prescriptions. They may even issue licences that allow recipients an open-ended choice to provide service using a combination of wireless and wireline technologies (i.e., unified licensing). These innovations enhance the general pragmatism of many updated spectrum management and licensing regimes."

## 4.6 Universal availability and affordability

Virtually every nation in the world promotes the widespread availability of affordable, relevant digital services—and, ultimately, internet adoption—as a major policy objective., especially in the developing world, where a large percentage of the population is not yet online. Traditionally, public policy has focused on two parts of this challenge: policies designed to increase the availability or affordability of communications services (e.g., universal service funds, cross-subsidies, mandates on regulated carriers), and policies aimed at increasing the supply of local content (typically through subsidies for producers, mandates on broadcasters, or some other combination).

As noted above, however, the digital ecosystem is made up of more than communications and content. To access digital services, people also need a device, and for that service to be useful, they also need to be able to access relevant applications. To achieve the ultimate objective of increasing digital services uptake, and the value created from that, all four modules should be available and affordable to all users.<sup>68</sup>

As shown in Table 4 on the following page, the vast majority of policy efforts—including fees and regulatory mandates, as well as subsidies—remain focused on traditional communications carriers. Indeed, despite clear evidence that new adopters overwhelmingly rely on mobile connectivity, some countries continue to count ‘adoption’ based on the proportion of the population with a wireline broadband connection. Ironically, many of the policies discussed above have the effect of actually increasing the costs of both fixed and mobile connectivity.<sup>69</sup>

A new regulatory framework approach would embrace the modular nature of digital ecosystem by adopting a balanced, holistic approach that improves the availability and affordability of the entire digital ecosystem platform. Such an approach would acknowledge the impact of network effects and other characteristics of the digital ecosystem, and would use private and public externalities generated by increased connectivity and the incentives of private companies—including content and application providers like Facebook and Google, as well as communications carriers—to increase online participation.<sup>70</sup>

68. While some content and applications are advertising-supported and therefore ‘free’ to users, devices typically are not. In Latin America, for example, mobile revenue per user is approximately \$10/month, or \$120/year. At the same time, the average price for a smartphone ranges from \$259 in Mexico to \$521 in Brazil, implying that the annual costs of device ownership are equal to or greater than the costs of connectivity. See GSMA, *The Mobile Economy, Latin America 2014*, <http://www.gsma-mobileeconomylatinamerica.com/>.

69. Sector-specific taxes are a good example. In Latin America, taxes can account for nearly 30% of the price paid by consumers for their mobile service, which greatly decreases affordability. See GSMA, December 2012, *Mobile Telephony and Taxation in Latin America*, <file:///C:/Users/Jeisenach/Downloads/GSMA-2012-Latin-America-Tax-ReportWEBv2.pdf>.

70. See e.g., Eisenach, 2015, *Economics of Zero Rating*, 5–7.

Table 4

## CURRENT POLICIES TO PROMOTE UNIVERSAL AVAILABILITY AND ACCESS

Item	Device	Communications	Application	Content
<b>Need</b>	<ul style="list-style-type: none"> <li>• Devices for sale</li> <li>• Affordable prices</li> </ul>	<ul style="list-style-type: none"> <li>• Network coverage</li> <li>• Affordable prices</li> </ul>	<ul style="list-style-type: none"> <li>• Locally relevant apps<sup>71</sup></li> <li>• Affordable prices</li> </ul>	<ul style="list-style-type: none"> <li>• Local language or relevance<sup>72</sup></li> <li>• Affordable prices</li> </ul>
<b>Regulation</b>	<ul style="list-style-type: none"> <li>• Freedom to import</li> <li>• Offer of disabled-adapted devices<sup>73</sup></li> <li>• Tax rebates for business devices acquisition</li> <li>• Computer giving to schools</li> </ul>	<ul style="list-style-type: none"> <li>• Coverage obligations in mobile licenses</li> <li>• Coverage obligations to fixed incumbents</li> <li>• Price cap regulation</li> <li>• Contribution to USF</li> <li>• Contribution to public TV funding</li> <li>• Obligation to deploy specific services &amp; speeds</li> <li>• Connecting schools &amp; public premises for free</li> <li>• Deployment of public phones and Internet booths</li> <li>• Offer of disabled-adapted services</li> </ul>	<ul style="list-style-type: none"> <li>• Stimuli to local app developing start-ups</li> </ul>	<ul style="list-style-type: none"> <li>• Compulsory licensing of some content</li> <li>• Minimum % of content in local language</li> <li>• Subsidies for local content</li> </ul>

71. E.g., an application informing of the time of day when Ramadan fasting begins and ends may be highly relevant in Muslim countries, but not elsewhere.

72. E.g., a global application with local map and shop information

73. In some countries, the obligation to supply disabled-adapted devices falls on universal service telecommunications operators.

