혁신 수용확산 이론의 IPTV 충성도 형성 프로세스 응용

Applications of Innovation Adoption and Diffusion Theory to IPTV Loyalty Formation Process

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초 록

본 논문에서는 IPTV 사용자의 충성도 형성 프로세스 모델과 이론화를 위한 실증 분석 결과를 제시하였다. IPTV의 혁신적인 방송통신 융합 성격을 고려하여 혁신 수용 및 확산 이론 프레임웍에기반하여 연구 모델을 도출하였다. 본 연구의 목적은 IPTV 서비스를 구성하는 다양한 요소에 대한 고객 인지 검증을 포함하고 있으므로 상대적 이점을 7개의 1차 요인으로 구성된 2차 요인으로 구분하였으며 이를 바탕으로 구조방정식 모델을 설계하였다. 연구 모델은 250명의 IPTV 사용자 대상 서베이를 통하여 수집된 데이터를 바탕으로 PLS 기법을 이용하여 검증하였다. 본 연구 결과에서 제시된 시사점은 디지털 융합 관련 하이테크 서비스 제품에 대한 수용 및 확산에 대한 향후 연구에 유용하게 활용될 수 있다.

ABSTRACT

In this paper, we report the empirical study results theorizing IPTV user's loyalty formation process. Considering the convergent characteristics ofinnovative media and telecommunication, we employed innovation adoption and diffusion as our theoretical framework for research model development. As the purpose of this research includes verification of detail attributes of IPTV service, we formulated structural model which treats relative advantage as the second order factor, of which incorporates the seven detail attributes as the first order factors. Then, using the data collected from 250 Korean IPTV subscribers, the model is validated and relevant attributes are identified through PLS analysis. The results provide insights for future research on the adoption and diffusion of new digital convergent high-tech services.

1. Introduction

Convergence implies the general tendency to bring entities together such as telecommunication, Internet, information technology and broadcasting, to offer distinctive new services on a single network or the ability to offer the same services via more than one medium multiple services [19]. Recently, digital convergence, convergent new services based on digital technology, has been received focal attention due to its wide application potentials and industry growth opportunities. While there are diverse definitions of digital convergence services and products, media and telecom merging services are regarded as one of the peculiar digital convergence business model in the sense that media and telecom markets are undergoing fundamental transformation, and new value added stages are distinctive [47].

At this moment, the culmination of media and telecom merging service is regarded as IPTV (Internet Protocol-based TV) service due to its huge market growth opportunities and service model's inclusiveness of previously evolved digital convergence related applications. IPTV service is, by definition, the digital TV service using IP based high speed Internet such as FTTH (Fiber-to-the -Home) as a transmission medium. In addition IPTV service includes most media and telecom merging services which has been developed up to now such as, let alone TV serv-

ice, VOD (video on demand), personal video recording, network PVR (network personal video recorder), electronic program guide, information service, interactive TV, interactive applications, and broadband applications [2].

The market growth expectations of IPTV has been very promising, for instance, Ovum [35] forecasted year 2012 IPTV revenue as 17 billion USD revenue with 64 million IPTV subscribers worldwide. In Korea, the number of IPTV subscribers exceeds 1 million as of October 2009 as well, and it reached 2.9 million as of August 2010. Furthermore, the growth trend is expected to persist for the time being. Compared to other recent digital convergence applications, the propagation of IPTV in Korea is rather rapid and successful. For instance, satellite DMB service in Korea, which was launched around 2005, was forecasted optimistically in terms of the number of subscriber, revenue, and market propagation rate. However, contradictory to initial forecast, the result was rather disappointing, and the service is now embedded into mobile phone handset, and exploited as a value adding service as a premium to select particular mobile telecom company.

We pointed out this contradictory phenomenon regarding the success of digital convergence related services, particularly in merging media and telecom area. However, the theoretical research on this area is rather limited. It is a daunting task to develop comprehensive theoretical model to explain the

nature of success on digital convergence services. Investigating digital convergence service model is a multi-faceted task; Wirtz [47] suggested three dimensions of industry convergence drivers, which are deregulation of markets, technology innovation, and change of user preference. Shin [41] extracted significant antecedents affecting IPTV adoption, based on TAM (technical acceptance model) theory through empirical analysis to investigate the variables significantly affecting adoption intention. As for the business model perspective, Bowman et al. [5] distinguished four dimensions in an IPTV business model : service, technology, organization and finance. However, literatures to illustrate comprehensive framework on the success of merging media and telecom service is scarce. We intended to fill out this research gap. Specifically, we focused on user preference dimension of IPTV service among the three dimensions of media and telecom merging service evolution which Wirtz suggested in 2001.

Since the extant research on digital convergence or media and telecom merging service area is limited, we also intended to suggest user preference perspective comprehensive model in this new area. For our purpose, IPTV should be an appropriate service model. As is evident from practical considerations or academic literatures on innovative IT related applications, the focal attention is paid to loyalty, which means continuing intention, for the particular product or service. For instance, in Germany, Gerpott et al. [16] investigated antecedents of affecting loyalty of mobile telecommunication service which they are using. Similarly, Kim et al. [23], and Aydin and Ozer [3] also performed the study to investigate antecedents which determine mobile telecom service adopter's loyalty for service provider. While attracting initial customers is necessary, loyalty is a key to sustaining profitability, which affects to prevent the existing subscribers from churning over alternative providers or quitting the service [39]. Therefore, our research is directed toward investigating loyalty formation of IPTV.

Most of the behavioral research investigating user preference behavior, in the area of information technology related services such as mobile communication, validated the proposed model through empirical analysis conducted with the experienced subjects. Sometimes, with reference to TPB (theory of planned behavior) [46, 49], individual level adoption or preference intention is evaluated. Indeed, TCE (total customer experience) perspective [29] is appropriate to loyalty formation investigation research since the theory suggests the key clues affecting moment of truth determining continuance of product/service usage are captured through the customer experience. As such, we captured early subscribers of IPTV in Korea with the help of telecom service providers, and theoretically derived behavioral model is analyzed through

the empirical survey conducted with them.

In next section 2, we developed research framework to comprehensively explain the loyalty formation process of the IPTV service. In this section, we elaborated multi-faceted theoretical constructs with reference to established frameworks. Subsequently appropriate candidate variables as per the conceptual framework are extracted and hypotheses are developed. In section 3, research methods are detailed, and statistical analysis result are presented in the following section 4. Implications and discussions are offered afterwards.

