Net Neutrality

Toshiya Jitsuzumi

1 Introduction

As broadband is widely believed to be a precondition for economic prosperity and social progress, many governments have been working hard to realize the broadband society at an early stage. However, this creates a new competitive problem in the broadband ecosystem. Since the latter half of the 2000s, as the speed of broadband penetration and increase in the use of bandwidth-rich content/application have been much faster than capacity building by network operators, network congestion is now an everyday problem for consumers and corporate users in the broadband society. This constraint, when accompanied by cost sub-additivity in their business operations and/or with a scarcity of spectrum resources, allows dominant network operator room to behave in an anti-competitive manner. Relating to this possibility, one of the recently debated topics is "zero-rating," which allows subscribers to access certain content or applications without having that traffic count against their data cap. By offering zero-rating, network operators prioritize certain content/applications over others. Thus, when used in an anti-competitive way by dominant network operators,

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H. Mitomo (ed.), *Telecommunications Policies of Japan*,
Advances in Information and Communication Research 1,
https://doi.org/10.1007/978-981-15-1033-5_11

zero-rating is a powerful tool for controlling neighboring markets and may cause a significant loss of efficiency in the broadband ecosystem as a whole.[1]

In order to achieve a broadband society within a competitive framework, policymakers have to take into account the potential impact of significant market powers (SMPs) in the market. Until very recently, network operators represented SMPs and attracted a great deal of policy attention, resulting in a traditional set of policies that combined price regulation and entry/exit controls. However, recently, giant online platforms have started representing SMPs in the broadband ecosystem. Online platforms are now supporting significant part of our lives and making us more and more dependent on their services when purchasing goods and services, finding information/entertainment online, keeping in touch with each other, and in many other ways. Since online platforms can control or adjust what we can watch/enjoy on the Internet and determine which content/application providers can get our attention, they have the power to significantly harm competition in the broadband ecosystem if they behave inappropriately. The potential threat from these online platforms has become so important that it is a frequent topic of discussion across many policy areas. As most powerful platforms cover multi-national markets, such policy discussion calls for close cooperation in international forums, such as the OECD.

Since it cannot always be assumed that the market dynamism can come up with an efficient and fair resource allocation, for nearly a decade, the above possibility has been widely discussed by telecom regulators under the name of "net neutrality," which (in its most basic form) requires "equal" treatment for all Internet traffic. Due to the differences in the broadband ecosystem and existing regulatory frameworks, there is no one-size-fits-all solution for every country. Indeed, policy packages that are actually adopted for dealing with net neutrality "problems" vary significantly among nations. For example, in the USA, the Federal Communications Commission (FCC) had to micromanage the behavior of network operators due to a lack of competitiveness in the broadband market. On the other hand, the Japanese telecom regulator, the Ministry of Internal Affairs and Communications (MIC), employed a market-based "light-touch" approach in order to deal with the problem in the fixed broadband market, relying on an authority that was bestowed originally for controlling natural monopoly of plain old telephone service operators. Treatment of zero-rating is not the same either: Some governments allow it, while others do not.

The remainder of this chapter describes the net neutrality "problems" that policymakers have to deal with (Sect. 2), how Japanese telecom regulation has been

[1]Zero-rating is also a big issue in developing nations where broadband is far from ubiquitous. As broadband Internet is now a key building block of our socioeconomic activities, closing a domestic, as well as an international, digital gap and guaranteeing fair and "neutral" cyber space for citizens have come to be one of the top policy issues for policymakers in many countries from the viewpoint of fostering democracy and freedom of speech. Since the low income is one of main reasons for not using broadband, many governments, especially in developing countries, faced a serious trade-off between (a) free but limited Internet experience of zero-rating, allowing potential harms of gatekeeping platforms, and (b) no Internet at all for poor people, allowing the persistent digital divide.

dealing with these issues (Sect. 3), and what challenges they are facing right now (Sects. 4–6). Section 7 concludes.

2 Net Neutrality "Problems"

"Network neutrality," or "net neutrality" in its short form, is a term coined by Wu (2003) to connote the equal and fair treatment of Internet packets by network operators, but this concept was not completely created from scratch. In fact, a similar concept stretches back to Article 3 of the Pacific Telegraph Act of 1860, or the Act to Facilitate Communication between the Atlantic and Pacific States, which states that "… messages received from any individual, company, or corporation, or from any telegraph lines connecting with this line at either of its termini, shall be impartially transmitted in the order of their reception, excepting that the dispatches of the government shall have priority …." This rule was then inherited by Article 201 (b) and 202 (a) of the Communications Act of 1934. It can be said that net neutrality has long been respected under a different name long before we started using the Internet. Thus, Wu's argument should better be translated as a declaration that a traditional concept for telegraph and telephone should still be applied to Internet services.

The reason why Wu's article attracted such huge attention can be attributed to the market conditions at that time. In the USA, the discussion of net neutrality started when the regional broadband access market came to be virtually duopolized by a telecommunication company (telco) and a cable company (cableco). This situation is due to a series of deregulation by the federal government and aggressive mergers and acquisitions in the network markets. Facing this market, net neutrality proponents argued that the anti-competitive behavior of dominant telcos or cablecos is distorting the resource allocation of the broadband ecosystem and harming consumer welfare. Then, they insisted that the behavior of telcos and cablecos had to be strongly regulated by the government.

From an economic viewpoint, as discussed in Jitsuzumi (2010), there are two aspects to this net neutrality "problem" in the simplest setting (Fig. 1). One is how to efficiently allocate scarce network resources to individual applications, and the other is how to discipline the market power of dominant network operators that control the network bottleneck.

