Business Models in Participatory Communication Networks:
Open Access Internet and the Concept of Priority

by Yoriko FUJII*

Abstract

This paper proposes the concept of "priority" as a measure of bandwidth preferences and goes on to show that prioritization will benefit the design of business models in current participatory communication networks. Research for this paper is based on the project plan for the WiMAX network developed at the Keio Research Institute at Shonan Fujisawa Campus, Japan. In this paper, network condition is suggested as a ready tool for determining cost sharing on broadband networks, with a view to both recovering investment and operating costs and providing the public with basic communication services at a low charge. Doing so is significant, as it leads to the expansion of network access. The process of creating value across the network is thus accelerated, and the value of the network itself is raised. Specifically, priority pricing will lower the rates for low priority service, and small bandwidth may be allocated to high priority service for private use during peak demand in return for a premium payment. This will generate substantial revenue, which would allow offering Internet access to the public at extremely low rates at ordinary, non-critical times.

1. Introduction

In this paper I will suggest prioritization of bandwidth preferences in the design of business models for open access communication networks and evaluate the effectiveness of priority pricing from two standpoints; that of recouping the cost of investment and running a business, and that of offering basic communication services at a low price.

From here on, I will refer to open access communication networks as "participatory" communication networks. The current prime participatory network, the Internet, is open to all. A range of providers jointly market the network; content

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providers offer content with or without charge, and users add value by providing content that induces other users to make use of and pay for accessing the network. Clearly, maintaining the openness of participatory communication networks is a key factor in boosting value creation. Against this frame of reference, I will focus on the construction and management of open access broadband networks in Japan.

Since the privatization of NTT and the introduction of competition in the Japanese telecommunications market in 1985, promotion of competition has been the chief pillar of Japanese telecommunications policy. Strategies for promoting competition have been quite effective not only in lowering prices of existing services such as traditional fixed-line telephone, but also in promoting new services such as ADSL and FTTH, which enable broadband Internet access. In addition, competition has also been effective in promoting a number of services in various telecommunication layers (i.e., in physical infrastructure, transportation, and applications layers). Competition within and outside these layers has brought us an array of services at low rates, promoted the use of all types of services, and rapidly increased traffic on the Internet. On the other hand, the very increase in the use of communication services has led to severe network congestion, this having the contrary effect of diminishing the motivation of users to access the networks. Making things worse, providers are faced with the difficult challenge of keeping their business running under inexpensive flat-rate pricing[1] for all, while in fact requiring new investments to counter congestion. There is the paradox, then, that expansion of the use of communication services will lead to the decline of communication networks. To resolve this problem and maintain sustainable participatory networks, I propose using the concept of "priority" in demonstrating how to share the cost of networks equitably and efficiently.

Taking a look at a technical aspect, the adoption of IP (Internet Protocol) gave networks versatility in carrying media that historically required proprietary dedicated networks. For instance, video streaming requires a stable network, while web browsing is less sensitive to the network condition. IP-based communication technology also allows a layered division of labor by unbundling various components of the communication infrastructure. All of this has enabled all kinds of companies to offer diverse services and applications and enter the telecommunications market on versatile networks. Naturally, they do so each with its particular preference for bandwidth usage.

From here on, I will use the term priority in the sense of expressing bandwidth preferences. I will propose a mechanism which allows cost sharing at three priority levels (high, middle and low), and then also examine the effect of priority pricing from two standpoints, that of recouping both investment and operating outlays, and that of offering basic communication services to the public at a low rate. Offering minimum communication services at a low rate is significant, as it leads to the expansion of access to the network. As a result, value creation across the network is accelerated, and the value of the network itself is raised. From the present analysis, we can conclude that priority is a useful cost allocation driver for the design of business models for open access broadband networks. More specifically, from two simulations of income and expenditure of participatory networks, we have obtained the following results. First, priority pricing will lower the rates for low priority service. Second, small bandwidth may be allocated to high priority service for private use in an emergency (i.e., amid extreme peak demand) in return for a premium payment. This will generate substantial revenue, which would allow offering Internet access to the public at extremely low charges during ordinary, non-emergency times.