2. Theoretical Development

The total customer experience theory argues that the competitiveness of a product or service is determined by customers' satisfactory experience with it, and that in order to provide customer with a satisfactory experience, businesses must offer effective clues to their customers, concerning both the mechanics and humanics of the product or service. Effective clues produce their impact on the moment of truth, which is the moment of purchase decision or the moment of decision to repurchase the same product or service, determining ultimately the quality of total customer experience [29]. Mascarenhas et al. [30] proposed major components of customer relationship management, critical for retain-

ing loyalty, from the TCE perspective. As for Meyer and Schwager [32], they proposed a series of factors in the 'management of customer experience,' a concept distinct from customer relationship management, and presented related experience data that are useful for monitoring customer experience, collected through target research and from gathering customer feedback and surveying consumers.

As such, we drew inspirations from the TCE paradigm [4] to devise the exploratory process for identifying those preliminary constructs which affect users' satisfaction with IPTV and their intention to continue using the service in a more strong and meaningful fashion than others, by evaluating the latter's experience of using this service. After the initial subscription to an IPTV service, users base their decision to continue or discontinue the subscription on their experience with the service. In order to understand which of the characteristics of the IPTV service influence this decision and the process through which such decision is made, we referred ourselves to Rogers' (2003, p. 170) innovation diffusion model as the first framework. In developing-research model to explain IPTV loyalty formation process, we followed innovation diffusion theory as the theoretical basis.

The innovation decision-making process is a process through which the initial perception of an innovation by a decision-making unit such as an individual or an organization comes to form an attitude toward the same

innovation, as the latter becomes aware of its various characteristics, and the decision to adopt or reject it becomes influenced by the attitude so formed. Once the innovation is adopted, the decision to continue or discontinue its use is based on the experience of actually using it. IPTV loyalty of the adopters is determined by the diffusion which, by definition, implies "the acceptance into use and continued use of an IPTV service" [51].

Unlike cable TV or the internet, IPTV is a converged media service, still new to the market; which justifies our choice of the innovation decision model as the framework to describe the process of consumers' decision-making concerning this service. The applicability of Rogers' innovation decision model to IT-related new technologies and services has already been established amply, through the works of Jeyaraj et al. [21], among others. Indeed, Chen et al. [11] addressed that these innovation attributes explain 49-87% of the variance in rate of adoption.

A potential adopter's attitude toward an innovation is formed, in Rogers' model, according to factors such as its relative advantage, compatibility, complexity, observability and trial ability, which, in turn, influence the decision to continue or discontinue its use, after the initial adoption. In this study, dealing with consumers' continuing intention of IPTV, we considered three of the five innovation characteristics, namely, relative advantage, compatibility and complexity, and excluded ob-servability and trialability. Since we investigate the loyalty formation process of IPTV adopters who experienced IPTV service, among the five constructs constituting innovation adoption and diffusion, both the observability and trialability of IPTV are not applicable. Literatures also suggested that only relative advantage, compatibility, and complexity were mostly employed to explain innovation adoption [45].

Rogers' innovation adoption and diffusion attributes are in line with most widely used TAM (Technology Acceptance Model) in the IT usage domain which pointed out perceived usefulness (PU) and ease of use (EOU) as the critical determinants of explaining user's attitude toward IT usage and satisfaction [12]. Perceived usefulness in TAM is equivalent to Rogers' relative advantage, and so ease of use does to complexity [33]. Teo and Pok [44] confirmed that relative advantage along with ease of use, and others impacted on adoption of WAP-enabled mobile phone adoption. Also, Chen et al. [11] used constructs of perceived usefulness and ease of use from TAM, and compatibility from Rogers as the determinants of attitude toward using enticing online consumers away from offline.

Innovation adoption and diffusion framework was also adopted in developing theoretical model and empirical validation of high-tech IT related product adopton behavior in Korea. For instance, Kim et al. [24] explored the factors affecting customer's intention to

use mobile game, to validate the five external factors such as service quality, social influence, instant connectivity, self-innovativeness, and self-efficacy. Also, Yoo et al. [50] and Suh [43] applied the related theoretical framework for ubiquitous computing services, and Internet banking services, each respectively.

Relative advantage in the context of this study means to what extent users perceive IPTV as superior to similar existing competing media. This is a factor which can influence the favorable perception of IPTV both on the part of current and potential users, at an economic and social level, as well as in terms of personal preference. As the major content of IPTV service overlap those of CATV or satellite TV, of which and most of the household residents are already subscribers, IPTV service should provide distinguished value compared them in order to attract the new subscribers and to maintain them as continuing customers. That is, relative advantage or equivalent perceived usefulness of IPTV over CATV or satellite TV should appeal to the IPTV subscribers more strongly.

Bowman et al. [5] distinguished four dimensions in an IPTV business model: service, technology, organization and finance. Meanwhile, among the factors enabling differentiation of IPTV from cable TV and satellite TV, they proposed its integration of video content with broadband internet and teleph-

ony, and value-added services including two-way service. Shin [41] selected, in his empirical study of factors influencing the adoption of IPTV, a series of customer-oriented variables. These variables include intrinsic factors such as personalized and differentiated service and content offerings; extrinsic factors such as two-way service and interactivity; economic factors such as the fee for use of the set-top box, and other personal factors and factors related to ease of use.

Altgeld and Zeeman [2] classified functions provided by an IPTV service into nine categories : TV service, VOD (video on demand), personal video recording, network PVR (network personal video recorder), electronic program guide, information service, interactive TV, interactive applications, and broadband applications. In terms of differentiated customer value offered by these service features, they proposed the attractiveness of video content, personalization of service bundles, competitive pricing, dispensing with the need of a satellite antenna and high image quality. In Korea, ease of use, interactivity, variety of content, and economic feasibility were presented, by Han and Suh's [17] comparative analysis, with existing broadcasting media, as the four distinctive features of interactive broadcasting media of IPTV.