The former aspect becomes important as the broadband Internet becomes popular in the market and stakeholders come to realize that network capacity, especially that of last mile network operators, is a scarce economic resource. Theoretically speaking, this issue has many things in common with road congestion problem, which transportation economists and related policymakers have long been dealing with. Therefore, the former problem is not too difficult to solve, if it stands alone. One of the most popular approaches is the introduction of congestion pricing, which effectively internalizes negative externalities in players' decision making. If network operators charge sufficiently higher fees during peak hours, demand will shift to non-peak times and attain optimal allocation of existing network resources among

competing usages in the short run. Furthermore, in the long run, incentive of profit maximization induces operators to increase network investment and creates more capacity.

However, owing to the SMP of giant network operators that enjoy network effects, economies of scale and scope, and ownership of indispensable resources (e.g., spectrum licenses), an application of such a simple solution results in a complicated issue that policymakers need to address further. As Farrell and Weiser (2003) and van Schewick (2007) show, when certain conditions are met, in order to maximize profit, dominant network operators will leverage their market power to control neighboring markets. They may distort competition in the content and application (CAP) market by prioritizing their own CAP subsidiaries and thus do not incorporate fair or "neutral" allocation of network resources. This can be the situation that was in the eye of US telecom regulators and thus rationalized their heavy-handed approach in 2015, where regulators try to closely manage the traffic control management of operators. Under different conditions that satisfy "Internalizing Complementary Efficiencies" (Farrell and Weiser 2003), network operators have reason to guarantee sufficient competition in the CAP market and thus do not inhibit proper introduction of congestion control measures. Alternatively, if there exists competition among network operators, we have no reason to be concerned about their inefficient leveraging at all. If this is the case, policymakers can deal with congestion management of network providers with much less interventions. The only thing policymakers have to do is to monitor the market and intervene only if there is a serious competitive problem. This is the situation that Japanese government faced in 2007 and justified their "light-touch approach" (see the following section). A similar argument can be found in Lüth (2015) that says "Fostering competition in the access market might therefore be sufficient to prevent exclusionary practices" (p. 322).

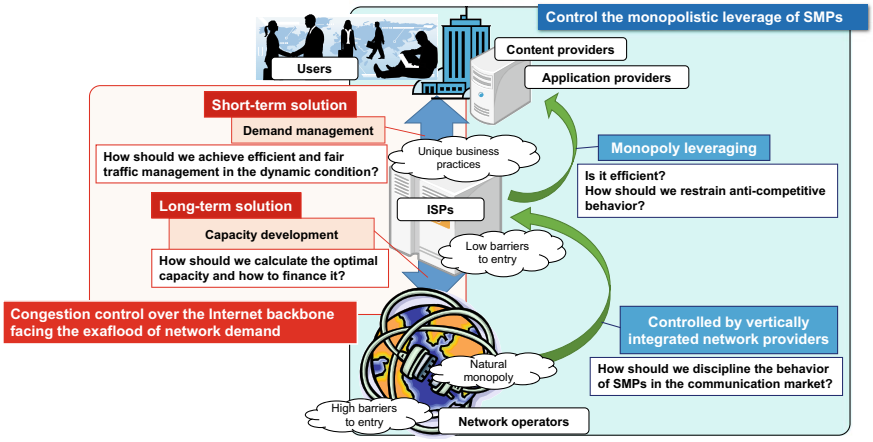


Fig. 1 Core of net neutrality "problems". *Source* Adapted from Fig. 1 in Jitsuzumi (2015a)

Moreover, recently, policymakers in more and more countries face a more complex situation where not only network operators but also online platforms control the broadband market. They have to design a policy package that disciplines two layers of SMPs altogether, each of which has a strong motivation to control the entire value chain. Increasing reliance on a two-sided market concept of broadband players also made the problem even more difficult, because measuring the market power of those players has to take the situation of both markets into consideration simultaneously.

Since there is no universally applicable solution (at least we have not found one yet), in order to produce an efficient solution for the net neutrality "problems," we have first to observe competitive situations of individual markets in the overall broadband ecosystem and calibrate related policies. According to the economic model analysis, whether government intervention for net neutrality can be welfare enhancing depends on the model parameters employed (Easley et al. 2018). For example, Bourreau et al. (2015) proved that assuming a two-sided market with two network operators and many CAPs, paid prioritization, in which network operators charge content providers for smooth delivery even in congestion, which is what net neutrality proponents strongly opposes, is welfare enhancing. Therefore, before designing a policy package, policymakers have to empirically recognize what the "problem" is and understand how far the existing market structure can solve the "problem."

Finally, in the real world, policymakers have to deal with a more complex model where the efficient allocation of network capacity is not the only concern in net neutrality discussions. Concerns for fostering democracy and for securing freedom of speech make the solving of issues via market competition very complicated.

3 Japan's Approach Thus Far[2]

In Japan, policymakers' discussion on net neutrality can be dated back to November 15, 2006, when the MIC convened a "Working Group on Network Neutrality" (WGNN). According to its report (MIC 2007), WGNN's objective was to design competition rules that can respond flexibly to developments in the broadband market. Eventually, after a 10-month-long discussion, on September 19, 2007, WGNN issued a final report (MIC 2007).

