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Governing Network Neutrality: Public Perception and Policy Capacity

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Abstract

Beyond technical matters, the network neutrality debate is closely tied to social, political, and economic debate over networks and the duties and the rights of various stakeholders. The study contextualizes the issue in terms of policy, innovation, values, and the society of Korean context. Focusing on user perspective, it analyzes the policy effectiveness of current network neutrality by analyzing user perception. A model is proposed to empirically test the policy effectiveness by incorporating factors representing network neutrality. The factors are drawn from the belief of people's perceived concepts on network neutrality. The findings show that while competition and regulation are the two main factors constituting network neutrality, both factors influence the formation of attitude toward policy effectiveness differently. Policy and managerial implications are discussed based on the model. Overall, this study provides in-depth analysis and heuristic data on the user drivers, industry dynamics, and policy implication within the network neutrality ecosystem.

Keywords: Network neutrality; Policy capacity; Korea; User-centered policy analysis

1. Introduction

By the advance of mobile broadband networks, network neutrality principle (NN) has been challenged in many parts of the world and demand for new traffic management rules have grown ever stronger. One of the most connected nations in the world, South Korea, is in the midst of a heated debate on NN. In June, 2012, 'Kakao Talk', a new Korean mobile VoIP was released in the Korean domestic mobile market. This service was developed by Korean start-up KaKao which operates the nation's most popular mobile messenger application. Subsequently, Korean telecommunication companies, including Korea Telecom and SK Telecom, launched attacks on Voice Talk, claiming that it will substantially degrade the quality of their data network services. They even said that this new innovation will not only threaten their telecom infrastructure but the public interest. Conflict between these telecom firms and Internet providers led to government intervention.

This incident concern NN, which is a hotly debated issue subject to regulatory and judicial contention among network users and access providers (Kim, 2012). In fact, the NN debate has emerged over the last several years, but the intensity of the debate has elevated discussion to the political level, where competing conflicts of interests are difficult to resolve. Against the heated debate over NN, Korea is struggling with the rising debate as there has been no consistent framework established yet. For example, in response to Kakao's incidence, the Korea Communications Commission (KCC) made a rule that the authorities have come up with a basic guideline for reasonable network management. However, this new rule would allow Korean telcos to discriminate against not only mVoIP, such as Voice Talk, but also Peer to Peer (P2P) technology that has been widely used in Korea for online broadcasting and downloading software patches. Like this example, until now, the government has not addressed the issue well,

foreshadowing more hurdles with the emergence of NN. This anomie has rendered chaos and confusion among stakeholders, where there has been ongoing debate but deepening the gap among them. In the ongoing struggles, it is imperative for Korea to clarify the issues and resolve possible conflicts before NN is fully applied.

In light of this ongoing turmoil and uncertainty, this study proposes a conceptual model of NN drawing data from different stakeholder groups. Unlike previous studies, which have mainly focused on macro issues, NN issues are closely investigated in this study from perspective and perception of the people. Against its intensifying growth and importance, NN has not yet captured public participation and public understanding. This is likely reflective of the lack of public awareness as well as the way that both the concept and the policy are conceptualized and discussed (Quail & Larabie, 2010). The degree to which and nature of the way NN theory and policy is addressed, and the way the public understands the issue, is significantly under-examined in current scholarly research as well as social discussion in reality (Shin & Han, 2012; Strover, 2010). Realizing the area, the goal of this study is to focus on user perception and attitude towards NN to conceptualize user-based policy approach.

This goal is nicely aligned with recent approaches in policy research. As Mazzoni, Castaldi and Addeo (2007) argue, policies formulated by government should be based on the customer's perspective, i.e., how consumers feel about NN policy, what current stakeholders' believe about the issue in specific contexts, and what the impact of NN will be. Similarly, Cecere and Corrocher (2012) argue that telecom strategies should be grounded in consumers' behavior in regards to the new services. This line of discussion is consistent with user-centered policy design and evaluation (e.g., Jaeger, 2008; Wellstead, Stedman, & Howlett, 2011). Jaeger (2008) argues that the user-centered approach offers a vital way to discover insights where conflicting interests are tangled. As technologies advance, complexity soars, and understanding the intricacies of how

different stakeholders interact is a key concern. As Cheng et al (2012) argue, it is important to investigate how different stakeholders perceive value, how their beliefs are formed and developed, what cognitive perceptions are embedded in the issue, and what factors determine consumers' attitudes toward NN. The following research questions guide this study:

RQ1: What are the factors influencing the acceptance of NN? What are the components of NN that people recognize?

RQ2: How do different stakeholders perceive the NN issue and what are the values underlying their perception?

RQ3: How to conceptualize user-centered policy or value-centered approach in policy formulation?

Through the questions, the eventual objective of this study is to draw implications for managerial and policy issues based on the factors and the model identified. This model has the ability to reveal underlying factors that are critical to NN acceptance, which will in turn be instrumental to managerial and policy issues. The dissected factors of NN not only reveal how the factors are related each other, but also how they are helpful in understanding the process of how a user's intention to adopt NN is formed and developed. In this light, the new model represents an improvement over previous policy research since it integrates users' cognitive variables and perceptual values as primary factors. Previous studies on policy analysis have often been criticized for their lack of context-specific understanding (Cheng et al., 2012; Shin & Han, 2012; Wellstead et al., 2011), which leads to an evaluation model with low explanatory power. Thus, by incorporating NN-specific factors into an adoption model, it can better explain how the

NN issue is accepted at an individual level, how it turns into practical idea in market, and how it eventually penetrates into society. The model, composed of people's values, would show a connection to value-centered policy approach (Cheng et al., 2012) in telecom area.

From a practical standpoint, the findings of this study can be used to both guide regulators in achieving an effective policy in order to facilitate diffusion and direct industry in selecting more effective strategies regarding NN. Regulators such as KCC have struggled to devise an effective policy model with regards to the introduction of NN. Likewise, industry is facing the challenge of how to deal with a new competitive market with the emergence of NN. With a better understanding of how diverse factors will impact adoption and diffusion, industry can obtain the insights they need to plan their NN strategies. The results of this study represent a set of guidelines to help the relevant industry better understand how people develop their perceptions of NN and how different factors affect people's perspective on NN.