Based on the existing literature discussed above, we identified the following seven as the source of value providing attributes comprising relative advantages of IPTV : content

attractiveness, price competitiveness, and bundling effectiveness. We define, meanwhile, content attractiveness as the sum of attractiveness of five different service features; namely, VOD, content variety, personalization, value-added services and interactive applications. The attractiveness of VOD, distinctively enabled by FTTH broadband technology, refers to versatility of on demand functionality.

Invirtue of telecom advantage, content variety has to do with the advantage associated with content other than TV, such as games and other entertainment content. Personalization relates to the ability to select programs of one's choice, and interactive applications, to the ability to take part in the program viewed via two-way broadcast. Finally, value-added services refer to online shopping and other practical features offered by IPTV, in addition to services that are directly related to TV and content.

Price competitiveness and bundling effectiveness may be defined as relative advantage in economic terms derived from IPTV, compared to other single services, sold separately. Bundling service includes TPS (Triple Play Services) which aggregates separate services of IPTV, Internet, fixed telephone services, and QPS (Quadruple Play Services) which adds mobile phone service altogether. To sum up the above discussions, we derived our first hypothesis as follows.

H1 : Relative advantage of IPTV consisting of VOD attractiveness, content variety, personalization, value added service, interactive application, price competitiveness, and bundling effectiveness positively influences IPTV subscriber's usage satisfaction.

Compatibility means the extent to which an innovation addresses the specific needs of a potential user and is compatible with his or her past experiences or values [40]. While compatibility was not included in original TAM theory, it has been adopted as a significant predictor to evaluate the expected technical acceptance level in the field of information systems research [1]. On the other hand, compatibility is revealed as a significant antecedent impacting on the perceived usefulness and perceived ease of use (two of the main constructs in the technology acceptance model) of an innovation [22]. In the case of IPTV, the familiarity felt by a user, accustomed to existing media such as cable TV or satellite TV, with the internet-based menu of IPTV for choosing channels and using the VOD service, is likely to influence his or her satisfaction with this new media service and intention to continue the subscription, along with its compatibility with his or her personal taste and lifestyle. Though perceived relative advantage is appreciated in terms of content variety, VOD attractiveness, and so on, the user's satisfaction on IPTV should be affected by the user's common practices or habit of

TV usage. For instance, if the user enjoys daily drama program, but cannot keep the broadcasting time of drama because of his daily work schedule, watching the drama using VOD function at later time will be compatible with user's existing daily life style. While VOD attractiveness, one of the sub-constructs consisting relative advantage, is fairly good, the IPTV satisfaction should be affected by the compatibility of a particular on the other hand. This argument is in line with Moore and Benbasat [33]'s definition of compatibility that innovation is effective only when it is compatible with potential adopter's need, let alone relative advantage offered by the innovation. In sum, we proposed following hypothesis.

H2 : Compatibility of IPTV influences IPTV subscriber's usage satisfaction.

Complexity, in the context of innovation adoption, means the extent to which an innovative new product or technology is difficult to understand or use, compared to existing products or technologies, and is understood as a factor which negatively influences the acceptance and penetration of the same product or technology. As opposed to complexity, convenience produces a favorable effect on potential users' adoption of an innovation as well as their intention to continue its use. In the field of communication services, Teo and Pok [44] indicated that the perceived

ease of use is a significant antecedent of attitude toward adoption of WAP-enabled mobile phones. Similarly, Hsu et al. [20] also verified the importance of the perceived ease of use as a significant factor to influence the adoption of multimedia message service in mobile Internet environment.

Just like compatibility, the degree of complexity felt by users, accustomed to the ease of switching channels using a remote control, vis-à-vis IPTV, is likely to affect their intention to continue to subscribe to the latter service. In the context of this study, convenience signifies the extent to which a new product or service is easy or convenient to use, and is used as a term equivalent to ease of use, simplicity or complexity of use.

H3 : Convenience of IPTV influences IPTV subscriber's usage satisfaction.

Customer satisfaction may be defined as customers' overall emotional response to a product or service, either based on the comparison of initial expectations they had prior to its purchase or use with the actual experience of it, or based on the early experience of it [34]. Customer satisfaction is a crucial factor in maintaining a positive relationship with customers over a long term, and a high degree of customer satisfaction is important for revenue prospects of a business [37].

IPTV satisfaction formed through accumulated experiences of content and other distinc-

tive functionalities compared to CATV or simple public broadcasting will affect subscriber's trust on their service provider as well as the attitude of continuing subscription. User satisfaction determined after a sufficient period of usage definitely affects the post- purchase behavioral intentions and behaviors such as complaint, trust, re-purchasing intention, and others. Under various contexts, customer satisfaction is known to be the basic determinant that influences re-purchase intention [28].

Trust in e-commerce, further, has primarily to do with the relationship between an organization and individuals (B2C), and internet technology itself is an object of trust concerning online transactions [42]. Existing studies reported strong evidence pointing that trust not only influences consumers' intention to purchase from a business, but has also a deep impact on their repurchase intention [38].

Trust, therefore, is a decisive determinant of customers' loyalty toward a business. Trust in e-commerce would be the combination of online shoppers' trust in an online seller and their trust and expectations in other related aspects of online transactions [31]. While both the satisfaction and the trust represent similar states of attitude toward the subject, trust signifies higher level than satisfaction in the sense that aggregated evaluation of satisfaction will impact on formation of trust. Numerous literatures on e-commerce [14] suggested that the extent of user satisfaction is accrued from the service provider's capability offered through web site, and the extent of trust on the service provider is directly related to the extent of satisfaction. Indeed, trust on the service provider exacerbate the continuing purchase through removing uncertainty and encourage long term oriented customer attitude [3]. Aggregating the above the following hypotheses are proposed.
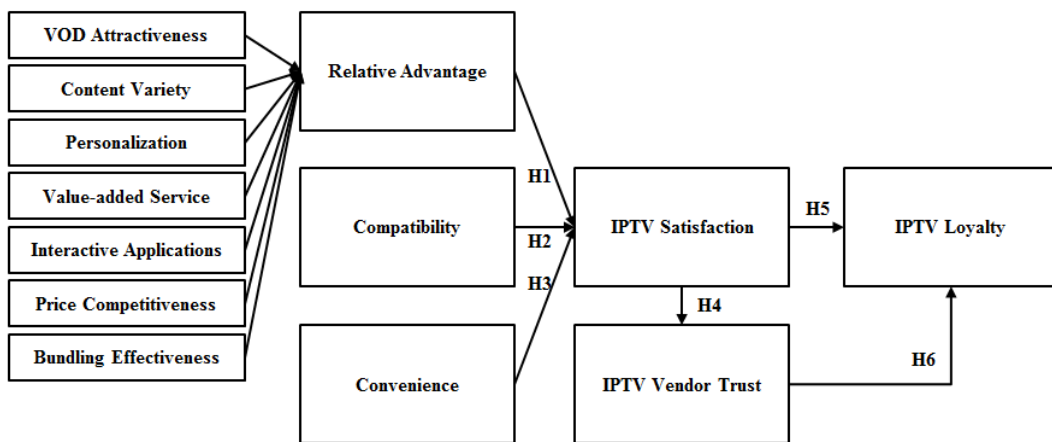
〈Figure 1〉 Research Model

H4 : The level of IPTV satisfaction positively influences the trust on IPTV service provider.