In the WGNN report, network neutrality was defined as a situation in which the following three principles are met (p. 7):

Principle 1	Consumers are entitled to use IP-based networks flexibly and access the content/application layer freely.
Principle 2	Consumers are entitled to connect to IP-based networks freely through terminals that comply with technical standards provided by laws and regulations, and these terminals may connect to each other flexibly.
Principle 3	Consumers are entitled to use the communication layer and the platform layer free from discrimination at a reasonable price.

[2]This section relies on Jitsuzumi (2011).

Then, considering not only horizontal relationships among network operators but also vertical relationships with adjacent players such as CAPs, this report proposed "fairness in network cost sharing" and "fairness in network use" as the two basic principles for addressing the net neutrality issues.

For the first principle (fairness in network cost sharing), the report pointed out that "coping with rapid increases in traffic (network congestion) requires dynamic terminal-network collaboration and the flexibility to absorb fluctuations in traffic" (p. 23). Considering the dramatic increase in Internet traffic, the report evaluated several engineering solutions (including peer to peer, IP multicasting, overlay multicasting, content distribution networks, packet shaping, and capacity expansion) to alleviate traffic congestion. It then analyzed how the cost of such solutions could be allocated to various stakeholders and concluded that the MIC should take a "light-touch approach" and allow the market itself to determine such an arrangement. In addition, based on similar logic, the report stated that placing a surcharge on content providers should not be considered a standard treatment and is better left to voluntary negotiations among stakeholders, instead.

The condition that allowed the MIC to take the light-touch approach was that the wholesale Internet service provider (ISP) market in Japan seemed sufficiently competitive at that time (Fig. 2), which could justify a clear difference in net neutrality approach between Japan and the USA. In clear contrast with the USA where telcos and cablecos could utilize market power in the physical layer to control retail ISP market due to a series of deregulation, in the latter half of the 2000s, the dominant NTT group held only 22–31% of the fixed ISP market and the level of the Herfindahl–Hirschman Index (HHI) remained in the 1500s, which indicated that the market was quite competitive (MIC 2009a). However, it is important to mention that, as Jitsuzumi

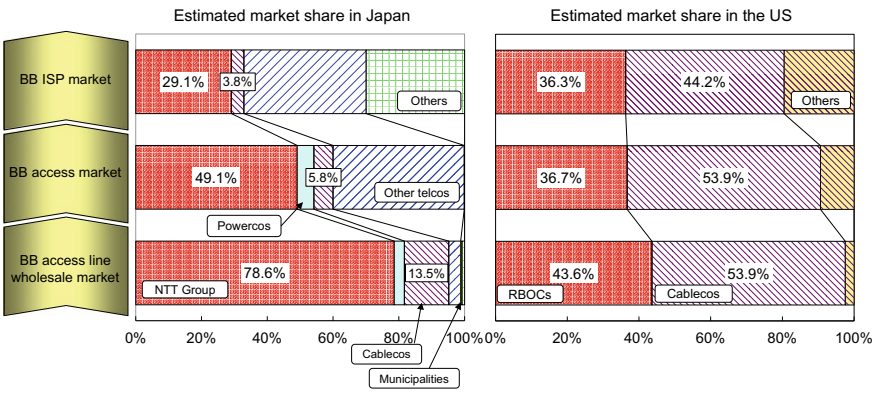


Fig. 2 Competitive situation in Japan and the USA. *Source* Created on the basis of MIC (2008), FCC (2008a, b), and Noam (2009). *Note 1* ISP shares in the US are based on revenues in 2006 (Noam 2009), which include satellite Internet; the shares in other markets are based on the FCC's line count and include fixed lines only. *Note 2* RBOCs stand for Regional Bell Operating Companies, telcos for telecommunications companies, powercos for power companies, and cablecos for cable companies

(2014) empirically pointed out, the actual competition level was much less than HHI indicated.

Long before the introduction of the Internet to the general public, the MIC relied on interconnection requirements and SMP regulations, both of which had been clearly stipulated in the Telecommunications Business Act (TBA), to deal with the possible anti-competitive behavior of incumbent "fixed" network operators. First, every telecom operator in Japan is required to accept a request from other telecom operators to interconnect (Article 32). Furthermore, terms and conditions that are offered by NTT East and NTT West (hereafter, NTTEW) shall obtain authorization from the Minister for Internal Affairs and Communications (Article 33) and NTTEW are not allowed to treat their group ISPs more favorably than others (Articles 30 and 31). In addition, the NTT Law controls one of the most important strategic discretions of NTTEW by listing up the scope of business domain exhaustively in Article 2; thus, NTTEW have still not been allowed to offer ISP services by itself and therefore cannot vertically integrate with ISP functions. As a result, these rules limit the discretion of NTTEW, which in turn helps to maintain competitiveness in the fixed broadband market; these mechanisms were still working when the WGNN report was drafted; and the MIC could count on the competitive dynamism to deal with net neutrality "problems."

One such problem was how to deal with particularly heavy users who consumed a disproportionately large share of network resources. For this problem, the WGNN report recognized the effectiveness of packet shaping, but it also pointed out its anti-competitive potential to stifle competition; therefore, it suggested a two-stage approach:

First stage: Establish minimum rules (packet shaping guidelines) that include operating requirements based on the mutual consent of diverse stakeholders.
Second stage: Allow each ISP to set a specific policy based on the guidelines.

This method reflects a shift toward co-regulation, through which a regulatory body provides legal oversight to the private sector's collaborative efforts. Responding to this call from the MIC, ISPs and network operators organized a committee in September 2007 and presented the "Guideline for Packet Shaping" in May 2008 that set a voluntary baseline regarding the shaping of packets in time of network congestion (Japan Internet Providers Association [JAIPA] et al. 2008). The MIC also let operators revise the Anti-DoS/DDoS Guideline in 2011 (JAIPA et al. 2011), which provides a baseline method for traffic management at the time of a security breach.

