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PRIORITY ANALYSIS OF SUBSCRIPTION ATTRIBUTES FOR HIGH-SPEED INTERNET SERVICE: APPLICATION OF AHP TECHNIQUE

HYUNG SEOK LEE

Faculty of Business Administration, Chungbuk National University, 1 Chungdae-ro Seowon-gu, Cheongju, Chungbuk 28644, Cheongju, South Korea

Tel: 82-43-261-3743;

Email: **hyunglee@cbnu.ac.kr; hslee0919@yahoo.co.kr**

Abstract

Korea's subscription rate for high-speed internet services has already reached a saturation point, and many internet service companies are still trying to entice new subscribers by offering various subscription promotions. Due to fierce competition, service providers have also tried to improve their offerings in the high-speed internet service market. This study thus focuses on the high-speed internet service market in Korea and consumers' decisions regarding the attributes and features for which they select high-speed internet service.

This study conducts a literature review and assesses the current promotions offered by internet service providers to determine the major attributes for high-speed internet service subscriptions. The AHP technique is used to determine the importance of the

subscription attributes, and unlike in prior studies, it hierarchically shows consumers' selection criteria to subscribe to a high-speed internet service and also calculates the weight of the subscription attributes as a result of their decision making. The results of the study are expected to provide practical implication for marketing practitioners and internet service providers.

Keywords: **Internet Service Provider; Broadband Internet; High-Speed Internet Service**

INTRODUCTION

Access to information and communication technology (ICT) provides extensive opportunities for businesses and individuals. Specifically, a faster internet access speed and more sophisticated networking technology enables consumers to access ubiquitous networking services and to engage with market places on the internet with ease. High-speed internet access services, also referred to as broadband internet services, provide internet access at speeds approximately ten times faster than with conventional modems, and broadband internet technology provides even faster than past dial-up modems and always-on connection. Thus, it dramatically changes the tendency of the internet users and plays an important role in making internet as a part of our lives [1]. The broadband internet technology has become the infrastructure of electronic commerce and has extended the spread of internet media and business [2].

Korean broadband internet access technology has developed in a remarkable manner compared to other developed countries. The accessibility to broadband internet services in Korea has resulted in a significant increase in the number of internet users, at about 45 million people or 92.1% of the Korean population (http://www.internetworldstats.com/stats3.html) [3]. Korea also ranks as one of the fastest countries in the world for internet connectivity, with the world's fastest average internet speed [4]. Akamai's Fourth Quarter 2015 State of the Internet Report stated that Korea had the highest average connection speed in the world at 26.7 Mbps, which is about five times faster than the world average of 5.6 Mbps and more than twice as fast as that in the United States at 12.6 Mbps [5,6]. Korean internet service providers (ISPs) were created through government planning and have played an important role in developing the ICT infrastructure of the country, producing a highly competitive business environment. Korea's ISP market is dominated by the "Big 3" providers that at present provide service to about 80 percent of Korea's 20 million Internet subscribers (http://www.pcmag.com/article2/0,2817,248232 8,00.asp) [7].

Currently, KT is the largest Korean ISP with about half of Korean consumers subscribed. However due to the presence of corporate rivals such as SK Broadband and LG Uplus, KT is in a fiercely competitive landscape. CJ Hello Vision is also

operating at a national scale, offering a range of technological solutions to deliver high-speed services in an attempt to compete with the three leading companies. Korea's subscription rate for high-speed internet services has already reached a saturation point. The number of high-speed internet subscribers surpassed 20 million in 2015, and internet service providers are trying to entice new subscribers through various promotions. Internet service providers need a diverse strategy to actively attract customers and to improve their competitiveness in the high-speed internet service market. Specifically, it is necessary to examine the factors that are important for customers when they subscribe to an internet service.

This study suggests a hierarchical model that investigates the service attributes that are important to customers when they subscribe to a service provider. A literature review and an assessment of current promotions offered by internet service providers are used in this study to determine the major subscription attributes for the high-speed internet service. This study employs the AHP technique using the Microsoft Excel to calculate the importance of the subscription attributes. Unlike prior research, this study hierarchically shows consumers' selection attributes for subscribing to a high-speed internet service and also calculates the weight of the subscription attributes as a result of their decision makings. In summary, this study first provides a brief review of the literature, focusing on high-speed internet access technologies, Korean high-speed internet service market, and applications and theory of AHP, and then calculates the priority weights of the criteria at each level. Finally, the implications and limitations of the findings are discussed.

