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Means and Ends toward the Broadband Society: Net Neutrality and Over-the-top Players

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Abstract

Because broadband is widely believed to be a precondition for economic prosperity and social progress, many governments have been improving the broadband environments in their respective countries. Net neutrality, which in its most basic form requires “equal” treatment for all Internet traffic, should be considered only as a means of improving broadband rather than as a stand-alone policy goal. Net neutrality has been a major topic of interest for telecom regulators in developed nations for nearly a decade. However, treating net neutrality as the ultimate target may prevent a more important goal from being achieved. Policy targets and priorities should be tailored to the broadband development stage of each market. In this study, the author argues that a strict net neutrality principle is not optimal and should be relaxed to accommodate the local needs of individual markets and reflect their development stages. In addition, discussion, especially in developed nations, should focus not on quality-of-service-based net neutrality but on quality-of-experience for optimal resource allocation.

Keywords: broadband, net neutrality, QoS, QoE

1. Introduction

Broadband is generally considered an initial requirement for achieving economic prosperity and social progress. Thus, many governments have been steadily working to improve the broadband environments of their countries. Net neutrality, which in its most basic form requires “equal” treatment for all Internet traffic, has been a major topic in telecom policy discussion for nearly a decade. However, treating net neutrality as the ultimate target may prevent the real policy goal from being achieved. Policy targets and priorities should be tailored to the broadband development stage of each market.

The purpose of this study is to reconsider what Professor Wu suggested in his famous 2003 paper: “network neutrality, as shorthand for a system of belief about innovation policy, is the end, while open access and broadband discrimination are the means” (Wu, 2003, p. 144). Although its definition varies even among strong advocates, the net neutrality concept has since its inception been considered one of the most critical Internet policy objectives and thus should be pursued at any cost. However, the goal of traditional broadband policies is to maximize social welfare by means of broadband development. Because these two goals are not exactly the same, some cases exist in which a quest for net neutrality is not fully compatible with national broadband policy. Internet.org in India is one such case in developing nations. In developed nations, particularly in the United States (U.S.), discussion concerning the appropriateness of the “Open Internet Rule of 2015” reflects the same conflict. In light of this issue, the author argues that a strict net neutrality principle is not optimal and should be relaxed to accommodate the local needs of individual markets and to reflect their stages of development. In other words, net neutrality is just one means for accelerating broadbandization, not the end goal.

The remainder of this paper is organized as follows. After summarizing the definition of “net neutrality”

concept and the difference between policy tools and targets in Section 2, the author examines the reasons that a naïve net neutrality principle may work against welfare maximization. Sections 3 and 4 discuss the cases for developing and developed nations, respectively. Section 5 provides a conclusion to the study.

2. Net neutrality: means or ends?

In his seminal study published in 2003, Professor Wu coined the concept of “network neutrality,” which in its most basic form requires “equal” treatment for all Internet traffic¹. He determined that this should be a policy goal by stating that “network neutrality, as shorthand for a system of belief about innovation policy, is the end, while open access and broadband discrimination are the means” (Wu, 2003, p. 144). By contrast, in its Open Internet Order 2015, the Federal Communications Commission (FCC) describes “the open Internet,” which represents the FCC’s interpretation of the net neutrality principle, as a policy tool and declares that the purpose of this open Internet is to enable “citizens to conduct commerce, communicate, educate, entertain, and engage in the world around them” (FCC, 2015, p. 3).

Net neutrality is not an entirely new concept. It actually corresponds to the concept that Salzer et al. (1984) described by the name of “end-to-end argument;” no government has treated the realization of net neutrality as a goal of telecom policy. However, in the recent discussion pertaining to net neutrality, some advocates prioritized this 11-year-old concept over other telecom policy targets. Of course, the author recognizes that net neutrality has been an important topic of interest for telecom regulators for nearly a decade, especially among those in developed nations, and should be equally considered in Japan as well; however, he argues that the concept may become incompatible with other telecom policy goals in several countries.

