Protect Network Neutrality against Intellectual Property Rights : a legal and social network perspective

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出版情報：International Proceedings of Economics Development and Research. 42, pp.7-11, 2012-06-30. 2012 International Conference on Knowledge, Culture and Society (Jeju Island, South Korea)

Protect Network Neutrality against Intellectual Property Rights
A Legal and Social Network Perspective

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Abstract. The ideal communication network in a democratic and equal society is represented by a complete graph. The telecommunications network is the essential infrastructure that is bringing our communication network very close to a complete graph. We have faced repeated attempts by intellectual property rights holders and their advocates to intervene in the neutrality of the telecommunications network. However, it is essential to protect the neutrality of the telecommunications network from both a legal and social network perspective.

Keywords: Internet, Neutrality, Intellectual Property Rights, Social Network

1. Introduction

On January 18, 2012, English Wikipedia initiated a "service blackout" in protest against the SOPA (Stop Online Piracy Act) and the PIPA (Protect IP Act). The advocates for strong intellectual property rights ("IP rights") protection insist that intervening in the major Internet players is essential to protect IP rights. On the other hand, advocates for the freedom of speech insist that the neutrality of the Internet is critical to our democratic and equal society. In light of these crucial debates, we should pay most attention to the decision of the Supreme Court of Japan on December 19, 2011, which found the developer of Peer-to-Peer communication software "Winny" not guilty—emphasizing the neutrality of the telecommunications technology—although Winny had been widely used to exchange copyright-infringing audio and visual files (Heisei-21(a)1900).

Our democratic and equal society is maintained by free communication among its members. In the most ideal form of communication network, each actor has direct communication with another. Such a network is represented by a complete graph. In a large-scale society, it is sometimes unrealistic to establish and maintain a dense communication network. However, if the Internet is neutral, a communication network might be realized that is very close to a complete graph.

Admittedly, intervention in the hub of a communication network is one of the most efficient ways to protect IP rights. However, intervention in the neutrality of the telecommunications network is likely to severely harm the infrastructure enabling the global dissemination of information and creative works, and conflict with the primary goal of IP rights. Protection of network neutrality is justified even against the exercise of IP rights.

2. Function of IP rights

It is obvious that wider dissemination of information and creative works (or, goods or services which implement creative works, such as books, music CDs, e-bookstores, e-music store, etc.) contribute to and increase social welfare. However, IP rights such as copyrights and patent rights give the right holder the power to prevent dissemination of creative works. (For example, *see* Articles 21 to 27 of the Copyright Act

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of Japan, and Article 68 and Article 2 of the Patent Act of Japan, the English translations of both acts are available at <http://www.japaneselawtranslation.go.jp/?re=02>. *See* also the Berne Convention for the Protection of Literary and Artistic Works, and the Paris Convention for the Protection of Industrial Property.). Therefore, IP rights appear contrary to social welfare and, accordingly, there is a great attempt to reorganize IP rights as the rights to access information (Efroni, 2011). However, it is possible to prove that IP rights promote social welfare under certain circumstances, applying the method of social network analysis (Teramoto, 2010). (The concepts and tools used herein are based on those of social network analysis （Scott, 2000）

Assume the following conditions: (i) both of $actor_{M1}$ and $actor_{M2}$ intend to distribute products that implement a new creative work ("*W*"); (ii) there are actors who want to access the benefit from *W*, and they are represented by $actor_R$; and (iii) the quality, quantity, price and any other conditions of the products do not differ whether they are distributed by $actor_{M1}$ or $actor_{M2}$. The relationship between $actor_{M1}$, $actor_{M2}$, and $actor_R$ is represented by the simple network in Fig. 1. In this network, the paths that enable $actor_R$ to access the benefit of *W* are $Path_{R,M1}$ and $Path_{R,M2}$. The capacity of $Path_{R,Mi}$ ($i \in \{1,2\}$) can be represented by the probability that the path exists ("$P_{R,Mi}$"). The volume of products available to $actor_R$ can be represented by $P_{R,M1} + P_{R,M2}$. The degree of separation between $actor_R$ and $actor_{Mi}$ ("$length_{R,Mi}$") can be represented by $1/P_{R,Mi}$ (if $P_{R,Mi} = 1$, $length_{R,Mi} = 1$ because $actor_R$ can reach $actor_{Mi}$ with one degree of separation; and *if* $P_{R,Mi} = 0$, their separation is infinite because $actor_R$ can never reach $actor_{Mi}$). Several works on social network analysis of information flow assumes that the length of a path influences the transmission and receipt of information (Bavelas, 1950; Borgatti, 2005; Freeman, 1978/79; Freeman, 2011). According to this idea, the accessibility of the benefit from *W* can be represented by $min(length_{R,M1}, length_{R,M2})$ ("$distance_{R,M}$"). In order to maximize the probability that $actor_R$ benefits from *W*, it is natural to maximize the total capacity of $Path_{R,M1}$ and $Path_{R,M2}$ by increasing both the probability that $Path_{R,M1}$ exists ("$P_{R,M1}$") and the probability that $Path_{R,M2}$ exists ("$P_{R,M2}$"). In this way, $length_{R,M1}$ and $length_{R,M2}$ are also minimized.