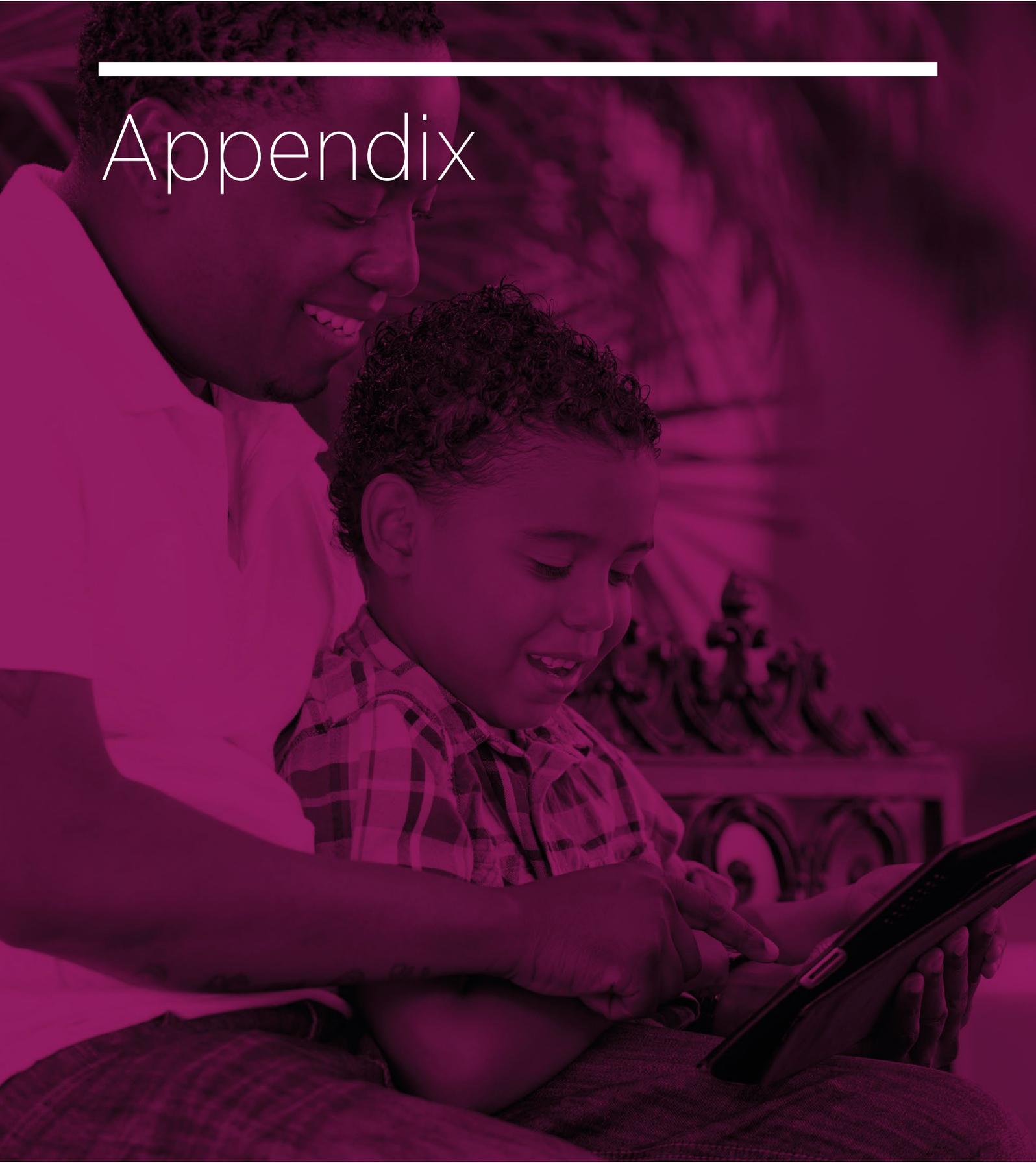
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# 5 Conclusion

This study is designed to assess in broad terms how changes occurring in the digital ecosystem relate to public policy in general and regulation in particular. We have concluded that these changes are both sweeping and profound, and that regulatory policy has failed to keep pace. The ultimate goal of government intervention in the economy is to identify and remediate, when possible, shortcomings in competitive markets, and thereby enhance social and economic welfare. Regulatory policies and institutions designed for a bygone era—when competition was less intense and markets were not so dynamic and interrelated—cannot achieve those objectives. To the contrary: as this study has demonstrated, today’s regulatory policies are, in many cases, having the opposite of their intended effects by distorting markets and inhibiting competition and innovation. In this context, policymakers’ efforts to understand and adapt to the new realities deserve encouragement and support.