2. Participatory open access communication networks

Let me illustrate the process of creating value in the participatory network in Figure 1. Various entities, constituting supply and demand, participate in this network as value generators.

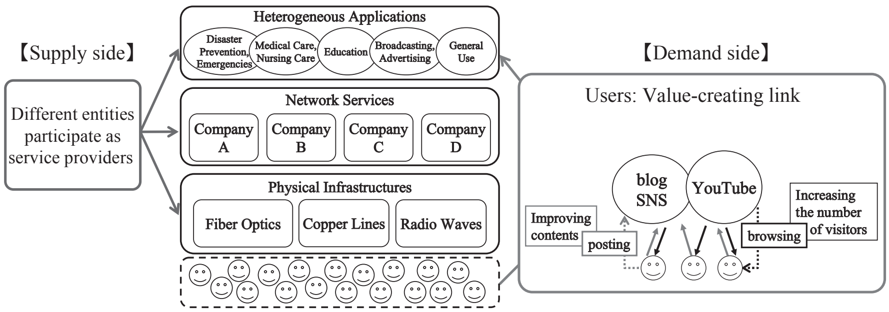

Figure 1: Creating value in participatory networks

As an example, let's take a look at YouTube as shown in Figure 1. A huge amount of videos is posted by users on YouTube[2], the popular video sharing website. These videos increase YouTube's value for both supply and demand side participants. The user benefits from a site that has an ever-growing video file store. For the supplier, on the other hand, a popular site that attracts many viewers has much value as an advertising medium. As is well known, most of the products and services associated with the networking industry exhibit such network externalities. In addition, as Shapiro & Varian [1998] have shown, positive feedback, an extension of the concept of network externality, creates a winner-take-all market in an information economy. Positive feedback seems to well describe the reason why YouTube has become the most popular video sharing website. It should be noted that YouTube, as a platform in itself, does not create any value; it is users who add value through accessing YouTube's video sharing function. However, as mentioned above, there is this contradiction: Imagine peak-time YouTube, with a lot of users flocking to the site to down-load or up-load video files. YouTube servers will become congested, and response times will be falling. Consequently, users will be discouraged from accessing YouTube. Moreover, a rise in YouTube utilization will cause severe congestion not only on servers, but also on networks, with both users and providers experiencing a disadvantage. Users are not likely to appreciate a sluggish Internet, may turn away in droves and thereby significantly blunt value creation. Moreover, users may be considering switching to other providers for a better environment. Clearly, disadvantaged providers will need to rapidly expand their network facilities to forestall diminishing traffic. The requisite investment to do so might however be massive, with providers then having to face the huge task of recouping it in a monthly flat rate Internet access charge. In fact, given progressive price destruction in the telecommunication services, it appears almost hopeless for providers to recover their heavy outlay. To solve this dilemma and share limited bandwidth[3] with a maximum of people remains an important challenge.

3. Sharing bandwidth and the concept of priority

3.1. Sharing bandwidth with heterogeneous applications

Before applying the concept of priority, let's take a look at the current situation of sharing bandwidth with heterogeneous applications, i.e., applications through which service providers furnish particular services. An example might be a medical service provider delivering a remote medial service by way of a remote medical application. Most of the provided services, such as telecommunications, television, remote medical care services, e-government services, and so on, serve through proprietary dedicated networks, each being provided by a different entity for a different purpose and hence having a different preference for bandwidth usage. For example, a remote medical care application requires a stable network as it is rather indispensable in the social context. On the other hand, web browsing is not so sensitive about its network condition as it is less vital in the social framework. Likewise, telecommunications services such as Internet access, remote medical care services and television broadcasting are providing through specific networks associated with particular bandwidth preferences. However, the current system for providing services through proprietary dedicated, inseparable networks contains inefficiencies, especially in overlapping investments for software and hardware. In this area we still find ourselves subject to the traditional vertical legal system, which, for example, mandates the Telecommunications Business Act to direct Telecom business, and the Broadcast Act to control broadcasting business[4]. However, it is becoming technically viable for heterogeneous applications to share bandwidth on a given versatile physical infrastructure.