2. Literature review

2.1. User-centered approach to net neutrality

NN, although widely accepted, is a term that has not reached a clear definition (Strover, 2010). Though most of the NN debates regard network interconnection, access and discrimination, there is no clear-cut division between what is neutral and what is not. Thus, scholars from a diverse range of backgrounds have addressed concerns surrounding NN with different approaches. Since Wu (2003) raised the issue, legal approach has dominated the NN discussion such as Philip Weiser and Kai Zhu. Law scholars have examined NN issues focusing on the politics, policies and practices of network management (Blevins & Shade, 2010).

On the other hand, NN has been researched by a group of economists who have attempted to find solutions through economic modeling. Schewick (2006) and Peha (2007) evaluate the NN issues with economic modeling and pricing analysis. Also, Economides and Tag (2012) analyze NN from an economic approach with a two-sided market analysis. Similarly, Cheng, Bandyopadhyay and Guo (2011) suggest an economic model, which involves financial arrangement between content providers and ISPs. Based on the model, they argue that abolishing NN provision will benefit ISPs and hurt content providers.

There is another way of understanding the NN issue from the perspective of public policy. Until the U.S. Supreme Court ruled that the digital subscriber line and cable modem services do not belong to the telecom services but are categorized as information services, Internet connection services applied general rules of common carrier service (Strover, 2010). Afterwards, the Supreme Court declared that content and application service providers could no longer depend on the common carrier regulation on guaranteed delivery of contents and application to the other end of the network. Several researchers have pointed out the public utility characteristics of NN from the perspective of public interest (Wilson, 2008; Zhu, 2007; Atkinson & Weiser, 2006).

Often, technical solutions of NN have been focused on resolving network conflicts. Zhu (2007) reviewed the technical aspects of NN and argued that some of the issues should be viewed from a technological standpoint. Similarly, Yoo (2010) claims that illegal NN regulations in some countries, i.e. ISP requirement on traffic management and regulations on illegal activities, cannot reflect the technological evolution of the Internet. In this light, he raises the need for traffic and congestion management from a technical perspective.

While there are various approaches toward NN, no approach is perfect and every approach has its pros and cons. This study argues that the discussion should be centered on user interests as public users should be the eventual beneficiary. In this light of importance, this study approaches NN from a people's perspective, also known as, user-centered policy design or user-centered policy evaluation (Jaeger, 2008). According to Jaeger and Bertot (2010), policy design should be profoundly based on user perspective and its evaluation should be done by users. Such evaluations can increase policy capacity by involving people who often left out of the policy-making process. As the convergence of ICTs has drastically changed the ICT environment, the evaluation of the networked environment has grown increasingly important. User-centered evaluation can play both a formative role, helping to continually refine and update policies, and a summative role, helping ascertain whether policy goals and objectives are being met (Thompson, McClure, & Jaeger, 2003). Given the public nature and the magnitude of NN, it is necessary to consider this spirit of user-centeredness. This perspective is even more needed when things are much more complicated as in the case regarding Korea.

2.2. Why is contextualizing net neutrality important?

NN arguments are often couched in rather theoretical terms, and ordinary people cannot really see what all the debate is about. This difficulty poses a challenge on how to contextualize NN in a particular local environment where the concept is applied into everyday lives. NN conditions differ depending on nation and region. For example, the condition of competition in telecom market in Korea differs from European market. For making proper policies for each case, it is necessary to figure out the concise situation of NN in each country.

Throughout the world, NN has been generally accepted that all packets transmitted over the public internet be treated equally, regardless of source, ownership, content, or destination

(Scott, Cooper, & Kenney, 2006). In the Korean context, NN has been discussed mostly within the frame of conflicting values between public interest and competition policy. Traditionally, as much of the Korean economy has been driven by the Chaebol structure (business-government collusion), the debate of NN has sparked the issue of how to create an industry structure that ensures public interest as well as enhances competition. With these two principles in focus, the Korean discussion has focused on the fact that those who own the networks do not control the content that runs over them. In Korea, as a major part of the NN debate confronts the concentration of ownership within the broadband industry, distinguishing between network owners and the flow of information is a key component to ensure that the network is neutral. NN debates in Korea thus concern an issue beyond network sharing; it implicates complicated issues such as industry structure, social justice, and economic equality. This type of debate in Korea is similar to Anderson's (2009) discussion that emphasizes how NN is rooted in common carriage, a concept that has historically governed telecommunications in Korea. In the context of the Internet, the idea of common carriage requires that "Internet service providers not discriminate – including speed up or slowing down Web content – based on its source, ownership, or destination" (Anderson, 2009, p. 8). Due to the unique nature of the Korean industry structure, the NN issue has been more contentious and controversial compared to those of other countries. It is certain that the debate over NN in Korea will proceed differently than it has in other countries, partly because of cultural differences and partly because Korea already possesses one of the world's most extensive digital networks. In sum, the NN issue in Korea is beyond the matter regarding another type of mandatory network sharing; it is about how to create a sustainable IT ecology in Korea.

2.3. Progress toward network neutrality in Korea

Korea is one of the world's most-wired societies with over 93 percent of its population of 50 million Internet literate. Amid explosive demand for data-intensive devices such as tablets, smartphones and Internet-enabled TVs, tensions are escalating between the nation's major telecom companies and manufacturers over NN.

As the network and the Internet are increasingly becoming the dominant platform, NN has been considered as the basis of a fair competitive market and the basis of democracy in Korea. In particular, Korean network industries traditionally have been protected by the government. That is, they have been birthed and handled by government protection, artificial market dominance and a market segment that has an inelastic demand for their services. In response to the walled garden of the Korean industry, NN has emerged as an alternative paradigm to bring healthy and effective competition into the oligopoly market (Kim, 2011).

The KCC's dilemma is also a result of the political economy of Korea's telecom industry. After years of working with the industry to promote network investment, the government is closely implicated in the industry's profits. The KCC does not want to eliminate the consumer benefits of network services, but the only alternative would lead to the erosion of operators' voice revenues and a major rebalancing of pricing towards data. This would threaten both the investment framework and service affordability.