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# Appendix



# APPENDIX A:

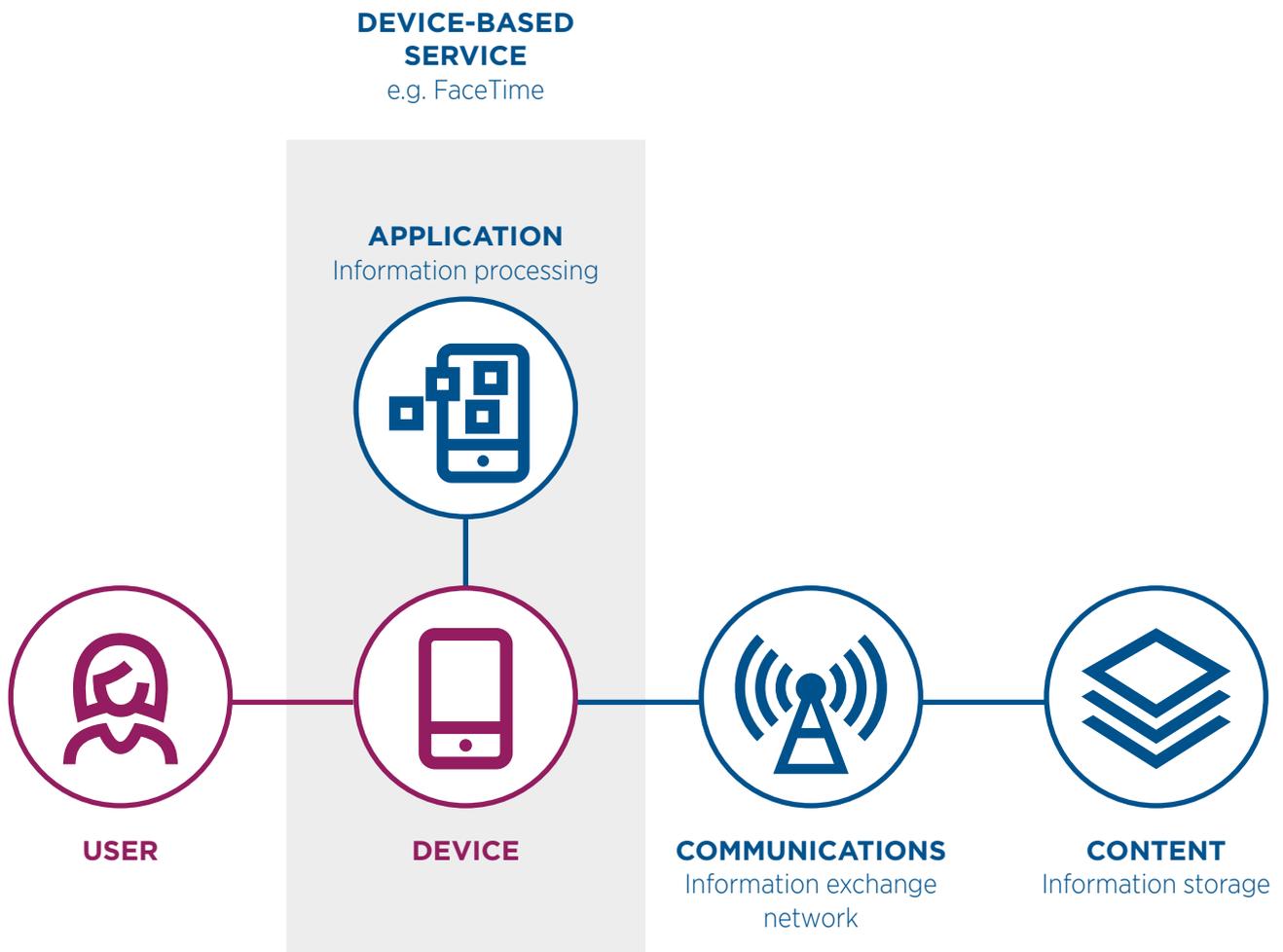
## Business models in the digital ecosystem

This appendix describes four commonly observed business models in digital ecosystems. The important takeaway from this discussion is that the digital ecosystem is characterised by companies and

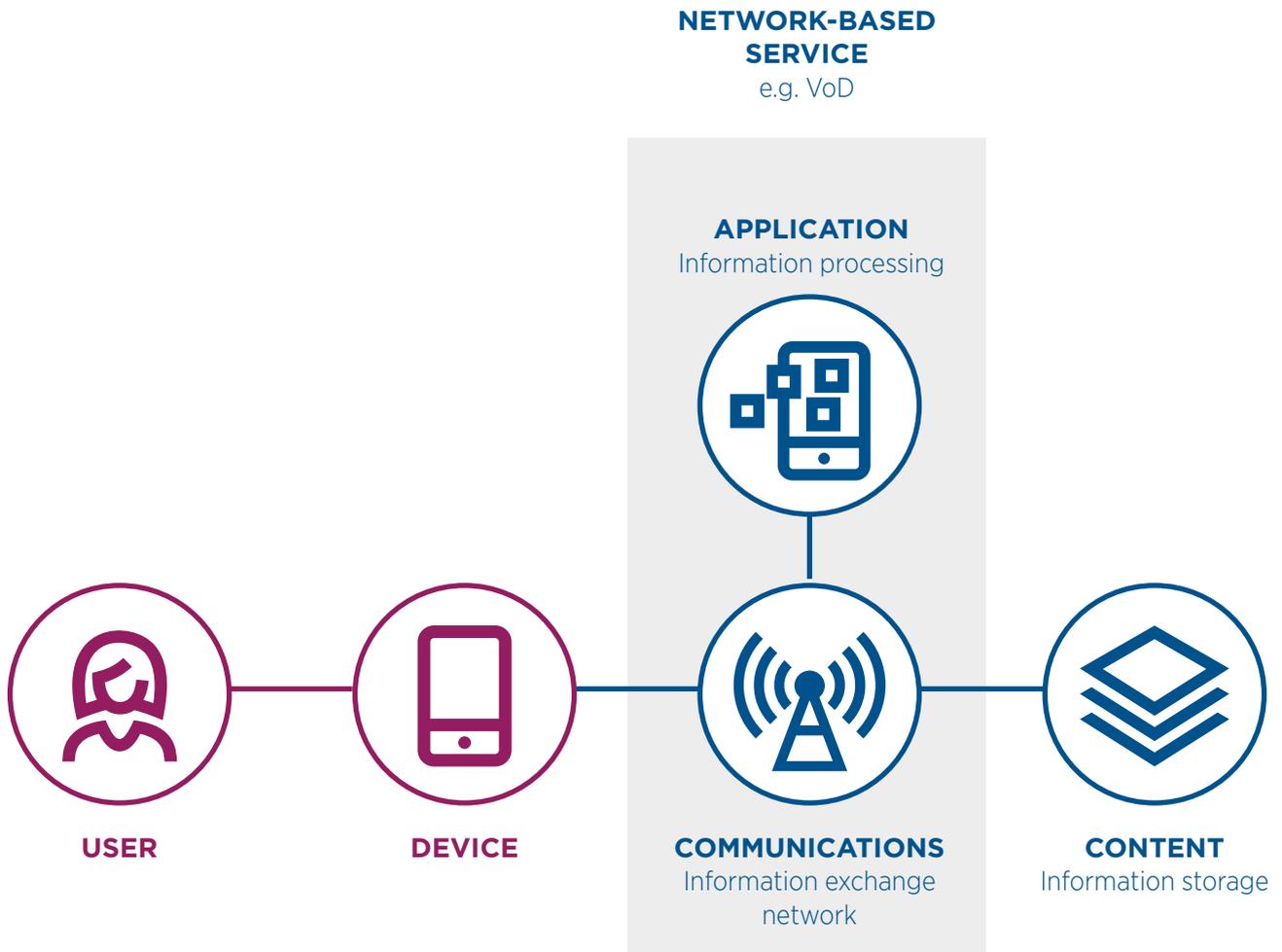
combinations of companies using very different (and constantly changing) combinations of technologies to provide services that meet similar or identical consumer needs.

