A Study on Calculating the Fee Range of Broadcasting Contents : Focus on IPTV

Minsoo Shin* · Jinho Kil** · Seonghoon Bae***

Abstract

Concerns have been growing about whether domestic internet protocol television (IPTV) can establish a solid foothold in the pay TV market, largely because of the lack of IPTV-only content and service differentiation. It has been difficult for IPTV providers to attract valuable PPs (program providers) to strengthen their positions, and IPTV providers have invested much money into procuring content. To survive this difficult situation, IPTV providers need to reappraise their profit sharing methods and content distribution structure to facilitate the expansion of their subscriber base. This can be done by attracting valuable PPs to IPTV providers and securing extra revenue by distributing more content for their PP partners. The IPTV industry has a different structure and value chain from the digital cable industry. Moreover, profit sharing schemes among participants in the IPTV industry are complicated. Thus it is essential to analyze the criteria for profit sharing, the selection of attributes in profit sharing, and their cause-effect relationship in developing fair pricing for broadcast content in the IPTV industry. This study introduces the attributes that need to be considered for the pricing of content and profit sharing among IPTV providers and PPs. In addition, this study uses system dynamics to analyze the relationship among those attributes along with additional associated factors for the pricing of content.

Keywords : IPTV, Pricing of Content, Profit Sharing, System Dynamics

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* Corresponding Author, School of Business, Hanyang University, e-mail : minsooshin@hanyang.ac.kr
** Business School, Graduate School, Hanyang University, e-mail : kiljinho@hotmail.com
*** NNPC, Korea Institute of Science and Technology Information, e-mail : ultratyphoon@naver.com

1. Introduction

IPTV services started when IPTV providers were selected by Korean government in October 2008, and they have been growing quickly, attracting 9.4 million subscribers by the end of 2014. However, more intense competition in the pay TV market and the appearance of smart TV are posing the question of whether IPTV services will continue to grow at this rate. The main reason for the concern is IPTV's remarkable lack of performance in the development of original content or differentiation. Content quality, representing program diversity, customization, and fitness for its purpose, has been shown to be more important to consumers than service quality, representing terminal quality and convenient use [Shin et al., 2009]. Other studiesalso show that the core element for competition is content [Lee, 2008; Yoo et al., 2011]. According to a survey done in June 2010 by the market survey specialist *Trend Monitor*, general satisfaction with IPTV service was low (34%). Specifically, satisfaction in the added service sector was very low (14.9%). As for complaints, most respondents indicated that "high-quality content is insufficient" (55.3%). In conclusion, poor content was the reason for low satisfaction with IPTV [*Trend Monitor*, 2010]. To improve content quality, IPTV providers pay 60-70% of their broadcasting license feesto content providers. In addition, IPTV providers are trying to support content providers by sharing profits with them while continuing to pay content license feesto terrestrial broadcasting companies. As a result, the number of subscribers to IPTV services has increased. However, the profitability of IPTV companies is of concern because of theirexcess costs in content sourcing.

To improve this situation, revenue allocation between IPTV providers and PPs (program providers) should be reviewed with a view toward securing subscribers by attracting PPs. Emerging issues regarding revenue allocation between IPTV providers and PPs include subscription fee distribution related to retransmission and the allocation rate for advertising on channels operated by an IPTV channel provider [Oh, 2007; Lee, 2008]. However, because a reasonable standard for broadcast content fee calculation has not yet been established, the conflict between IPTV providers and PPs is becoming aggravating. Therefore, we studied a broadcast content distribution model and a business model in the Korean IPTV industry to calculate a fair fee between players and prepare a reasonable revenue allocation system for active distribution of broadcast content across IPTV. We deducted internal and external environmental factors in calculating a broadcast content fee. We've also provided an analysis of the current status, the problem of revenue allocation between IPTV providers and PPs, and suggestions for reasonable revenue allocation and price scope.

2. Price Calculation Model Development

To make an accurate revenue allocation between IPTV providers and PPs, a price calculation principle for each of following 3 areas is required. First, IPTV providers need a price calculation

principle to determine appropriate fees for use of content from PPs because IPTV providers earn income by charging users certain fees as they distribute content from a PP. Second, as PPs create income by distributing their content through an IPTV platform, they need a calculation method to determine the network fee, which is the transmission cost they pay to the IPTV provider. Third, IPTV providers pay content fees to a coalition of PPs, and coalition members need a calculation principle to determine how those fees can reasonably be divided among them.

The content fee for a PP is calculated by distributing a certain part of the subscription fee paid by subscribers to IPTV providers. If the total sum of the fee collected by IPTV providers from subscribers is P_C, then the amount to be allocated to the PP is P_C. If the revenue allocation rate between an IPTV provider and a PP is r_c, then the amount allocated to the PP is $\pi_{pp} = P_C \cdot r_c$, and the amount remaining after subtracting π_{pp} from P_C is the income of the IPTV provider, which is $\pi_{IPTV} = P_C \cdot (1-r_c)$. For the IPTV provider to continue in business, it should maintain the break-even point, at which income and costs are equal, and that means that π_{IPTV} should be greater than the fixed costs of the IPTV provider. For an IPTV provider to maintain the break-even point, (P_S) and (P_V) are subtracted from π_{IPTV}. When advertising revenue (P_{AD}) and the network fees paid by PPs (P_N) are added, the amount should be greater than 0 won. A fixed cost (P_S) is continuously incurred regardless of the number of subscribers, including labor, depreciation of invested system construction, and other expenses. Variable costs (P_V) include channel supply costs (π_{PP}), marketing costs (P_M), and conduction and management of transmission equipment (P_{MT}). Currently, the telecommunication providers that operate the internet network are also the IPTV providers, so network capacity additions or additional construction costs for transmission equipment are decided in common with services such as general internet provision and VoIP. Therefore, among the variable costs, construction and management of transmission equipment (P_{MT}) can be regarded as a shared cost or a total common cost in a wider concept; thus P_{MT} should be calculated by applying only the amount of network resources used to transmit content from PPs.

Fixed costs :

Ps = Labor + Depreciation + Other expenses

Variable costs :

P_v = Channel supply cost (π_{pp}) + Marketing cost (P_M) + Cost of construction and management of transmission equipment (P_{MT})

$$\pi_{IPTV} - (P_S + P_V) + P_{AD} + P_N) > 0$$

$$r_C < \frac{(P_{AD} + P_N) - P_S + P_V}{P_C} + 1$$

Currently, the subscription fee paid by an SO (System Operator) to PPs is fixed at 25% by recommendation of the Korea Communications Commission, and the subscription fee rate between IPTV providers and PPs is also at the same level. So far, the government has given no mandatory guideline on revenue allocation for IPTV (r_c) leaving it to be regulated autonomously by agreement among the players.

To calculate the content transmission cost (price for using the network) through the IPTV platform, 3 principles are applied. First, given that the fee for use can be regarded as the price for using a resource, it is proportional to the amount of content transmitted. Second, the fee for use should reflect the value of the content transmitted. Third, the fee for use should reflect the transportation distance, in other words, the value contribution.

Content revenue allocation to each PP participating in a single coalition is calculated by setting up $\pi_{pp} = P_C \cdot r_c$, from the subscription fees of an IPTV provider and allocating that to each PP. When the revenue allocation function between PPs, $R_{PP}(\pi)$, is applied to the allocation amount, the price allocated to PP_1will be $\pi_{PP1} = R_{PP}(P_C \cdot r_C) = R_{PP}(\pi_{PP})$.

In defining the revenue distribution function between PPs, $R_{PP}(\pi)$, the standard subscription fee allocation between PPs in existing SOs is considered. From 1995 to 2001, the allocation standard changed, and one of the major changes was to include various factors to raise the program investment factor of PPs, such as viewer preferences and marketing contributions, unlike equal allocation. In 2002, an allocation rate decision by autonomous negotiation between players was introduced. Then, beginning in 2007, the allocation factor went back to the method from 2001,including equal allocation to ensure the survival of all PPs, and an HD content rate. From a double-sided market perspective, an indirect network effect is produced in the IPTV market : as the number (type) and quality of content provided to consumers increases → PTV subscribers increases →'revenue increases →'income increases → increases, and so on in a virtuous circle of content distribution, creation, and consumption. For IPTV providers, securing PP channels has a positive effect on attracting subscribers; therefore, part of that additional IPTV income should be passed on to the PP at a price corresponding to its contribution. Therefore, to measure the contribution of PPs to the IPTV industry and apply it to the allocation standard between PPs, the channel ratings of PPs, trends of IPTV subscriber increases, and the increase rate of an IPTV provider's income following from an increase in subscribers should be considered comprehensively. On the other hand, the ratio of SD/HD content affects price increases caused by an increased use of network resources. It is expected to decrease the additional income of PPs that results from the increased contribution; thus it is excluded from the allocation standard. To activate digital content, securing SD/HD content is of the foremost importance. Because high-resolution content increases the quality of broadcasts and enhances the quality of IPTV as a whole, more detailed study on SD/HD content is required to calculate content and network prices. In addition, in considering an allocation standard based on program production cost, channel originality should be defined by whether the program is broadcast on IPTV and SO at the same time. Because IPTV is a digital media service that uses internet networks, the survey method of 'Return Path Data' can be used to measure ratings not only per channel but also per program, thereby providing a more accurate and realistic rating survey.