THEORETICAL BACKGROUND

High-Speed Internet Access Service

High-speed internet access has a maximum speed of fifty times faster than dial-up internet access and is always connected to the internet, unlike dial-up access with which users use a telephone call to an internet service provider. In addition, its biggest advantage is that is does not need an exclusive use of a phone line. Thus, consumers can make or receive voice phone calls and can browse the web at the same time. To use high-speed internet, consumers have to choose a cable modem provided by a cable company or a digital subscriber line (DSL) provided by a telephone company.

While cable modem uses traditional coaxial cable for transport from residence, DSL uses copper telephone wires with a computer digital network to provide high-speed internet access [8]. Subscribers can access their cable modem service simply by turning on their computers without the need for dial-up access. Cable modems are external devices with two connections: one to the cable wall outlet, the other to a computer. Cable models also enable consumers to watch cable TV during internet use. Transmission speeds vary depending on the type of cable modem, cable network, and traffic load (http://www.broadband.gov/broadband_types.html) [9].

Consumers subscribe to ISPs to use high-speed internet services, and they compare the performance of the data connections in terms of the network speed, which is typically measured in units of million bits per second (Mbps). DSL is a wireline transmission technology that transmits data faster over traditional copper telephone lines that are already installed in homes and businesses. The connectivity and speed of DSL services relies on the distance from a household to the closest telephone company facility. Both cable modem and DSL services offer asymmetrical speeds with different upload and download speeds. DSL transmission technologies can be classified into asymmetrical digital subscriber line (ADSL) and symmetrical digital subscriber line (SDSL). The first is typically used by residential customers who receive much data but do not send much. In other words, it provides a faster downstream speed than upstream. The latter is used by businesses for service that need significant bandwidth both upstream and downstream (http://www.broadband.gov/broadband__types.html) [10].

In Korea, high-speed internet services were first introduced in 1996, and its commercialization began in 1998 with Korea Thrunet. High-speed internet is key infrastructure for Korea's ICT, with a sharply increasing number of subscribers. KT is the largest ISP in Korea, with about half of the Korean consumers subscribed. SK Broadband and LG Uplus are two other wired internet service providers. The largest cable system operator, CJ Hello Vision, also offers high-speed internet services. High-speed internet is no longer just a stand-alone service. Rather, ISPs sell the high-speed internet in combination with other products because many consumers tend to subscribe to the internet to watch IPTV or to use VoIP. Three major ISPs provide high-speed internet services for subscribers free of charge in case that they subscribe to more than two mobile phones and IPTV or VoIP together. In addition, with the introduction of LTE (long-term evolution) technology, mobile internet speeds have surpassed the speed of high-speed internet. This situation thus threatens the future of wired high-speed internet market [11].

Faced with such competition, Korean ISPs are having difficulties attracting new customers. An effective way to entice and retain customers is to examine the attributes that are important to them. However, research regarding the attributes or features influencing decision of consumers seeking to subscribe to high-speed internet services are rare.

Lee [12] suggested low price, value-added services, brand power, speed, and stability as significant factors affecting subscriber's ISP choices. In brief, subscribers who value a low price in choosing their ISPs tend to leave the ISP to the cable TV operating systems, while subscribers attaching great importance to value-added services and brand power tend to switch to the ISPs. Thus, Lee's research is expected to provide implications for ISPs and academics carrying out research related to subscription to high-speed internet services.

Ida and Sakahira [13] focused on broadband migration from narrowband to broadband services and migration inside broadband service, and investigated the crucial factors for broadband service subscriptions. The estimation model explains that price (monthly fixed basic fee), income, IP phone usage, moving-picture viewing, and type of residence significantly influence broadband migration. Some of the explained variables affecting broadband migration can be employed in the further research for broadband subscription features.

Kang et al. [14] studied consumer satisfaction towards broadband internet network services. They investigated the antecedents and outcomes of choice satisfaction in the context of broadband internet network services. The results indicated that product variety evaluation, price evaluation, choice difficulty, and the number of alternatives can be regarded as consumers' decision-making attributes in satisfaction with high-speed internet services.