So far KCC has not announced any official position for NN policy. KCC has been extremely cautious trying to avoid hasty commitments whenever asked to express its opinion towards NN (Kim, 2012). This was probably because they knew how immense the effects this issue would potentially have on the future of Korea's communications industry in the long term, if not in the short term.

The current Telecommunications Business Act (TBA) in Korea regulates unfair competition of telecommunication companies, or infringement of consumer's rights. Article 3 of the TBA states that "a telecommunications carrier shall not refuse to provide any telecommunications service, without any justifiable reason." In regard to licensing common carriers, Article 5 allows to "attach the conditions necessary for the promotion of fair competition, protection of users, improvement of service quality, and efficient use of information and communications resources." Under the TBA, the articles indicate that the domestic legislative system has partially adopted the principle of NN.

Over recent years, NN had suddenly turned from an important but long-term issue to an urgent current issue. It led to the operation of the Network Neutrality Forum hosted by KISDI (Korea Information Society Development Institute) and supported by KCC. This forum was the first case in Korea officially publicizing the NN issue. Through the forum, various opinions and perspectives have been gathered and reflected in the formulation of the policy. The forum consisted of members from various backgrounds and interests, including the professors of law, economics, engineering, and the executives of telcos and on-line service providers as well as the experts from KISDI and KCC (Kim, 2012). Spurred by the forum, the Korean National Assembly is preparing to address NN in the near future as the debate begins to intensify. The new NN bill is garnering more attention in the public sphere than previous legislation attempts and could signal a new battle between NN proponents and opponents.

3. Model development

A model is created to test the model of NN policy. Building upon the findings of

previous research (Chen et al., 2012; Shin & Han, 2012; Shrimali, 2008; Strover, 2010; Wallsten & Hausladen, 2009), a baseline model was identified, which is composed of three clustered components – antecedents, perceived values, and policy effectiveness. The regulatory debate and its underlying assumptions can be drawn from several focus group sessions and the Delphi method (See Section 4 for details). The following concepts emerged from the qualitative method and are summarized as follows:

-Non-discrimination

Discrimination was the most frequently touted term in the NN discourse, reflecting non-discrimination is a key spirit of NN (Strover, 2010). The principle is to prohibit service providers such as KT and SKT from using their network resources to prioritize data as it crosses their networks so as to improve the performance of specific applications.

Generally, proponents argue that the current Internet is not neutral as its implementation of best effort generally favors file transfer and other non-time-sensitive traffic over real-time communications. User groups argue that a network, which blocks some nodes or services for the customers of the network, would normally be expected to be less useful to the customers than one that did not. Content providers stated that network providers often enter into peering arrangements among themselves, and these agreements often stipulate how the flow of certain information should be treated. They also present terms of service that often include rules about the use of certain applications as part of their contracts with users. They gave the example of KT's iPhone, which would not be possible if KT did not ensure that its network could handle the increase in data traffic that the iPhone would require.

-Freedom (digital rights and freedom)

When asked about freedom in terms of digital rights, respondents showed divergent views. Proponents, who include users and academics, argue that NN ensures that the Internet remains a free and open technology, fostering democratic communication. Proponents argue that NN guarantees digital civil rights, and freedom should be preserved on the Internet. Opponents, namely network providers and ISPs, counter-argue that over-freedom in using digital contents on the Internet will be harmful to content creators by decreasing their incentives to create new content. On the other hand, government officials generally expressed neutral views in that appropriate digital rights management systems should be established which can provide checks and balances.

-Competition and unbundling

Proponents argue that allowing content providers the right to demand a toll to guarantee quality or premium delivery would create an unfair business model. Proponents claim that by charging every Website, from the smallest blogger to portals, network owners may be able to block competitor Websites and services, as well as refuse access to those unable to pay. Proponents of NN argue that allowing the preferential treatment of Internet traffic, or tiered service, would put newer online companies at a disadvantage and slow innovation in online services. Proponents further argue that NN creates an “even playing field” and that “the Internet has always been driven by innovation. Websites and services have succeeded or failed on their own merit.”

The debate over unbundling is based on whether or not the benefits of promoting intra-platform competition outweigh the possibility of reducing infrastructure investment through

decreasing the private returns to incumbents' investments by requiring them to share their infrastructure. Korea did not require unbundling until 2001. Proponents argue that unbundling can create incentives for an operator to maintain a neutral network. In particular, they argue, an infrastructure operator has less incentive to favor one type of content over another if it does not sell retail services to end users or is just one of many service providers.

-Control of data

Proponents of NN want a legal mandate ensuring that ISPs and network operators allow content providers free access to their cable lines, which is called a *common carriage agreement*, and is the model used for dial-up Internet. They want to ensure that cable companies cannot screen, interrupt, or filter Internet content without a court order. Proponents accuse cable and ISPs of wanting to be "Internet gatekeepers, deciding which Websites go fast or slow and which won't load at all." For example, one respondent from KT says, "We want to set a rule that we can equally apply to every platform operator that offers data-heavy content as those services threaten to black out our network." On the other hand, opponents argue that "the fundamental flaw in NN policy is that it assumes that service providers are in a position to dominate Internet service and applications."

-Quality of service

With the emergence of convergence services, such as mobile VoIP, IPTV, and other applications, which are influenced by low latency, various attempts to address the inability of some private networks to limit latency have arisen, including the proposition of offering tiered service levels that would shape Internet transmissions at the network layer based on application

type. Proponents argue that legislation should ban the charging of fees for any quality of service that would allow networks both to implement quality of service and remove any incentive to abuse NN ideas. Since implementing quality of service does not require any additional costs over a non-QoS network, there is no reason why implementing quality of service should entail any additional fees.

-End-to-end principle

This principle states that, whenever possible, communications protocol operations should be defined to occur at the end-points of a communications system, or as close as possible to the resource being controlled. Proponents argue that NN is needed in order to maintain the end-to-end principle. This is the end-to-end design of the Internet that has made it a powerful force in regards to economic and social good. Proponents argue that under the end-to-end principle, the Internet is a dumb network, merely passing packets regardless of the applications they support. Opponents counter that network intelligence does not relieve end systems of the requirement to check inbound data for errors and to rate-limit the sender or for the wholesale removal of intelligence from the network core.

