통신 방송 융합 서비스 수용에 관한 연구 : DMB를 중심으로

Understanding the Adoption of Telecommunications-Broadcasting Convergence Services : The Case of DMB

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초 록

통신과 방송의 융합은 오늘날 디지털 환경의 가장 대표적인 혁신이자 신기술로 이미 포화 상태에 이른 개별 시장의 한계를 극복하기 위한 대안으로 제시되어 통신 사업자와 방송 사업자 등을 비롯한 관련 산업군의 많은 기업들이 시장에 진입하고 있다. 그러나 해당 서비스 및 시장의 성장이 기대에 미치지 못하는 것이 현실인데, 그 원인 중 하나로 사용자에 대한 이해가 부족하다는 점을 지적할 수 있다.

기존의 통신 기술은 사용자의 도구적 목적을 지원하는 반면, 방송 서비스는 내재적 가치인 오락 기능을 제공하기 위해 주로 사용되었다. 본 연구의 목적은 개별적인 통신과 방송 영역이 융합되었을 때 사용자의 태도와 의사 결정에 영향을 미치는 요인들을 규명하는 것이다. 연구 모델은 내재적 동기인 유희적 가치와 외재적 동기인 실용적 가치, 그리고 융합 서비스의 실제 사용에 있어 내·외부적 조건이 되는 인지된 통제성을 주요 변인으로 제시하고 있다. 이를 검증하기 위해 대표적인 통신 방송 융합 서비스인 DMB를 대상으로 실증 분석을 실시하였다.

ABSTRACT

The convergence of telecommunications and broadcasting is representative of many innovative technologies in the digital environment. It has recently been emphasized as an alternative solution to overcome the on-going saturation of the telecommunications and broadcasting markets. Despite this effort, however, growth of the market and its related services cannot reach prior expectations due to lack of understanding on the real user-end.

Telecommunications technology used to serve its instrumental purpose and broadcasting services usually support entertainment functions which in themselves have an inherent value. Our research questions what factors influence users' attitude and decision-making when it comes to using telecommunications-broadcasting convergence services. The research model of this paper proposes intrinsic motivator focusing on hedonic value, extrinsic motivator having utilitarian values, and perceived control as internal and external conditions.

To verify our model empirically, we selected the DMB technology which is a good example of distinctive telecommunications-broadcasting convergence service.

키워드 : 디지털 컨버전스, DMB, 인지된 유희적 가치, 인지된 실용적 가치, 기술 수용 이론, 동기 이론
Digital Convergence, DMB, Perceived Hedonic Value, Perceived Utilitarian Value, TAM, Motivation Theory

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1. Introduction

The concept of "convergence" is becoming a new paradigm across various fields, including economy, politics, culture and technology. The cross effect of each individual technology has dramatically changed human life [17]. Its best example is the convergence of telecommunications and broadcasting. It has recently been proposed as an alternative solution to overcome the limitations in the already saturated telecommunications and broadcasting markets. New services that borderline with other areas of service such as DMB (Digital Multimedia Broadcasting), VOD (Video on Demand), IPTV (Internet Protocol Television), and data broadcasting, have also been developed and provided. DMB was particularly designated as one of eight services of the u-IT 839 strategy of the Korean government, and it is evaluated as a major growth power force in promoting the domestic IT industry and increasing Korea's competitive edge. The service is expected to bring a ripple effect of 14.7 trillion won (about USD 15 billion) in the national economy and to create 163,000 jobs until 2010 [16].

DMB is a mobile multimedia broadcasting service which provides users with high-quality audio and video contents over handheld devices on the move (the maximum speed of 200 km/h) by using digital broadcasting technology. It is classified into terrestrial DMB (T-DMB) and satellite DMB (S-DMB) by transmission channels. In Korea, TU Media started to offer S-DMB in May, 2005 and the consortium of KBS, MBC, SBS, YTN, and U1 Media launched T-DMB in December 1, 2005.

Though Korea has commercialized both S-DMB and T-DMB before any country, the absence of efficient business models and regulation policy and conflicts among market participants make the growth of the market difficult. Nevertheless, the more serious problem is the lack of understanding about the behavior of actual users.

Several existing DMB researches examined the standardization or the technical trend of S-DMB and T-DMB focusing on political and technical perspectives. There have been a few studies about the revitalization plan of the market or the characteristics of potential demand toward the Korean market [9, 23, 25, 27]. But both academic and practical fields seldom try to investigate the factors affecting DMB usage directly or even indirectly.

This paper examines the determinants of the adoption of DMB service through literature review and empirical tests, based on the motivation theory and the technology acceptance model. The outcome of this study can potentially help related parties to set guidelines to establish a

positioning strategy in the market.

2. Literature Review

2.1 Perceived Hedonic Value and Perceived Utilitarian Value

The motivation theory [13, 14] classifies drivers of behavior into intrinsic motivator and extrinsic motivator. Intrinsic motivation means the pleasure and the satisfaction derived from a specific activity itself, while extrinsic motivation focuses on performing particular behavior to achieve a specific goal. These concepts have been redefined as hedonic and utilitarian values which would be the major two dimensions of an individual's attitude and have been much investigated in various fields, including sociology and psychology.