H5 : The level of IPTV satisfaction positively influences the continuing intention of the IPTV service.

H6 : The level of trust on IPTV service provider influences the continuing intention of the IPTV service.

3. Research Method

3.1 Sample and Data Collection

The data for this study were collected by surveying a sample group of IPTV users. Before the actual survey, the questionnaire was pretested on a group of experts, including university faculties and researchers conducting research on IPTV-related topics. Using their feedback, the questionnaire items and measurement variables were appropriately revised and supplemented. Next, 250 IPTV users were selected through random sampling, among current subscribers to three Korean IPTV service providers, and these users were contacted by phone by surveyors of an external research organization, and asked whether they were willing to take part in the survey. Surveyors met with those users willing to participate in the survey for a face-to-face interview. After they were offered a complimentary gift and basic information on the questionnaire, the respondents each filled out a questionnaire and returned completed questionnaires to the survey team. The demographic characteristics of the respondents are provided in <Table 1>. People of the age group 30~39 (54%), working adults (89.2%), college graduates (69.2%) and those who earned 2.5 to 5 million won in monthly income (50.4%) accounted for the largest percentage of the respondents.

〈Table 1〉 The Profile of Sample Projects

Demographic characteristics		Frequency	Percentage	Demographic characteristics		Frequency	Percentage
Gender	Male	148	59.2	Education	High school graduates	27	10.8
	Female	102	40.8		College students	21	8.4
	Total	250	100		College graduates	173	69.2
Age	20~29	67	26.8		Master's degree/Higher	29	11.6
	30~39	135	54.0		Total	250	100
	40~49	36	14.4	Income (monthly)	Less than $2,500	38	15.2
	Over 50	12	4.8		$2,500~5,000	126	50.4
	Total	250	100		$5,000~7,500	56	22.4
Occupation	Students	9	3.6		Over $7,500	30	12.0
	Housewife	10	4.0		Total	250	100
	Workers	223	89.2				
	Other	8	3.2				
	Total	250	100				

3.2 Measuring Instruments

The survey was designed to discover factors influencing users' satisfaction with IPTV and their intention to continue using an IPTV service, based on their experience. Measurement items for each variable used in the survey questionnaire were selected among those widely used in the existing literature, and some of the questionnaire items were created by reformulating operational definitions of the variables in the form of a question. A 7-point Likert type multiple-item scale was used, assigning a score between 1 and 7 (1 being 'strongly disagree' and 7 'strongly agree').

The variable 'relative advantage,' an innovation decision-related variable, was composed of three detailed constructs; namely 'content attractiveness,' 'price competitiveness' and 'bundling effectiveness.' For measurement instruments of content attractiveness, we did not distinguish pleasure and usefulness, since that would not be relevant for IPTV. Five first-order constructs were defined by consulting related items used by Davis [12] and Altgeld and Zeeman [2], each having to do with VOD, personalization, interactive applications, value-added services and variety. Content attractiveness was separately measured for each of the five features of IPTV; namely, VOD, personalization, two-way interactive applications, value-added services and variety (i.e., VOD attractiveness, attractiveness of personalized features, etc.).

The above-described five features of IPTV were selected by referring, on the one hand, to IPTV features discussed by Altgeld and Zeeman [2] and, on the other, to the menus of the three Korean IPTV service providers, by also taking into account the input of experts, gathered from an interview. In measuring content attractiveness, in order to avoid common method bias, we separated the five measurement items so that the five features of IPTV are each evaluated independently. The five items were re-combined after the collection of data, to test their internal consistency. As for measurement items related to price competitiveness and bundling effectiveness, we used conceptual descriptions and variables used by Liang and Huang [26] and Yadav and Monroe [48], by appropriately modifying them to fit the purposes of an IPTV questionnaire. The variables 'compatibility' and 'convenience,' were each given three measurement items, which were created by revising related items used by Agarwal and Prasad [1] to suit the purposes of the IPTV use environment.

Finally, for the selection of measurement instruments related to satisfaction, trust and loyalty, we consulted works by [7], [14]. All variables and measurement items used in this study are listed in <Table 2> below :

〈Table 2〉 Measurement Variables and Items

Variables		Items	References
Relative advantage(7)	Content attractiveness(5) : VOD, Content variety, Interactive applications, Personalization, Value-added service	Pleasure of use, useful features, assistance with everyday tasks, flexible schedule, possibility of spontaneous and productive use	[2], [12], [17]
	Price competitiveness	Price compared to competing media, Affordability of price	[26]
	Bundling effectiveness	User benefits from bundling, price discounts, other advantages from bundling	[48]
Compatibility		Matches preferred leisure and recreational activities, compatibility with lifestyle and everyday tasks and activities	[1]
Convenience		Ease of use, easy-to-navigate menu, intuitive interface	[1]
IPTV Satisfaction		Positive assessment of a purchase choice, satisfaction upon experiencing a new service	[6], [27]
IPTV Vendor Trust		Trust in the service and service provider, reliability of service provider, considerateness of service provider	[8], [15]
IPTV Loyalty		Intention to continue using the same service, unlimited trust in, and satisfaction with, service provider	[6]

3.3 Analytical Instruments

The purpose of this study is to explore the process through which users of IPTV come to develop loyalty toward the service or service provider they are currently using so that they decide to continue using the same service or service provider, and to create an explanatory model for this process through structural analysis of empirical data. In this study, we conducted a structural empirical analysis using a PLS (Partial Least Squares)-based estimation approach.