-Innovation and investment

Opponents of NN argue that prioritization of bandwidth is necessary for future innovation on the Internet. Network providers, ISPs, and cable companies argue that telecom providers should have the ability to provide preferential treatment in the form of tiered services, for example, by giving those online companies that are willing to pay for the ability to transfer their data packets faster than other Internet traffic. The added revenue from such services could be

used to pay for building increased broadband access to more consumers. They have also argued that NN regulation would have adverse consequences for innovation and investment in the market for broadband access by making it more difficult for ISPs and other network operators to recoup their investments in broadband networks.

Network providers are concerned that they will have no incentive to make large investments to develop advanced fiber-optic networks if they are prohibited from charging higher preferred access fees to companies that wish to take advantage of the expanded capabilities of such networks. Similarly, one respondent from a network provider is concerned that NN could slow the growth of the IT sector, potentially affecting as many as a million jobs.

-Counterweight to server-side non-neutrality

Opponents argue that the Internet is already an open playing field; large companies achieve a performance advantage over smaller competitors by replicating servers and buying high-bandwidth services. Network operators argue that a richly funded Website, which delivers data faster than its competitors to the front porches of the Internet service providers, want it delivered the rest of the way on an equal basis. They argue that the neutrality system actually preserves a more fundamental inequality. On the other hand, proponents claim that the current Internet is not neutral as, among all applications, its implementation of best effort generally favors file transfer and other non-time-sensitive traffic over real-time communications.

-Bandwidth availability

One of the main arguments of the opposition comes from limited bandwidth availability. With new technologies in place, Internet traffic has increased exponentially. This might be

common sense in that physical networks are limited resources. In this light, network providers argue that they should have the right to charge portals and smaller companies offering free video content using substantial amounts of bandwidth. They said that YouTube, MySpace, and blogs are increasingly posing problems in regards to network bandwidth. They worry that NN would prevent broadband networks from being built, which would limit available bandwidth and thus endanger innovation.

-Opposition to additional legislation

Opponents raise a questionable doubt with respect to the government's ability to make and maintain meaningful regulation that does not cause more harm than good. Telecom network providers said that telecom has already been heavily regulated and do not want additional legislation. Given the previous failures of policy made by the Korean government, ISPs argue that poorly conceived legislation could make it even more difficult for ISPs to legally perform necessary and generally useful packet filtering, thereby preventing the spread of computer viruses. One respondent from a network provider said, "It is silly to come up with another regulation for NN, which is essentially *laissez-faire*. It is actually very difficult to create NN laws." Some proposed pieces of legislation would even make fair queuing illegal as it requires prioritization of packets based on criteria other than that permitted by law.

To sum up the above discussion, two values can be clearly emerged—competition and regulation, each of which is aligned with equality/non-discrimination and bandwidth/market order. The two perceived values are hypothesized to affect attitude, which in turn influence

policy capacity. These path relations are tested and confirmed by Wellstead et al. (2011). Thus, considering the above discussion, the following model is proposed (Figure 1).

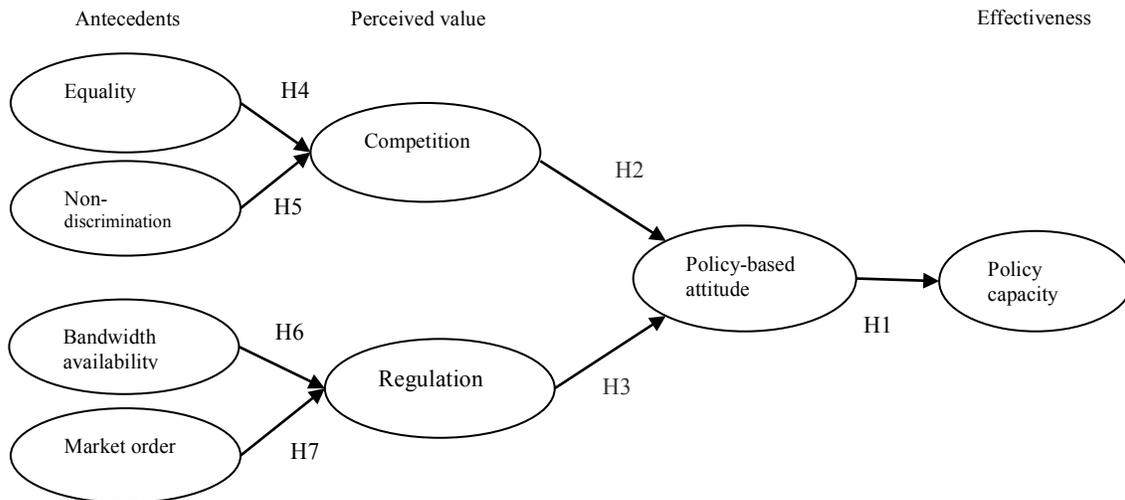


Figure 1. A perceptual model of network neutrality

4. Study design

The study design consisted of multiple processes, in which interview, participant observation, and archival research with these groups, provided ample empirical evidence that were helpful to understand ongoing NN issues from its context.

First, individual in-depth interviews were conducted with diverse stakeholders from government, research, industry, and user groups. Three respondents were invited for an in-depth interview from each sector. A total of 27 respondents were asked to explain their attitudes and opinions about the ongoing NN issue (Table 1). A simplified Delphi method was used over a two-month period to draw factors from people. In particular, policy Delphi (Turoff, 1970) was designed to focus on NN from a policy point of view. The policy Delphi method was modified to

incorporate web-based communication for a more interactive tool. A specific website was built for a discussion and respondents could comment and upload their views anytime at their convenience. These in-depth interviews not only produced factors of NN, but also provided an overall picture for the ongoing issue of NN.

Table 1. In-depth interview

Industry sector	No.	Method
Network operators	3	Face-to-face, telephone, email, and web-based system
Content providers	3	Face-to-face, telephone, email, and web-based system
Service providers (portals)	3	Face-to-face, telephone, email, and web-based system
User groups	9	Telephone, email and web-based system
Government (Regulators)	9	Correspondence, telephone and web-based system

Second, with the help of a Korean regulatory agency based in Seoul, Korea, focus groups consisting of diverse stakeholders were organized. Three focus group sessions were conducted throughout a two-month period. A main topic of discussion in the focus group was how they think about the NN issue and what factors would influence the future of NN policy. The goal of the individual in-depth interviews and focus group sessions was to test and validate the research model, to identify items missing from the model, and to gain a preliminary understanding of the factors that constitute NN.