Sharing in this manner has several advantages. First, sharing bandwidth boosts efficiency on investment, especially in unprofitable rural areas, where private enterprise infrastructure providers find little opportunity to generate business and recover their initial outlay. By sharing bandwidth with a range of applications, providers can avoid overlapping investments and, by consolidating scattered demand for their products, increase utilized capacity. Similarly, positive effects on investments can be generated if urban centers share bandwidth with heterogeneous applications available to the wider region, such as web browsing, television, remote medical care, remote nursing care for elderly people, disaster prevention applications such as community broadcasting systems, remote educational systems, and so on. Consequently, bridging the geographical divide in an efficient way should be regarded as an opportunity for limiting outlays.

Second, sharing bandwidth on versatile physical networks with heterogeneous applications can be seen as a solution to network congestion. Different services on the Internet make different demands on the network. For example, video streaming and VoIP (Voice over Internet Protocol) attach considerable importance to real time action, while downloading files for later use, such as for viewing on the weekend, does much less so and can be done in off-peak time. The point here is that users are prepared to pay for services in accordance with their demands regarding network condition. Therefore, setting prices on a given bandwidth according to network condition required by each application will maximize total revenue. At the same time, bandwidth will be efficiently shared by a number of applications, with the result of congestion being relatively low.

3.2. Priority: criteria for classifying heterogeneity

In this section, I will outline a new approach to cost sharing at different priority levels. Then, in the next chapter, we will see how the concept of priority might be used in determining the price of services.

Let's define the new approach to cost sharing in three steps as follows. Step 1 will summarize relevant features of participatory networks, where bandwidth is shared by heterogeneous applications. Step 2 will propose four types of heterogeneity and show their relationships across the participatory network. Step 3, then, will make the attempt to integrate the four criteria of heterogeneity into the single concept of priority.

Step1: Participatory networks

Figure 2 shows how heterogeneous applications share bandwidth on the participatory network in terms of supply and demand. Institutions, businesses and individuals may at once be providers and users of any type of application; they potentially play both supply and demand roles in "many-to-many" relationships. The situation is markedly different from traditional telephone services where we can neatly distinguish producers on the supply side and customers on the demand side. However, the conventional supply and demand dichotomy can no longer be applied in discussing present day networks, which are characterized by a large number of entities participating in diverse and interrelated ways. Therefore, in order to adequately explore and discuss current networks we need to come up with new analytical tools. I propose to use priority as one such tool as it has the potential to initiate a new analytical framework.

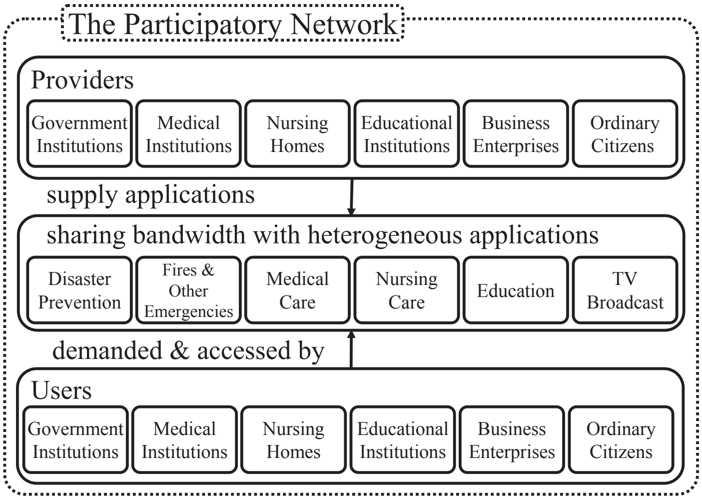

Figure 2: The participatory network

Step 2: Types of heterogeneity and relationships

Heterogeneity of applications across the participatory network can be defined in terms of the following four categories:

(1) Application objective; TV broadcast, medical care, nursing care, education, etc.
(2) Intended user; general public or individuals.
(3) Preference for network condition; expressed as user's willingness to pay in accordance with quality of network.
(4) Connectedness of facilities and legal systems with applications.