The Packet Shaping Guideline declares the following:

1. Increased traffic must be primarily dealt with by network investment or enhancing network capacity; packet shaping must be considered exceptional.
2. Packet shaping should be targeted solely at network congestion, the existence of which must be substantiated by objective data.
3. In order not to jeopardize the secrecy of communication (Article 21 of the Constitution), ISPs must obtain the "clear" and "individual" consent from users.
4. To maintain fairness in use (Article 6 of the TBA), packet shaping must be nondiscriminatory and adequate, unless there are valid reasons.

5. ISPs must disclose their packet shaping information beforehand, as requested by the Guidelines for the TBA Consumer Protection Rules.

In addition, the Guideline states that packet shaping must satisfy the "validity of means" criteria; for example, throttling a certain application that occupies excessive capacity is acceptable, but complete blocking is not. It also stipulates that throttling the traffic of heavy users does not violate the "fairness in use" principle as long as heavy users can experience the same actual speed that average users can.

Concerning the second principle (fairness in network use), the WGNN report is mainly focused on the next-generation network (NGN) provided by NTTEW. An NGN is a carrier-managed network that achieves both the flexibility of an IP-based network and the reliability of a traditional circuit-switching network and can guarantee transmission quality and security; thus, it can be an equal or better substitute for the ordinary Internet. Therefore, if combined with market-dominating power, NGN has the potential to change the industrial organization on which the WGNN report stands. Declaring the need "to maintain an environment in which consumers can freely choose and use networks" (freedom to choose networks) (MIC 2007, p. 8), this report proposed to expand the current asymmetric regulation to cover NTTEW's NGN in order to deal with the possible vertical leveraging of NTTEW.

After concluding WGNN, the MIC convened another meeting, named "Panel on Internet Policy," on February 26, 2008, and reaffirmed the light-touch approach (MIC 2009b). Additionally, in order to guarantee the proper working of market dynamism, the MIC strengthened the transparency requirement of ISPs, by revising the Guidelines for Consumer Protection Rules that mandate ISPs to notify subscribers of the details of their packet shaping practices in order to satisfy the transparency requirement of Article 26 of the TBA (MIC 2009c).

Since then, Japanese telecom regulators have not adopted any special regulations; however, it is not proper to forget that behavioral regulation that was originally designed for plain old telephone service operators provides a robust safeguard for Japanese broadband users. Article 6 of the TBA, which states that "no telecommunications carrier shall engage in unfair and discriminatory treatment with regard to the provision of telecommunications services," has been protecting the equal and fair treatment of communications over the network infrastructure. Because Japanese telecom regulation focuses not on services but on operators, this decades-old safeguard could underpin Japanese net neutrality in the broadband era.

So far, this approach has been working well. Indeed, we have not experienced any major incidents that violate net neutrality principles, in general, at least in the fixed broadband space.

4 Japan's Challenge[3]

Nowadays, the number of people who owns smartphones is larger than the number of people who owns computer, more and more people access the Internet via smartphones than via computers (MIC 2018a) and mobile download traffic is growing much faster than fixed traffic (MIC 2018b), it is widely agreed that ordinary users in Japan have come to value mobile broadband more than fixed broadband.

Compared to its fixed counterpart, the Japanese mobile broadband market is less competitive. Three big mobile network operators (MNOs), NTT Docomo, KDDI, and SoftBank, together control 89.4% of the retail market as of March 2018. HHI of the mobile market is 2,904, which is larger than that of the fixed broadband market (HHI = 2,272) (MIC 2018c). Now, a fourth MNO, Rakuten, is preparing market entry, but considering the strong brand loyalty of Japanese subscribers to incumbent MNOs (e.g., see Jitsuzumi 2015b, 2018) and the underlying network effect, the current oligopolistic situation by three MNOs is expected to stay for the meanwhile. In addition, on May 13, 2014, NTT announced that NTTEW would start wholesaling fiber access services. By utilizing this wholesale framework, mobile operators have gained the ability to provide a one-stop service for a comprehensive broadband experience in the retail market, utilizing their existing market power cultivated on their home ground. For example, since March 1, 2015, NTT Docomo has started providing a fixed fiber access service ("docomo Hikari") combined with bundled discounts to mobile subscribers, which is expected to have a huge impact on the fixed ISP market.

These changes are transforming the core of net neutrality and require the MIC to reconsider the more-than-decade-old "light-touch" approach. In the first place, the industrial structure of mobile broadband in Japan is quite different from that of its fixed counterpart. Mobile broadband access is fully controlled by mobile phone operators, because they are all vertically integrated with ISP functions. In clear contrast to NTTEW, NTT Docomo, one of the major members of the NTT group and 63.31% of its shares are still owned by NTT, is free to expand its business domain and provides Internet access services of its own. Moreover, the TBA's rules on mobile SMPs are less strict than those for fixed ones.

Consequently, the broadband access ecosystem is coming to be, and will possibly be, controlled more and more by vertically integrated mobile operators (Fig. 3), and will possibly require Japanese government to design a new policy package in the end. If the mobile transition continues, the situation in Japan will become similar to the US broadband market, where duopolistic markets forced the FCC to introduce special rules for net neutrality. Once a market loses sufficient competition, Japanese policymakers cannot rely on market dynamism to attain net neutrality, too.