Torfi et al. [15] applied the analytic hierarchy process to select the appropriate means of internet access. To determine the priority of three internet access types (DSL, cable TV line, wireless), they established three criteria: speed, quality and cost. Paired comparison data obtained from expert interviews was analyzed using the Expert Choice software. The most important criterion was quality and the subsequent criteria were cost and speed. The results of the paired comparison indicated that DSL in terms of price and wireless in terms of quality and speed were the most important alternatives. The best alternative for internet access appeared to be wireless. The implications of the study are not only to help individuals to make more appropriate decisions to select internet access but also to understand the decision-making process. Thus, the findings of this study provide selection criteria for the further study of internet access services.

Hidalgo and Oviedo [16] analyzed the impact of broadband quality standards on the structure of the internet services market. Specifically to evaluate the effect of regulatory decisions for setting download-speed standards, they employed discrete choice models to estimate the structural demand function. The main variables of the estimation model consisted of the download speed and monthly-fee for the internet service, and the contracts, ISPs, the ratio of contracts to ISP and available technologies were considered as municipality attributes. These variables thus determine the attributes of high-speed internet services.

Although few studies have investigated high-speed internet attributes, an overview of previous studies is useful to derive meaningful factors relevant to selecting high-speed internet access. This study thus discusses an analytic hierarchy process and establishes a hierarchic model to evaluate internet service attributes.

Analytic Hierarchy Process Technique

The analytic hierarchy process (AHP) first introduced by Saaty [17] is a multi-criteria decision-making methods. AHP is a structured method that ranks decision alternatives

and it is appropriate to establish a prioritization schema [18].

AHP composes the visual formalization of intuitive human judgment of complex decision problems using a hierarchic structure. In other words, it enables decision-making through multiple attributes, visually, in the form of an attribute hierarchy. AHP consists of three levels: goal of the decision problem at the top, multiple criteria that define the alternatives in the middle, and competing alternatives at the bottom. If the criteria are highly abstract, subcriteria are sequentially generated through a multilevel hierarchy [19].

A major feature of the AHP technique is to systematically convert qualitative subjective opinions or judgments into quantitative outputs by using basic linear algebra. In general, the AHP technique carries out a paired comparison to obtain actual measurements and includes somewhat subjective opinions. For various realistic and complex decision-making situations, AHP provides practical solutions to practitioners such as policy makers and administrators. For these reasons, the AHP technique has been extensively applied in academia and in the field. Within the healthcare field, Schmidt et al. [20] indicated that the number of studies applying AHP has sharply increased since 2005. Most studies were from Asia (29.75%), followed by the U.S. (about 25.62%): In particular, the number of publications in Asia and Europe have surpassed that of the US since 2010. Even though the result of the research was limited to a specific field, most researchers would agree that studies applying AHP have steadily increased. Major studies using the AHP technique are shown in Table 1.

Table 1: Summary of Application Studies of AHP (since 2005).

Subject	**Researcher (year)**
Banking	Haghighi et al. [21], Secme et al. [22]
Firms and Organization	Amiri et al. [23], Lee and Kim [24], Tseng and Lee [25]
Health and Medical Care	Brent et al. [26], Danner et al. [27], Dolan et al. [28]
Internet and Telecommunications	Lee and Kim [29], Liu and Chen [30], Torfi et al. [15]
Manufacturing and Operations	Chamodrakas et al. [31], Chan and Kumar [32], Ic and Yurdakul [33], Labib [34], Li and Huang [35], Yang et al. [36]
Restaurants	Lee [37], Lee [38]
Software	Cebeci [39], Chang et al. [40], Hsu et al. [41]
Technology	Hsu et al. [42], Lai and Tsai [43]
Warehousing and Sites	Ho and Emrouznejad [44], Onut et al. [45]

Unlike other decision-making methods, the AHP technique decomposes a complicated problem into separate hierarchic levels and produces relative priority weights for the criteria via pairwise comparisons. Hence, decision makers choose an alternative with

the highest priority weight. Dolan et al. [28], on the basis of Saaty [17], suggested that the implementation of AHP consists of the following six steps.