Figure 3 shows the relationships between the four types of heterogeneity across the participatory network.

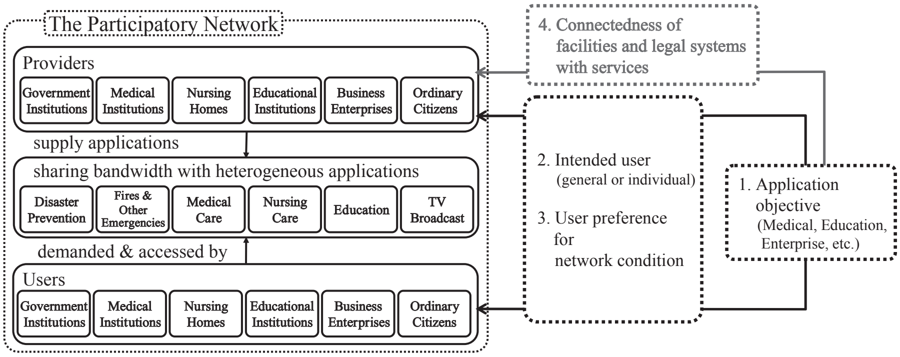

Figure 3: Relationships between the four types of heterogeneity

As shown in Figure 3, application objective incorporates two closely linked aspects, intended user and user preference for network condition. These two aspects affect both the provider and the user; in other words, these criteria affect both supply and demand side. Taking the emergency call as an example, such as by calling “110” or “119” in Japan, the person who dials the emergency number really needs stable network conditions. If the call were to be cut off in the middle, the emergency may well become life threatening. Consequently, there is a strong preference for a stable network condition in the case of such calls, even in a very narrow band. Moreover, the emergency call function is of great social importance. By contrast, looking at video streaming as an example, while people are not so concerned about the network condition, they will express strong demand for broadband. An application, from the user’s viewpoint, may be either of general or private significance. For instance, TV broadcasting enjoys a high degree of social demand while VOD (Video On Demand) meets a rather private demand. In terms, then, of what we have considered thus far, most applications are being provided over a proprietary dedicated network. This situation has its roots in heterogeneity types (1), (2) and (3).

However, it has recently become technically feasible for heterogeneous applications to share bandwidth. This is partly due to the fact that the connectedness of applications with facilities and legal systems has weakened. Kita [1974], in his discussion of factors characterizing natural monopoly in public utility industries, shows that public utility services (both by public and private entities) can only be provided if they are closely connected with existing facilities, this coupling being referred to as the inseparability of facilities and services. For example, providing

TV broadcast and traditional telephone services requires special and rather large-scale facilities. These facilities entail massive investments and large operating outlays. Consequently, the facilities and services are strongly interconnected, or “inseparable.” On the other hand, launching data communications through Internet protocols does not require any special facilities, with IP-based services being freely able to communicate through versatile IP networks. Adoption of IP gave networks the capacity to carry different kinds of media that historically required proprietary dedicated networks. IP-based facilities require less overall expenditure and so attract many providers jointly offering networks and applications. As a result, the connection between facilities and services, or applications, has become weak. In the same way as for facilities and services, tight coupling exists between legal systems and services, such as between the Broadcast Act and TV broadcasting, or between the Telecommunications Business Act and Telecom services. Given technological progress, however, the boundary between broadcasting and Telecom services has tended to become blurred. Consequently, plans for the renewal of vertically integrated legal systems in form of a single law are being discussed in Japan. It follows that the inseparability of legal systems and services is also in the process of being weakened.