In general, considering the scarcity of available resources, any government needs to make a tradeoff among mutually incompatible policy targets. Those that should be prioritized must be determined based on the marginal contribution to the ultimate policy target, that is, the maximizing of the welfare of the people, and minimizing the policy costs involved. As discussed in the next section, when the expansion of broadband availability is the clear priority, as in developing nations, exercising a strict net neutrality rule can be counterproductive. This is because it may limit the management practice of Internet service providers (ISPs) for obtaining sufficient funds necessary for developing broadband infrastructures. By contrast, in developed nations, respecting net neutrality in its naïve form will hinder effective resource allocation in the broadband ecosystem. Thus, policy targets and priorities should be better tailored to the broadband development stage of each market.

3. Developing nations

In the early stage, which is characterized by limited broadband availability, increasing broadband

¹ Although the meaning of net neutrality is itself a major question, a minimum consensus exists among stakeholders. Acknowledging the many extant definitions of “net neutrality,” Krämer et al. (2013) state that the existence of effective competition and a constitutional safeguard for freedom of speech are critical factors when discussing whether net neutrality regulations are required. Sharing this perspective while emphasizing the economic aspects, Jitsuzumi (2010, 2011a) states that the net neutrality issue is nothing but a combination of two concerns: the congestion problem produced by limited network capacity and the threat that dominant Internet service providers will engage in anti-competitive behaviors.

coverage and penetration as well as closing national and transnational digital gaps are the critical policy objectives for fostering socioeconomic prosperity.

Unfortunately, as indicated in Fig. 1, a north-south concern exists in networks regarding what is known as the “digital divide.” Although the Internet is meant to be borderless and available for anyone with access, some countries, especially developing countries, cannot keep pace with developed nations in this regard. As of 2015, the International Telecommunications Union (ITU) (2015) estimated that 43% of the world’s population is having some form of regular access to the Internet. By contrast, four billion remain without regular access. In the least developed countries (LDCs), only 9.5% of the population is online. As for access through broadband, which makes the Internet experience more fruitful, ITU statistics show that, in 2015, fixed-broadband penetration remains at less than 1% in LDCs. In particular, Africa and the Arab States stand out as the regions with the fewest fixed-broadband subscriptions per 100 inhabitants. As for mobile broadband, Africa is the only region where penetration remains below 20%.