Third, based on the first and second process, a final survey questionnaire was developed through several rounds of comments from an expert panel consisting of professors of policy research, researchers of telecom, and experts in the mobile industry. Prior to its use, the

questionnaire was tested by administering a pilot survey among possible users who, in turn, provided a comprehensive review of individual responses to the survey. Thirty respondents, randomly selected from each sector, participated in the pilot survey. Prior to answering the questionnaire, they were instructed to ask questions concerning questions they did not understand. These precautions eliminated the possibility of participants answering some questions without exactly understanding their content. The wording of items was reviewed and modified by experts in quantitative research and based on pilot test findings.

The finalized survey was administered by a marketing firm specializing in survey development, data collection, analysis, and reporting. The company possesses robust panel data related to various social issues. The specific topic of NN made it necessary to use a professional marketing firm to ensure data quality. Over a seven-month period, a total of 370 responses were compiled by the company. In order to refine and increase the validity of the survey data, 41 responses containing answers with systematic errors or inconsistent information were excluded. For the post-hoc analysis, the collected respondents were divided into three groups: industry, government, and users. These groups were used for comparing structural equation models (SEM). The results of the cross-validation reveal the reliability and representativeness of the data. Table 2 presents the sample demographics.

Table 2. Survey respondents' characteristics (total = 331)

Age	Number	Percentage (%)
21–30	142	43.0
31–40	91	27.4
41–50	57	17.1

≥51	41	12.4
Education		
College	136	41.0
Master's or Above	105	31.6
Doctorate	90	27.4
Gender		
Female	161	48.6
Male	170	51.4
Work type		
Research and Education	101	30.5
Government	95	28.7
Industry	99	29.9
Others	36	10.9

-Data analysis

Analysis of variance (ANOVA), factor analysis and SEM using AMOS software were used for the analysis of research questions. ANOVA techniques involving the assessment of variations in the mean responses given to survey questions are well known. Factor analyses use correlations to identify clusters of similar responses to different questions. SEM is less well known but an increasingly popular multivariate regression model in which the response variables in one regression equation in any SEM may appear as a predictor in another equation, and the

SEM variables may influence each other reciprocally, either directly or indirectly, or through other variables as intermediaries (Joreskog & Sorbom, 1996).

-Measurement development

The variables used in the model are well established in the Policy Study, Marketing, and Telecommunications literature. To assess the validity of the measures, we conducted a pilot test prior to further study. The participants indicated their agreement with a set of statements using a 7-point Likert-type scale. Each variable included three measurement items. As the items in the survey were adapted from previously validated work, content validity for these two constructs was established through literature review.

-Instrument validity and reliability

A pretest was undertaken to examine test-retest reliability and to construct reliability indices before conducting fieldwork. After eliminating the measured items that failed in either the retest or the alpha test, Cronbach's alpha was applied to identify poor item-to-total-correlation items. The alpha values ranged between 0.851 and 0.913, suggesting acceptable construct reliability. When theoretical models do not exist, pretests are useful in the early stages of empirical analysis in cases for which the basic purpose is exploration. Additionally, using principal components analysis, the construct validity of the measurement instrument was confirmed. After three items regarding the original survey were removed (due to high cross-loading), all item loadings were greater than 0.5, with no cross-loading above 0.4 (Hair et al., 2010). Similarly, discriminant validity was confirmed as the correlation between items in any

two constructs was lower than the square root of the average variance shared by the items within a construct (Fornell & Larcker, 1981).

5. Results

5.1. Factor analysis

A factor analysis of eight survey items was conducted, which produced two distinct items: Competition and regulation. Interestingly, this result is in line with the results of the Delphi method and the two factors are named as such. Respondents' attitudes towards policymaking on NN were also assessed through analysis of their general views of perceived governmental support for maintaining or improving policy capacity. A factor analysis of eight survey items was conducted and it produced two central dimensions (Table 3). The first dimension, labeled 'competition', emphasized attitudes related to facilitating the open market and increasing competition in the industry sector. The second column, 'regulation', reflected the perceived politicization of policy work in order to maintain market order and to enhance the development of stable industry.

Table 3. Structure of attitudes towards NN governance

	Competition	Regulation
Non-discrimination	0.735	
Freedom (digital rights and freedom)	0.759	
Competition and unbundling	0.784	
Control of data	0.683	
Quality of service	0.839	

End-to-end principle		0.674
Innovation and investment		0.742
Counterweight to server-side non-neutrality		0.758
Bandwidth availability		0.756
Opposition to additional legislation		0.759

5.2. Structural paths and hypothesis tests

To test the structural relationships, the hypothesized causal paths were estimated, and all eight hypotheses were supported (Table 4 & Figure 2). The results support the proposed model, confirming the key roles played by the antecedents and values. In addition, the results highlight the significant role of antecedents in determining users' perceived values, which directly affect attitude. A user's perceived policy capacity is influenced by attitude, supporting H1 ($\beta=0.43$, $t=3.120$, $p < 0.01$). It can be stated that a user's assessment is indirectly influenced by antecedents and values. Given the strong paths, four factors (antecedents-value-attitude-capacity) can be established as a key backbone relationship specific to NN. In this relational path, competition is found to be the most significant factor ($\beta=0.55$, $t=5.981$, $p < 0.001$), followed by regulation. Approximately 44% of the variance in the attitude of NN was explained by the variables in the model ($R^2=0.440$). The R^2 of attitude is explained to approximately 52% by the two exogenous constructs in the model. Both R^2 s show fairly high values.

Table 4. Adjusted t-statistics and standardized path coefficients.