The reason why we adopt PLS method in-stead of LISREL, despite of the sufficient sample size, is as follows. Firstly, one of the main purposes of this study is to explore the significant factors among the IPTV functional attributes. This investigation is, instead of anchoring on a theoretical basis, rather new in this area. PLS method is used more often in analysis for causal prediction or at the initial stage of development of a theory, than for measuring goodness of fit [10]. Henceforth, PLS method is widely used in information technology-related studies, most often for the purpose of measuring the explanatory power of constructs, rather than measuring the

goodness of fit of a model. This is one reason why we adopt the PLS method.

Secondly, while LISREL method provides various fit indexes to validate robust structural model supported by strong theoretical background, the method does not provide the functionality of formative first-order structure in hierarchical model. While LISREL supports only the reflective indicator model in support of second-order factor, the PLS method supports both the high-order models having a hierarchical structure consisting of first-order and second-order factors indicating in both the reflective and formative way [9, 25, 52]. As such, unlike with the co-variance-based LISREL technique in which only reflective indicators can be used, with the PLS method, we could develop a model using both reflective and formative indicators [7], as this method is component-based.

For the above-explained reasons, in this study, we employed PLS as the analytical instrument and used Smart PLS Version 2.0 M3 as the PLS statistics program. Smart PLS, while offering virtually identical functionalities as PLS-Graph, has a better graphic interface and a more stable platform than the latter(http://www.smartpls.de).

3.4 Reliability and Validity

The term 'reliability,' concerning constructs used in a research model, refers to the possibility of obtaining the same measured value at the repeated measurement of a construct, using an independent measurement instrument. Reliability is generally taken as a measure of internal consistency between items, and is most often measured separately for indicators and constructs [36]. The reliability of an indicator is tested by measuring the loading of the corresponding construct. For an indicator to be considered reliable, the loading of the relevant construct must either meet the cut-off confidence level of 99% or have a value of at least 0.6 [10]. Meanwhile, the reliability of a construct is evaluated through its composite reliability. For a construct to be considered reliable, its composite reliability must meet or exceed the threshold value of 0.7 [10]. In this study, the loading of indicators was within the range of 0.811~0.946, and the value of composite reliability, within the range of 0.916~0.962, as listed in <Table 3>. In other words, both the indicators and constructs exceed their respective thresholds of 0.6 and 0.7 in loading and composite reliability values, attesting, therefore, to the reliability of the IPTV customer loyalty model.

Validity, meanwhile, refers to the appropriateness of measurement instruments to constructs they measure. There are three types of validity: content validity, convergent validity and discriminant validity. In this study, content validity was assessed either using evaluation criteria from studies expanding on the existing literature or by testing consistency between indicators, or by interviewing ex-

〈Table 3〉 Reliability and Convergent Validity Analysis

Measures	Items		Standard Loading	CR[*]	AVE[**]
	Initial	Select			
Relative Advantage					
VOD Attractiveness	5	5	0.866, 0.906, 0.856, 0.887, 0.910	0.948	0.785
Content Variety	5	5	0.811, 0.904, 0.885, 0.880, 0.901	0.943	0.769
Personalization	5	5	0.864, 0.875, 0.881, 0.866, 0.898	0.943	0.769
Value-added Service	5	5	0.866, 0.906, 0.856, 0.887, 0.910	0.949	0.788
Interactive Applications	5	5	0.867, 0.912, 0.883, 0.919, 0.889	0.952	0.800
Price Competitiveness	2	2	0.939, 0.946	0.940	0.887
Bundling Effectiveness	3	3	0.906, 0.917, 0.897	0.933	0.822
Compatibility	3	3	0.932, 0.937, 0.938	0.955	0.875
Convenience	3	3	0.910, 0.914, 0.931	0.942	0.844
IPTV Satisfaction	4	4	0.921, 0.918, 0.935, 0.944	0.962	0.865
IPTV Vendor Trust	5	5	0.889, 0.879, 0.909, 0.865, 0.881	0.947	0.783
IPTV Loyalty	3	3	0.858, 0.883, 0.914	0.916	0.784

Note) [*]Composite Reliability, [**]Average Variance Extracted.

〈Table 4〉 Discriminant Validity Analysis

Measures	1	2	3	4	5	6	7	8	9	10	11	12
1. VS	**.888**											
2. PS	.434	**.877**										
3. IA	.741	.381	**.894**									
4. CV	.864	.390	.691	**.877**								
5. VA	.600	.697	.509	.559	**.886**							
6. PC	.379	.203	.397	.427	.320	**.942**						
7. BE	.212	.413	.206	.254	.368	.192	**.907**					
8. CP	.428	.504	.354	.484	.529	.547	.463	**.935**				
9. CO	.426	.411	.355	.502	.452	.636	.285	.688	**.919**			
10. SA	.373	.434	.311	.443	.495	.529	.464	.551	.549	**.885**		
11. TR	.354	.217	.383	.428	.351	.472	.297	.500	.563	.518	**.930**	
12. LY	.252	.244	.241	.363	.331	.546	.332	.463	.500	.686	.710	**.885**

Note) 1. Value-added Service(VS), 2. Personalization(PS), 3. Interactive Applications(IA), 4. Content Variety (CV), 5. VOD Attractiveness(VA), 6. Price Competitiveness(PC), 7. Bundling Effectiveness(BE), 8. Compatibility(CP), 9. Convenience(CO), 10. IPTV Satisfaction(SA), 11. IPTV Vendor Trust(TR), 12. IPTV Loyalty(LY).

perts and university faculties specialized in this area. As for convergent validity, we employed the AVE (average variance extracted) method for its evaluation. The AVE value of measurement instruments in this study ranged between 0.769 and 0.887, exceeding the threshold value of 0.5 [18]; hence pointing to the existence of convergent validity 〈Table 3〉.

Discriminant validity is measured through the square root of the AVE value. A construct is considered to have discriminant validity when the value of the square root of its AVE is greater than that of its coefficient of correlation with other constructs [13]. The results given in <Table 4> indicate that the IPTV customer loyalty model designed in this study possesses a good level of discriminant validity.