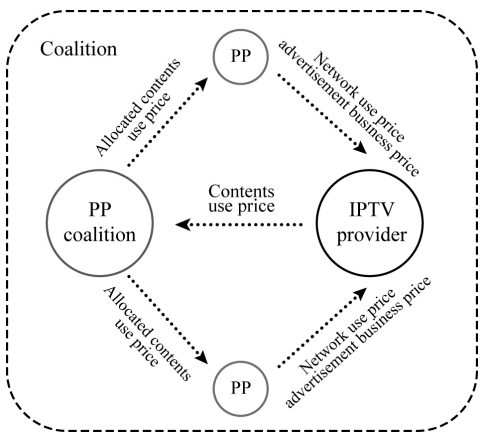
Because IPTV provides both real-time and VOD service, graded price calculation according to the characteristics of each service is required. First, for real-time IPTV service, the price can be calculated by applying a part of the price calculation currently used in existing SO-PP relationships. In the subscription fee allocation standard of 2001, before the introduction of a separate contract method between SOs and PPs in 2002, equal allocation (20%), broadcasting time (15%), ratings (30%), ratio of first programming (10%), viewer preference (10%), marketing contribution (10%), and AI (appreciation index) (5%) were considered. In this study, we used AI to measure the contribution and thus excluded it from the allocation standard, changing the weight of the marketing contribution to 15%. 10% of the weight was assigned to channel originality using the minimum rate of the subscription fee allocation standard of 2001. By adjusting the weight of equal allocation and rating, which is controversial, the ratio was adjusted : equal allocation (15%), broadcasting time (15%), ratings (25%), ratio of first programming (10%), viewer preference (10%), marketing contribution (15%), and channel originality (10%). Given that most of the broadcast content provided by an IPTV VOD service is registered on IPTV after the programming is first transmitted, the ratio of first programming was excluded from the allocation standard for IPTV service. Also, given that broadcasting time is determined by each viewer's own selection in a VOD service, broadcasting time was replaced with watching time. Because groundwave broadcasting systems operate both real-time channels and VOD channels, when the equal allocation standard is applied, groundwave broadcasters can have duplicate allocation. However, it was excluded because this can cause a problem in equity. Accordingly, in our simulation, we adjusted the subscription allocation standard among PPs that provide IPTV VOD channels into watching time (30%), ratings (35%), viewer preference (10%), contribution (15%), and channel originality (10%). Subscription allocation between IPTV providers' real-time channels and VOD channels can be applied identically in each allocation standard. Both standards include ratings, viewer preference, and contribution, which represent the characteristics of both real-time and VOD channels. Also, in the simulation, we added the type of subscriber because the subscription fee allocated to real-time service or VOD service depends on the products to which consumers subscribe : 'real time+VOD' or 'VOD only.'

As competition among IPTV providers has intensified, many of them are providing SLAs (service level agreements). Also, corporations' attitudes toward providing a high-quality service that can satisfy various customer demands are changing. IPTV service quality affects subscriber loyalty, which is one of the factors to consider in calculating the price [Lee et al., 2008; Lim et al., 2008; Shin, 2009; Wenige, 2010]. Two possible quality measurement indices are QoS (quality of service) and QoE (quality of experience) [ATIS, 2006; ITU-T Focus Group on IPTV, 2006] however, no QoS or QoE measurement method has been quantified in the IPTV service area. Because QoS and QoE are measured by a technical index, measuring the con-

tribution of PPs using only QoS and QoE is limited; thus they must be supplemented using a quality measurement index from the broadcast users'point of view. When service quality measurement was studied, Rosengren [1996] defined quality as one or more properties that satisfy a certain standard and are considered valuable from an aspect of basic value or regulation [Rosengren et al., 1996]. Park [1991] divided program quality into diversity and quality, defining diversity as something that widens the viewer selection and quality as something that helps viewers realize a socio-cultural value [Park, 1991]. However, many researchers have encountered difficulty in measuring program quality, which requires a broader approach than diversity [Park, 1991; Ishikawa, 1996; Rosengren, 1996].

Jung [2007] also shows that consumers summarize the criteria by which they select an IPTV provider as price, quality, and amount of available content. After combining such existing study results, Jung concluded that quality consists of IPTV transmission network quality to ensure a high QoS and QoE and program quality and diversity as evaluated by users [Jung, 2007]. Among those quality measurement factors, network quality depends on efforts by the IPTV providers, not PPs. So in this study, we excluded a consideration of network quality and considered only content quality and diversity level to measure the net contribution of PPs.

When we studied the groundwave broadcasting system to consider its allocation method for PP advertisement business, we found that all advertisement revenue following program transmission was allocated to the groundwave broadcasting system without an explicit allocation system. Groundwave broadcasters do not ask cable TV providers for the price of channel use and do not allocate to them any advertisement revenue. Both parties calculate using the 'bill and keep'method. However, PPs pay part of their advertisement revenue to cable TV providers at an average allocation rate of 20 : 80 (SO : PP).



〈Figure 1〉 Flow of Money Among Players in a Coalition

IPTV providers pay PPs a price for their content, but when a PP obtains an order for advertising and transmits that advertising across an IPTV provider's network, the PP generates revenue using the IPTV provider's facility. Thus, the process of price calculation should consider the allocation of advertising revenue from ads transmitted by a PP across an IPTV network.

Based on the preceding description of price calculation model development and the core factors being considered, price items and their flow between players, as applied to an IPTV provider and a single PP participating in a coalition, are shown in <Figure 1>.

The calculation formula for prices to be allocated to each player by allocation item is summarized in <Table 1>.

The allocation rate and revenue allocation function applied by price item are shown in <Table 2>.

3. Validation of Price Calculation Model Using System Dynamics

In this chapter, based on the price calculation discussed in chapter 2, we'll verify the causal relation of price calculation from an executive point of view using system dynamics (Vensim 5.0). The number of IPTV subscribers has grown by an average of 39% per year (2008~2014). The situation of IPTV services in 2009 shows the average growth rate and thus offers a representative situation, which we have adopted for our study. Specifically we have used data from August 2009. During that month, the number of IPTV subscribers exceeded 2,370,000 (about 700,000 subscribers for each IPTV provider). For data related to PPs, we used data published by the Korea Communication Commission.

3.1 Content Price Calculation Model Analysis

(1) Calculation Model for Price of Network Use

<Figure 2> shows the calculation model for the price of using a network as a system dynamic causal relation map. Calculation of the main component variables is shown below :

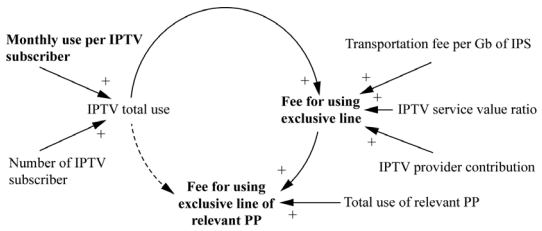
〈Table 1〉 Calculation Formula for Price Item per Player

Item	Player	Calculation formula
Content use price	IPTV provider	IPTV total subscription fee* (1-Content revenue allocation rate)
	All PPs	IPTV total subscription fee* Content revenue allocation rate
Content revenue allocation to the relevant PP	Relevant PP	Content revenue allocation for PP* Revenue allocation function ($R_{PP}(\pi)$).
Price for network use	Relevant PP	Transportation cost per Gb* Total use of IPTV* IPTV service value ratio* IPTV provider contribution
Price for advertisement business	IPTV provider	Own advertisement revenue+Total advertisement revenue of PP* (1-Advertisement revenue allocation rate)
	Relevant PP	Total advertisement revenue of PP* Advertisement revenue allocation rate

〈Table 2〉 Allocation Rate and Revenue Allocation Function

Item	Calculation formula
Allocation rate (r_C)	Following calculation formula (1)*
Allocation rate (r_{AD})	Allocation rate following separate negotiation between players is applied
Revenue allocation function ($R_{pp}(\pi)$)	Rpp(π) = Rpp (Equal allocation, broadcasting time, watching time, ratings, first transmission rate, viewer preference, contribution, channel originality, type of subscriber)

*Formula (1) : $r_C < \frac{\text{(Own advertisement revenue+price for network use)-(Fixed cost+variable cost)+other income}}{\text{Subscription fee}} + 1$.