Hypothesis	Path	t-value	Support
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	coefficient (β)		
H1: Attitude \rightarrow Capacity	0.43**	3.120	Yes
H2: Competition \rightarrow Attitude	0.55***	5.981	Yes
H3: Regulation \rightarrow Attitude	0.42**	4.420	Yes
H4: Equality \rightarrow Competition	0.44**	3.001	Yes
H5: Non-discrimination \rightarrow Competition	0.38*	3.359	Yes
H6: Bandwidth \rightarrow Regulation	0.49**	2.021	Yes
H7: Market order \rightarrow Regulation	0.43**	2.001	Yes

* $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

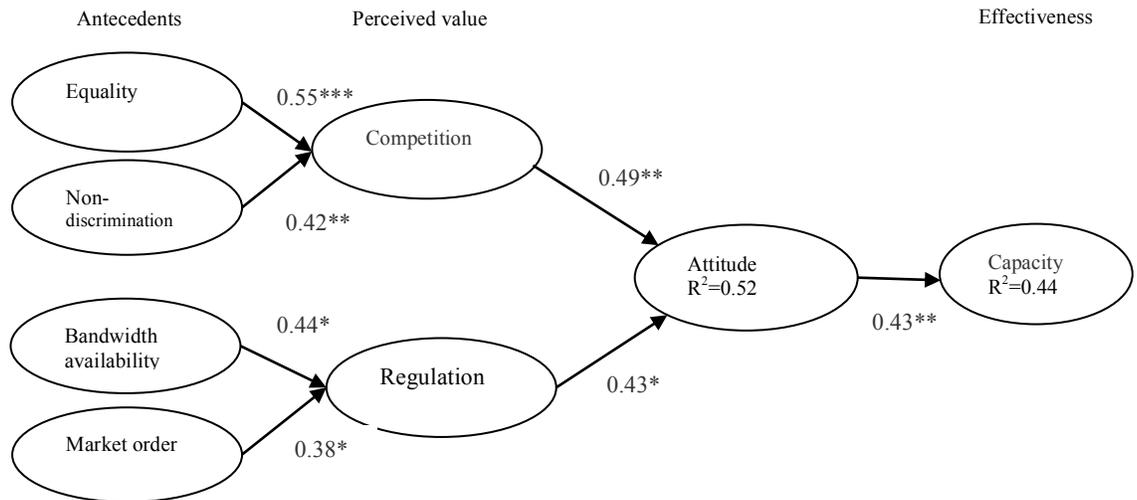


Figure 2. Research model results

5.4. Model comparison between different people

As the model shows a significant result, it is worthwhile to further investigate how different groups of people perceive NN. Given that the issue of NN is highly debatable, the

acceptance model would be different among different groups. For example, it is assumed that the issue of NN would be differently appreciated by industry, government, and citizens. With this assumption, the initial respondents were categorized into the three groups and were analyzed by the groups. The results of the three models show an interesting contrast. While the model from industry respondents shows a high inclination toward competition, the ones from government demonstrate the opposite. The model from users shows a similar pattern from the initial model.

Apparently, differences in the pattern among the groups may be attributed to the fact that there are inherent significant differences among the groups by nature. The results reconfirm two sets of distinctive factors in NN: competition and regulation. While previous studies have shown that these two factors are the main frameworks for the development of NN (Kim, 2011; Strover, 2010; Wellstead et al., 2011), the present study shows that such factors are clearly different based on the respondents' prior attitude and belief. This different pattern implies that NN is still a vague concept among people. Further research is needed in this aspect.

In the government model, regulation has been found highly significant ($p=0.001$) along with competition ($p=0.05$). It can be said that both regulation and competition are equally important to government respondents. The paths from antecedent variables to perceived values are found significant in the government model. On the other hand, the industry model shows that competition ($p=0.001$) is a more important factor compared to regulation ($p=0.05$). This is because the majority of industry respondents were from service/content providers and their prior belief might favor positive NN policy. If more respondents from network operators were included, the model would show higher significance on regulation. The user model shows that it clearly favors competition. It can be inferred that users would welcome competitive environment

where they can benefit from innovative services with lower cost. Users seem to believe that NN would accelerate this transition.

Commonly, all three models show that the paths from attitude to policy capacity are highly significant. This implies that while different groups prioritize different values, they all seem to believe that a positive attitude leads to higher policy capacity. This finding raises the importance of social consensus and public awareness in the formation and development of NN policy. In doing so, it also raises the need for the proactive role by governments.