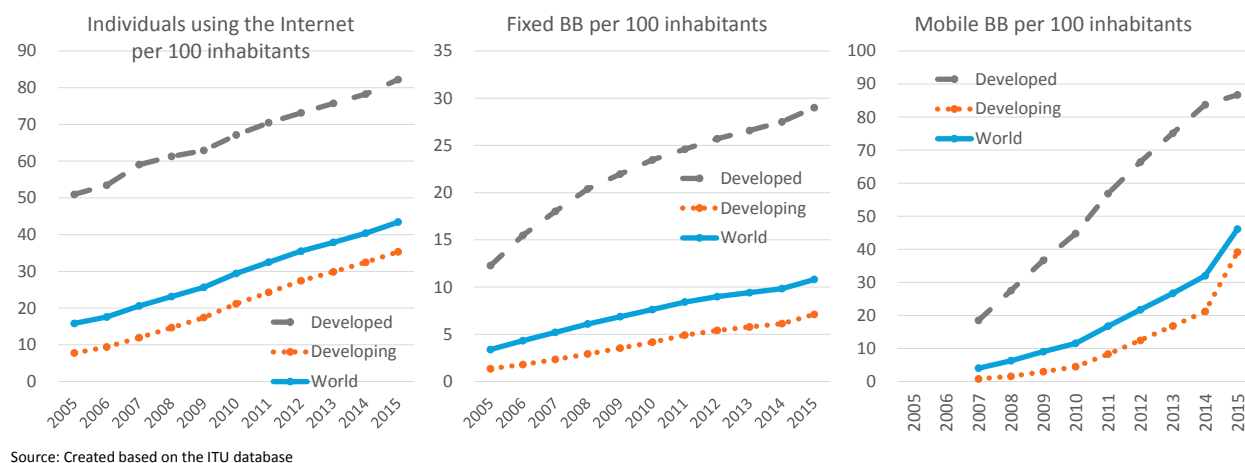


Fig. 1 Global Digital Divide

One main reason for this divide is differences in income levels. For example, Zhang (2013) showed that GDP per capita has a positive correlation with the speed of Internet diffusion. In addition, Andrés et al. (2010) empirically discovered that, when considering network effect for the period 1990–2004, “low- and high-income countries [are] clearly in different phases of the process of Internet adoption” (p. 335). As for fixed broadband penetration, using data related to Organization for Economic Cooperation and Development (OECD) countries, Lin and Wu (2013) found that income, education, and variety of Internet content can facilitate broadband adoption in the innovator and early adopter stage; platform competition and previous broadband penetration are relevant in the early majority stage; and broadband price is related in the late majority and laggard stage. In summary, although information and communication technology (ICT) development has reduced the cost of Internet and broadband usage every year, for people in developing nations, broadband remains a luxury.

However, Internet adoption, especially broadband Internet adoption, is an essential means for economic development. For example, Mr. Houlin Zhao, ITU Secretary-General, has stated the following²:

² <http://www.itu.int/en/action/broadband/Pages/default.aspx>

Broadband networks offer perhaps the greatest opportunity we have ever had to make rapid and solid advances in global social and economic development – across all sectors, including healthcare, education, new job opportunities, transportation, agriculture, trade and government services. In the twenty-first century, broadband networks therefore need to be considered as basic critical infrastructure, like roads, railways, water and power networks.

This assertion is supported by many studies. For example, Gruber et al. (2014) empirically found that, for the European Union (EU), the overall future benefits in broadband outweigh investment costs. Using the data of 22 OECD countries for the period of 2002–2007, Koutroumpis (2009) discovered a significant causal positive link between broadband penetration and economic growth, especially when a critical mass of infrastructure is present. Ng et al. (2013), using panel data for 10 countries of the Association of South East Asian Nations (ASEAN) for the period from 1998 to 2011, found that broadband deployment has a positive relationship with economic growth. In addition, Auriol and Fanfalone (2014) predicted that a three-fold increase in mobile broadband penetration in developing regions of the world will attain a B/C ratio ranging from 14.41 to 21.74. This means that every dollar spent will generate between \$14.41 and \$21.74 to the society.

These findings suggest positive feedback loops: higher broadband penetration will increase the income level of a nation, which in turn facilitates further broadband penetration. However, these positive feedback loops may influence only the transnational digital divide. Focusing only on the situation in the United States (U.S.), Holt and Jamison (2009) could not ultimately determine the connection between ICTs and economic growth based on the U.S. broadband experience; Kandilov and Renkow (2010) found no evidence that loans received as part of the current Broadband Loan Program provided by the U.S. Department of Agriculture (USDA) have had a measurable positive impact on recipient communities. Furthermore, Whitacre et al. (2014) suggested that high levels of broadband adoption have boosted the rural economy in the U.S., but broadband availability has had only limited effect. In addition, Shinohara et al. (2015) determined that income levels did not contribute considerably to mobile broadband penetration in OECD countries, suggesting that such a feedback loop may not operate in the mobile broadband market of developed nations.

Thus, the policy focus in these developing countries must be to deploy broadband networks as quickly as possible with the objective of generating the benefits of broadband through the aforementioned positive feedback loop. Several means for attaining such policy goals exist. If the government is sufficiently rich, spending public money in order to deploy broadband to the people is straightforward. However, because governments in developing nations usually have additional policy concerns that receive higher priority and because most of those governments lack investment money, traveling such a path is practically impossible. Instead, private players must take the initiative. However, relying on private initiatives may result in a suboptimal outcome because broadband investment has economic externalities and leads to spillover benefits. According to Gruber et al. (2014):