The introduction of zero-rating services has bought an additional challenge to Japanese telecom regulators, because it can have a huge impact on the CAP market. Additionally, it is sometimes stated that deep packet inspection (DPI) is required to

[3]This section relies on Jitsuzumi (2016).

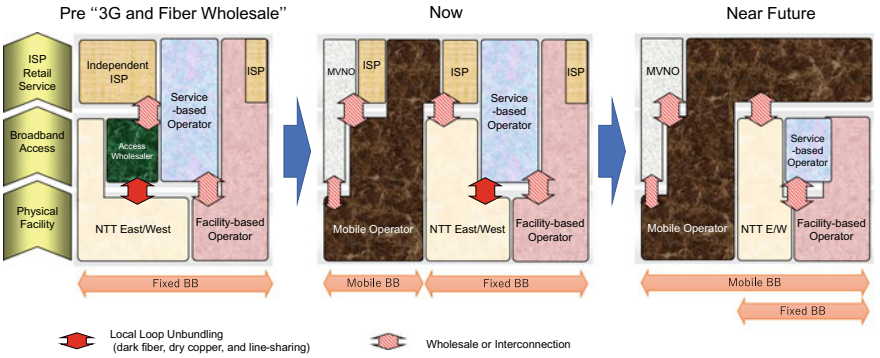
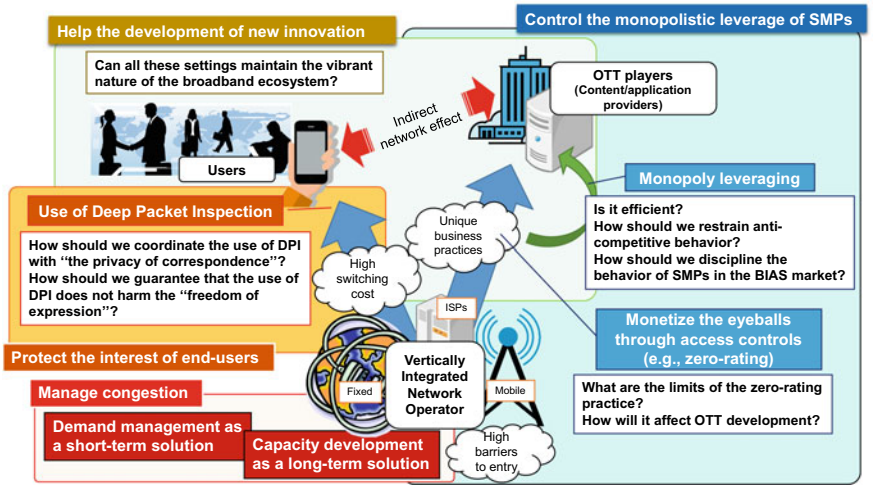


Fig. 3 Changing broadband ecosystem

fine-tune zero-ratings. If this is the case, protecting end users' secrecy of communication and freedom of expression will be among the top issues that policymakers have to deal with.

Consequently, net neutrality, which was nothing but a congestion problem coupled with the anti-competitive issue of network operators (Fig. 1), is evolving to the next level, "net neutrality 2.0" (Fig. 4). This new level reflects the fixed mobile conversion of network services and basically is a combination of previous two issues (congestion management and SMP control, the latter of which slightly changes to include zero-rating) with additional two new issues (the protection of the interests of end users'



Note: OTT stands for over-the-top, and BIAS stands for broadband internet access service.

Fig. 4 Net neutrality 2.0

secrecy of communication and freedom of speech, and the development of optimal innovation policy).

Furthermore, thanks to big data analysis, the development of artificial intelligence (AI), Moore's law, and network effects, a new segment of players that was once considered as broadband users is now becoming key players in the entire ecosystem by providing "online platforms" for neighboring markets. Online platforms can be defined as digital services that facilitate interactions between two or more distinct but interdependent sets of platform subscribers who interact through the service via the Internet. The most famous and the most powerful examples include four US-based firms, Google, Apple, Facebook, and Amazon (GAFA), and three Chinese firms, Baidu, Alibaba, and Tencent (BAT). Netflix and Rakuten are following these top-tier companies. Online platforms support so many of our socioeconomic activities that we have become dependent on them; thus, they have become so important in policy discussion relating to labor and employment, taxation, competition, privacy, and consumer protection. Net neutrality discussion, the ultimate policy goal of which is to attain "neutral" networks, cannot be an exception to this. In order to guarantee "neutral" services to end users, we need cooperation from every layer of the broadband ecosystem, such as devices, networks, platforms, and content. Policymakers have to take the competitive impact of online platforms into consideration in dealing with net neutrality in the future (net neutrality 3.0) (Fig. 5).

Faced by this decreasing level of competition in the mobile broadband market and the continuing transformation of the net neutrality landscape, the MIC has to accept the loss of the fundamental conditions that justify the previous "light-touch approach" and had better start designing an alternative policy package. Currently, as at the point of writing this (December 2018), the MIC is having a study group for net neutrality that ultimately aims to design a competition rule that enables the broadband ecosystem to realize "neutral" networks.