〈Figure 2〉 Calculation Model of Network Use Fee

- *Total use of IPTV = Monthly use by IPTV subscriber×number of IPTV subscribers*
- *Price for using exclusive line = Total use of IPTV×Transportation fee by ISP Gb×IPTV service value rate×IPTV provider contribution*
- *Price for using exclusive line of relevant PP = Price for using exclusive line×(total use of the relevant PP/total use of IPTV)*

The monthly average of use time per subscriber and equivalent bandwidth per subscriber are proportional to the monthly use per IPTV subscriber. Additionally, IPTV total use is determined using the monthly use per IPTV subscriber and the number of IPTV subscribers. The current subscription plan for ISPs and IPTV providers is fixed, and the total subscription fee for each provider is determined only by the number of subscribers, regardless of the total amount of use. A fee for exclusive line use is calculated by the total use of an IPTV user and a transportation fee per Gb; the IPTV value ratio adjusts the transportation fee per 1Gb charged by the ISP. This means that the unit price of transportation per Gb for an IPTV provider is determined by the unit price of transportation per Gb of the relevant ISP and the value ratio of the IPTV service. Also, we consider the contribution of the IPTV provider to the revenue of the relevant PP, which is reflected in the fee for using an exclusive line.

The total use of IPTV can increase the fee for using the exclusive line of a relevant PP, but when the total use of IPTV increases while the total use of the relevant PP stays constant, it can decrease that PP's fee for using an exclusive line. The fee for an exclusive line to be paid by

〈Table 3〉 Definition of Component Variables in Network Use Fee Calculation Model

Variable	Definition
Monthly use per IPTV subscriber	Monthly data use for IPTV per 1 subscriber (Monthly average use time per subscriber×equivalent bandwidth per subscriber)
Number of IPTV subscribers	Number of users subscribed to IPTV
Total use of IPTV	Monthly data use of all IPTV subscribers
Total use of relevant PP	Amount of data produced by use of the relevant PP's content
Transportation fee per Gb charged by ISP	Cost to transmit 1 Gb of data
IPTV service value ratio	Ratio of transportation fee for Gb charged by the ISP and the IPTV provider
IPTV provider contribution	Contribution of IPTV provider (network) to the revenue of the relevant PP
Fee for using an exclusive line	Network use fee paid by all PPs in a coalition to transmit content using the ISP's network
Fee for using the exclusive line of the relevant PP	Network use fee paid by individual PP to transmit content using the ISP's network

all PPs to a IPTV provider should be distributed among the PPs. In this model, we used the total use of the relevant PP (amount of data transmitted when users access its content) as the allocation standard. Therefore, the fee for using the exclusive line of the relevant PP is based on the ratio of the total use of IPTV to the total use of the relevant PP.

<Table 3>shows the definitions of the component variables for the model network use fee calculation.

Virtual data and a calculation formula simulating the IPTV market in August 2009 based on the model described above were input as indicated in <Table 4>.

After substituting the formula for each variable, 3 data sets were entered as shown in <Table 5> to analyze the difference in price for using an exclusive line following a change of the relevant variable.

〈Table 4〉 Data and Calculation Formula by Component Variable in Network Use Fee Calculation Model

Variable	Data and calculation formula	Unit
Monthly average use time per subscriber	50	Time
Equivalent bandwidth per subscriber	1.5	Mbps
Monthly use per IPTV subscriber	(50(60×60)×1.5)/1,000	Gbps
Number of IPTV subscribers	70	10,000 persons
Total use of IPTV	Monthly use per IPTV subscriber×Number of IPTV subscribers	Gbps
Total use of relevant PP	5,000,000	Gbps
Transportation fee per Gb charged by ISP	100	KRW
IPTV service value ratio	0.5	-
IPTV provider contribution	10	%
Fee for using an exclusive line	Total use of IPTV×ISP transportation fee per Gb× IPTV service value ratio×IPTV provider contribution	100 million KRW
Fee for using the exclusive line of the relevant PP	Fee for using exclusive line×(Total use of relevant PP/total use of IPTV)	100 million KRW

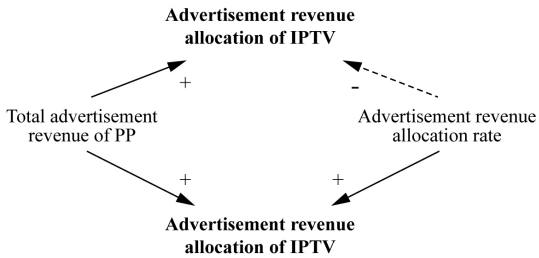
〈Table 5〉 Simulation Result of Network Use Fee Calculation Model

Variable	Data SET 1	Data SET 2	Data SET 3
Monthly use time per subscriber	50 hours	50 hours	50 hours
Equivalent bandwidth per subscriber	1.5 Mbps	1.5 Mbps	1.5 Mbps
Monthly use per IPTV subscriber	270 Gbps	270 Gbps	270 Gbps
Number of IPTV subscribers (persons)	700 thousand	700 thousand	1.4 million
Total use of IPTV (Gbps)	189,000,000	189,000,000	378,000,000
Total use of relevant PP (Gbps)	5,000,000	5,000,000	5,000,000
Transportation fee per Gb charged by IPS	100 KRW	100 KRW	100 KRW
IPTV service value ratio	0.5	0.5	0.5
IPTV provider contribution	10%	20%	10%
Fee for using an exclusive line	945 million KRW	1.89 billion KRW	1.89 billion KRW
Fee for using the exclusive line of the relevant PP	25 million KRW	50 million KRW	25 million KRW

When the contribution of the IPTV provider doubles, the network use fee doubles at the same rate to 1.89 billion KRW. When the number of IPTV subscriber doubles, the fee for using an exclusive line doubles as well. This is because the total use of IPTV increases. However, if use of the contents from the relevant PP does not change, the fee for using an exclusive line paid by the PP does not change either.

(2) Advertising Revenue Allocation Model

<Figure 3> shows the advertising revenue allocation model as a system dynamics causal map. The calculation formulaeof the main component variables are as follows :



〈Figure 3〉 Advertising Revenue Allocation Model

- *Advertisement revenue allocation for PP = Total advertisement revenue of PP× Advertisement revenue allocation ratio*
- *Advertisement revenue allocation for IPTV provider = Total advertisement profit of PP× (1-Advertisement revenue allocation ratio)*

The advertisement revenue allocation rate between IPTV providers and PPs is determined by autonomous negotiation between each IPTV provider and the relevant PPs. The total advertisement revenue of a PP represents all ad revenue derived from its IPTV business. It is distributed to the PP and IPTV provider using the advertisement revenue allocation ratio, which signifies how much of the total revenue belongs to each party.

<Table 6> shows the definitions of the component variables of the advertisement revenue allocation model.

Based on the model above, we entered virtual data and calculation formula for each variable, as shown in <Table 7>.

〈Table 6〉 Definition of Component Variables of the Advertisement Revenue Allocation Model

Variable	Definition
Total advertisement revenue of PP	Total advertisement revenue from IPTV business area
Advertisement revenue allocation ratio	Standard ratio to allocate advertisement revenue owed to PP
Advertisement revenue allocation for IPTV provider	Amount owed to IPTV provider from advertisement revenue of PP
Advertisement revenue allocation for PP	Amount retained by PP from its total advertisement revenue

〈Table 7〉 Data and Calculation Formulae per Component Variable of the Advertisement Revenue Allocation Model

Variable	Data and calculation formula	Unit
Total advertisement revenue of PP	86	100 million KRW
Advertisement revenue allocation ratio	70	%
Advertisement revenue allocation for IPTV provider	Total advertisement revenue of PP× (1-comercial revenue allocation ratio/100)	100 million KRW
Advertisement revenue allocation for PP	Total advertisement revenue of PP× (commercial revenue allocation ratio/100)	100 million KRW

〈Table 8〉 Simulation Result of the Advertisement Revenue Distribution Model

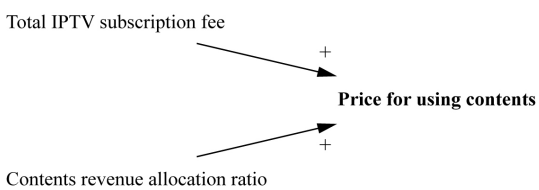
Variable	Data SET1	Data SET2	Data SET3
Total advertisement revenue of PP	8.6 billion KRW	8.6 billion KRW	4.3 billion KRW
Advertisement revenue allocation ratio	70%	50%	70%
Advertisement revenue allocation for IPTV provider	2.58 billion KRW	4.3 billion KRW	1.29 billion KRW
Advertisement revenue allocation for PP	6.02 billion KRW	4.3 billion KRW	3.01 billion KRW

After entering the formula for each variable, 3 data sets were entered as shown in <Table 8> to analyze changes in advertisement revenue allocation. When the total advertisement revenue of a PP stays the same and the advertisement revenue allocation rate is reduced, then the allocation of advertisement revenue to the IPTV provider increases, and the advertisement revenue allocated to the PP is reduced.