It emerges that for the EU as a whole the broader economic benefits of broadband investment outweigh their cost. This result may fly in to the face of empirical evidence of private

investment by telecommunications operators proving to come forward only very slowly. The reason for this is that the economic benefits are only to a small degree appropriable by private investors in infrastructure. Much of the benefits are spilling over to users and the general economy in terms of increased growth. ... It is clear that the market would not provide the speed and extent of coverage entailed by these estimates. It therefore calls for extended public subsidies to ensure the widespread roll-out of broadband infrastructure. (Gruber et al., 2014, p. 1057)

Therefore, we must internalize the externalities of such broadband investment for optimal broadband development. One means to achieving this is to allow governments to intervene in the investment project by providing direct subsidies or low-interest loans for broadband development. Indeed, the Japanese government tried this in the 2000s. The e-Japan Strategy released in 2001 successfully expanded broadband availability to 30 million households and fiber-to-the-home availability to 10 million households in less than three years, which is two years ahead of schedule. Although the strategy itself was simply a policy manifestation, the government did provide the following regulatory and financial support packages (see Table 1).

Table 1 Complementary Supports for the e-Japan Strategy

2000	<ul style="list-style-type: none"> • Interconnection rules for DSL services (i.e. unbundling, collocation) • Subsidy for DSL expansion (1.85billion yen)
2001	<ul style="list-style-type: none"> • Unbundling rules for fibers • Amendment of the Telecommunications Business Act to introduce asymmetric regulation, Universal service fund • Enlargement and Improvement of the Act on Temporary Measures concerning Telecommunications Infrastructure Improvement <ul style="list-style-type: none"> • Improvement of the subsidy conditions for rural area development • Expansion of the support coverage to include facilities related to DSL, FWA, and cable Internet • Financial support for building the local intranet infrastructure
2002	<ul style="list-style-type: none"> • Enactment of the Act on Broadcast on Telecommunications Services • Subsidy for FTTH expansion (1billion yen)

Source: Created based on the MIC document (http://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/chousa/bb_seibi/pdf/050124_2_15.pdf)

Another approach is to allow private players to develop their own internalization mechanisms. Because this approach does not directly require public money, governments with strict budget constraints can more easily adopt it than direct governmental intervention. However, expecting that the externality is fully covered is very difficult. Thus, some inefficiency may remain in the end. In addition, the fact that because everyone believes differently about future profitability, satisfying all stakeholders is very difficult and can create additional problems. Openet Telecom (2013) was involved in the successful case of Turkcell, the leading mobile phone operator in Turkey, which attained a 9% increase in average revenue per user by providing a free-of-charge Twitter Zero and then encouraging the use of paid data services. Lyons (2015) explains the motivation of involved players in the case of Facebook Zero as follows:

For wireless providers, these arrangements provide an inexpensive way to offer additional services to feature-phone customers and perhaps entice them to migrate to more profitable

smartphone plans. For content providers, it is an investment in penetrating their brands further into the developing world, where future growth may be found. (Lyons, 2015, p. 22)

Following the aforementioned line of argument, we can examine the Internet.org project, which was advocated by Facebook founder Mark Zuckerberg and attempts to deliver broadband to less-developed countries without charging end users. We can also review the “Google Free Zone,” which is Google’s project to provide free-of-charge broadband experience of selected Google products such as Google search, Gmail, and Google+, as examples of such internalizing mechanisms and thus should be positively evaluated in terms of expanding broadband availability in developing nations. From this perspective, the recent net neutrality discussions in India, in which several over-the-top players (OTTs) criticized the Internet.org initiative and left the coalition, should be considered not as a battle over net neutrality but as a disagreement over an appropriate course for broadband development. Considering the aforementioned positive feedback loop, the author argues that the net neutrality principle, which will ban this kind of management maneuvering by network operators, should be deprioritized. In particular, the direct involvement of OTTs in network development (as in the Internet.org project) would be acceptable because the primary goal is not to create a “neutral” network but to make broadband widely available as soon as possible.