Step3: Integrating the four types of heterogeneity into the concept of priority

Let’s return to the participatory network running heterogeneous applications. Intended user and user preference for network condition, both being integral to the application objective, can be merged into the single concept of priority, as shown in Figure 4. Focusing on user preference for network condition, we can say that applications that demand stable network conditions show high priority in communication processing as well. Next, as for intended user, it appears that applications whose objective gives rise to very strong demand for these applications, whether directed at the general public or at private individuals, also attract high priority in communication processing.

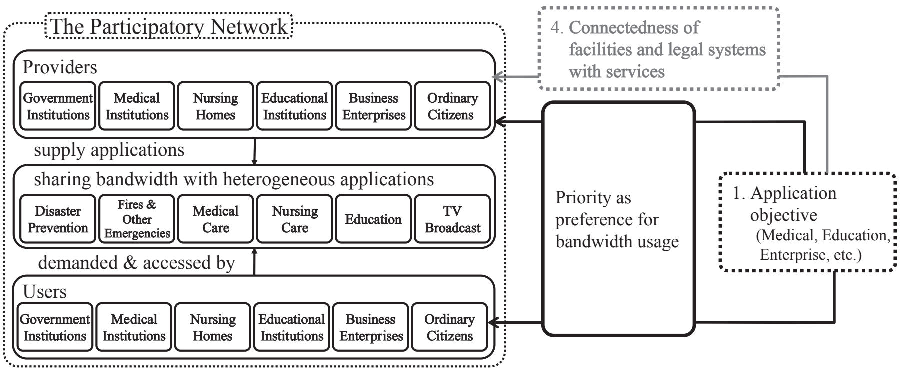

Figure 4: The concept of priority

Now, using the concept of priority as defined, we may go on to determine the cost of sharing broadband networks.

4. Simulations: priority, a cost allocation driver on the participatory network

First, let's see how to use priority as a cost allocation driver. Following that, we will consider how priority may be useful for determining service prices.

4.1. Definition and application of priority

In this paper, priority may be regarded as best-effort priority communication processing, or more specifically as best-effort packet priority handling on the network, and we will see why I consider this concept as a useful tool in the Internet era.

When considering sharing bandwidth with different applications, it seems appropriate to combine emergency and ordinary situations as this enables a more effective use of bandwidth. We should exploit the fact that peak times for demand vary across applications, due to intrinsic differences. For instance, a disaster prevention application such as a community broadcasting system will carry a lot of traffic when a disaster strikes, but experience significantly less traffic during peaceful times. Consequently, this type of application joins the share-ride of bandwidth. In the absence of disasters, the result is a more efficient use of bandwidth as would be the case if the application were provided through a proprietary dedicated network. No doubt, efficient use of bandwidth promotes price reduction, which the concept of priority, as used in this paper, allows us to make a claim for. The point being made here is to enable communication services at the time they are needed by flexibly sharing bandwidth with various other applications in both an emergency and an ordinary situation.

4.2. Participatory network simulations

In this section, I will consider simulations of income and expenditure of participatory networks at three priority levels, high, middle and low. Two simulations were conducted. The purpose of the first simulation was to examine the usefulness of the concept of priority. The aim of the second simulation was to determine what effect the intended user (the general public or individuals) has on income and expenditure under priority communication processing conditions.

I based my trial calculations on the data of the WiMAX project plan developed at the Open Wireless Broadband Platform Laboratory of the Keio Research Institute at Shonan Fujisawa Campus (SFC), Kanagawa Prefecture, Japan.

The project plan envisages WiMAX services throughout Fujisawa City with an initial investment of approximately 860 million yen. Given this figure, I estimated operational cost to come to about 3 billion yen over the term of the simulation. I assumed that 60 percent of families in Fujisawa-city would subscribe to WiMAX, the number of subscribers therefore coming to about 96,000 families. I set the term of the simulation to six years, which is the legal useful life of digital switching facilities such as servers and routers.