4. Hypothesis Testing

In this study, the construct of 'relative advantage',which is composed of seven first order factors, was designed to the concept of two-dimensional hierarchical structure of the configuration (second order factor reflecting multiple first order factors). In order to measure LV (latent variable) score of relative advantage, first order factors were converted into a single measure, through calculating relative and absolute level contributions of each first order factors. The method of using formative indicators is effective to inhibit collinearity among the detail attributes consisting of second order factor, and the revealed statistics are used as the criterion to distinguish only statistically valid first order factors [7].
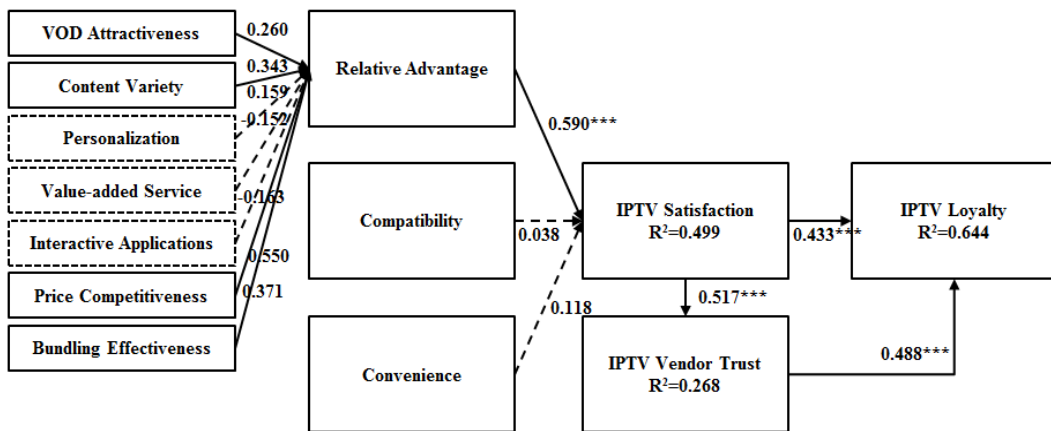
With reference to <Table 5>, among the seven first order factors, personalization, value-added service, and interactive applications are not shown to be valid (t = 1.454, t = 0.870, t = 1.615, each respectively). Statistically significant effects are revealed only for those four attributes; VOD attractiveness, content variety, price competitiveness, and bundling effectiveness. As such, the hypothesis 1 is partially supported, and the result is pictorially illustrated in <Figure 2>.

Statistical analysis results indicate that relative advantage (consisting of four first order factors) significantly influences IPTV customer satisfaction ($\beta = 0.590^{***}$), with the explanatory power of 0.499 (R^2). However, compatibility and convenience are not shown

<Table 5> 2nd Order Factor Verification Result

2nd-order Construct	1st-order Construct	Relative indicator contributions		Absolute indicator contributions	
		Weight	t-Stat	Loading	t-Stat
Relative Advantage	VOD Attractiveness	0.260^{**}	2.266	0.695^{***}	9.075
	Content Variety	0.343^{*}	1.957	0.631^{***}	6.800
	Personalization	0.159	1.454	0.608^{***}	6.900
	Value-added Service	−0.152	0.870	0.532^{***}	4.985
	Interactive Applications	−0.162	1.615	0.444^{***}	3.877
	Price Competitiveness	0.550^{***}	6.643	0.755^{***}	11.454
	Bundling Effectiveness	0.371^{***}	3.963	0.655^{***}	8.345

Note) *t > 1.645, **t > 1.965, ***t > 2.576.

〈Figure 2〉 Structural Model Analysis Result

〈Table 6〉 Hypothesis Testing Result

	Path Analysis	R^2	Estimate	t-Stat	Result
H1	Relative Advantage → IPTV Satisfaction		0.590***	7.843	Partially Support
H2	Compatibility → IPTV Satisfaction	0.499	0.038	0.539	Not Support
H3	Convenience→ IPTV Satisfaction		0.118	1.602	Not Support
H4	IPTV Satisfaction → IPTV Vendor Trust	0.268	0.517***	9.757	Support
H5	IPTV Satisfaction → IPTV Loyalty	0.644	0.433***	7.575	Support
H6	IPTV Vendor Trust → IPTV Loyalty		0.488***	7.980	Support

Note) *t > 1.645, **t > 1.965, ***t > 2.576.

to be statistically significant (t = 0.539, t = 1.602, each respectively). Neither hypothesis H2 nor hypothesis H3 is supported. The most plausible explanation for this is due to the subscriber's familiarity with Internet and TV watching, and handling IPTV were not critical to most IPTV subscribers.

Statistically significant effect is detected for IPTV satisfaction impacts on vendor trust (β = 0.517***, R^2 = 0.268), which supports hypothesis H4. And, both the IPTV satisfaction and vendor trust are shown to affect the loyalty at statistically significant level (β =

0.433***, β = 0.488***, each respectively) with explanatory power R^2 of 0.644. The results support H5 and H6 altogether.

5. Discussion and Conclusion

The goal of this study was to explore the process through which users of IPTV develop loyalty toward this media service to derive implications for the industry and market and identify consumers' behavioral factors which can accelerate the growth of this sector. In

order to achieve this research goal, we combined several theories, paradigms and models, such as the theory of innovation diffusion, and tested various factors potentially influencing the process of loyalty formation against empirical data, using structural equation modeling as the chief methods, to structuralize and conceptualize the process.

We found that customers' satisfaction with IPTV was affected by perceived relative advantage which consists of content attractiveness (VOD attractiveness and content variety), price competitiveness, and bundling effectiveness). And, satisfaction, in turn, had an effect of strengthening their loyalty toward this media service; in other words, inciting them to continue to use the service. This result suggests that service providers must pay special attention to content, price and bundling, if they want to enhance the level of customers' satisfaction with IPTV. Trust in the service provider, a factor having precedence over satisfaction, in terms of influence on customers' loyalty toward IPTV, contributes to continue using the service.

The analysis of the model revealed that the single-most important factor contributing to users' decision to continue using IPTV was trust in their service provider, while satisfaction also importantly influenced it, by producing an impact on both loyalty and trust. What this means in practical terms is that IPTV service providers, in order to strengthen customers' intention to continue using this service, must increase the variety of content provided and invest in the enhancement of service quality. This must be also coupled with the effort to improve price competitiveness and bundle IPTV with other essential telecommunications and media services. An increase in satisfaction and trust in service providers, achieved through these efforts, ensures that more customers will opt to continue their subscription to IPTV.

