Network neutrality from an innovation research perspective

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***Abstract*—In this article, arguments concerning innovation activities and innovation effects in the context of the network neutrality debate will be described and analysed. It will be shown that from an innovation research point of view, there is no single most important argument in favour or against network neutrality laws. This may be disappointing to a certain extent because everyone is looking for an argument that could definitely decide on the matter. However, in a convergent world, applications and networks increasingly depend on each other. Thus, a counting up of innovation effects of either area is not a suitable method to identify which one shall be privileged in the context of network neutrality regulation.**

Taking into account a convergence model of innovation it will be concluded that regulators shall not follow the simple logic of counting up innovation effects but that they have to strike a specific balance between restricting monopolistic tendencies of both network providers and big Internet firms, and safeguarding a field for experimentation with new technologies and applications.

Keywords—Network neutrality; telecommunication regulation; innovation reseach; convergence

I. INTRODUCTION

In the debate about network neutrality, the concept of „innovation“ is of central importance. The well-known issue of net neutrality is that of whether providers of Internet connectivity - be they fixed or mobile network providers - should be prevented by law from restricting or differentiating the services and content available to end users [1].

Supporters of a legal provision of network neutrality have argued that in a world without such a legal provision, innovation activities in the Web content and application areas would strongly be discouraged. The reason for this is that start-up companies or individuals would no longer be able to easily go online with their new applications but have to ask network providers or ISPs for permission first. Also, if network providers were not prohibited from assigning bandwidth priority to certain content providers who pay for it, new services and innovative applications would only be possible for big companies [2, p. 204ff], [3].

On the other hand, opponents of a state regulation of network neutrality argue that Internet innovations do not depend on neutrality from network providers and claim that in fact the Internet has never been so neutral [4]. Others argue that state intervention and regulatory provisions will stifle innovation activities because of bureaucracy and the wave of law suits that usually come with such a regulation [5],[6].

In this article, arguments concerning innovation activities and innovation effects in the context of the net neutrality debate will be described and analysed. It will be shown that from an innovation research point of view, there is no single most important argument in favor or against network neutrality laws.

In fact, there may be political or economic reasons, regulatory considerations to ensure a level playing field for Internet connectivity, or consumer protection considerations underpinning the decision for or against network neutrality. Yet, as will be argued in this article, “innovation” is not an adequate argument to settle the matter. Looking deeper into the nature of innovation processes in the digital age, it will be shown that innovations are possible with or without legal provisions for network neutrality. This conclusion is eminently counter-mainstream because supporters and to some extent also the opponents of network neutrality laws claim that the future capacity to innovate is what is at stake when deciding about the regulation.

The article is structured in the following way: First, examples will be presented which show the relevance of the topic for all Internet users and service providers. It will be shown how telecommunication companies strategically deal with the new technical options to monitor traffic over their networks and the possibility to reserve bandwidth for certain applications.

The second part of this article will analyse the different arguments concerning innovation aspects in the debate on network neutrality. It will look at the different innovation processes on the application level and on the infrastructure level. These two levels are usually contrasted, claiming that application level innovations are more important, relevant and economically more significant than infrastructure level innovations. It will be shown that this conclusion systematically ignores past innovations on the infrastructure level and underestimates the role networks play at delivering broadband Internet applications.

In part three of this article, attempts to count up the number and relevance of innovations from either the application or the infrastructure side will be presented. Very quickly it will become clear that a counting-up - although very popular in the literature - of past or even future innovation impulses is not a proper method on which the net neutrality issue can be decided

on. It will be explained why this is in fact a fruitless undertaking alluding to the deficits of available statistics as well as to definition problems concerning the question what to assign to the application/ software level and what to assign to the infrastructure/ hardware level. Also, it will be argued that counting-up of innovation effects is not possible because it ignores the increasing interdependence between networks and contents when creating new Web applications.

In the conclusion, it will be stated that innovations are possible on all levels in a converging world, and that Next Generation Networks substantially add to this potential. The separation of application level innovations and infrastructure level innovations is in fact a thing of the past. In a telecommunications world which is digital, IP-based and in which media applications are increasingly converging, these areas are mutually dependent on each other and innovations only occur as new, specific, and intelligent combinations of the both.