Customer proposition	Device	Communications	Content	Application
<b>Device-based</b>	Smart device	“Dumb pipe”	“Dumb server”	Device-resident
<b>Network-based</b>	“Dumb terminal”	Intelligent network	“Dumb server”	Network-resident
<b>Edge-based (over-the-top)</b>	“Dumb terminal”	“Dumb pipe”	Server-resident	Intelligent server
<b>Management-based</b>	Open	Open	Open	Distributed

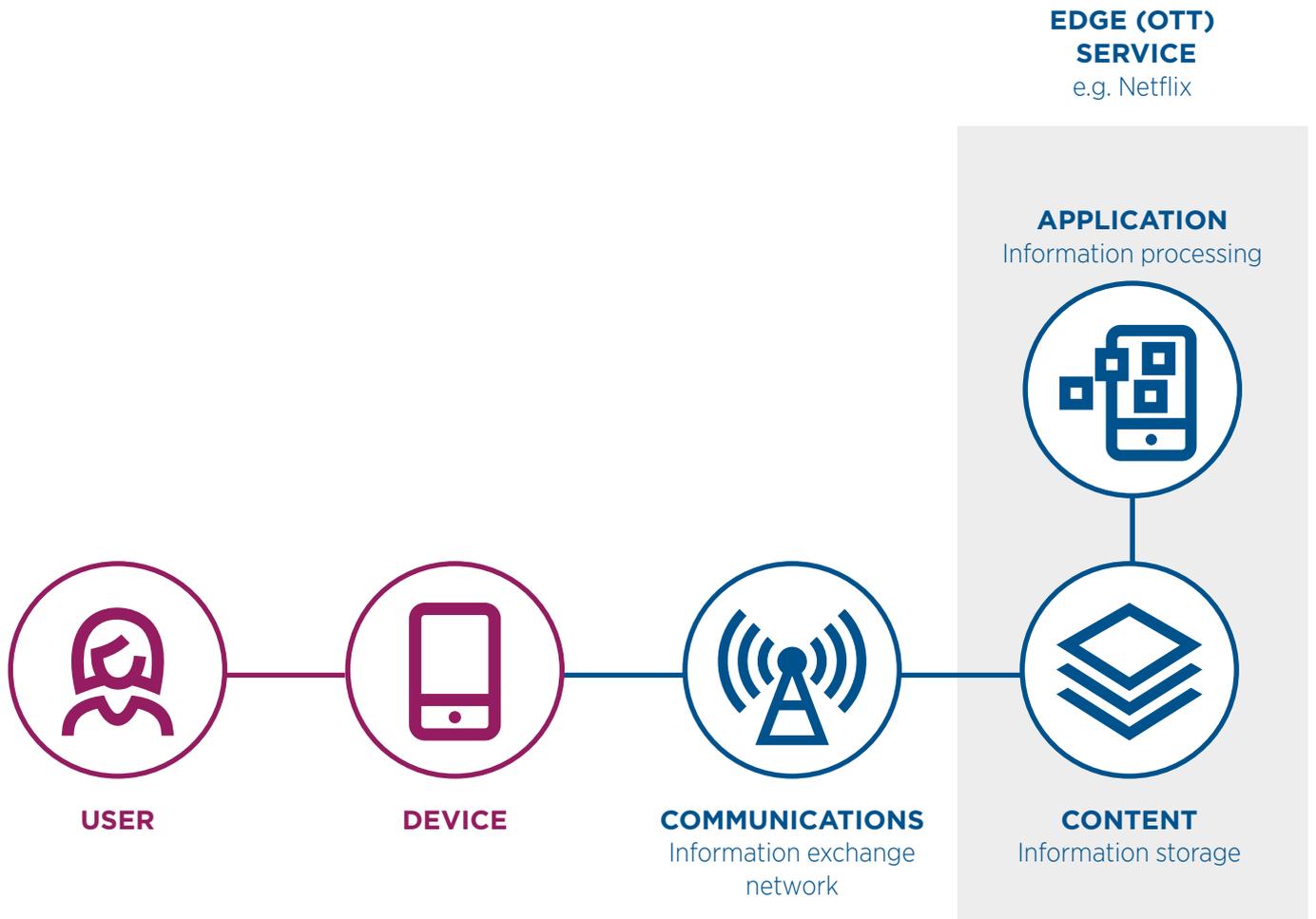
Device-based customer propositions build on the processing power and design of devices. This is the case with smartphones like iPhone and connected gaming consoles like Xbox or SmartTVs, in which the device provider controls functions and economic transactions across the whole ecosystem.