- Define the decision goal (or focus), criteria, and alternatives
- Rate the criteria in pairwise comparisons
- Calculate the relative priority weights for the criteria
- Calculate the criteria's global priority and combine the alternatives' priority
- Control for inconsistency
- Perform a sensitivity analysis

Through these hierarchic levels, the main criteria can be further divided at lower levels into Subcriteria. Originally the AHP technique was introduced for group decisions, but it can also be applied to single persons. In addition, many studies on selection factors don't follow the six steps entirely. For instance, the sensitivity analysis doesn't need to be employed in hierarchic decision making [12,20,38]. Therefore, many researchers who aim to apply AHP to their research area and interest follow a simple four-step guide below [12,46,47].

- Define the problem and determine the kind of knowledge sought.
- Structure the decision hierarchy from the top with the goal of the decision, through the intermediate levels (criteria on which subsequent elements depend) to the lowest level (which is a set of the alternatives).
- Construct a set of pairwise comparison matrices and calculate the relative priority weights for the criteria.
- Check consistency and synthesize the priority weights to obtain a global priority or a ranking.

The step developing the decision hierarchic structure involves the decomposing the complicated decision problem into a hierarchic structure with each element. To obtain consistent judgment (or reliable paired comparison) matrices, each element of the hierarchic structure does not have more than seven elements in one level [17,48]. For each element of the hierarchic structure all associated elements in a low hierarchy are compared in pairwise comparison matrices [49]. To calculate the relative priority weights for the criteria, the maximum eigenvlaue method is applied in each paired comparison matrix. Thus, the equation to obtain the priority weights is as follows:

$$A \cdot W = \lambda_{max} \cdot W \qquad (1)$$

Where A is the paired comparison matrix, W is the relative weight of matrix A, λ max is the maximum eigenvalue of matrix A.

In the next step, to check for consistency, the AHP technique uses the consistency index (C.I.) and consistency ratio (C.R.). The value of the C.I. is calculated using the following formula:

$$C.I.=(\lambda_{max} - n)/(n-1) \qquad (2)$$

Where n is the dimension of the matrix (or the number of criteria).

Finally, the value of C.R. is calculated as follows:

$$C.R.=C.I./R.I. \quad (3)$$

Where R.I. is the random consistency index of randomly generated reciprocal matrices using the scale 1/9, 1/8,…, 1, …8, 9 and is calculated by the average of their eigenvalues. In other words, the random index is the average consistency index of 500 randomly filled matrices.

If C.R. is less than 0.1, the matrix can be considered to have an acceptable consistency. Thus, since the decision makers' judgments are consistent, the priority weights that are calculated can be used. The random indexes of order 1-15 of the matrixes are shown in Table 2.

Table 2: Random Index [50,51].

n	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
R.I.	0	0	0.58	0.90	1.12	1.24	1.32	1.41
n	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
R.I.	1.45	1.49	1.51	1.54	1.56	1.57	1.58	

AHP MODELING AND ANALYSIS

Hierarchic Structure and Data collection

All criteria were obtained from the literature and through expert interviews. In particular, interviews with experts including ICT related practitioners and professors made it possible to define the criteria for this study that were already considered as valid in prior studies or were considered realistic market circumstances. As such, they are suitable for AHP modeling. Based on the earlier studies, this study derives the criteria that are to be considered as subscription attributes for high-speed internet services.

The firm reputation refers to the scale of ISPs and the image of the ISPs in consumers' minds [12], which plays an important role in consumer choice that tends to rely on the size of the firms.

Price refers to the cost and discount of a monthly fee for high-speed internet service. In many prior studies, price including the cost and a monthly fixed fee turned out the crucial factors for high-speed service subscriptions [12-15,16]. Hidalgo and Oviedo [16]