If the total advertisement revenue of a PP is reduced, then the advertisement revenue allocation to both the IPTV provider and the PP is reduced as well.

(3) Content Price Calculation Model between IPTV and PPs

<Figure 4> shows the content price calculation model between an IPTV provider and a PP using a system dynamics causal map. The calculation formula for the main component variable is as follows :



〈Figure 4〉 Price Calculation Model between IPTV and PPs

- *Price for use of content = Total IPTV subscription fee×Content revenue allocation ratio*

The amount an IPTV provider pays the relevant PP for using its content is allocated according to the content revenue allocation rate, which is based on the total IPTV subscription fee received from consumers. Thus, the total IPTV subscription fee is proportional to the price for use of content. If the price for use of content is subtracted from the total IPTV subscription fee, the remaining amount is part of the IPTV provider's income. The content revenue allocation ratio is a policy variable; thus it is presumed to be adjusted by negotiation between providers.

<Table 9> shows the definitions of the component variables of the content price calculation model between IPTV providers and PPs.

Based on that model, we entered virtual data and the calculation formulae, as shown in <Table 10>.

After entering the formula for each variable, we entered 3 data sets, as shown in <Table 11>. We analyzed changes in the price for use of content against changes in other variables. When the content revenue allocation rate doubles, the price for use of PP content doubles as well, but the subscription fee revenue of the IPTV provider is reduced. Similarly, the revenue per subscriber for the IPTV provider or the number of IPTV subscribers is reduced. The total IPTV subscription fee decreases with the price for use of content.

〈Table 9〉 Definition of Variables

Variable	Definition
Content revenue allocation rate	Allocation rate to calculate how much the IPTV provider pays the relevant PP for content
IPTV total subscription fees	Total sum that IPTV provider receives in usage fees from consumers
Price for use of content	Total amount paid by IPTV provider to all PPs for using content

〈Table 10〉 Data and Calculation Formulae of Content Price Calculation Model Between IPTV Providers and PPs

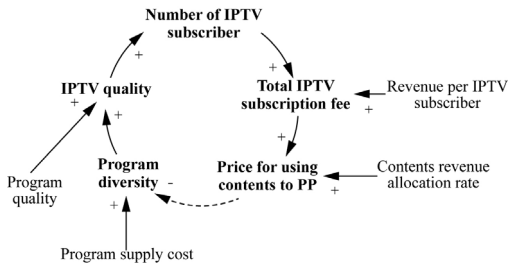
Variable	Data and calculation formula	Unit
Content revenue allocation rate	30	%
IPTV total subscription fees	46.22	Billion KRW
Price for use of content	IPTV total subscription fee×Content revenue allocation rate	Billion KRW

〈Table 11〉 Simulation Result of Content Price Calculation Model Between IPTV Providers and PPs

Variable	Data SET 1	Data SET 2	Data SET 3
Content revenue allocation rate	20%	40%	20%
IPTV total subscription fees	46.22 billion KRW	46.22 billion KRW	23.12 billion KRW
Price for use of content	9.244 billion KRW	18.488 billion KRW	4.624 billion KRW

(4) Model To Measure PP Contribution

<Figure 5> depicts a model to measure PP contribution in the form of a system dynamics causal map. The calculation formulae of the main component variables are shown below :



〈Figure 5〉 Model To Measure Contribution of PPs

- *IPTV quality = Program quality sensitivity + Program diversity sensitivity×(Program supply cost/Price for using PP content)*
- *Number of IPTV subscribers = IPTV quality sensitivity×IPTV quality*
- *Total IPTV subscription fee = Number of IPTV subscribers×Revenue per IPTV subscriber*

To measure the PP contribution, one of the content revenue allocation standards among PPs, we examine the quality of the IPTV service, which mediates the total PP revenue and the number of IPTV subscribers in the PP contribution measurement model. IPTV quality is measured by the quality and diversity of the programming, which have a proportional relationship : the cost supplying programming and the price for use of content both increase program diversity. In this study, we define program diversity as program supply cost divided by the price for use of PP content. This means that the degree of investment in a program following an increase in PP revenue and the price for use of content are inversely proportional to program diversity.

Therefore, the price paid to a PP for use of its content includes factors that both increase and decrease IPTV quality. Program quality is proportional to consumer satisfaction and intention to use, and it affects the number of subscribers [Jung, 2007]. Factors that motivate investment from the IPTV point of view are an increase in IPTV total subscription fees (income) and an increase in the number of IPTV subscribers attributable to IPTV quality improvement.

From a PP's point of view, an increase in its total revenue created by increasing the price for use of its content is attributable to an increase in an IPTV provider's total subscription fee. <Table 12> shows the definitions of the component factors of the PP contribution measurement model. Based on that model, virtual data and calculation formulae were entered as shown in <Table 13>.

After entering the formula for each variable, we entered 3 data sets as shown in <Table 14> to analyze the difference in IPTV subscriber numbers according to a PP's contribution. When the program supply cost (investment) is halved, the program diversity index is reduced, along with IPTV quality. Therefore, the increase in the number of IPTV subscribers holds steady, but PP_1's contribution to the IPTV provider's subscription base is reduced from 8,300 to 5,300.

In data SET3, even though there was no change in program quality or diversity, the number of subscribers increased from 700 thousand to 850 thousand because of an increase in the sensitivity An increase in IPTV quality sensitivity is not an increase in the sensitivity to actual quality. Rather, as sensitivity increases, the number of subscribers increases even though the increase in IPTV quality is small. This results from insensitivity to quality among users, which is actually reduced sensitivity. of consumers to IPTV quality. Thus, the number of IPTV subscribers increased with only marginal IPTV quality improvement.

〈Table 12〉 Definition of Component Variables of the PP Contribution Measurement Model

Variable	Description
IPTV quality	General quality level of IPTV service
Program diversity	Number of programs provided by IPTV (diversity)
Program quality	General quality of broadcast content
AI	Quality level measurement index of broadcast content
Program supply cost	Total program supply cost, including own production, outsourcing production, and purchase
Number of IPTV subscribers (y)	Number of IPTV subscribers of IPTV in year y
Number of IPTV subscribers (y+1)	Number of IPTV subscribers in y+1 year
IPTV total subscription fee	Total amount of IPTV use fees paid by consumers
Revenue per IPTV subscriber	Average IPTV use fee per subscriber
Price for use of content of the relevant PP	Amount relevant PP receives for use of content from IPTV provider
IPTV quality sensitivity (η)	Sensitivity of users to IPTV quality as it affects intention to maintain IPTV subscription
Increase in number of subscribers attributable to PP_1	Increase in number of IPTV subscribers attributable to PP_1

〈Table 13〉 Data and Calculation Formulaeby Component Variable for PP's Contribution Measurement Model

Variable	Calculation formula	Unit
IPTV quality	(0.3×program quality)+(0.3×program diversity)	-
Program diversity	Program supply cost/price for use of content paid to PP	-
Program quality	AI	%
AI	10	%
Program supply cost	Price for using contentpaid to PP×0.5	100 million KRW
Number of IPTV subscribers (y)	60	10 thousand
Number of IPTV subscribers (y+1)	(IPTV quality sensitivity×number of IPTV subscribers (y))+ number of IPTV subscribers (y)	10 thousand
IPTV total subscription fee	Number of IPTV subscribers×revenue per IPTV subscriber	100 million KRW
Revenue per IPTV subscriber	7,200	KRW
Price for use of content of the relevant PP	IPTV total subscription fee×0.3 (ratio to be allocated by the relevant PP ratio)	10 thousand
IPTV quality sensitivity (η)	Number of IPTV subscribers (y+1)-Number of IPTV subscribers (y) IPTV quality sensitivity×Number of IPTV subscribers (y)	-
Increase in number of subscribers attributable to PP_1	Increase in the number of IPTV subscribers attributable to PP_1	10 thousand

〈Table 14〉 Simulation Result for PP's Contribution Measurement (1)