II. NETWORK NEUTRALITY: A DEBATE FAR FROM BEING „OVER"

The most current development in the area of network neutrality regulation is also the most spectacular: In June 2011, the Dutch parliament approved a bill forcing mobile Internet providers to let customers use Skype and other rival services on their networks without charging extra or giving preferential treatment to their own offerings. Telecommunications companies including KPN, Vodafone, and T-Mobile had lobbied against the bill and said it may lead to higher prices for customers or make it impossible to offer quality guarantees for key services.

The move of the Dutch parliament is spectacular because it was commonly expected that fixed networks and not mobile networks will be regulated first, if at all, in such a way. It is also spectacular because it is the first time that a concrete network neutrality rule was passed in Europe. All other European countries are in the midst of discussing their strategies in the context of network neutrality.

Interestingly, however, the Dutch decision was not the result of a process in which the arguments in favor and against network neutrality were carefully weighted against each other, but the Dutch bill took shape in just two months as politicians reacted swiftly to a public outcry over telecom KPN's pricing policies. In April 2011, KPN announced poor first quarter earnings because customers with smart phones flocked to a messaging service called "WhatsApp." WhatsApp is an Internet application which lets mobile phone users send messages for no additional charge, sidestepping KPN's lucrative SMS business. In response, KPN chief executive Eelco Blok announced plans to charge customers extra for using WhatsApp and Skype [7]. Following this announcement, customers were outraged, and many began questioning for the first time how the company even knew which applications they were using on their phones. KPN argued that the practice is common in the industry. But the Netherlands' consumer rights watchdog demanded an investigation into possible privacy violations, and politicians, reading public sentiment, moved to stop the plan.

Long before the Dutch decision, in June 2010, Deutsche Telekom´s T-Mobile in Germany had announced to end its blockade against Skype without pressure by the government [8]. The company explained that the blockade does not fit to Deutsche Telekom´s strategy anymore which forsees to cooperate closer with Internet service and content providers in the future. However, this move should not be mistaken as a self-committal of Deutsche Telekom to the principle of network neutrality. Instead, it can be assumed that T-Mobile has started negotiations with Skype about a cost and profit-sharing model.

Another recent example of how telecom companies can restrict or at least influence what Internet users can actually use, is AT&T´s IPTV-service with the name „U-verse". According to Simon Schlauri [9] AT&T reserves about 15 MBit/s of the available bandwidth in its fixed networks for U-verse. The remaining 6 Mbit/s are being used for all other Internet services which share this bandwidth using the best-effort principle. Competing IPTV-services thus would have no chance as they were restricted to the artificially limited best-effort area of the network.

Interestingly, in a similar situation, Swiss fixed network operator Swisscom decided otherwise. The company did not reserve bandwidth for its own IPTV-service called „Bluewin TV", but to the contrary offered competing Internet-TV provider „Zattoo" multicast functionalities within its network, which increased the transmission quality of Zattoo substantially. Swisscom argued that gaining new DSL-subscribers is currently more important than increasing the number of subscribers to its own IPTV service. And by privileging a popular Internet service the DSL connectivity provided by Swisscom gains in popularity [9].

The examples of AT&T and Swisscom show that incumbants currently are in a phase of transition and have not finally decided about their strategy whether to support their own services or to cooperate with independent, start-up Internet services. On the other hand it seems quite obvious that with respect to established Internet companies like Google, YouTube or Facebook, telecom companies follow a uniform strategy: They aim at sharing revenues with these big companies which earn their money using their infrastructure at practically no cost.

Two examples may illustrate this: In August 2010, the New York Times reported that Google and the U.S. telecom company Verizon agreed that services from Google, like Google search or YouTube will be treated with prority in Verizon´s fixed network. The two companies denied that this agreement included money transactions. However, they did not deny sharing revenue from commercials or joint support of marketing campaigns. In fact, both companies said that they abide to the rules of network neutrality - with two exceptions: First, additional and „innovative" online services which require cooperations between network and content providers should be exempted from the neutrality principle. „Cooperation" in this context may also include prioritising certain services [10]. Second, the mobile network shall be excluded from the rule of

network neutrality altogether because here, more competition and more market dynamics are in place, according to Verizon and Google [11], [3]. In the U.S., the Google-Verizon-deal has fired up the discussion on network neutrality rules. The agreement is currently under investigation by the FCC.