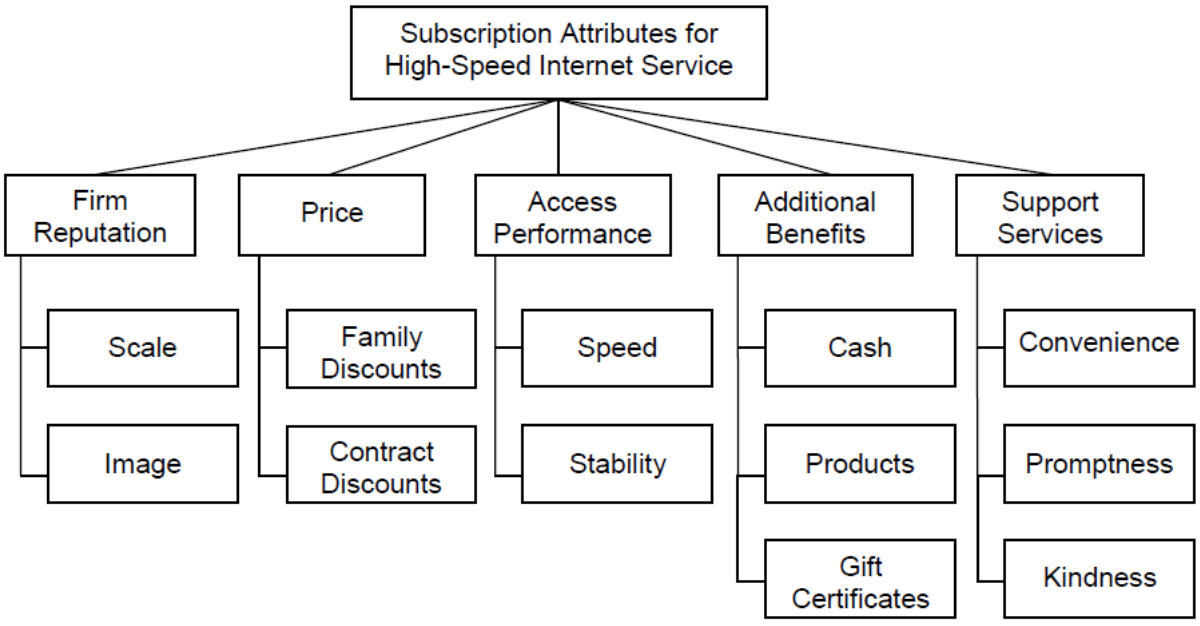
mentioned that high-speed internet services differ in two aspects regarding subscription and contract term differentiation. Many internet subscribers maintain two-year or more than one year contract with their ISPs due to monthly fee discounts.

Access performance refers to upload and download speeds, stability and transmission of high-speed internet services [12,15,16]. In fact, almost all consumers prefer ISPs offering faster and more stable transmission speeds for the same monthly fee. Additional benefits refer to promotional gifts that ISPs offer internet subscribers. Typical promotional gifts include cash, products (e.g., PC monitor, printer and TV) and gift certificates.

Support service refers to the service that ISPs offer to solve problems related to internet use (e.g., internet access problems and equipment repair). Subscribers who want to receive convenient and prompt service from their ISPs when unexpected problems occur during internet use. Thus, the AHP questionnaire and modeling comply with the hierarchical decision-making process.

Figure 1 shows the hierarchic structure of the subscription attributes for high-speed internet service. The decision goal is to determine the priority of the subscription attributes for high-speed internet service. Each criterion is then comprised of Subcriteria.

Figure 1: The subscription attributes for high-speed internet service.



The criteria in the first level consist of firm reputation, price, access performance, additional benefits and support services. The first criterion is the firm reputation, which

includes the scale and the image of firm. The second criterion is the price, with Subcriteria including family discounts and contract discounts. The third criterion is access performance containing access speed and stability. The next criterion is the additional benefits including cash, products and gift certificates. The last criterion is support services including convenience, promptness and kindness.

After the hierarchic structure has been constructed, pairwise comparisons between the criteria are carried out. To make the comparisons, this study uses the scale of absolute numbers, as shown in Table 3. The scale of numbers indicates how many times more important one element is over another element with respect to the criterion [47]. In accordance with the suggestion by Saaty [17], the questionnaire is drawn up from comparison matrices of all elements in each level of the hierarchy.

The data were collected by a researcher during the 3rd week of September 2016. A questionnaire was administered to undergraduate students of the School of Business at Chungbuk National University of Korea. Before the respondents answered the questionnaire, they listened to a detailed explanation of the AHP scales. Undergraduate students were selected as respondents because they strongly tend to be IT-oriented and have a high interest in high-speed internet services as well as wireless internet services [52]. A total of 45 questionnaires distributed, and 41 questionnaires were returned. Of the 41 respondents, 51% were male and 49% were female. This study employed the AHP technique to produce the priorities of subscription attributes, and Microsoft Excel was used for the necessary calculations.