Variable	Data SET 1	Data SET 2	Data SET 3
IPTV quality	0.18	0.105	0.18
Program diversity	0.5	0.25	0.5
Program quality	0.1	0.1	0.1
AI	10%	10%	10%
Program supply cost	648 million KRW	324 million KRW	648 million KRW
Number of IPTV subscribers (y)	600 thousand	600 thousand	600 thousand
Number of IPTV subscribers (y+1)	700 thousand	700 thousand	850 thousand
Total IPTV subscription fee	4.32 billion KRW	4.32 billion KRW	4.32 billion KRW
Revenue per IPTV subscriber	7,200 KRW	7,200 KRW	7,200 KRW
Price for use of content of the relevant PP	1,296 million KRW	1,296 million KRW	1,296 million KRW
IPTV quality sensitivity (η)	0.16666667	0.16666667	0.416666667
Increase in number of subscribers attributable to PP_1	8,300	5,800	20,750

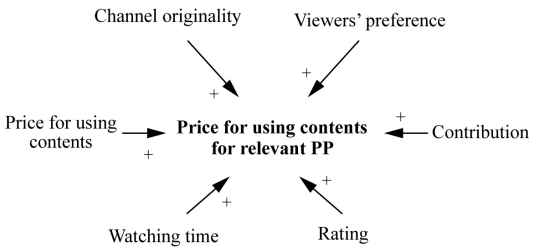
Next, we entered only one set of data and changed the number of IPTV subscribers, as shown in <Table 15>. IPTV quality remained the same for 3 years, and IPTV quality sensitivity was also presumed to be the same (0.2) for 3 years. The number of subscribers was 700 thousand in year y, 864 thousand in year y+1, and 900 thousand in year y+2. The contribution of PP_1 to IPTV quality (IPTV quality index of PP_1/ sum of IPTV quality index of all PPs×100 = 8.3%) contributed an increase of 9,960 subscribers in year y, 11,952 subscribers in year y+1, and 14,342 subscribers in year y+2. When quality is guaranteed to be consistent, the number of subscribers steadily increases at a certain level when consumers'sensitivity to IPTV quality is maintained.

〈Table 15〉 Simulation Result of PP's Contribution Measurement Model (2)

Variable	Data SET (y)	Data SET (y+1)	Data SET (y+2)
IPTV quality	0.18	0.18	0.18
Program diversity	0.5	0.5	0.5
Program quality	0.1	0.1	0.1
AI	10	10	10
Program supply cost	648 million KRW	778 million KRW	999 million KRW
Number of IPTV subscribers (y)	30%	30%	30%
Number of IPTV subscribers (y+1)	600 thousand	720 thousand	1,090 thousand
Total IPTV subscription fee	72 10 thousand	86.4 10 thousand	103.7 10 thousand
Revenue per IPTV subscriber	4.32 billion KRW	5.18 billion KRW	6.22 billion KRW
Price for use of content of the relevant PP	7,200 KRW	7,200 KRW	7,200 KRW
IPTV quality sensitivity (η)	1,296 million KRW	1,555 million KRW	1,866 million KRW
PP1's contribution to IPTV quality	0.2	0.2	0.2
Increase in number of subscribers attributable to PP_1	9,960 persons	11,952 persons	14,342 persons

(5) Content Revenue Allocation Model Among PPs (VOD Service)

<Figure 6> shows the content revenue allocation model among PPs. The calculation formulae of the main component variables are as follows :



〈Figure 6〉 Content Revenue Allocation Model Among PPs (VOD Service)

- *Contribution = AI*
- *Price for use of the content of the relevant PP = Price for use of content×(10%×Channel originality of relevant PP+10%×Viewer preference for relevant PP+15%×Contribution of relevant PP+35%×Rating of relevant PP+30%×Watching time of relevant PP)*

This is a model for content revenue allocation among PPs that provide only VOD content. Because the price for using PP content is allocated using the content, the 2 variables are proportional.

All 5 allocation criteria tend to drive a high price for use of PP content.

<Table 16> shows the definitions of the component variables in the contribution measurement model among PPs.

Based on that model, virtual data and calculation formulae were entered for each component variable as shown in <Table 17>.

After entering the formula for each variable, we entered 3 data sets as shown in <Table 18>, and we analyzed the price change for use of the content of the relevant PP according to changes in other variables. When the overall price for content use doubles, the price to use content from the relevant PP also doubles. When rating increases double, the price increases by 35%×25%×10 billion = 875million KRW.

〈Table 16〉 Definition of Component Variables of Content Revenue Allocation Model Among PPs

Variable	Description
Price for use of content	Broadcast content fee for all PPs paid by IPTV provider
Channel originality	Whether or not same broadcast content is transmitted on platform other than IPTV
Rating	Proportion of viewers watching the channel at the same hour
Viewer preference	Viewer preference toward the channel
Watching time	Total time viewers spend watching the channel
Contribution	Degree to which a PP's broadcast content increases the number of an IPTV provider's subscribers (AI)
Price for use of the content of the relevant PP	Content use fee paid to relevant PP by IPTV provider

〈Table 17〉 Data and Calculation Formulae per Component Variable of Content Revenue Allocation Model Among PPs

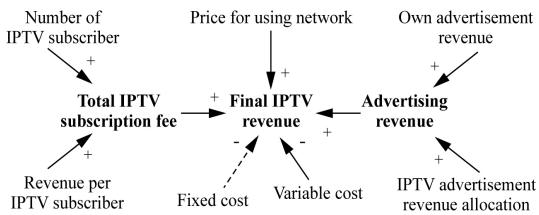
Variable	Formula	Unit
Price for use of content	10	Billion KRW
Channel originality	10×Channel originality of relevant PP	%
Rating	35×Rating of relevant PP	%
Viewer preference	10×Viewer preference of relevant PP	%
Watching time	30×Watching time of relevant PP	%
Contribution	15×Contribution of relevant PP	%
Price for use of the content of the relevant PP	RPPn (Channel originality, rating, viewer preference, watching time, contribution)	100 billion KRW

〈Table 18〉 Simulation Result of Content Revenue Allocation Model Among PPs

Variable	Data SET 1	Data SET 2	Data SET 3
Price for use of content	10 billion KRW	20 billion KRW	10 billion KRW
Channel originality	20%	20%	20%
Rating	25%	25%	50%
Viewer preference	20%	20%	20%
Watching time	25%	25%	25%
Contribution	10%	10%	10%
Price for use of the content of the relevant PP	2.175 billion KRW	4.35 billion KRW	3.05 billion KRW

(6) Break-Even Point Model for IPTV Providers

<Figure 7> shows the break-even point model for an IPTV provider in the form of a system dynamics causal map. The calculation formulae of the main component variables are as follows :



〈Figure 7〉 Break-Even Point Model for IPTV Providers

- *Total IPTV subscription fee = Number of IPTV subscribers×Revenue per IPTV subscriber*
- *Advertisement revenue = IPTV advertisement revenue allocation+Own advertisement revenue*
- *Final IPTV revenue = Total IPTV subscription fee+Advertisement revenue+Network using price-Variable costs-Fixed costs*

〈Table 19〉 Definition of Component Variables in Break-Even Point Model for IPTV Providers

Variable	Description
Total IPTV subscription fee	Total sum received from consumers
Revenue per IPTV subscriber	Average fee per subscriber
Number of IPTV subscribers	Number of people subscribed to IPTV service
Combined service	Discount rate for combined services
IPTV fee level	Basic IPTV fee level
Paid additional service	Number of additional services for which subscribers pay
Fixed costs	Consistent fixed costs regardless of increase or decrease in number of subscribers
Labor	Labor costs for employees working in IPTV business
Depreciation of broadcasting facilities	Depreciation of systems built for IPTV
Other expenses	Costs of other items
Variable costs	Costs that increase or decrease with the number of IPTV subscribers
Expense for additional construction of transmission equipment and management costs	Additional network installation and management costs created by an increase in the number of subscribers
Price for use of content	Price paid to all PPs for use of broadcast content
Marketing expenses	IPTV provider's marketing expenses to attract subscribers and maintain current customers
IPTV profit	Net profit by subtracting expenses from total revenue
Advertising revenue	All revenue from advertising
Advertising revenue allocation	Portion of PPs' advertising revenue allocated to IPTV provider
Own advertising revenue	Advertising revenue from IPTV's own advertising sales
Price PPs pay to use network	Price PPs pay to use network to transmit their program over IPTV

〈Table 20〉 Data and Calculation Formulae for Break-Even Point Model for IPTV Providers

Variable	Calculation formula	Unit
Total IPTV subscription fee	Number of IPTV subscribers×Revenue per IPTV subscriber×12 (month)	100 million KRW
Revenue per IPTV subscriber	IPTV fee level×(1-combined service/100)+(paid additional service×2000)	won/person
Number of IPTV subscribers	70	10 thousand
Combined service	40	%
IPTV fee level	12,000	KRW
Paid additional service	0	number
Fixed costs	Labor+depreciation of broadcasting facility+other expenses	100 million KRW
Labor	3.89	Billion KRW
Depreciation of broadcasting facilities	10	Billion KRW
Other expenses	2.5	Billion KRW
Variable costs	Additional construction costs for transmitting equipment and management cost+Price for using content+Marketing costs	100 million KRW
Expense for additional construction of transmission equipment and management costs	15.1	Billion KRW
Price for use of content	13.87	Billion KRW
Marketing expenses	13.9	Billion KRW
IPTV profit	Total IPTV subscription fee-Variable costs-Fixed costs+Advertising revenue+Price PPs pay to use network	100 million KRW
Advertising revenue	Advertising revenue allocation+Own advertising revenue	100 million KRW
Advertising revenue allocation	2.58	Billion KRW
Own advertising revenue	4.25	Billion KRW
Price PPs pay to use network	1.512	Billion KRW

When an additional service is added to the tiered products currently used or new subscriptions are added on an upper grade, the revenue per IPTV subscriber will increase. Therefore, 'paid additional service' is defined as the number of paid additional services added to tiered products. We presume that every subscription to one additional service produces 2,000 won of additional fees. In 'combined service,' a discount is applied to the IPTV fee by subscribing to a combined product (Internet+IPTV+VoIP), reducing the revenue per IPTV subscriber. We apply an average discount of 40%. The final IPTV revenue is composed of the total IPTV subscription fee, the price PPs pay for using the network, and advertisement revenue. It decreases through variable and fixed costs.