Also in 2010, René Obermann, CEO of Deutsche Telekom, announced that the German telecom incumbant will ask big Internet companies like Google, Apple or Yahoo offering data intensive services to pay for the transport of their data. The announcement raised concerns about the end of network neutrality in Germany. Although formally supported by the German government, network neutrality has not found concrete legislation in Germany yet.

These examples show two things: First, the debate on net neutrality is far from being „over", as some observers have stated [15]. Especially in Europe the need for regulation was long deemed not necessary because the marked worked well. The inofficial agreement between regulators and incumbants in Europe was to intervene only when the market is not working. With the Dutch decision, the situation gets a new drive. The EU Commission currently thinks anew about ways to impose network neutrality. In the U.S. and in Canada there have already been approaches to impose network neutrality, at least partially with respect to fixed networks. Still, the only country with a comprehensive network neutrality regulation today is Chile.

The second finding of these examples is that the concept of innovation is of central importance. In almost all examples the central question is: What are the most favourable conditions for innovations? How can future innovations be secured? What kind of regulatory regime is necessary to make new services and applications possible? In fact it has been tried to count up innovation effects with and without network neutrality regulation on a theoretical level. In the next sections it will be critically analysed whether or not possible innovation effects are suited to decide on the issue and how the process of innovation in the digital world can be conceptualized.

III. Application level innovation vs. network level innovation

In order to show the consequences of a world in which telecommunications companies are allowed to prioritise certain pay-services and slow down competing services, supporters of network neutrality have tried to separate innovation effects on two levels of the digital word: the application level and the network level. Arguing that innovations on the application level outstrip innovation effects on the network level, it was concluded that only in a regime of strict network neutrality can the digital world continue to grow. The argument was made especially strong by Internet activist Barbara van Schewick in her work "Internet architecture and innovation" [2] and has influenced several investigations (see for example [12], [13]). On the other hand, network providers have emphasized their role in the innovation process claiming that the history of liberalisation in the telecommunications sector has shown that freedom from state regulations has stimulated innovative behaviour of all market partners [6].

The next two sections will analyse the arguments put forward by both parties before contrasting and counting up the assumed innovation effects.

A. Application level innovations

Application level innovations are for example new Web portals, new services offering interactive media content or new social media platforms. The list of past innovations on the application level is long and consists of many well-known examples ranging from Google to Amazon and Skype. Supporters of network neutrality provisions see the most important innovation potential in this area and take network availability and compliance as more or less granted (see for example [14], p. 378ff).

It is argued that independent application programmers will no longer be able to go online with their new applications if infrastructure providers agree with big Internet firms about prioritising their applications. This would mean that small, innovative start-up companies would not be able to offer their applications on equal grounds and speeds. To illustrate this threat, it is argued that (once) established bookseller Barnes & Noble supposedly would have won out over Amazon, Microsoft Search prevailed over Google Search and Skype would never have had a chance to go online in a regime without network neutrality [3].

Recalling the history of companies and services like Yahoo, Del.icio.us, ebay, Facebook and others, van Schewick ([2], p. 204ff) extends this list and concludes that without network neutrality, long-term incentives to innovate in the areas of content, application and devices will decrease. This will lead to dynamic efficiency losses and to welfare losses in general.

Especially the role of endusers who are able to program new services is highlighted in this context: „Enabling users to innovate, may leave less customer needs unserved. In addition, users often make their innovation freely available to others; as a result, such innovations will reach a higher level of diffusion than a similar innovation of comparable quality that is produced by a network provider which sells the innovation to make a profit" [14], p. 382.

B. Infrastructure level innovations

On the other hand it has been shown that innovations on the infrastructure level are also of great importance. The reason why infrastructure innovations are often underexposed in the public debate is that they are of a rather technical nature and are not as obvious and self-explaining to endusers as most new services are. Infrastructure level innovations are for example new access technologies, improved frequency multiplexing techniques, seamless rate adoption techniques or new and more efficient error correction mechanisms. These innovations enable applications which are based on always-on and broadband capabilities. These new and improved technologies have found their way into the different networks (traditional

telephone network, cable-TV-network, fibre network in the backbone, mobile networks, satellite based Internet connectivity, Wireless Local Loop and other wireless access networks).