4.2.1. Simulation 1: examining the effect of priority

I simulated the income and expenditure of participatory networks at three priority levels, high, middle and low. The point is that, in setting the prices of services, we need to examine the level of priority in relation to price elasticity, as shown in Table 1. Specifically, I assumed that the price elasticity of demand becomes inelastic if the application requires higher priority. Consequently, I set a high price for high priority applications. On the other hand, I assumed that the price elasticity of demand becomes elastic if the application is not sensitive about priority. So I set a low price for low priority applications.

First, let's take a look at the mechanism of sharing the initial cost. In this simulation, cost is shared by the entities that provide and/or use particular types of applications. Applications of the type that are assumed to be used, or to be both provided and used by each entity are shown in Table 2. The initial cost is shared by the entities, which require high priority communication processing in emergency situations, up to the maximum percentage of available bandwidth. Operational cost is shared by entities within the maximum percentage of available bandwidth and depends on the priority levels applying in an ordinary situation. In the ordinary situation, three price levels apply in terms of a flat rate, namely, inexpensive, moderate, and expensive. The price of these services was calculated by multiplying the inverse number of price elasticity of demand by the figure estimated for operational cost shared by entities in accordance with the maximum percentage of available bandwidth. I estimated price elasticity of demand for each entity, i.e., the application user/provider, as shown in Table 3. Next, I assumed the price of low priority service for ordinary citizens in an ordinary situation to be 500 yen per month. Considering that broadband Internet access in Japan costs about 2,000-6,000 yen per month[5], we can say that the price of 500 yen per month is quite reasonable. Finally, I compared the results of the trial calculations using two methods:

(a) with priority as a cost allocation driver;
(b) with an available percentage of bandwidth as a cost allocation driver, but without reference to priority.

Table 1: Cost share mechanisms in Simulation 1

<table>
<tr><th rowspan="2"></th><th rowspan="2">Entity</th><th rowspan="2">Intended user</th><th rowspan="2">Priority level</th><th rowspan="2">Degree of price elasticity of demand</th><th rowspan="2">Maximum % of available bandwidth</th><th colspan="2">Price</th><th rowspan="2"></th></tr>
<tr><th>as an initial cost</th><th>as an operational cost</th></tr>
<tr><td rowspan="4">Emergencies</td><td>Government Institutions & Rescue</td><td rowspan="3">general public</td><td rowspan="3">high</td><td rowspan="3">low</td><td>70%</td><td>70%</td><td rowspan="3">—</td><td rowspan="3">sharing initial cost according to maximum % of available bandwidth in high priority situation</td></tr>
<tr><td>Medical Institutions</td><td>15%</td><td>15%</td></tr>
<tr><td>Nursing Homes</td><td>5%</td><td>5%</td></tr>
<tr><td>Ordinary Citizens</td><td>individual</td><td>low</td><td>—</td><td>10%</td><td>—</td><td>—</td><td></td></tr>
<tr><td rowspan="6">Ordinary times</td><td>Fire Departments & Rescue</td><td rowspan="4">general public</td><td>high</td><td>low</td><td>1%</td><td>—</td><td>Flat rate: expensive</td><td rowspan="6">sharing operational cost according to maximum % of prioritized available bandwidth</td></tr>
<tr><td>Medical Institutions</td><td rowspan="4">middle</td><td>middle</td><td>15%</td><td rowspan="4">—</td><td rowspan="4">Flat rate: moderate</td></tr>
<tr><td>Nursing Homes</td><td>middle</td><td>15%</td></tr>
<tr><td>Educational Institutions</td><td>middle</td><td>10%</td></tr>
<tr><td>Business Enterprises</td><td rowspan="2">individual</td><td>middle</td><td>10%</td></tr>
<tr><td>Ordinary Citizens</td><td>low</td><td>high</td><td>49%</td><td>—</td><td>Flat rate: inexpensive</td></tr>
</table>