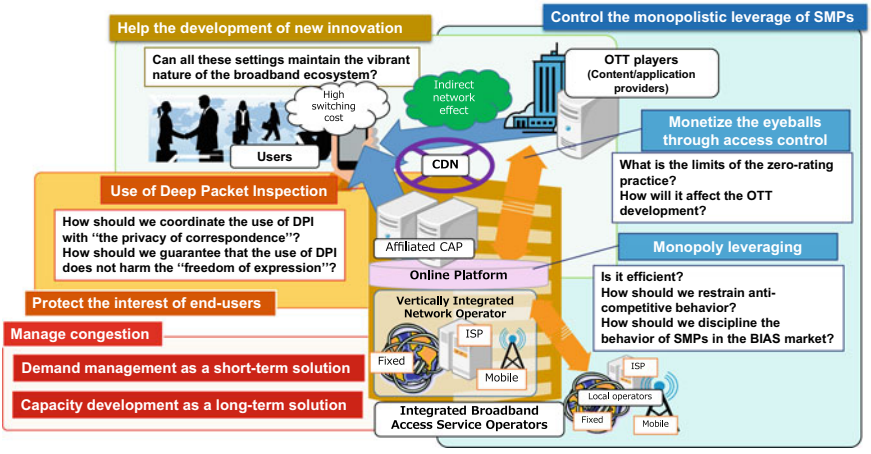


Fig. 5 Net neutrality 3.0

5 Zero-Ratings

One[4] of the recently debated topics on net neutrality is "zero-rating," which has been attracting attention from academia, industry groups, and policymakers. Annex A of DotEcon et al. (2017) provides a good summary of previous articles on zero-rating. In those discussions, zero-rating is widely understood as "a tariff (or tariff option) that allows end-users to access certain content without being charged for the corresponding data consumption" (Krämer and Peitz 2018, p. 5). Since this can result in a competitive edge only when there is usage-based pricing or data caps, it is mainly adopted by mobile broadband operators. From the viewpoint of users, this zero-rating offers a significant discount on the cost of accessing particular content; thus, it is "expected to affect: the decision whether or not to obtain access; the choice of access provider; and the choice of content and the amount of data consumption overall" (DotEcon et al. 2017, p. 2).

According to OECD (2015), there exist three types of zero-rating: One is applied by ISPs to their own content or that of pre-selected partners; the second type is introduced when there is a large difference in cost between on-net and off-net traffic; and the final one is found in developing countries and provides access only to a limited number of websites. The first one primarily aims to increase non-price attractiveness to end users, the second one is for cost minimization, and the last one is to motivate consumers to subscribe to broadband by allowing them to experience the value of the Internet. What we observed in Japan belongs to the first type, and all but one is offered by mobile virtual network operators (MVNOs). The only exception is provided by SoftBank. On August 29, 2018, SoftBank announced that it would start providing zero-rating services for major Internet video services and SNSs starting on September 7, 2018.

The competitive impact of zero-rating cannot easily be determined. In a certain setting, giving preferential treatment to some content is considered as "anti-net-neutral." By offering zero-rating, network operators prioritize certain content/applications over others and can distort the competition in the CAP market, hurting the business prospects of nonzero-rated content owners. When the selection of content is fee based (e.g., "Sponsored Data" by AT&T), players with sufficient financial strength can prosper. Thus, when employed by dominant network operators, zero-rating is a powerful tool for controlling neighboring markets and may cause a significant loss of efficiency in the ecosystem. However, some academic research points out other possibilities: Tripuraneni (2016) briefly analyzes the impact of Free Basics on start-up offerings and finds that it does not deter net neutrality, nor is it discriminatory; Dewenter and Rösch (2016), using a rather simple model, insist that, as long as the market power of the ISP is disciplined, there is no need to regulate net neutrality; also using a model-based approach, Somogyi (2016) shows that zero-rating can be either welfare-enhancing or welfare-decreasing, depending on the attractiveness of the content; and Yoo (2017) sees the zero-rating favorably as an enabler of service differentiation and points out its merits on the demand and supply sides. On the other

[4]This section relies on Jitsuzumi (2016, 2018).

hand, Marsden (2016) questions the appropriateness of zero-rating and insists that it is acceptable only in the short term and as long as it is not exclusive and is "Fair Reasonable and Non-Discriminatory" (p. 254). On the other hand, zero-rating can change the competitive framework in the network market by widening the dimensions along which firms can compete and help small players take over a part of the incumbents' market. This is particularly important when incumbent players have benefited from high entry barriers generated by the network effect. If used mainly by non-dominant players, zero-rating can work as a pro-competition measure, especially in the long run, and increase the efficiency of the broadband ecosystem. The former case provides a reason for stricter governmental intervention, and the latter calls for the adoption of a market-based, or light-touch approach, with strict safeguards against SMP.

Thus, faced by a decreasing level of competition in the mobile broadband market, zero-rating may demand Japanese regulators to act. In general, when there is not sufficient competition, offering zero-rating per se becomes a policy concern. In fact, OECD (2015) states as follows:

> Previous experience in OECD countries has shown that zero-rating becomes less of an issue with increased competition and higher or unlimited data allowances. Indeed, it can be a tool to increase competition. …Nevertheless, in any market with limited competition for access, zero-rating could be an issue of concern (p. 192).

6 Demand for Zero-Rating in Japan[5]

In Japan's case, no zero-rating survey has been conducted that is comparable to the one above. Since the net neutrality debate has been a central issue mainly in the EU and the USA, empirical attention on zero-rating mostly covers cases in those two areas, such as DotEcon et al. (2017); and observations in other areas are very scarce. The exceptions found by the author are Chen et al. (2017), who conducted an in-depth survey of zero-rating in South Africa; and Drossos (2015), who briefly summarizes the situation in OECD markets, points out that "(i)n competitive markets like Finland, where mobile internet access prices are very affordable and volumes are practically unlimited, zero-rating could do no harm" (p. 4).