<Table 19> shows the definition of the component variables of the break-even point model for IPTV providers.

Based on that model above, we entered virtual data and calculation formulae as shown in <Table 20>.

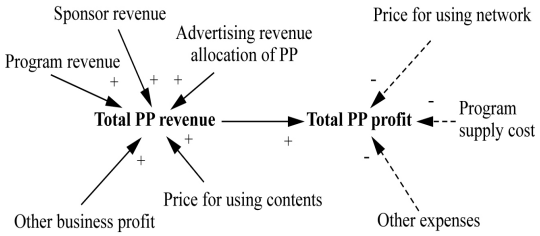
After entering the formula for each variable, we entered 3 data sets as shown in <Table 21> to analyze the changing revenue of IPTV providers following changes in other variables. When 2 additional services are added to the currently used tiered products, revenue per IPTV subscriber increases to 11,200 KRW. The final IPTV revenue is 43.162 billion KRW, with a revenue increase of 4.5 times the 9.562 billion KRW of data SET1. Based on data SET1, when the final IPTV revenue is 0 KRW, which means the break-even point is reached, the price for using content will be 23.443 billion KRW. This is about 39% of the total IPTV subscription fee 60.48 billion KRW. In other words, about 2,800 KRW per subscriber is incurred as the price paid to PPs for use of content.

〈Table 21〉 Simulation Result of Break-Even Point Model for IPTV Providers

Variable	Data SET1	Data SET2	Data SET3
Total IPTV subscription fee	60.48 billion KRW	94.08 billion KRW	60.48 billion KRW
Revenue per IPTV subscriber	7,200 KRW	11,200 KRW	7,200 KRW
Number of IPTV subscribers	700 thousand	700 thousand	700 thousand
Combined service	40%	40%	40%
IPTV fee level	12,000 KRW	12,000 KRW	12,000 KRW
Paid additional service	0	2	0
Fixed costs	16.39 billion KRW	16.39 billion KRW	16.39 billion KRW
Labor	3.89 billion KRW	3.89 billion KRW	3.89 billion KRW
Depreciation of broadcasting facilities	10 billion KRW	10 billion KRW	10 billion KRW
Other expenses	2.5 billion KRW	2.5 billion KRW	2.5 billion KRW
Variable costs	42.87 billion KRW	4.287 billion KRW	52.432 billion KRW
Expense for additional construction of transmission equipment and management costs	15.1 billion KRW	15.1 billion KRW	15.1 billion KRW
Price for use of content	13.87 billion KRW	13.87 billion KRW	23.432 billion KRW
Marketing expenses	13.9 billion KRW	13.9 billion KRW	13.9 billion KRW
IPTV profit	9.562 billion KRW	43.162 billion KRW	0
Advertising revenue	6.83 billion KRW	6.83 billion KRW	6.83 billion KRW
Advertising revenue allocation	2.58 billion KRW	2.58 billion KRW	2.58 billion KRW
Own advertising revenue	4.25 billion KRW	4.25 billion KRW	4.25 billion KRW
Price PPs pay to use network	1.512 billion KRW	1.512 billion KRW	1.512 billion KRW

(7) Break-Even Point for PPs

<Figure 8> shows the break-even point for PPs as a system dynamics causal map. The calculation formulae of the main component variables are as follows :



〈Figure 8〉 Break-Even Point for PPs

- *Total PP revenue = program revenue+price paid for use of content+Advertisement revenue allocated toPP+Sponsor revenue+Other business revenue*
- *Total PP profit = Total PP revenue-Cost for using network-Other expenses*

As program revenue (SO broadcasting transmission fee revenue, broadcasting program sales revenue, product sales fee revenue), sponsorship revenue, advertising revenue allocated to PP, price paid for use of content, and other business revenue increase, the total revenue of a PP also

〈Table 22〉 Definition of Component Variables of Break-Even Point Model for PPs

Variable	Description
PP total revenue	Total revenue of PP
Sponsorship revenue	Sponsorship revenue for the program
Program revenue	Sum of revenue from SO broadcasting subscription fee, broadcast program sales revenue, and product sales fees from home shopping
Revenue from SO broadcasting subscription fee	Revenue from general cable provider for content
Broadcast program sales revenue	Revenue from selling own program to other PPs or broadcasting platforms (including copyright fees)
Revenue from product sales fees	Revenue from product sales fees through advertisement or home shopping channel
Price for use of content	Fee IPTV providers pay for use of content
PP's advertising revenue allocation	Advertising revenue allocated to PP
Other business revenue	Other revenue related to broadcasting business, including event/culture projects, rental income, and PPL
PP's total profit	Net income, total revenue less expenses
Program supply costs	Total program supply costs, including own program production, outsourced production, and purchase costs
Costs for own program production	Costs of own productions, excluding outsourced production and purchase
Outsourcing costs	Cost to produce content using an outsourcing company
Purchase costs	Cost to purchase programs in the domestic or international markets
Price for using network	Price paid to ISP or IPTV provider to use its network to transmit content
Other expenses	Expenses such as facility investment, labor,and marketing costs
PP's marketing expenses	Marketing costs to secure a channel from an IPTV provider and for other projects
Facility investment costs	Costs related to facility investment, such as production, transmission, broadcasting, and additional equipment
Labor costs	PP workers' wages

〈Table 23〉 Data and Calculation Formulae per Component Variable of the Break-Even Point for PPs

Variable	Calculation formula	Unit
PP total revenue	Sponsorship revenue+Program revenue+advertisement revenue allocated to PP+Price for use of contents+Other business revenue	100 million KRW
Sponsorship revenue	75.8	Billion KRW
Program revenue	SO broadcasting subscription fee revenue+Broadcasting program sales revenue+Product sales fee revenue	100 million KRW
Revenue from SO broadcasting subscription fee	260.91	Billion KRW
Broadcasting program sales revenue	40.53	Billion KRW
Revenue from product sales fees	1 trillion 526.16	Billion KRW
Price for use of content	13.87	Billion KRW
PP's advertising revenue allocation	686.28 (SO sector)+6.02 (IPTV sector)	Billion KRW
Other business revenue	1 trillion 223.1	Billion KRW
PPs' total profit	Total revenue of PP-Program supply cost-Other expenses-Price for using network	100 million KRW
Program supply costs	Own program production cost+ Outsourced production +Purchase cost	100 million KRW
Costs for own program production	1 trillion 991.3 (own production cost) +4.57 (joint production cost)	Billion KRW
Outsourcing costs	61.37 (net outsourcing)+7.77 (special affiliate)	Billion KRW
Purchase costs	70.856 (domestic purchase)+ 91.1 (international purchase)	Billion KRW
Price for using network	9.45	Billion KRW
Other expenses	Facility investment+Labor+PP's marketing cost	Billion KRW
PP's marketing expenses	10	Billion KRW
Facility investment costs	79.552	Billion KRW
Labor costs	9,100 persons×30 million KRW = 273	Billion KRW

increases. Also, the total profit of a PP is inversely proportional to the price it pays for using an IPTV network, program supply cost, and other expenses.

Based on the model above, virtual data and calculation formulae were entered for each component variable as in <Table 23> above.

After entering the formula for each variable, we entered 3 datasets as shown in <Table 24> to analyze a PP's profit/loss change following changes in the variables. In the future, as the number of IPTV subscribers increases, reducing the revenue from broadcasting subscription feesin a certain ratio while increasing the amount IPTV providers pay to use PP content in the same ratio will result in mostly stable total revenue for PPs.