Table 2: Types of applications used, or provided and used by each entity

<table>
<tr><th></th><th>Entity</th><th>Types of applications provided & used</th><th>Intended user</th><th>Priority level</th></tr>
<tr><td rowspan="4">Emergencies</td><td>Government Institutions & Rescue</td><td>disaster-relief activities, fire-fighting operations, lifesaving activities</td><td rowspan="3">general public</td><td rowspan="3">high</td></tr>
<tr><td>Medical Institutions</td><td>emergency medical care</td></tr>
<tr><td>Nursing Homes</td><td>remote nursing care</td></tr>
<tr><td>Ordinary Citizens</td><td>confirmation of safety of relatives</td><td>individual</td><td>low</td></tr>
<tr><td rowspan="6">Ordinary times</td><td>Fire Departments & Rescue</td><td>emergency call (110, 119)</td><td rowspan="4">general public</td><td>high</td></tr>
<tr><td>Medical Institutions</td><td>remote medical care, electronic health record</td><td rowspan="4">middle</td></tr>
<tr><td>Nursing Homes</td><td>remote nursing care</td></tr>
<tr><td>Educational Institutions</td><td>distance learning</td></tr>
<tr><td>Business Enterprises</td><td>advertisement, promotion and marketing</td><td rowspan="2">individual</td></tr>
<tr><td>Ordinary Citizens</td><td>web browsing, video streaming, e-mail, etc.</td><td>low</td></tr>
</table>

Table 3: Assumed value of price elasticity of demand

	Entity	Priority level	Degree of price elasticity of demand	Assumed value of price elasticity of demand
Ordinary times	Fire Departments & Rescue	high	low	0.1
	Medical Institutions	middle	middle	0.3
	Nursing Homes		middle	0.4
	Educational Institutions		middle	0.5
	Business Enterprises		middle	0.5

Let's briefly examine the results of the trial calculations. Using method (a), the cumulative surplus at the end of the sixth year was approximately 1.28 billion yen. Again under method (a), if we offer the low priority service for ordinary citizens in normal situations for free, we still remain with approximately 1 billion yen of cumulative surplus. As a result, we can achieve both recouping the initial investment and reducing the price of low priority services. As can be seen, it is possible to offer the low priority service to the public at no charge. By contrast, using method (b), the cumulated deficit at the end of the sixth year ran to approximately 1.22 billion yen.

Comparing the results from methods (a) and (b), we can say that "priority" is a useful cost allocation driver. In terms of construction and management of network infrastructure, prioritized pricing has a significant effect on income. As a result, it would be quite feasible to offer the public user Internet access at an extremely low rate.

Medium priority applications also have a notable effect on income in terms of reducing the price of low priority services. Before making the trial calculations, I anticipated that high priority services would decrease low priority service prices as well. However, results did not agree with my expectations and the effect of medium priority applications on income was rather significant. In other words, high priority applications are less effective in reducing the price of low priority services than might be assumed.

4.2.2. Simulation 2: examining the effect of the type of user being targeted

The aim of this simulation was to come up with an answer to this question: what will be the effect of targeting private individuals with high priority demands - as opposed to general users with low priority demands - on income and expenditure under priority communication processing conditions? The cost share mechanism in simulation 2 is shown in Table 4. The high priority service for private purposes in an emergency situation, as shown in Table 4, has been added to Table 1, as indicated by the heavy-line rectangle. Let’s call it “egotistic” communication services. Here is an example of egotistic communication services. Suppose a large earthquake occurs and someone at a remote location has a strong desire (i.e., demand) to confirm the safety of his or her pets. This demand is of the private use type and requires high priority even though the available bandwidth is quite narrow. In simulation 2, making a trial calculation using the same assumptions as for price elasticity of demand in each entity shown in Table 3, the price of the low priority service for ordinary citizens in a normal situation also comes to 500 yen per month, just as for simulation 1. I compared the results of the trial calculations for income and expenditure in the following cases where:

(c) the egotistic communication service is provided in an emergency situation
(d) the egotistic communication service is not provided in an emergency situation (same as simulation 1, case (a))