Table 3: The Fundamental Scale of Absolute Numbers.

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation

Reciprocals of above	If activity *i* has one of the above nonzero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*	A reasonable assumption

RESULTS AND DISCUSSION

This study used the Geometric Mean Method (GMM) to aggregate individual pairwise comparison matrices. The GMM is one of the most commonly-used methods in AHP to aggregate individual judgments within a group [53,54]. Aczel and Saaty [55] demonstrated that the geometric mean is suitable to aggregate individual judgments because the judgment matrices are reciprocal. Foman and Peniwait [54] also insisted that the GMM should be used to aggregate individual judgments so that the reciprocity requirement for the comparison matrices is satisfied [53,56].

This study controlled the inconsistency of individual judgments by investigating whether or not individual responses have consistency before aggregating individual pairwise comparison matrix. Of 41 responses, 35 responses that have consistency were used to calculate the priority weights, and the remaining responses that proved to be inconsistent were eliminated. Thus, a final pairwise comparison matrix aggregated by the GMM was used to calculate the relative weights for the criteria. The consistency test of the relative weights for each level was assessed using the C.R. value, as suggested by Saaty [17]. The C.R. value represents the consistency of the paired comparison matrix, and the interpretation of the results is acceptable only when the C.R. is less than 10%. As shown in Tables 4-6, all C.R. values were much less than 0.1, indicating that the consistency of the priority weights was satisfied. Thus, the respondent's judgments are consistent, and the priority weights that were calculated can be used to evaluate the subscription attributes for high-speed internet service.

Table 4: Results of Criteria Weights.

Criteria	**Weight**	**Ranking**	**Consistency**
Firm Reputation	0.089	5	
Price	0.270	2	λ_{max}=5.007
Access Performance	0.368	1	C.I.=0.002
Additional Benefits	0.108	4	C.R.=0.001
Support Services	0.165	3	

Table 4 shows the weights and priority rankings for the criteria in the first level. The most important criterion for high-speed internet subscription is the internet access performance, with a value of 0.368. That is, it is the main reason for which consumers use wired high-speed internet services is due to the superiority of internet access performance. Thus, ISPs need to provide internet access performance to meet consumer's expectations for high-speed internet. The other criteria, price, support services, additional benefits and firm reputation have values of 0.270, 0.165, 0.108 and 0.089, respectively. The fact that firm reputation is the lowest ranking means that ISP reputation hardly influences consumers' selection of high-speed internet service. Korean consumers also judge that there is no difference between ISPs' reputations, or they have almost equivalent reputations.

The Subcriteria in Table 5 are weighted by the priority of each parent criterion to obtain each global priority. For instance, the global priority of the stability (0.233) is obtained by multiplying the priority of the stability by the priority of the access performance (0.368). Table 6 shows the global weights and priority rankings of the criteria. As shown in Table 6, the internet access stability is at the top of the ranking, followed by contract discounts, internet access speed, family discounts, convenience and so on. Internet access stability is the most important criterion for high-speed internet subscription, and it has a value of 0.233. When consumers subscribe to high-speed internet services, they consider access stability to be the most important criterion. Thus, the subscription rate for high-speed internet is expected to depend largely on the internet access stability.

Table 5: Results of Subcriteria Weights.

Criteria	**Subcriteria**	**Weight**	**Ranking**	λ_{max}	**C.I.**	**C.R.**
Firm Reputation	Scale	0.401	2	2.000	0.000	0.000
	Image	0.599	1			
Price	Family Discounts	0.432	2	2.000	0.000	0.000
	Contract Discounts	0.568	1			
Access Performance	Speed	0.366	2	2.000	0.000	0.000
	Stability	0.634	1			
Additional Benefits	Cash	0.507	1	3.005	0.002	0.004
	Products	0.238	3			
	Gift Certificates	0.255	2			
Support Services	Convenience	0.443	1	3.002	0.001	0.002
	Promptness	0.425	2			
	Kindness	0.132	3			

Table 6: Results of Global Weights and Priority Ranking.