To the best of the author's knowledge, the first zero-rating in Japan was a plan that was introduced in June 2015 by an MVNO, a subsidiary of a photograph supply shop, to provide free access to its photograph-printing site. Since then, zero-rating has been primarily introduced by MVNOs, which is consistent with the comments of Layton and Calderwood (2015) and Yoo (2017). They suggest that entrant operators such as MVNOs and resellers, who are less able to differentiate based on network quality and price, have often implemented zero-rating. In addition, Stallman and Adams (2016) state that "(i)n markets where new competitors struggle to establish themselves, zero rating may give consumers more competitive choices among carriers" (p. 21).

[5]This section relies on Jitsuzumi (2018).

As mentioned in the previous section, a possible policy treatment has to be determined on a case-by-case basis, reflecting the situation of the individual market. As a very first step for policy discussion, in order to determine the net neutrality and zero-rating situation in Japan, the author conducted a Web-based questionnaire survey on pre-registered monitors of NTTCom Online Marketing Solutions Corporation in January 2018 (Table 1). It is important to stress that, when this survey was conducted, zero-rating services were provided only by MVNOs.

Although we have to take the higher-than-average IT literacy of the respondents into consideration, it is possible that zero-rating seems significantly attractive in Japan, which is, of course, very good news for zero-rating providers. According to the survey, the penetration of zero-rating among the respondents is 7.1% and an additional 20.9% know about the option but are not using it, meaning one-quarter of the respondents who acknowledge this option actually use it (Fig. 6). This result is not significantly influenced by whether the sample's main handset is MNO or MVNO. This attractiveness of zero-rating may help MVNOs to get market share in Japan where the respondents do not have very positive views of MVNOs. Forty-two percent of the respondents see MVNOs as an inexpensive substitute for MNOs, and 16% value MVNOs as innovative service providers, while the remaining 43% see them as inferior operators.

It is also possible that at least around 10% value zero-rating is a favorable tool to escape the data cap. Eighty percent have never exceeded their mobile monthly data cap[6] (Fig. 7), and responses when the data cap is exceeded are different between those who have experienced data overage and those who have not (Fig. 8). For those with overage experience, the most popular immediate response was to "use home Wi-Fi," followed by "do nothing," and about half of them indicated they would not change their usage pattern in the following months. Those with overage experience

Table 1 Survey descriptive statistics

2018 Survey	
Survey period	January 25, 2018–January 30, 2018; February 9, 2018–February 28, 2018
Number of responses	1,504
Demographics	
Gender	Male: 787 (52.3%) Female: 717 (47.7%)
Average age	45.8 years old 15–29: 282 (18.8%), 30s: 288 (19.1%), 40s: (20.5%), 50s: 313 (20.8%), Over 60: 312 (20.7%)
Average household income	6.3 million yen per annum
Average Internet experience	9.5 years
Average mobile Internet experience	7.5 years

[6]This implies the monthly cap level may be above the optimal level, which might be due to information asymmetry, excessive risk aversion, or the result of prospect theory (Kahneman and Tversky 1979).

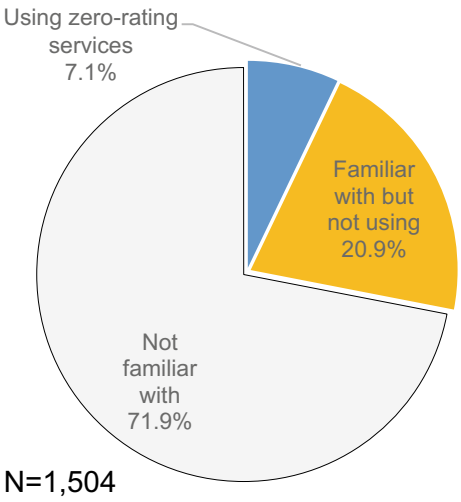


Fig. 6 Penetration of zero-rating in Japan

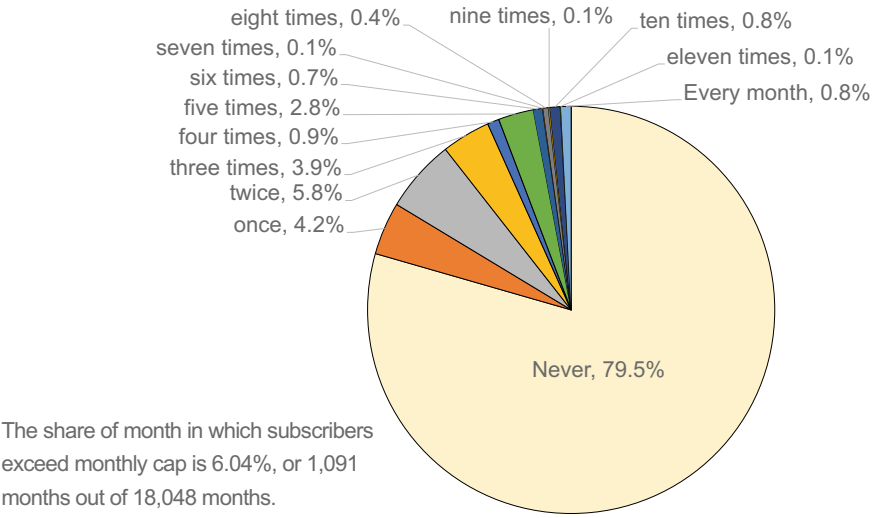


Fig. 7 Number of data overage in 2017

purchase additional data immediately at the point of overage and tend to change their usage pattern by reducing streaming and carrier network usage in the following billing period. Twelve percent of those with overage experience and 5% of those without overage experience would increase their contracted monthly cap, and thus, they are the most probable beneficiary of zero-rating as long as an additional payment required to enjoy zero-rating is less than that to subscribe to a larger cap.