Network-based customer propositions build on network resident intelligence, be it in the telecommunications switching and control equipment, or in servers distributed across the network and tightly integrated into network nodes. This is the case with most traditional telecommunications services, as well as some new ones like video on demand or mobile banking. The whole service is controlled and managed by the network operator.



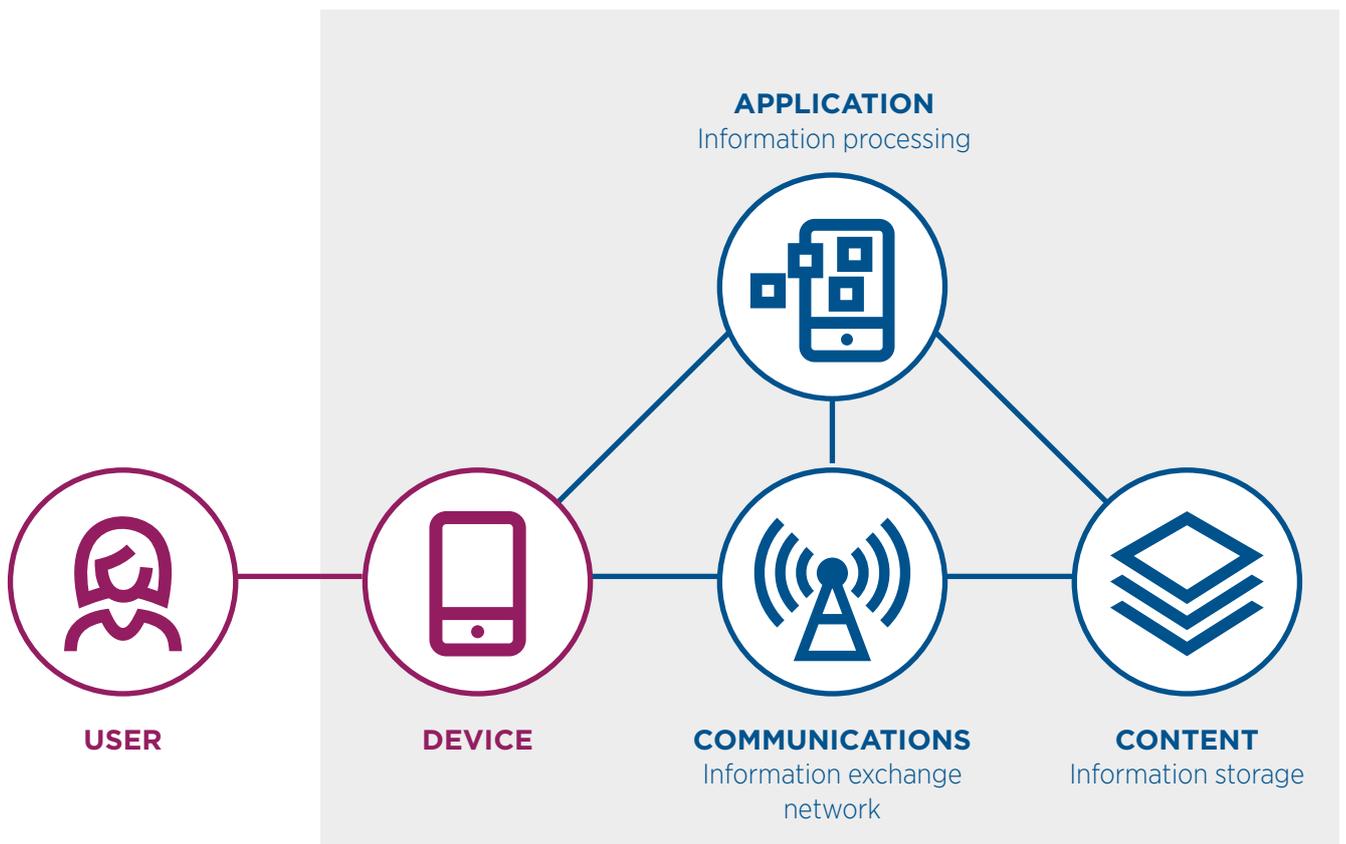
Edge or OTT customer propositions are based on integrated application and content servers that interact with the user device using a transparent communications connection. The OTT provider controls the whole service, relying on open connectivity to the device.