Revenue from product sales feesin 2008 is estimated to be about 2.5 trillion KRW, most of it from home shopping PPs and other PPs. They have little revenue from product sales. Therefore, if the revenue from the product sales fee is reduced or PPs are not eligible for this revenue, profitability can be lowered.

〈Table 24〉 Simulation Result of Break-Even Point Model for PPs

Variable	Data SET 1	Data SET 2	Data SET 3
PP total revenue	3,832.67 billion KRW	3,848.34 billion KRW	2,459.13 billion KRW
Sponsorship revenue	75.8 billion KRW	75.8 billion KRW	75.8 billion KRW
Program revenue	1,827.6 billion KRW	1,579.74 billion KRW	1,827.6 billion KRW
Revenue from SO broadcasting subscription fee	260.91 billion KRW	13.05 billion KRW	260.91 billion KRW
Broadcasting program sales revenue	40.53 billion KRW	40.53 billion KRW	40.53 billion KRW
Revenue from product sales fees	1,526.16 billion KRW	1,526.16 billion KRW	152.62 billion KRW
Price for use of content	13.87 billion KRW	277.4 billion KRW	13.87 billion KRW
PP's advertising revenue allocation	692.3 billion KRW	692.3 billion KRW	692.3 billion KRW
Other business revenue	1,223.1 billion KRW	1,223.1 billion KRW	1,223.1 billion KRW
PP's total profit	1,233.7 billion KRW	1,249.37 billion KRW	-1,39.838 billion KRW
Program supply costs	2,226.97 billion KRW	2,226.97 billion KRW	2,226.97 billion KRW
Costs for own program production	1,995.87 billion KRW	1,995.87 billion KRW	1,995.87 billion KRW
Outsourcing costs	69.14 billion KRW	69.14 billion KRW	69.14 billion KRW
Purchase costs	161.96 billion KRW	161.96 billion KRW	161.96 billion KRW
Price for using network	9.45 billion KRW	9.45 billion KRW	9.45 billion KRW
Other expenses	337.55 billion KRW	337.55 billion KRW	337.55 billion KRW
PP's marketing expenses	10 billion KRW	10 billion KRW	10 billion KRW
Facility investment costs	79.55 billion KRW	79.55 billion KRW	79.55 billion KRW
Labor costs	273 billion KRW	273 billion KRW	273 billion KRW

3.2 IPTV Eco-System Model Based on Price Calculation

For this section, we constructed an eco-system model for the whole IPTV market, as shown in <Figure 9>, integrating the 7 models analyzed in section 3.1. The effect from an increase/decrease in the price for use of content, price for using network, total revenue of the IPTV provider, total revenue of a PP, contribution of the relevant PP, and content revenue allocation among PPs are analyzed as follows.

(1) Increase of Relevant PP's Contribution

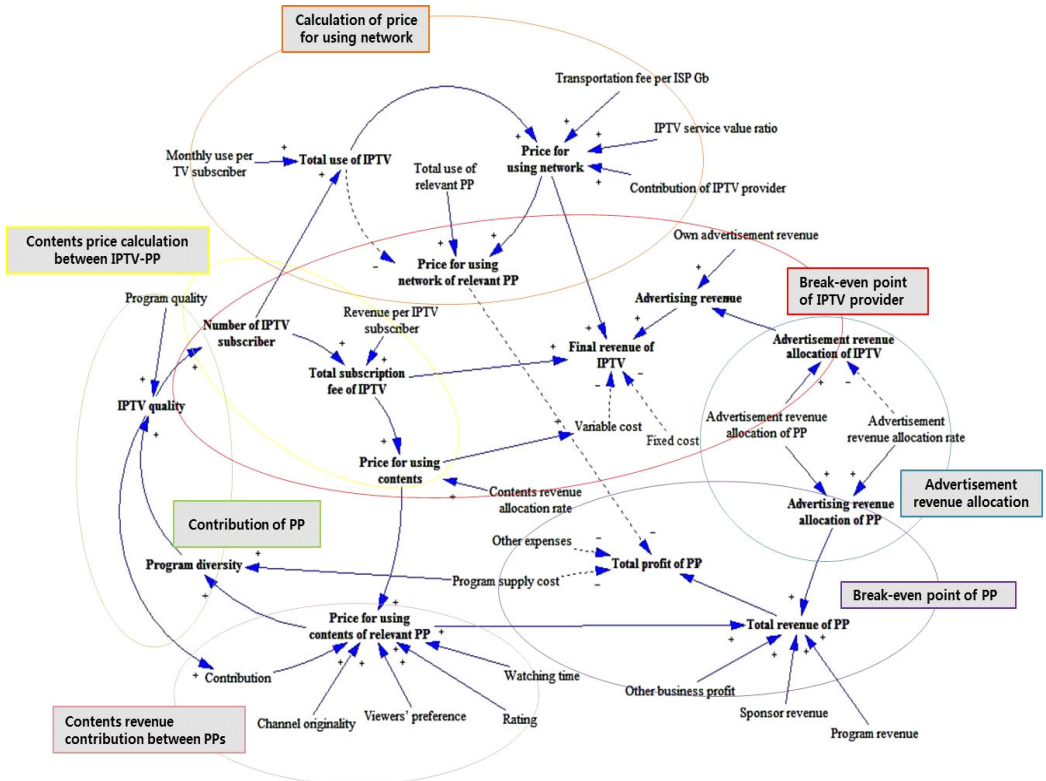
- As the contribution of the relevant PP increases, IPTV quality improves, and the number of IPTV subscribers increases.

(2) Increase of Program Quality and Diversity of the Relevant PP

- As the program quality and diversity of the relevant PP increases, the number of IPTV subscribers increases.
- As the program quality and diversity of the relevant PP increases, the contribution of the relevant PP to an increase in IPTV subscriber numbers and the price for use of content of the relevant PP increase.

(3) Advertising Revenue Allocation Ratio Increases.

- As the advertising revenue allocation ratio increases, the PP's advertising revenue allocation increases along with its total revenue.
- As the total revenue of the PP increases, program supply costs, program quality, and



〈Figure 9〉 IPTV Eco-System Model

the number of IPTV subscribers all increase. Those changes increase the revenue of the IPTV provider; however, if the increase in the PP's contribution from the increased advertising revenue allocation ratio is relatively low, the final revenue of the IPTV provider is reduced.

(4) Content Revenue Allocation Ratio Increases

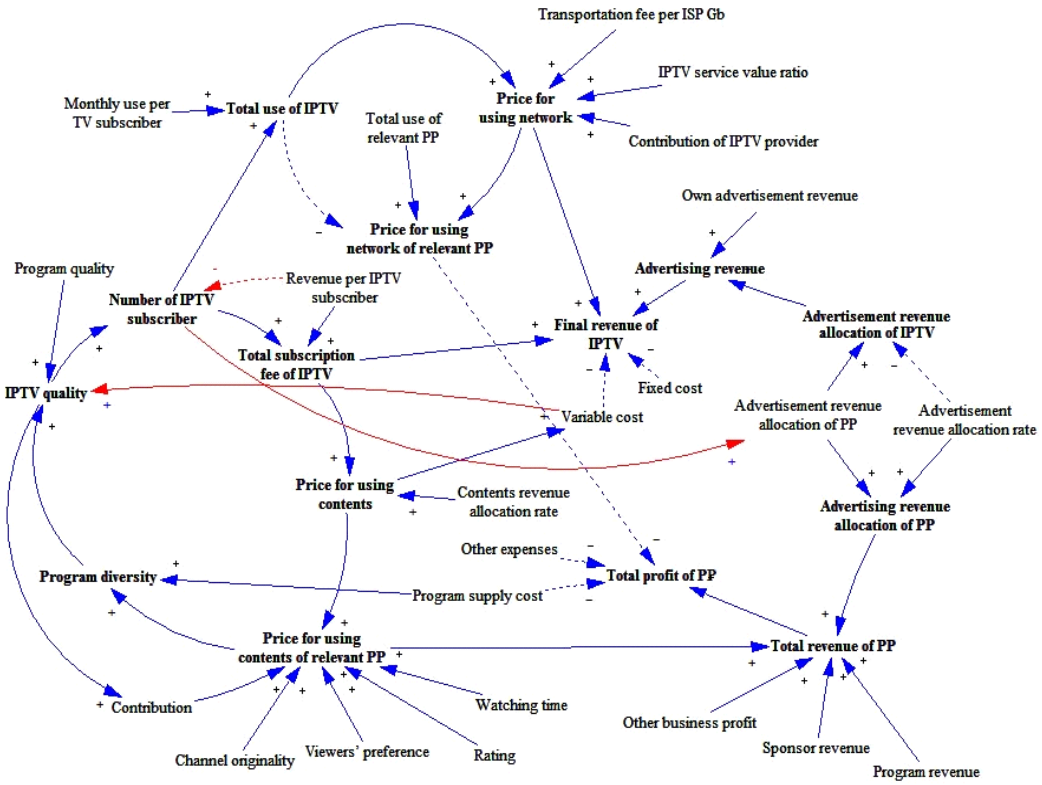
- As the content revenue allocation ratio increases, the price for use of content increases along with the total revenue of the PP.
- As the content revenue allocation ratio increases, the variable costs of the IPTV provider increase, and the final revenue of the IPTV provider is reduced.