Table 4: Cost sharing mechanism in simulation 2

<table>
<tr><th rowspan="2"></th><th rowspan="2">Entity</th><th rowspan="2">Intended user</th><th rowspan="2">Priority level</th><th rowspan="2">Degree of price elasticity of demand</th><th rowspan="2">Maximum % of available bandwidth</th><th colspan="2">Price</th></tr>
<tr><th>as an initial cost</th><th>as an operational cost</th></tr>
<tr><td rowspan="5">Emergencies</td><td>Government Institutions & Rescue</td><td rowspan="3">general public</td><td rowspan="3">high</td><td rowspan="3">low</td><td>70%</td><td>70%</td><td rowspan="3">—</td></tr>
<tr><td>Medical Institutions</td><td>15%</td><td>15%</td></tr>
<tr><td>Nursing Homes</td><td>5%</td><td>5%</td></tr>
<tr><td rowspan="2">Ordinary Citizens</td><td rowspan="2">individual</td><td>high</td><td>low</td><td>1%</td><td>1%</td><td>—</td></tr>
<tr><td>low</td><td>—</td><td>9%</td><td>—</td><td>—</td></tr>
<tr><td rowspan="6">Ordinary times</td><td>Fire Departments & Rescue</td><td rowspan="4">general public</td><td>high</td><td>low</td><td>1%</td><td>—</td><td>Flat rate: expensive</td></tr>
<tr><td>Medical Institutions</td><td rowspan="4">middle</td><td>middle</td><td>15%</td><td rowspan="4">—</td><td rowspan="4">Flat rate: moderate</td></tr>
<tr><td>Nursing Homes</td><td>middle</td><td>15%</td></tr>
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<tr><td>Business Enterprises</td><td rowspan="2">individual</td><td>middle</td><td>10%</td></tr>
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</table>

Sharing initial cost according to maximum % of available bandwidth in high priority situation

Sharing operational cost according to maximum % of prioritized available bandwidth

Let’s summarize the results of these calculations. In case (c), the cumulative surplus at the end of the sixth year was approximately 1.29 billion yen. By contrast, in case (d), the aggregate surplus at the end of the sixth year came to approximately 1.28 billion yen. Though the additional surplus in (c) may appear slight at approximately 9 million yen over the entire period, when we see that it is the result of only one percent of bandwidth allowed for the egotistic communication service, we must conclude that “egotistic” communication services are highly significant in generating increased revenue.

5. Conclusion

From the analysis of present research, we can conclude that priority is a useful cost allocation driver for the design of business models for open access communication networks. Two important results were obtained in the simulations. First, medium priority applications turn out to be significant in terms of their positive effect on revenue. As we have seen, medium priority applications will lower the prices of low priority services. Second, a small portion of bandwidth for high priority services may be allocated to private users in an emergency situation (i.e., amid extreme peak demand) in return for a premium payment. This could generate considerable revenue. Therefore, allocating a small portion of high priority services to private users in an emergency situation would be significant in that it allows offering Internet access to the public at extremely low rates. While it is easy enough to know the negative aspect of egotistic demand in the usual sense, through our research we were able to establish its commercially beneficial aspect.

The research outcome is useful not only when considering issues in the construction and management of open access communication networks such as network neutrality - who pays for the network, and what kind of criteria are used to determine the fee - but also with regard to the heated debate surrounding the use of the Internet for the retransmission of television broadcasts.

NOTES

1. This issue is discussed in many countries as “network neutrality.”
2. http://www.youtube.com/
3. In this paper, I use the word “bandwidth” in the sense of bit rate.
4. In Japan, renewing the legal system to suit the media convergence era is under consideration.
5. Prices differ among the various types of access lines and bandwidth. The URLs below may serve as examples:
   http://www.ocn.ne.jp/hikari/
   http://www.ocn.ne.jp/adsl/
   http://www.ocn.ne.jp/mobile/

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