Management-based customer propositions are centered on the integration skills of the platform manager. The managed platform operator may be a pure service platform company, like Akamai running its Content Delivery Network (CDN), or a provider of other modules that has leveraged its systems integration skills into services management, like Amazon’s diversification from book and other content retailing into cloud computing, or Telefónica’s expansion from communications networks into eHealth. Managed platform providers have some degree of control over most or all of the modules used to deliver the service, even if they do not own some of them.

**MANAGEMENT-BASED SERVICE**

e.g. Akamai CDN



## APPENDIX B:

# Dynamic contestability at work—the Czech fixed broadband market

In the late 1990s, as internet was becoming a mass service, one of the major drivers of growth for telecommunications operators was dial-up access. It allowed them to increase traffic over their installed local loop and switching facilities, and also triggered demand for second analog lines or upgrades to recently launched ISDN basic rate connections.

At the same time, however, markets were being opened to competition, and a host of new technologies were being introduced that had the potential to compete with incumbent telco networks for internet access: cable modems, Power Line Communications (PLC), fibre optics and several fixed wireless technologies like Wi-Fi or LMDS. Although most of them required deploying networks from scratch, other technologies like cable modem or PLC allowed powerful companies with deep pockets to back incremental upgrades to existing networks. To make things worse, while ISDN basic speed was sufficient for most internet applications in 1998, most of those new technologies could provide faster internet access than basic ISDN could deliver and were therefore better suited for potential new internet applications that required larger bandwidth.

Telecommunications operators faced a strategic dilemma. They could assume that their existing customer base and sunken assets gave them an unassailable cost and business advantage and continue exploiting their installed assets, or they could conclude that their market had become contestable and that they needed to out-innovate their potential competitors with a new,

more powerful technology—even if that meant cannibalising growth and potentially rendering the very expensive assets it had recently deployed obsolete. By this time, ADSL was ready for launch, but it required expensive investments and it was less reliable than ISDN.

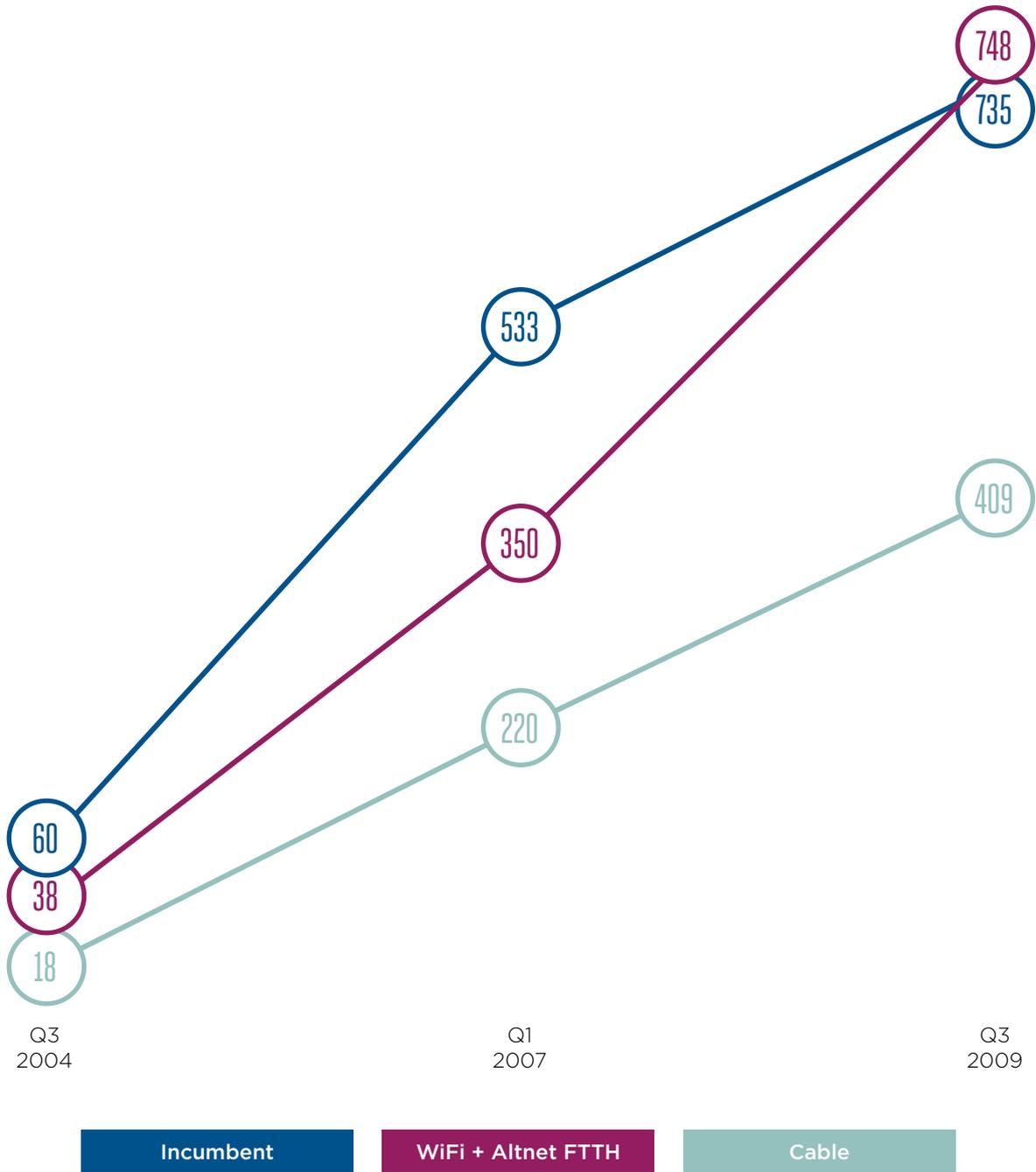
Most operators across the world decided to bet on broadband and launched ADSL services between 1998 (USA) and 2000 (UK). In hindsight, it was the right decision. Out of the score of competing technologies that were launched, only cable operators successfully consolidated a strong market position in most countries.