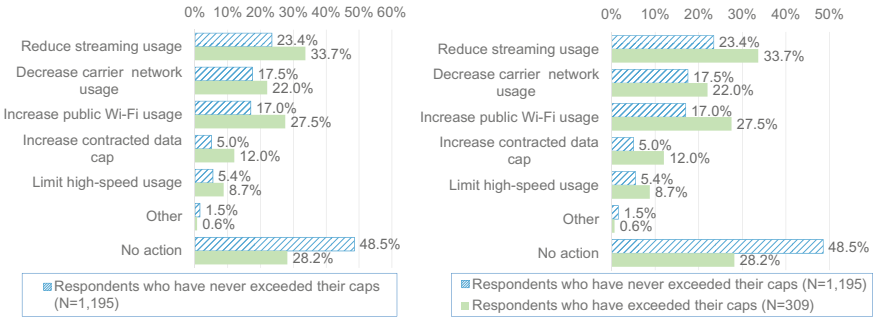


Fig. 8 Responses to data overage

7 Conclusion

The reason why "net neutrality" is so important is that it is an indispensable building block for guaranteeing an efficient use of broadband and maximizing social welfare in the coming information society. However, due to differences in the industrial structure and regulatory framework of each country, there is no one-size-fits-all solution and actual policy treatments adopted vary among nations. This chapter explains why the Japanese government adopted a light-touch approach in the fixed broadband age and why they have to change their approach in the mobile broadband age.

In concluding this chapter, it is important to stress that guaranteeing net neutrality is a necessary but not sufficient condition for welfare maximization, which is the ultimate aim of broadband policy. Since the broadband ecosystem consists of a couple of layers (Fig. 9), in order to achieve the policy objective via a market-based approach, it is important either to maintain competitiveness in each layer or to guarantee interface conditions fairly or neutrally when competitiveness is not sufficient. When designing a proper policy package for net neutrality, we have to take overall competitiveness and interface conditions among layers into consideration. If the insufficient market dynamism in some layers, or unfair interface among them cause far larger efficiency losses than insufficient neutrality, policymakers should better focus on them. Therefore, discussing net neutrality is the most important when network operators are so powerful that they dominate the entire ecosystem. Now that the increasing popularity of online platforms has come to threaten the long-lasting dominance of network operators, the rank of platform neutrality or search engine neutrality is rising in terms of policy agenda. For example, the Japan Fair Trade Commission issued a study group report[7] on June 6, 2017, and presented its intention to monitor the development of platform dominance. On April 26, 2018, European Commission submitted a proposal for a regulation on promoting fairness and transparency for business users of online platforms (European Commission 2018). Furthermore, in September 2018, the US

[7] https://www.jftc.go.jp/en/pressreleases/yearly-2017/June/170606_files/170606-4.pdf.

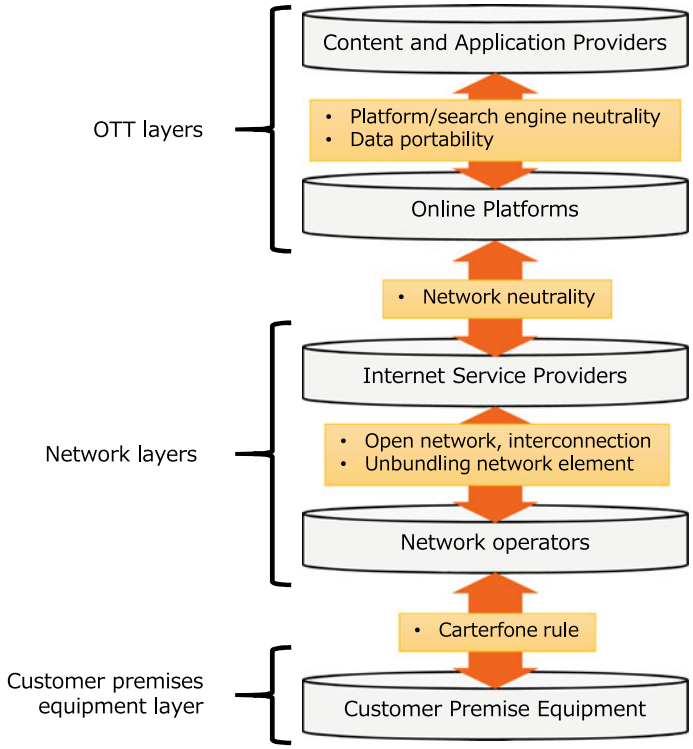


Fig. 9 Broadband ecosystem and interface issues

Federal Trade Commission started a series of hearings on competition and consumer protection in the twenty-first century.[8]

Finally, the above consideration has to be data-driven. Unless empirical studies confirm the existence of efficiency loss in the ecosystem and discover that the lack of network neutrality is the primary reason, it is better for policymakers to refrain from introducing net neutrality packages. Moreover, from the viewpoint of maximum use of competitiveness, in the policy package, improving end users' literacy about the value of neutral networks has to be one of the important components.

Acknowledgements This work was partly supported by JSPS KAKENHI Grant Number JP 16K03630.

[8] https://www.ftc.gov/news-events/press-releases/2018/09/ftc-hearings-competition-consumer-protection-21st-century.

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