The primary contribution of this research is the empirical validation of loyalty formation process of innovative convergent service such as IPTV. Also, the mythology to incorporate various details of IPTV service attributes, by treating them as a first order construct comprising second order relative advantage, provides the opportunity to verify which of them are useful and valid. While most research adopting relative advantage construct with reference to innovation adoption and diffusion framework provide evidence that the construct is effective, they lack practical implications in some sense.

Investigating the detail attributes which significantly affect the user's perception of the relative advantage could offer more insights to both the practioners and academicians. The results reveal several interesting facts about the subscriber's behavior toward continuing the service. For instance, the two hypotheses were rejected; those are compatibility and convenience impact on satisfaction, and that suggests the contextual considerations of in-

novation adoption theory should be considered with careful attention. Furthermore, those three IPTV attributes, which are revealed to be non-significant, such as personalization, value added service, and interactive applications, could be the critical managerial focus for the practioners seeking to find competitive differentiation functionalities of IPTV compared to other competing services.

Our study, however, had some limitations. First, our study was conducted as a snapshot without considering the dynamic nature of customer loyalty formation process. Ideally, a longitudinal study that tracks the customer attitude over time is needed. Second, the results may have to be carefully interpreted since the population was restricted to Korea. The resulting framework is useful in providing a better understanding of how to develop a successful loyalty formation with existing innovative convergent service subscribers from a managerial perspective.

References

[1] Agarwal, R. and Prasad, J., "The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies," Decision Sciences, Vol. 28, No. 3, pp. 557–582, 1997.

[2] Altgeld, J. and Zeeman, J. D., Whitepaper IPTV/VoD : "The IPTV/VoDchallenge-Upcoming business models," IBM Paper for the International Engineering Consortium (IEC), 2007.

[3] Aydin, S. and Ozer, G., "The analysis of antecedents of customer loyalty in the Turkish mobile telecommunication market," European Journal of Marketing, Vol. 39, No. 7/8, pp. 910–925, 2005.

[4] Berry, L. L., Carbone, L. P., and Haeckel, S. H., "Managing the total customer experience," MIT Sloan Management Review, Vol. 43, No. 3, pp. 85–89, 2002.

[5] Bouwman, H., Zhengjia, M., Duin, P. V. D., and Limonard S., "A business model for IPTV service : a dynamic framework," Info, Vol. 10, No. 3, pp. 22–38, 2008.

[6] Bhattacherjee, A., "Understanding information systems continuance : An expectation-confirmation model," MIS Quarterly, Vol. 25, No. 3, pp. 351–370, 2001.

[7] Cenfetelli, R. T. and Bassellier, G., "Interpretation of formative measurement in information systems research," MIS Quarterly, Vol. 33, No. 4, 2009, pp. 689–707.

[8] Chiou, J. S. and Droge, C., "Service quality, trust, specific asset investment, and expertise : Direct and indirect effects in a satisfaction-loyalty framework," Journal of the Academy of Marketing Science, Vol. 34, No. 4, pp. 613–627, 2006.

[9] Chin, W. W. and Gopal, A., "Adoption intention in GSS : Relative importance of beliefs," Data Base Advances, Vol. 26, No. 2–3, pp. 42–64, 1995.

[10] Chin, W., The partial least squares approach to structural equation modeling, G. A. Marcoulides, ed. Modern Methods for Business Research, Lawrence Erlbaum Associates, Mahwah, N. J., pp. 295–336, 1998.

[11] Chen, L. D., Gillenson, M. L., and Sherrell, D. L.,"Enticing online consumers : An extended technology acceptance perspective," Information and Management, Vol. 39, No. 8, 2002, pp. 705–719.

[12] Davis, F. D., "Perceived usefulness, Perceived ease of use, and user acceptance of information technology," MIS Quarterly, Vol. 13, No. 3, pp. 318–339, 1989.

[13] Fornell, C. and Larcker D. F., "Evaluating structural equations with unobservable variables and measurement error," Journal of Marketing Research, Vol. 18, pp. 39–50, 1981.

[14] Flavian, C., Guinaliu M., and Gurrea R., "The role played by perceived usability, satisfaction and consumer trust on website loyalty," Information and Management, Vol. 43, pp. 1–14, 2006.

[15] Floh, A. and Treiblmaier H., "What keeps the E-banking customer loyal? A multi-group analysis of the moderating role of consumer characteristics on E-loyalty in the financial service industry," Journal of Electronic Commerce Research, Vol. 7, No. 2, pp. 97–110, 2006.

[16] Gerpott, T. J., Rams, W., and Schindler, A., "Customer retention, loyalty, and satisfaction in the German mobile cellular telecommunications market," Telecommunications Policy, Vol. 25, pp. 249–269, 2001.

[17] Han, E. J. and Suh, B. M., "Competitive Analysis among Interactive Broadcasting Media in Korea Affected by the Introduction of IPTV : Adopting the Niche Theory," The Journal of Society for e-Business Studies, Vol. 15, No. 4, pp. 219–244, 2010.

[18] Hair, J. F. Jr, Anderson R. E., Tatham R. L., and Black W. C., Multi variate data analysis, 5th ed., Prentice-Hall, Upper Saddle River, NJ, 1998.

[19] Hanrahan, H., Network convergence-services, applications, transport, and operations support, John Wiley and Sons, Ltd, 2007.

[20] Hsu, C., Lu, H., and Hsu, H., "Adoption of the mobile internet : An empirical study of multimedia message service (MMS)," Omega, Vol. 35, No. 6, pp. 715–726, 2007.

[21] Jeraraj, A., Rottman, J. W., and Lacity M. C., "A review of the predictors, linkages, and biases in IT innovation adoption research," Journal of Information Technology, Vol. 21, pp. 1–23, 2006.

[22] Karahanna, E., Agarwal, R., and Angst, C. M., "Re conceptualizing compatibility beliefs in technology acceptance research," MIS Quarterly, Vol. 20, No. 4, pp. 781–804, 2006.