But this was not a predetermined outcome. Other technologies posed real competitive threats, but were preempted by the quick deployment of ADSL. The Czech Republic is an interesting counter-example. Because of a series of business and regulatory decisions, ADSL services were only launched in the Czech market in 2003, or 5 years later than in the U.S. This provided a window of opportunity for new entrants, and hundreds of entrepreneurs deployed fixed wireless broadband networks combining Wi-Fi technology and directional antennae to increase performance and decrease costs over conventional Wi-Fi hotspots. Wi-Fi operators grabbed a sizable market share, and managed to not only withstand Cesky Telekom's competitive response, but even to win market share over time. In 2009, six years later, they had begun to upgrade their networks to FTTH and surpassed DSL as the leading fixed broadband platform.

Figure 7

## FIXED BROADBAND CONNECTIONS, CZECH REPUBLIC

(In thousands, by technology, 2004-2009)



Source: ECTA Broadband Scorecard

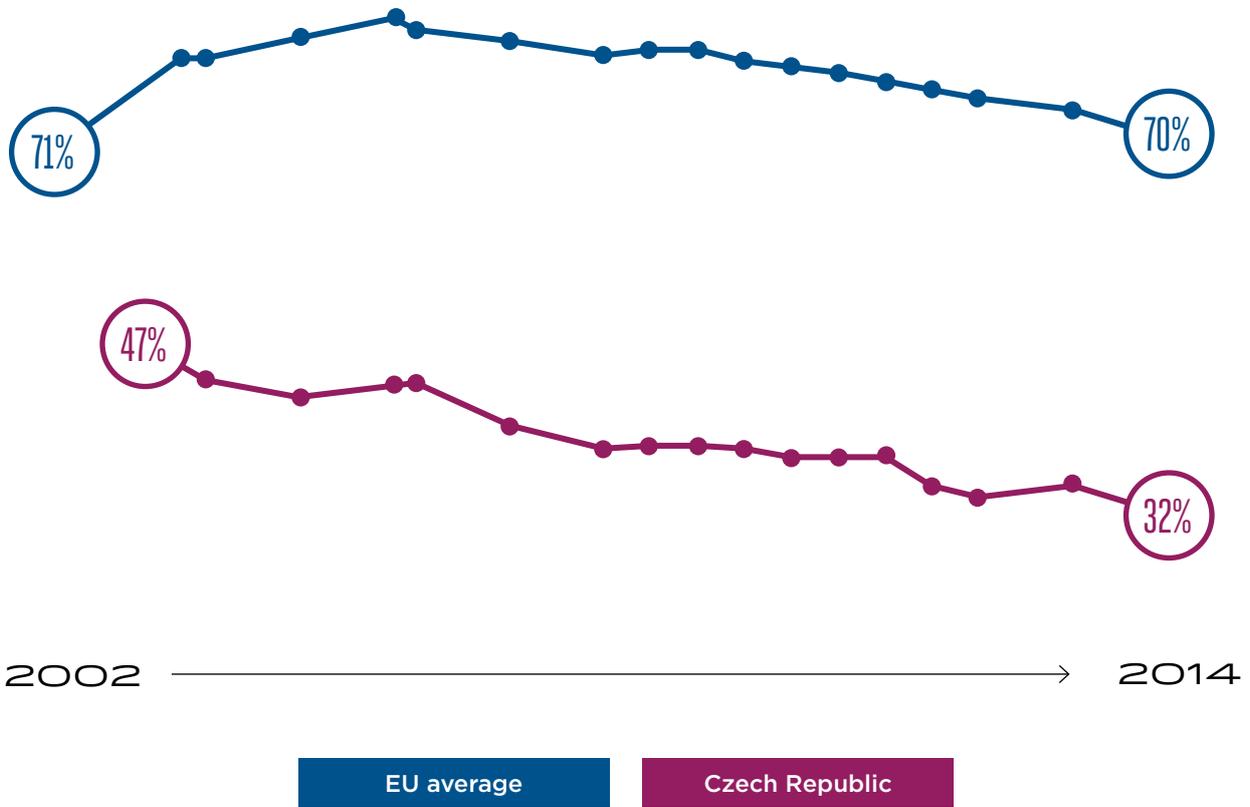
The incumbent never recovered market leadership. In 2014, its retail fixed broadband market share—31%—was still the lowest of EU incumbents, and it is

also weak in the wholesale market, despite the advantages it had at the time when DSL service was launched.