4. Developed nations

The broadband issue in developed nations, especially the U.S. and Japan, is quite different from that in developing countries. Compared with the OECD average, these two countries enjoy a higher penetration of broadband (see Table 2), but because of the dramatic increase of Internet usage (especially Internet video watching), end users in both countries complain of sluggishness of “broadband” and stinginess of ISP contract terms.

Table 2 Broadband in the US and Japan

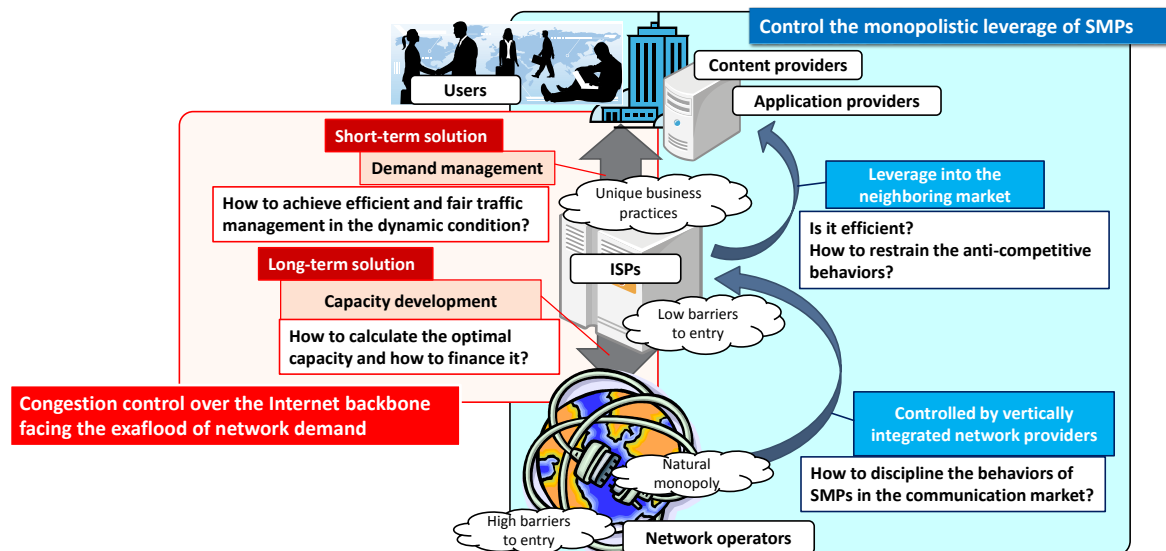
As of Dec. 2014	The U.S.	Japan	OECD average
Fixed BB per 100			
DSL	9.6	3.7	13.4
Cable	17.7	4.7	9.1
Fiber	2.8	20.7	4.8
Satellite	0.8	0.0	0.2
Fixed Wireless	0.3	0.0	0.4
Other	0.2	0.0	0.2
Mobile BB per 100	104.0	124.1	81.3
Standard mobile	NA	96.0	NA
Dedicated mobile data	NA	28.1	NA

Source: Created based on the OECD Broadband statistics (<http://www.oecd.org/sti/broadband/oecd-broadband-portal.htm>)

This is the primary case Professor Wu used to identify the anti-competitive threat of dominant ISPs and the basis for which he reintroduced the traditional concept of “end-to-end argument” under the new title of “network neutrality” in his seminal study. Many concepts are indeed related to the net neutrality concept. From an economic perspective, Jitsuzumi (2010, 2011b) saw that the net neutrality issue is a combination of the traffic congestion problem, which occurs because of a limited network capacity at the Internet backbone, and the possibility of anti-competitive behaviors by dominant network operators (Fig. 2). In addition, Jitsuzumi

indicated that the former one possesses the following three uniqueness that complicate matters in finding a solution:

- Internet backbone is a collective commons supported by many individual operators.
- Prevalence of best-effort quality may inhibit network investment if competition is insufficient.
- A serious information asymmetry exists with respect to network quality of service (QoS) between ISPs and end users.