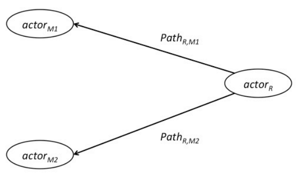

Fig. 1: The relationship between $actor_{M1}$, $actor_{M2}$ and $actor_R$.

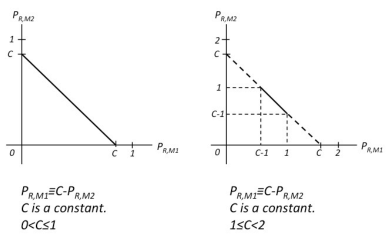

Fig. 2: The negative correlation between $P_{R,M1}$ and $P_{R,M2}$.

However, under certain circumstances, $P_{R,M1}$ and $P_{R,M2}$ have a negative correlation (Fig. 2). This can happen if the demand of $actor_R$ is not adequately large enough to give both $actor_{M1}$ and $actor_{M2}$ sufficient profit-earning opportunities. Under such circumstances, the total capacity of $Path_{R,M1}$ and $Path_{R,M2}$ remains *C* ($=P_{R,M1} + P_{R,M2}$); accordingly, we cannot improve $actor_R$'s access to the benefit from *W* by increasing path capacity. The remaining way to improve such access is to minimize $distance_{R,M}$. If $P_{R,M1} > P_{R,M2}$, we can reduce $distance_{R,M}$ by further reducing $P_{R,M2}$; if $P_{R,M1} < P_{R,M2}$, we can reduce $distance_{R,M}$ by further reducing $P_{R,M1}$; and if $P_{R,M1} = P_{R,M2}$, we can reduce $distance_{R,M}$ by reducing either $P_{R,M1}$ or $P_{R,M2}$ (Fig. 3). If $actor_{M1}$ has the IP rights to *W*, and enforces the rights, $P_{R,M2}$ is reduced; if $actor_{M2}$ has the IP rights to *W*, and enforces the rights, $P_{R,M1}$ is reduced. This simulation suggests that IP rights can promote social benefit by improving our accessibility to creative works, but under limited circumstances in which IP rights can reduce the distance between the receiver and the disseminator of the benefit from a creative work. In consideration of this suggestion, in order to assess the adequacy of a moderate or aggressive degree of IP rights enforcement, the author focuses on whether the enforcement of IP rights can reduce the distance.

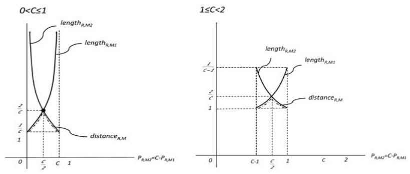

Fig. 3: Increase and decrease of $distance_{R,M}$.

3. A Neutral Telecommunications Network Enables Better Communication

3.1. A Small-World Network

In a society without telecommunications services, almost all communication is considered limited to person-to-person communication in any geographical vicinity. Assuming that every actor in a society can be a creator, a beneficiary of a creative work by others, and also an intermediary between a creator and a beneficiary, an example of such society can be represented by the left graph in Fig. 4 (Each of $actor_{1,2,3,\ldots 16}$ directly communicate with other four actors in its vicinity. Because communication between each pair of actors is deemed both-directed, the graph omits the direction of the edge connecting each pair of actors). The average distance (namely, the average of the distances between each pair of actors) of this network is *2.4*.

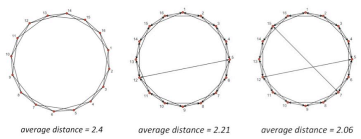

Fig. 4: Shortcuts reduce the average distance.

It is well known as a "small-world network" that even one shortcut connecting an arbitrarily chosen pair of actors reduces the average distance (Watts & Strogatz, 1998; Watts, 1999). For example, a shortcut between $actor_5$ and $actor_{12}$ reduces the average distance to *2.21*. Such shortcuts are found everywhere, and it is the reason why we often see a "small world" phenomenon (Barabási, 2003; Watts, 2003). If we add another shortcut that connects $actor_7$ and $actor_{15}$, the average distance is reduced to *2.06* (Fig. 4). Because IP rights obstruct the arbitrary connection of shortcuts, IP rights are likely to resist average distance reduction.