Figure 8

### FIXED BROADBAND MARKET SHARE OF INCUMBENT DSL (WHOLESALE + RETAIL)

(2002-2014)



Source: European Commission Implementation Reports

## APPENDIX C:

# Regulation of mobile messaging

Mobile messaging is a service mainly delivered to customers in two ways: SMS and MMS services built in mobile networks of 2G and 3G technologies, and internet messaging applications like Whatsapp, FaceTime or Viber, which use a mobile internet data connection. Those applications may be resident in the device or in web servers at the network edge.

From the customer's point of view, those services are broadly substitutes because they deliver the same functionality: sending short messages to other users. The reasons to choose one or another depend on many parameters: the community of users you can reach with each service, price, user-friendliness, and additional features like creating and managing distribution lists, etc.

However, the regulatory regime for all of those services is not the same. For historical reasons, SMS messaging is subject to much more stringent regulatory obligations than internet messaging in most jurisdictions. The European Union is a case in point.

Under the current European Regulatory Framework (ERF), SMS and MMS are considered electronic communications services, while internet messaging is considered an information society service.<sup>74</sup> This distinction means that companies supplying SMS services can be subject to a wide number of regulatory obligations specified in the ERF that do not apply to internet messaging. Furthermore, since some of those obligations are contingent on the electronic communications provider having a dominant position, and the relevant market definition

does not include internet messaging services, market shares of SMS suppliers appear higher than they actually are.<sup>75</sup>

When the ERF was enacted, broadband internet access was only used by a minority of people, and mobile broadband services were just being introduced to the market. Therefore, market structure and functionality more or less coincided. However, when broadband services penetration exploded in subsequent years, and especially when smartphones and cheap mobile broadband made internet messaging cheaper and very popular, maintaining the regulatory distinction between the two sets of services began to cause market distortions.

In the European Union at present,<sup>76</sup> SMS roaming is subject to a 2012 regulation<sup>77</sup> that does not directly affect internet messaging providers<sup>78</sup>. SMS providers must offer their customers the option to purchase SMS roaming separately from all other contracts and to change their roaming provider at any time; they have to interconnect with other roaming providers following some regulatory-defined technical characteristics; both wholesale and retail prices for SMS origination and termination are capped, and there are additional customer information obligations. Those obligations will only expire in 2022. The rationale for them was a lack of competition in the market and a finding that technological developments such as VoIP or Wi-Fi<sup>79</sup> had not yet had a significant impact on the market for SMS roaming.

74. Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive), art. 2

75. Even if internet messaging services were considered in the same relevant market as SMS, an additional problem would arise with market share measurement. SMS are usually paid for directly by users, and thus the allocation of revenue to the service is quite straightforward. Other messaging services, however, have different monetisation strategies. The price of Apple's FaceTime, for instance, is included in the price premium customers pay for Apple devices. Blackberry, in addition to the device price, charged a flat rate for a service that bundled email (that was free in most other providers) and instant messaging. Facebook relies primarily on advertising, and Whatsapp charges a small fee to customers.

76. A new regulation is being considered by the Council and European Parliament but has not yet been approved.

77. Regulation (EU) No 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications networks within the Union.

78. It indirectly affects internet messaging, for it regulates data roaming services as well. However, internet messaging users often circumvent it by connecting to their favourite messaging services while abroad through public Wi-Fi services.

79. It should be noted however, that while Regulation (EU) 531/2012 states that Wi-Fi is not having a significant competitive impact on roaming, Regulation (EC) 544/2009 found that that public wireless access to the internet was a competitive constraint for data roaming.

In any case, the market situation evolved very quickly, so when regulations designed to tame the market power of mobile operators came into force, competition from internet messaging and public Wi-Fi was already doing the job. Internet messaging has by far surpassed SMS as the preferred messaging service: by the end of 2014, WhatsApp alone was conveying 30 billion messages per day, while all mobile operators worldwide were carrying just 20 billion SMS messages.<sup>80</sup> And Wi-Fi has consolidated itself as a mighty competitor for roaming: 28% of British citizens connected to public Wi-Fi services while abroad in 2015, most of them using smartphones.<sup>81</sup> This figure goes up to 37% for

people under 35 years old, and rises to 39% for the top income groups (i.e., the population segments that are more intensive users of telecommunications services).

The SMS roaming regulatory process has imposed a significant procedural burden. Mobile operators have incurred regulatory discussion and compliance costs and taxpayer money has been used to pay regulators and legislators to analyse and debate the issue. Perhaps more importantly, scarce managerial and regulatory talent has been distracted from improving services and creating new products while it devoted itself to an unnecessary regulatory debate.

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80. Benedict Evans (Andreessen Horowitz), January 11, 2015, "WhatsApp sails past SMS, but where does messaging go next?", <http://ben-evans.com/benedictevans/2015/1/11/whatsapp-sails-past-sms-but-where-does-messaging-go-next>

81. Ofcom, The Communications Market 2014 - 5 Telecoms and networks.





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