Source: Recreated from Jitsuzumi (2015)

Fig. 2 Twin issues in the net neutrality discussion

Because of differences in competitiveness of ISP markets in the U.S. and Japan, each government has adopted a discrete approach to dealing with net neutrality. Thanks to the effectiveness of asymmetric regulations on network operators, Japan's Ministry of Internal Affairs and Communications (MIC) has relied on the self-regulatory framework of stakeholders in the ISP market. By contrast, the FCC in the U.S. has no other choice than to introduce an entirely new rule without relying on such competitive dynamism³. Although the actual approach may not be the same in these two countries, to deal with congestion problems, policymakers must focus on efficiency in resource allocation. Otherwise, the level of investment will be less than optimal or, as seems more likely, because maintaining customer-base expansion at the mature stage is difficult, excessive investment will be the result.

What end users are concerned about is not the technical specifications/capabilities of their ISP services (i.e., ISP's QoS), but their quality of experience (QoE) when using the Internet. Users pay to enjoy applications and content smoothly, or stress-free connectivity. Thus, in order to improve the overall economic efficiency of the society and maximize consumer welfare, regulators and policymakers should pursue parity between the marginal investment cost and marginal economic value of QoE. In essence, discussion should focus not on QoS-based net neutrality but on QoE.

³ However, this unique condition may not hold, as the Japanese broadband ecosystem becomes increasingly oligopolistic due to the technological evolution in mobile broadband and market development led by NTT East/West. Because it is apparent that the current Japanese regulatory framework will not be effective in addressing the emerging net neutrality concerns, the MIC must begin examining its policy options immediately.

It is important to remember that QoE can be influenced by many factors, including the QoS offered by ISPs, the capacity of in-house networks and user terminal equipment, the kinds of content and applications users enjoy, the quality of call centers, and the brand image of service providers. Similarly, QoS itself depends not only on the efforts of the ISP but also other factors. According to Marcus and Waldburger (2015, pp. 15–16), the QoS offered by ISP for end users when watching Internet videos depends on the performance at every point along the path that the data travels, such as:

- the speed of the content and application provider's (CAP's) service, especially the servers;
- the speed of the ISP that serves the CAP (noting that the CAP may self-serve);
- any number of intermediate ISP transit networks and (at most, in general) one peering interconnection point;
- the speed of the ISP that serves the end user;
- the user's own customer premises equipment, including routers within the user's home, as well as the consumer's personal computer, tablet, or smart phone.

These clearly indicate that maximizing end users' utility or QoE is not necessarily equal to maximizing QoS.

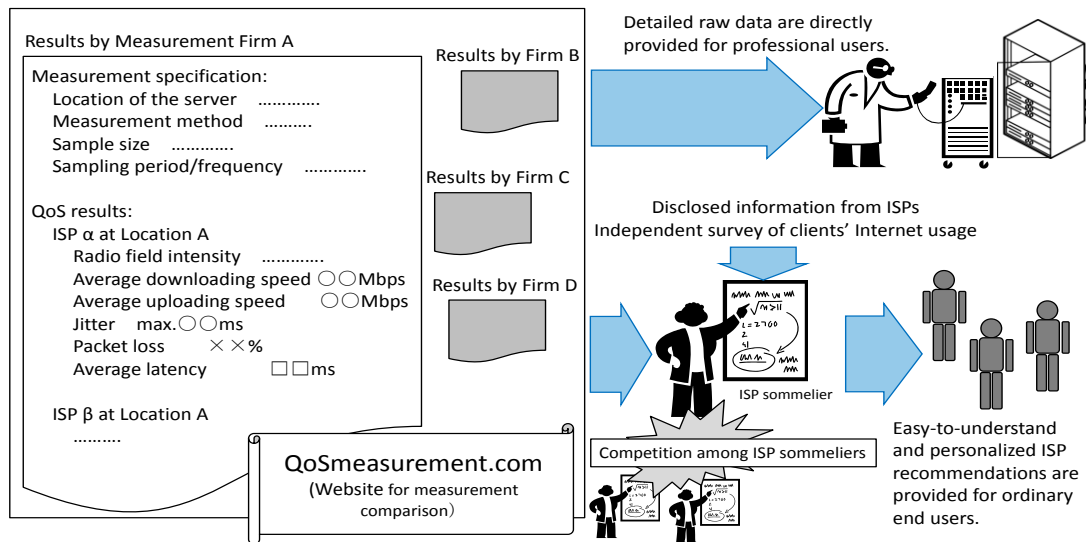
Thus far, the net neutrality concept has been interpreted as an equal treatment of all packets transmitted over the Internet. However, a fair treatment of all QoE for those subscribe to the same network is much more essential. Therefore, to ensure appropriate policy-making for telecom regulators in developed countries, a different concept other than "net neutrality" is required, or the concept should at least be reinterpreted. A similar line of argument can be found in Yoo (2005) and Lyons (2015).