Criteria	Subcriteria	Global Weight	Priority Ranking
Firm Reputation	Scale	0.036	9
	Image	0.053	8
Price	Family Discounts	0.117	4
	Contract Discounts	0.153	2
Access Performance	Speed	0.135	3
	Stability	0.233	1
Additional Benefits	Cash	0.055	7
	Products	0.026	11
	Gift Certificates	0.028	10
Support Services	Convenience	0.073	5
	Promptness	0.070	6
	Kindness	0.022	12

The support services subcriterion of kindness exhibits the lowest priority for high-speed internet subscription, with a value of 0.022. Kindness does not play an important role in decision making for internet subscription. Convenience (0.073) and promptness (0.070) are more important than kindness. Thus, ISPs need to provide convenient, prompt support services for consumers who intend to subscribe to high-speed internet service.

CONCLUSION

The internet provides access to ubiquitous networking services relevant to all areas of modern life. Korea is known as one of nations with the most advanced internet in the world, and it remains an ICT powerhouse with the highest rates of internet access. Korean firms work to provide superior high-speed internet access services. However, Korea's subscription rate for such services has already reached a saturation point. Thus, many ISPs try to increase their numbers of new subscribers through various marketing promotions, and they also fight hard to improve their competitiveness in the high-speed internet services market.

In spite of the importance of high-speed internet access service as the core of Korean ICT industry, Korean researchers do not investigate service technology and its use. Thus, this study focused on Korean high-speed service market and consumers' decisions in terms of the subscription attributes that are relevant for high-speed internet services. The study determined the subscription attributes for high-speed internet service based on previous literature and current promotions that internet service providers use. The AHP technique is applied to produce the priorities for the subscription attributes. First, the high-speed internet transmission technologies and the

Korean ISP market were reviewed. Second, the subscription attributes for high-speed internet service were reviewed as well as the applications and theory of AHP. Third, a hierarchic structure was established for the subscription attributes, and their priorities were calculated.

The results of the weight analyses using the AHP technique are as follows. In the first level, internet access performance was revealed to be the most important criterion for high-speed internet subscription. Access performance was followed by price, support services, additional benefits and firm reputation, in that order. To obtain each global priority, the subcriteria priorities were weighted by the priority of each parent criterion, and the global priority of the stability was at the top of the ranking, followed by contract discounts, internet access speed, family discounts, convenience and so forth. Thus, internet access stability was the most important global criterion for high-speed internet subscription.

These results provide important insights for researchers and practitioners. First, consumers consider superior internet access performance to be important when they select high-speed internet services. Specifically, consumers subscribing to high-speed internet services consider internet access stability as the most important criterion. Consumer decision making for high-speed internet subscription depends largely on internet access stability. Hence, ISPs need to provide suitable internet access performance that meets consumer's expectation of their high-speed internet access service.

Firm reputation has the lowest priority and ranking at the first level explains, which means that there is no difference regarding ISP reputation. This implies Korean consumer's decisions for high-speed internet service are seldom influenced by the ISPs' reputations. In addition, kindness has the lowest priority and ranking of the global priorities, which indicates that kindness does not play an important role in consumer decisions for high-speed internet subscriptions. Consumers want to receive convenient, prompt service rather than kind service from their ISPs when they have a problem with their internet access. Second, this study suggests that the AHP technique can be applied to research on the attributes of high-speed internet services. Most previous studies on internet access services have focused on causal relationships between antecedents and consequences. In contrast, this study pays attention to the hierarchic structure of the subscription attributes for internet access service, and further research needs to expand the range of the AHP technique from high-speed internet service to a wider range of ICT research areas, including the selection attributes for mobile services and smart products. In addition, the proposed hierarchic structure and global priorities that were calculated are expected to provide a more realistic understanding of consumers' decision making process for high-speed internet subscriptions to ISPs and insight for broadband internet-related marketing practitioners.

This study has the following limitations. The responses for the survey were obtained from one university in one city due to convenience of the sampling method, which

decreases external validity. However, according to Lee [52], undergraduate students as respondents tend to be strongly IT-oriented. They also have a high interest in high-speed internet services and are expected to be typical consumers of high-speed internet. Nevertheless, future research to strengthen the present study findings needs to include a larger range of responses and also needs to investigate more detailed criteria and include alternatives for decision-making on ISPs.

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