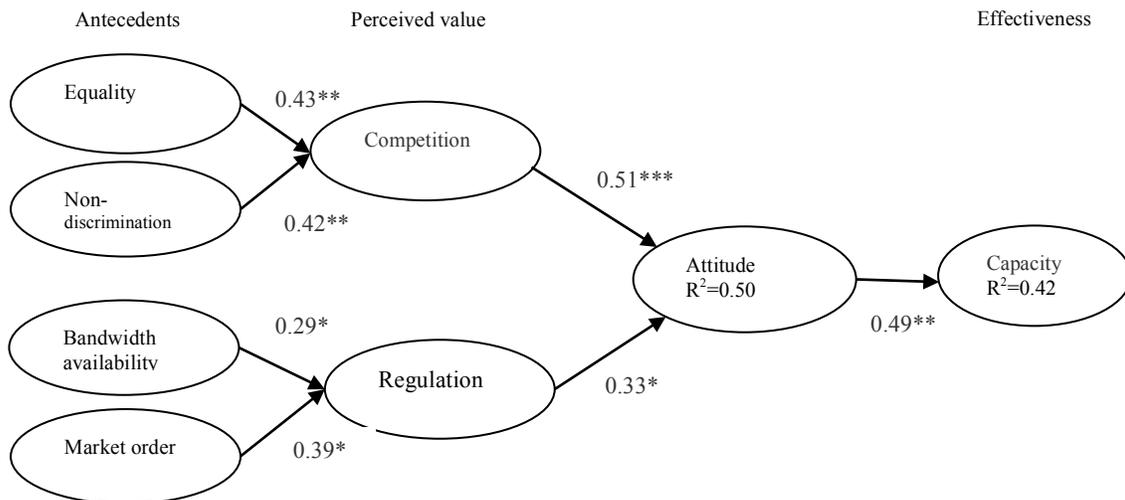


Figure 3. Model for industry

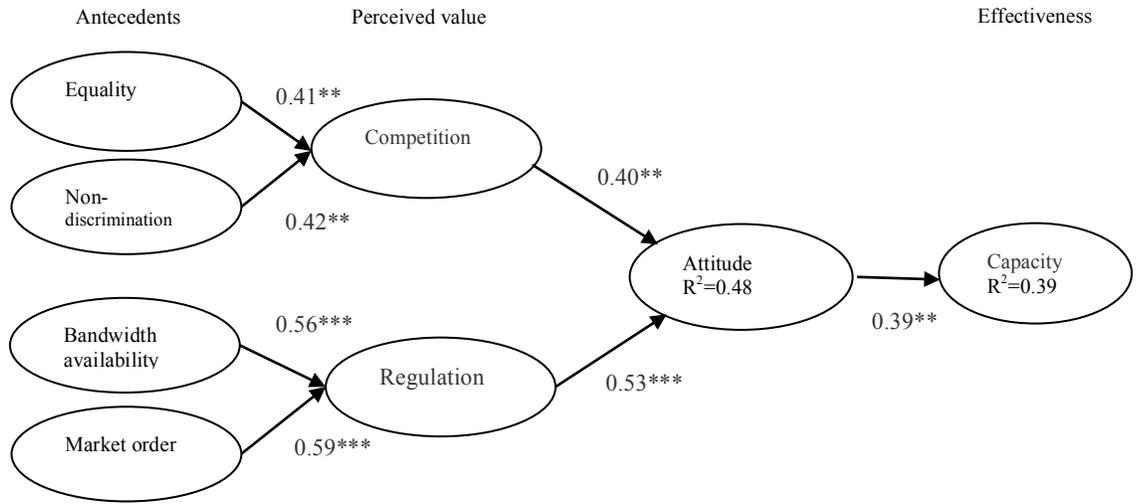


Figure 4. Model for government

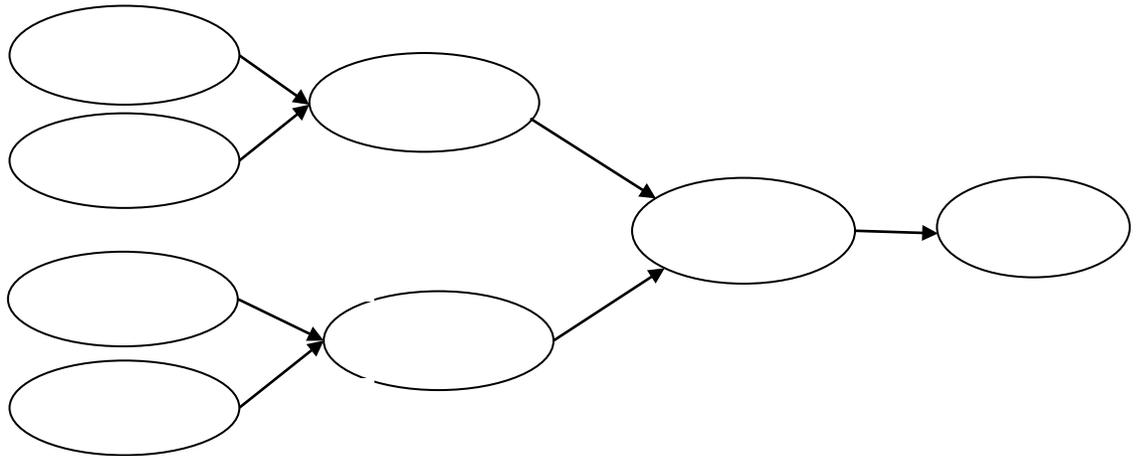


Figure 5. Model for citizens

5.5. ANOVA

To validate the differences of the three models, post-hoc analyses were conducted. In

particular, the ANOVA test was conducted for each factor. The mean scores of each factor were closely compared using ANOVA. A one-way ANOVA was used to test for mean differences among the three groups. The ANOVA results show that there are clear difference in the antecedents and values among the three groups. Table 5 shows the results of the variance between groups and the variance within groups. ANOVA analysis found that the three groups differed quite strongly on the endogenous variables used in the SEM. For non-discrimination, the significance level=0.000 signifies that there is a significant difference in the mean responses between different groups ($F(9, 235) = 9.014, p=0.113$). There are also significant differences in the mean of market order between the pro and con group at the $p < 0.05$ level ($F = 7.113, p=0.000$). Likewise, other variables (competition and regulation) show significant differences in the means among the groups. However, significant differences do not exist among two factors (attitude and capacity).

In order test whether the differences between the groups were statistically significant, the standard method of Scheffe post-hoc contrasts was used. The differences between three factors (equality, bandwidth availability & market order) for three groups were significant at the 0.001 level, indicating that the perception of NN was sharply different. Other than the three factors, the rest of four factors were significant at the 0.05 level between all factors except capacity. It is interesting that policy capacity was found to be significant in the ANOVA test, but no significance resulted from the Scheffe test. This discrepancy often occurs due to the problem of the post-hoc test itself.

Table 5. One-way ANOVA of group differences

Factors		SS	df	MS	F	Sig.

Equality	Between groups	1.442	9	0.360	9.014	0.013
	Within groups	42.943	235	0.302		
Non-discrimination	Between groups	0.293	9	0.074	0.113	0.000
	Within groups	16.291	235	0.112		
Bandwidth availability	Between groups	0.293	9	0.073	0.014	0.003
	Within groups	16.291	235	0.112		
Market order	Between groups	1.234	9	0.337	6.332	0.043
	Within groups	22.522	235	0.291		
Competition	Between groups	1.234	9	0.337	0.014	0.001
	Within groups	42.851	235	0.291		
Regulation	Between groups	0.389	9	0.134	0.114	0.031
	Within groups	25.482	235	0.198		
Attitude	Between groups	0.389	9	0.137	0.102	0.323
	Within groups	23.525	235	0.199		
Capacity	Between groups	2.163	9	0.540	5.673	0.203
	Within groups	68.232	235	0.475		
	Within groups	42.245	235	0.478		

*SS: Sum of Squares; MS: Mean Square

6. Discussion

With the drastic changes of the market environment triggered by smart innovation, NN has suddenly turned from a theoretical ideology to an urgent current issue in Korea. In response to its rising importance, this study examined people's perspectives on NN. The results of this study add to the understanding of the ongoing development of NN and future evolution in a

radically evolving telecom environment. The findings also serve to clarify the practical implications of developing effective policy for realizing a neutral network.