[23] Kim, M. K., Park, M. C., and Jeong, D. H., "The effects of customer satisfaction

and switching barrier on customer loyalty in Korean mobile telecommunication services," Telecommunications Policy, Vol. 28, pp. 145-159, 2004.

[24] Kim, H. J., Han, C. H., Suh, B. M., and Kim, K. C., "A Study on the Factors Affecting Customer's Intention to Use the Mobile Game Service," The Journal of Society for e-Business Studies, Vol. 10, No. 1, pp. 1-19, 2005.

[25] Ko, M. H. and Kwon, S. D., "A Study on the Effects of User Participation on Stickiness and Continued Use on Internet Community," Asia Pacific Journal of Information Systems, Vol. 18, No. 2, pp. 41-72, 2008.

[26] Liang, T. P. and Huang, J. S., "An empirical study on consumer acceptance of products in electronic market, a transaction cost model," Decision Support Systems, Vol. 24, pp. 29-43, 1998.

[27] Lin, C. S., Wu, S., and Tsai, R. J., "Integrating perceived playfulness into expectation-confirmation model for web portal context," Information and Management, Vol. 42, pp. 683-693, 2005.

[28] Lin, H. H. and Wang, Y. S., "An examination of the determinants of customer loyalty in mobile commerce contexts," Information and Management, Vol. 43, pp. 271-282, 2006.

[29] Lofgren, M., "Winning at the first and second moments of truth : an exploratory study," Managing Service Quality, Vol.

15, No. 1, pp. 102-115, 2005.

[30] Mascarenha, O. A., Kesavan, R., and Beranacchi, M., "Lasting customer loyalty : A total customer experience approach," Journal of Consumer Marketing, Vol. 23, No. 7, pp. 397-405, 2006.

[31] McKnight, D. H. and Chervany, N. L., "What trust means in e-commerce customer relationships : An interdisciplinary conceptual typology," International Journal of Electronic Commerce, Vol. 62, pp. 35-59, 2002.

[32] Meyer, C. and Schwager, A., "Understanding customer experience," Harvard Business Review, February, pp. 1-12, 2007.

[33] Moore, G. C. and Benbasat, I., "Development of an instrument to measure the perceptions of adopting an information technology innovation," Information System Research, Vol. 2, No. 3, pp. 192-222, 1991.

[34] Oliver, R. L., "An investigation of the attribute basis of emotion and related affects in consumption: suggestions for a stage-specific satisfaction framework," in Sherry, J. and Sternthal, B. (Eds), Advances in Consumer Research, Vol. 19, Association for Consumer Research, Provo, UT, pp. 237-44, 1992.

[35] Ovum, IPTV Forecast 2007~2012, 2008. 11. 27.

[36] Peter, J., "Reliability : A review of psychometric basics and recent marketing practices," Journal of Marketing Research, Vol. 16, pp. 6-17, 1981.
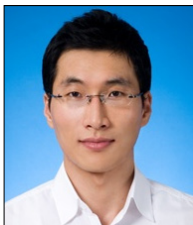
[37] Patterson, P. G., Johnson, L. W., and Spreng, R. A., "Modeling the determinants of customer satisfaction for business to business professional services," Acad. Marketing Science Journal, Vol. 25, No. 1, pp. 4-17, 1997.

[38] Ranaweera, C. and Prabhu, J., "On the relative importance of customer satisfaction and trust as determinants of customer retention and positive word of mouth," Journal of Targeting Measurement and Analysis for Marketing, Vol. 12, No. 1, pp. 82-90, 2003.

[39] Reichheld, F. F. and Schefter, P., "E-loyalty : your secret weapon on the web," Harvard Business Review, Vol. 78, No. 4, pp. 105-113, 2000.

[40] Rogers, E. M., Diffusion of innovations, 5th Edition, New York, NY : The Free Press, 2003.

[41] Shin, D. H., "Potential user factors driving adoption of IPTV. What are customers expecting from IPTV?," Technological Forecasting and Social Change, Vol. 74, pp. 1446-1464, 2007.

[42] Shankar, V., Urban, G. L., and Sultan, F., "Online trust : Astakeholder perspective, concepts, implications, and future directions," Journal of Strategic Information Systems, Vol. 113, No. 4, pp. 325-344, 2002.

[43] Suh, B. M., "The Impact of Perceived Security Control on the Acceptance of Internet Banking," The Journal of Society for e-Business Studies, Vol. 11, No. 1, pp. 25-52, 2006.

[44] Teo, T. S. H. and Pok, S. H.,"Adoption of WAP-enabled mobile phones amonginternet users," Omega, Vol. 31, No. 6, pp. 483-498, 2003.

[45] Tornatzky, L. G. and Klein, K. J., "Innovation characteristics and innovation adoption-implementation : a meta-analysis of findings," IEEE Transactions on Engineering Management, Vol. 29, No. 1, pp. 28-45, 1982.

[46] Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D., "User acceptance of information technology : Toward a unified view," MIS Quarterly, Vol. 27, No. 3, pp. 425-478, 2003.

[47] Wirtz, B. N., "Reconfiguration of value chains in converging media and communications markets," Vol. 34, pp. 489-506, 2001.

[48] Yadav, M. S. and Monroe, K. B., "How buyers perceive savings in a bundle price : An examination of a bundle's transaction value," Journal of Marketing Research, Vol. 30, No. 3, pp. 350-358, 1993.

[49] Yi, M. Y., Jackson, J. D., Park, J. S., and Probst, J. C., "Understanding information technology acceptance by individual professionals : Toward an integrative view," Information and Management, Vol. 43, pp. 350-363, 2006.

[50] Yoo, H. S., Kim, M. Y., and Kwon, O. B., "A Study of Factors Influencing Ubi-

quitous Computing Service Acceptance,"
The Journal of Society for e-Business
Studies, Vol. 13, No. 2, pp. 117–147, 2005.

[51] Zaltman, G. and Stiff, R., "Theory of dif-
fusion," in : S. Ward, T. S. Robertson
(Eds.), Consumer Behavior : Theoretical
Sources, Prentice-Hall, Englewood Cliffs,

NJ, pp. 416–468, 1973.

[52] Zeying, W., Yinglei, W., and Nicole, H.,
"Why people benefit from e-learning dif-
ferently : The effects of psychological
processes on e-learning outcomes," Infor-
mation and Management, Vol. 45, pp. 513–
521, 2008.

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