(5) IPTV Provider's Contribution Increases

- As the revenue of a PP increases through the IPTV platform, the price of that PP's network use increases.
- As the price for using the network increases, the final revenue of the IPTV provider increases.
- As the price for using the network increases, the total revenue of the PP is reduced.

(6) Price for Use of Content to Relevant PP Increases

- As the price for use of content for the relevant PP increases, the total revenue of that PP increases.
- If the PP's investment in programs doesn't increase, program diversity decreases, even



〈Figure 10〉 IPTV Eco-System Model (3 factors added)

though the price for use of content to the relevant PP increases.

- If the program diversity decreases, the IPTV quality is reduced, and the contribution of the relevant PP is reduced as well, reducing the price for use of content to the relevant PP in the future.

(7) Broadcasting Program Purchase Dependency Increases

- Due to program outsourcing and program purchases, program supply costs increase, which reduces the total profit of a PP.
- When program supply costs increase, the ratio of program investment costs to revenue increases, improving IPTV quality.

The effects of changes in the 7 factors are shown above. In addition, we added 3 factors that were not included in the simulation in this study, as shown in <Figure 10>, to study their effects.

(8) Moving Away from a Low Price Market Structure and Improving the IPTV Fee Level

- If the number of households that use services in addition to existing tiered products increases, or if the basic fee for IPTV service increases, then the number of IPTV subscribers is reduced.
- As the number of subscribers is reduced, the total profits of the IPTV provider and its PPs are reduced.

(9) Combined Service

- As combined services are offered, a discount is applied to the usefee. The fee level decreases, increasing the number of subscribers.
- As combined services are offered, the fee level and revenue per IPTV subscriber decrease. That can reduce the total IPTV subscription fee however, the increased number of subscribers compensates for the reduced subscription fee.

(10) Increase in Construction of Transmission Equipment and Management Costs

- As construction and management costs for transmission equipment increase, IPTV quality is improved, and the number of IPTV subscribers increases.
- As the number of IPTV subscribers increases, construction and management costs for transmission equipment continue to increase.
- As the construction and management costs of transmission equipment increase, variable costs increase, reducing the total profit of IPTV providers. However, the total subscription fees increase with the increasing number of subscribers following IPTV quality improvement, which compensates for the reduced profit.

(11) Increase in Number of IPTV Subscribers

- As the number of IPTV subscriber increases, IPTV's advertisement effect increases, and the total advertisement revenue of PPs increases.
- As a PP's total advertisement revenue increases, the total revenues of IPTV providers and PPs increase.

4. Evaluation of Price Scope Calculation Model and Suggestions

With the simulation of the 7 models analyzed above, we studied changes in revenue following changes in population parameters and suggested the IPTV eco-system model through the results. We also discussed the increase/decrease effect on the price for use of content, price for using network, total revenue of the IPTV provider, total revenue of PPs, contribution of the relevant PP, and content revenue allocation among PPs by changing each core variable.

The price calculation model discussed in this study can be evaluated from various points of view.

First, does this model consider the perspective of supply and demand? From the aspect of supply, the IPTV provider allows PPs to carry out their business through its network. To make an accurate and efficient price calculation (which is the base logic of a content-use price calculation), the following factors are considered : (8) equivalent bandwidth, (9) contribution of IPTV platform to PP's profitability, (10) reduction of transportation cost per Gb by usage because IPTV is a fixed rate service, and (11) representative resources and expenses required in business. From the aspect of demand, we used the price applied to a representative consumer of IPTV. To measure contribution, we considered consumer satisfaction with quality, in-

tention to maintain an IPTV subscription based on willingness-to-pay, and the value consumers ascribe to IPTV service.

Second, were all the relevant costs and income items of the related players considered? Our model includes all factors related to cost calculation, such as revenue and cost factors of both IPTV providers and PPs. In addition, we considered costs duplicated with services other than IPTV, such as total shared expenses. All expenses related to providing the service were considered, including the specific costs of service provision.

Third, when value is created on the IPTV platform, could expense and profit be equally distributed to all players that contribute to value creation? For the additional revenue produced by the business of the PP, we calculated the compensation by a consistent principle that accounts for the characteristics of each PP and its contribution to any increase in the number of IPTV subscribers.

Currently, IPTV providers are making a significant investment, but they have yet to find an effective profit model other than subscription fees. Therefore, rather than hoping to increase revenue through additional business, more important issues are finding a way to reduce costs and secure subscribers. Accordingly, the content revenue allocation rate, which is a variable cost, should be adjusted at some point. The advantage of our model is its comprehensive explication of the interests among related players. However, our model does contain a cost overestimation factor. When IPTV providers and PPs overestimate their costs, IPTV providers want to reduce the fee for use of content, and PPs want to increase it. Therefore, the players must agree to transparent accounting practices among themselves. Similar issues have been seen in telecommunication network connection fee calculation and other broadcasting service price calculations. In calculating the price for network use, resource usage is measured with data applied to representative consumers, such as service use time, equivalent bandwidth, and monthly average fee, which reduce the chance of cost overestimation. In calculating content prices among PPs, IPTV provides more accurate measurements than cable providers, including channel originality, ratings, watching time, and contribution. For content revenue allocation to the IPTV provider, we used revenue-sharing rather than cost-sharing, which allows PPs to be more aggressive in their investments to improve content quality. The price for channel provision and transmission between an IPTV provider and PPs used in this study must be decided through autonomous negotiation among players depending on market circumstances. The IPTV industry obtains a content investment factor through an indirect network effect according to two-sided market theory. Although PPsdo so voluntarily, it can be a natural phenomenon that the price is determined by the market power of the contracting parties.

In this study, we explored the internal/external environmental factors related to price calculation and revenue allocation between players in the IPTV market to establish a reasonable price scope, including consideration of comprehensive precedent/subsequent factors. Thus we

have provided tools for market players to establish a reasonable profit allocation rate using transparent accounting data. With these tools, IPTV providers can increase their revenue by increasing existing content sales and promoting consumption of high quality/low price content, allocating more profit to PPs through a fair trade of content and promoting policy changes to induce content investment. Therefore, we expect this study to underlie the establishment of strategies among related players for fair price calculation and profit distribution. We also expect it to be used to establish a technical, economical, and political base to accomplish early activation of IPTV through transparent and reasonable profit distribution.

The biggest problem of this study is that we were unable to use accurate accounting information for the IPTV-related players. To make a more detailed price calculation, IPTV providers and PPs need to disclose accurate accounting data. Particularly given the characteristics of IPTV service as a convergence service, expenses incurred in duplicate with other services, such as total common costs, should be distinguished to calculate the specific costs, expenses, and profits produced by the IPTV business. For the PP data used in this study, we used a 2004~2008 actual condition survey of the broadcast industry. Because those data cover both cable broadcasters and PPs, we inferred the IPTV-related data for our simulation. The contribution of the relevant PP, which is the core of this study, was measured by program quality and program diversity, based on data inferred to measure quality and diversity. However, to obtain AI to measure the actual program quality, viewer surveys should be made. To measure program diversity, the number of all programs transmitted by all PPs should be calculated. We tried to deduce an accurate contribution using a time series analysis based on the survey, but we could only estimate the contribution.

In this study, we examined allocation and price scope between IPTV providers and PPs to determine related precedent and subsequent factors, design a calculation model, and figure out the effects of the factors in price calculation using system dynamics. Therefore, to validate this study model, the market situation should be comprehensively analyzed over time. Then those data should be substituted in this model to verify that it produces an accurate profit allocation rate between IPTV providers and PPs. For that purpose, statistical data should be constructed for the IPTV-related industry, rather than cable TV or groundwave broadcasting.

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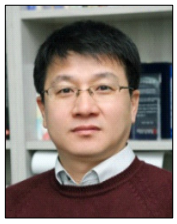
Author Profile



신 민 수

한양대학교 경영대학 교수로 재직 중에 있으며, 관심분야는 주요 관심분야는 지식경영, 정보화정책, 통신정책, 첨단기술혁신정책 등이다.

길 진 호

현재 한양대학교 경영대학원 경영정보시스템 박사과정에 재학중이다. 다수의 통신정책관련 프로젝트를 진행하고 있으며, 주요 관심분야는 지식경영, 통신전략 및 정책, 디지털 콘텐츠이다.

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