Consistent with previous studies on NN, the findings show that both competition and regulation have considerable impacts on attitude and eventually the policy capacity of NN. In particular, it was demonstrated that these two critical factors are greatly influenced by four antecedents; perceived values (competition and regulation) are characterized by equality/non-discrimination and bandwidth/market order, respectively. As shown, the effects of the antecedents show a strong impact on intention. While extensive research has been conducted on the topic of NN, the contextual antecedents of competition and regulation have yet to be clearly examined in a specific context. That being said, it is unclear as to what constitutes NN and how to understand NN practically.

In this study, the antecedents of the two variables were clearly identified in the context of NN. Such a finding can be a modest conceptual advancement, grounding new variables in a telecom policy area. This work was applied in the specific issue regarding a specific context of Korea with a series of user factors. Researchers that have examined the telecom policy (e.g., Cecere & Corrocher, 2011; Mazzoni et al., 2007; Shin, 2012) argue that policies formulated by government should be based on the perspective of individuals. Similarly, Shin and Han (2012) argue that telecom firms' strategies should be grounded in consumers' attitude and behavior for the new services. On that note, this study investigated NN based on how people perceive value, how their intentions are formed and developed, what cognitive perceptions are fulfilled, and what factors determine people's belief on policy capacity.

Future smart services in a neutral network environment will be considerably different from other services in terms of their capability, coverage, and the level of service quality. Thus,

its governance should be based on concrete contextual factors. It is important to note this ubiquitous context and the ubiquitous-specific factors accordingly. The new variables, which reflect the neutral networks and shed light on future network evolution, are found to be valid and significant in this study. This result warrants a sustainable model for the NN and stable theory development. Hence, the model proposed here provides a meaningful contribution to the emerging body of literature on future telecom environments.

7. Why is social process important in the NN policy?

The analyses imply that the emergence of NN in Korea will likely continue to be a socially intricate, legally complicated, and technologically sophisticated development. With the increasing demand and the trend of open networks with increasing competition, it is very likely that Korea will be facing a severe debate. Thus, it is suggested that a clear model will help to avoid confusion and minimize the social cost of such a debate.

As the findings of this study imply, there are acutely diverse stances toward NN among stakeholder groups. This gap implies challenges for policy makers in that it should draw social consensus among all the relevant stakeholders. For the NN policy to be successful, it needs to be developed in close cooperation and coordination with various sectors along with wide participation by the public. For example, in recruiting respondents of this study, it faced a procedural difficulty whereby most initial respondents were largely unaware of NN, particularly from user groups. This study screened initial respondents to ensure the participating respondents had some level of knowledge regarding NN. However, the lack of awareness concerning NN is highly problematic. This lack of knowledge is troubling, and poses serious questions to the level of awareness amongst the general public. Indeed, much more awareness is needed about NN and

those providing the information need to be aware of the complexity of the issue, who they are addressing, and how. All of this would aid the public in deciding the importance of NN as a policy issue. Take for example the Federal Communication Commission (FCC), who has opened a series of public debate over NN seeking public comments and feedback on NN rules. As Quail and Larabie (2010) argue, the ability to succeed in policy making is the ability to construct a perception that differs from reality. It is what FCC is different from KCC in regard to preparing NN regulation.

While it is unclear how the future of the NN in Korea will ultimately play out, the vitality of the social process derives from the broad involvement and active participation by the many communities that will have a positive impact on the future of NN. A key to the success of network governance is to ensure that various stakeholders have a fair and equitable way of participating in its evolution. This recognition raises a legitimate question of the proper long-term role for government in the continued evolution of NN. This study concludes that government can still make a series of important and due contributions: government should play a facilitator's role to guide the social construction of NN. Moreover, government involvement in this area will be vital to the long-term well-being of NN.

8. Value-centered approach in policy analysis

As previously mentioned, the variety and multi-faceted nature of policy analysis makes it clear that there is no single, let alone one best, way of conducting policy design and analyses. Acknowledging this reality, this study analyzed the NN policy in terms of the user-centered approach. While the study confirms the validity of the approach, it further sheds light on the possibility of the value-centered approach in policy analysis.

Based on the findings from the approach, it is concluded that despite the significant differences between the three groups in terms of NN orientations, the matrix of interest in different groups of people remains paramount in explaining the future success of NN. As focused on the user-centered approach, the results concur with Cheng et al. (2012)'s study, which highlight the importance of human value in policy analysis. Values are important with regard to who supports specific policy remedies for NN. As Cheng et al. (2012) stated, policy design is a complex value-laden process that seeks not only to determine the best means to given ends but also to determine what the ends in themselves should be. User values should be the eventual ends of NN policy – the goals and obligations that policy aims to promote as desirable in their own right, not just as a simple tool to some other goals. In this proposition, policy analysis of NN should be a process of interaction that allows stakeholders to identify and communicate their implicit or explicit values rather than an objective evaluation of public policy (Cheng et al., 2012). People's values influence policy goals, decisions, and implementations. At the same time, policy analysis can also influence the values of people in the policy-making process and of people affected by this process. Also, policy analysis regarding NN cannot avoid the importance of user values.

One of the most important aspects in NN is probably establishing a new system in response to the evolution of the rising smart ecosystem. NN involves more than simply specifying the rights and obligations of carriers in traffic management. What is more important than technical traffic management is establishing a system where network advancement costs are reasonably shared by all interested parties including carriers, users and content providers that benefit from the Internet, and this process should be heavily based on user values. In this respect, it suggests heuristic directions for future research, which should focus on the central factors in the matrix and the nature of the tasks performed in any assessment regarding the analytical capacity of a government's policy.

Finally, this study concludes that because of the unresolved theoretical and empirical questions concerning the prospective results of NN regulation, the dichotomous debate over competition versus regulation for a network's neutral treatment is somewhat meaningless. The distinct effects of different kinds of discrimination suggest that different forms of non-neutrality that differing tradeoffs between investment in the core of the network and investment at the network's edge. NN regulation should not equally permit nor equally ban all forms of discrimination for the priority of network traffic. As the debate develops, it should therefore go beyond its polar extremes by addressing a combination of values that will in turn prevent abuses while allowing networks to bring together users and applications as efficiently as possible.

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