In fact, using Quality of Service features and having the possibility to assign different prices for different services, network providers can introduce innovative services of their own or in cooperation with other companies.

Of special interest in this context is the evolution of traditionally separated voice and data networks into all-IP (Internet Protocol) networks, the so-called Next Generation Networks (NGN). In contrast to traditional telecommunication networks, NGN are not closed systems in which proprietary telecom standards are used and in which service and application programming are restricted to a handful of equipment companies. NGN are modular systems with open interfaces which allow independent companies and even individual end users to program own (Internet-) applications. Because the transport level and the application level in NGNs are connected by the Internet protocol, the telecom companies essentially lose their souvereignity over the service-layer. This has allowed new market entrants an easy access to the network in the first place. In fact, this new openness of the network has been compared to the openness of the Internet as a whole, being responsible for many new services and applications (see [15], p. 150ff).

IV. COUNTING UP INNOVATION EFFECTS

Supporters of network neutrality regulation do not deny that innovations are also possible on the network level. However, they claim that innovation effects on the service level strongly exceed innovations on the infrastructure level (see [14], p. 388, [2], p. 387ff and [12], p. 17).

On the other hand, Dewenter, Jaschinski and Wiese [18], p.10ff, who have analysed a large body of literature on innovation effects in the context of network neutrality, conclude that innovations on the application level will not come to a halt when network neutrality principles are touched. They found that incentives to innovate on the application level will still exist even in a world where network neutrality is loosened in one way or another.

Concerning the overall effects of innovations they found ambivalent results and no clear evidence – neither in model-based approaches, nor in theory-led approaches, nor in empirical studies. Their analysis included 15 scientific articles on innovation effects in the context of network neutrality. But the counting up of effects did not reveal a convincing answer to the question which area to support and which area to restrict.

This result does not come as a surprise, however: Drawing from our own work ([16] and [17]) on the nature of innovation process in an all-IP world and on economic effects of the Internet, we question the adequacy of counting up innovation effects in this way. The counting-up exercise seems plausible only at first sight. But when looking deeper into it it becomes clear that there is no statistical evidence for the alleged effects as it is unclear what the reference base is. It is left open whether it is employment, market value of involved companies, and whether or not the calculations principally include spill-over effects into other sectors.

And there are problems on a conceptional level: Because of the increasing interdependence between network level and application level developments, counting up innovation effects of the one against innovation effects of the other area becomes less plausible. The analytical separation between the two levels does not hold in a technology environment were IP is the prevailing standard for all services. This development has been described as convergence and many of the new applications draw their innovative dimension by integrating formerly separated contents and functionalities. In fact, in a converging world, innovations are possible on all levels, network as well as applications, and Next Generation Networks substantially add to this potential.

V. CONCLUSION

It has been shown that supporters as well as opponents of network neutrality regulations use „innovation activities“ or „innovation effects“ as arguments for their respective positions. Whereas the one side fears that imposing network neutrality regulations on market players would bring innovation activities to a halt, the other side fears that this would happen exactly if such regulations would *not* be in place.

In this article, it was argued that it is not adequate anymore to separate innovation effects between the application level and the infrastructure level and that it is not possible to count up effects against each other. Instead, in a converging world, applications and networks increasingly depend on each other. Innovations are possible on all levels and can originate from all players, including network operators, application developers, individual users, Web portal companies, search engines and content providers of all sorts. The effects of these innovations can not be calculated in advance.

It has to be emphasized that an adequate assessment of the capacity to innovate also has to look at the local market structures, the dynamics of current Internet developments and possible spill-over effects to other sectors.

Although it seems obvious, many analysts fail to see that in the convergent world, applications can not be developed and implemented without appropriate infrastructures, and also that infrastructures are worthless without appealing applications.

In this context it seems unsatisfying that innovation research can not solve the issue of network neutrality. However, two conclusions arise from this analysis. First, a differentiated innovation model is necessary to properly describe the developments in the converging world. To look more closely at developments in the past may help refining this model. There is more research necessary on the actual interplay between networks and applications.

Second, the obvious failure to decide the matter based on innovation effects points to the importance of the specific market structure, the influence patterns and the political and regulatory situation in a given country. The Danish example,

where network neutrality regulations for mobile networks were imposed within a two months period shows that national peculiarities may play a greater role than generalised assumptions on the principal behaviour of certain market players.

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