3.2. A Complete Graph vs. A Star Network

The simulation above suggests the way in which we can minimize the average distance of a communication network. By connecting each pair of actors directly by a shortcut, we can reduce the average distance to *1*, the minimum possible value. Such a network is represented by a complete graph (*i.e.*, a graph in which every pair of nodes are connected directly (Wilson, 2010)) shown in the left of Fig. 5. A complete graph network seems ideal because it is able to convey information created by each actor to every other actor with the minimum degree of separation. However, establishing a complete graph network is not realistic in a large-scale society with numberless actors. It costs too much for the respective actors to identify a counter party and establish a shortcut with him/her.

In reality, we often see a star network, of which the hub is an enterprise (a publisher, a record label, a film distribution company, etc.) which distributes goods or services implementing creative works. A star network seems to be a better (even if not the best) solution because it can connect the information originator and the information receiver with two degrees of separation.). However, the hub actors are not usually neutral because they choose works that are likely to give them profit. There is probably a certain degree of difference between choice by respective hub actors. Still, however, many creative works are neglected. Therefore, a star network is not an ideal solution to disseminate as much information as possible to society. The right graph of Fig. 5 shows a star network in which only the works of $actor_1$, $actor_7$, and $actor_{12}$ are distributed by hub actors ($actor_{17}$, $actor_{18}$, and $actor_{19}$). Because the dissemination of information is heavily dependent on the hub actor in a star network, a party who control the hub actor gains a good chance to control the flow of information (Burt, 1988). Accordingly, it is natural for the IP rights holders to seek control of the hub actor to protect their interests.

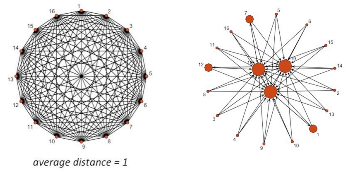

Fig. 5: A complete graph, and a star network.

3.3. A Neutral Telecommunications Network

Assume that there is a neutral actor who intermediates communication between each pair of actors, and the neutral intermediating actor can quickly receive and re-transmit information originated by each actor to every other actor without filtering or modification, and at low cost. The graph representing such communication network also looks like a star network (Fig. 6). However, each pair of actors is guaranteed to connect with every other actor with only *two* degrees of separation. Moreover, in light of the neutral nature of the hub actor of this network, the degree of separation of each pair of actors can be deemed very close to *1*. Because the cost of using such a neutral intermediating actor is minimum (very close to *0*), many actors tend to use such an actor even when communicating with actors in their vicinity (*e.g.*, e-mails, chat, etc.). If the hub of this communication network is designed to transmit such communication in the vicinity to remote actors simultaneously, the global dissemination of information and creative works is strongly promoted (*e.g.*, Social Network Services such as Facebook, Twitter, etc.). Such a neutral telecommunications network substantially realizes a communication network that is very close to the ideal network represented by a complete graph. It should also be noted that this is not a dream, but a reality based on the development of cloud computing technologies.

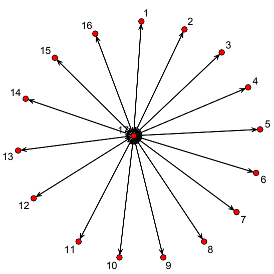

Fig. 6: A network with a neutral intermediating actor ($actor_{17}$).

The geometric position of the hub of a neutral telecommunications network is almost identical to the position of the hub of a star network. Naturally, those who seek effective protection of the interests of IP rights holders expect that they will intervene in the neutral hub's activity. However, intervention in the neutral activities of the hub actor should be prevented because it will severely damage the neutral network that is essential to the dissemination of information in our society.

4. Conclusion

A simple analysis of graphs representing several forms of communication networks suggests the essential role of neutral telecommunications networks. This analysis justifies the opinion of the Supreme Court of Japan that ruled against IP rights intervention in the neutrality of telecommunications technologies.

5. Acknowledgements

In preparing this work, I benefitted greatly from discussions with Professor Nobuhiro Nakayama (professor emeritus at the University of Tokyo), Dr. Yusho Ishikawa (project professor at the University of Tokyo), and Associate Professor Ryu Kojima (Kyushu University).

I am also much obliged for the financial support by J-Mac System, Inc. (Sapporo), Linux Professional Institute Japan N.P.O. (Tokyo), and YJS Co., Ltd. (Osaka).

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