Instead, my analysis suggests that public policy might be better served if policymakers were instead to embrace network diversity. Doing so would permit end users to enjoy the benefits of product variety. ... It also accommodates technological dynamism and humility by providing maximum room for experimentation and development. This is not to say that policymakers should reject network neutrality once and for all. What is called for is a sense of balance and optimality that can adjust with the circumstances. (Yoo, 2005, p. 76)

... , as an increasing amount of our daily activities migrate online, different customers are likely to demand different services from their network providers. Allowing broadband providers to tailor offerings to customers' particular preferences can be more efficient than forcing them into one-size-fits-all plans that are ill-suited to their needs. In an increasingly diverse Internet ecosystem, innovative new broadband models can potentially enhance consumer welfare. (Lyons, 2015, pp. 37–38)

The remaining problem is whether the market can find an efficient equilibrium under the new, or renovated, policy framework. Here, the most critical issue from the demand side is that average users lacks

sufficient ICT literacy to understand proper QoE for themselves and what level of QoS is required and therefore tend to end up with insufficient broadband setups. This situation is not ideal for OTTs who therefore have a legitimate reason to intervene. The Google Video Quality Report seems to be such an attempt. The author believes that introducing a new intermediary will help improve the situation. The intermediary, which I call an “ISP sommelier,” gathers information about the usage patterns of a client, the electromagnetic features of the client premises, and the QoS data of available ISPs. This intermediary then proposes an optimal mix of his or her broadband environment (Fig. 3).



Source: Recreated from Jitsuzumi (2015)

Fig. 3 How ISP sommeliers works

On the supply side, in order to provide appropriate QoS to build sufficiently tailored QoE, ISPs should pursue network access diversity and provide sufficient variety of QoS⁴. Because a naïve net neutrality principle may work against such diversification, which is a prerequisite for QoE maximization, we must relegate net neutrality again to the backburner.

5. Conclusion

Because broadband is widely believed to be a precondition for economic prosperity and social progress, many governments have been working to improve the broadband environments of their countries. A variety of policy tools exist that are designed to improve broadband environments and, depending on the development stage of individual nations, priority must be given to certain tools over others.

In the last decade, net neutrality has been the center of telecom policy discussion in the most advanced nations. Recently, it has become a topic of discussion in developing nations and in an international arena, such as the Internet governance argument at the NETmundial in 2014⁵.

Here, we must remember that net neutrality, which in its most basic form requires “equal” treatment for all Internet traffic, is a means to an end not an end itself. Thus, when this concept is not the most appropriate for

⁴ Of course, in order to maximize QoE only by providing better QoS, ISP traffic management must be customized for individual customers, which is impossible with respect to engineering and management.

⁵ <http://netmundial.br/wp-content/uploads/2014/04/NETmundial-Multistakeholder-Document.pdf>

a telecom policy agenda, it should be deprioritized. As discussed in this study, in the early stage of development, policy focus must be on deploying broadband networks as quickly as possible. The net neutrality principle, which may block management maneuvering by network operators, is not the primary concern. However, in the later stage when consumer welfare and investment efficiency are primary concerns, a naïve net neutrality principle may work against competition and thus be counterproductive.

Acknowledgement

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