Holbrook and Hirschman [20] emphasized 'pleasure-oriented consumption' and identified it as an experiential view that had rarely been considered in the information processing model. The information processing model focuses on utilitarian functions based on objective characteristics of a product or service, while the experiential perspective concentrates on hedonic value. Many studies on pleasure-oriented consumer activities have been investigated since their research [3, 8, 29, 35].

External motivation that determines a consumer's purchase activities or attitude is a similar concept to the cognitive usefulness in TAM (Technology Acceptance Model) [12, 32]. The model based on TRA (Theory of Reasoned Action) explains perceived usefulness and ease of use affect the individual's IT acceptance. In addition, Davis et al. [12] added perceived enjoyment, an intrinsic motivator, to the model.

Hedonic value on intention to IT usage refers to the extent to which how much fun and enjoyment can be derived from using it. This value gives intrinsic psychological rewards to users. A user who experiences direct and immediate pleasure and enjoyment from using a system is likely to use it more extensively than others, regardless of any other anticipated performance outcome. Thus, the user is likely to use the system more intensely than other systems [12, 19, 21, 22, 26, 32, 37].

Moon and Kim [26] extended the TAM to the Web context and proposed perceived playfulness, including concentration, curiosity, and enjoyment, as an intrinsic motivator based on Barnett's researches [6, 7]. Moreover, they divided the users into the entertainment and work groups according to their purpose in using Web and compared the effect of perceived playfulness and perceived usefulness

between these two groups. They discovered that perceived playfulness had significant effects on both groups, while perceived usefulness did significant influence only on the work-purpose group.

Chae et al. [10] introduced the purpose of usage as a mediated variable to measure the quality of the mobile Internet service. They assumed that a user with utilitarian purpose pursues specific information, while another user with the hedonic purpose enjoys using the system without a goal in mind. Heijden [19] distinguished utilitarian systems to provide users with instrumental value and hedonic systems to provide them with self-fulfilling value. Hedonic systems aim continuous usage by giving users a pleasurable experience during using the systems while utilitarian systems strive to improve task performance by increasing efficiency and/or productivity. He insisted that the hedonic quality of information systems is an important boundary condition to the validity of the TAM.

2.2 Perceived Control

Although a system or service can satisfy users' requirements and the users are well motivated both intrinsically and extrinsically, they probably show actual behaviors and usage depending on non-motivational factors such as available resources and opportunities (e.g., time, money, skills, and cooperation with others) [1]. Those who can access and acquire the resources and opportunities may have stronger behavioral intention. In other words, users' confidence in their own ability to perform a given behavior forms positive attitude and evaluation of such an attitude.

Bandura [4, 5] organized the Self-Efficacy Theory and proposed the concepts, outcome expectation and efficacy expectation. They referred to the perceived ability of organizing and performing a specific task successfully. Outcome expectation is associated with perceived usefulness in TAM, and efficacy expectation can be regarded as perceived ease of use [34].

Moreover, self-efficacy is compatible with perceived behavior control in TPB (Theory of Planned Behavior), referring to the extent to perform a behavior with the ease or difficulty [1]. If users have identical behavioral intention, one with the higher self-efficacy level is more likely to execute the actual behavior. In particular, even though there is identical intention to use a new information system, a user with confidence in usage would be more skilled in using the system and use it more often than others.

Taylor and Todd [31] pointed out the limitation of TAM which had not considered the perceived ability and control

and compared explanatory power of TPB and TAM. They decomposed perceived behavior control into facilitating conditions and self-efficacy. The former is the availability of resources that is necessary to engage in a behavior such as time, money, or other specialized resources. The latter is an individual's self-confidence in his/her own ability to perform a behavior. We conceptualize perceived control, covering ease of use in TAM, efficacy, and facilitating conditions. They are internal and external conditions for IT usage.

3. Methodologies

3.1 Research Model and Hypotheses

Perceived utilitarian value can be derived from extrinsic outcome, such as improving job performance, productivity, or effecti veness. Perceived hedonic value focuses on intrinsic motivation and lays emphasis on interacting between a technology and an individual.

DMB service, the objective of this research, provides not only audio and video but also various data through mobile devices. People can listen to English educational programs or watch music videos or check stock prices on the move. That is to say that DMB serves both hedonic and utilitarian purposes. An individual can use DMB service for entertainment purposes or for performing a task regardless of time and place. Therefore, we propose perceived hedonic value (PH) and perceived utilitarian value (PU) as key determinants of DMB adoption and hypothesize these factors to have a positive influence on intention to DMB usage. These hypotheses are consistent with prior studies. Davis et al. [11] argued that acceptance of information systems may be affected by anticipated job performance regardless of overall attitude. In other words, even a user who dislikes a system uses it due to perceived usefulness of its job performance. Some researches [28, 36] found that user's positive attitude results from pleasant experience. In addition, Katz's study [24] showed certain high correlation between playfulness and users' positive attitude by doing a comparison analysis between microcomputer users and mainframe users.

One may regard emotional worth as a priority. From this point of view, Heijden [19] insisted that "an intrinsically motivated user is derived by benefits derived from the interaction with the system per se." An individual experiencing pleasure while using DMB can perceive the usage itself to be useful. Thus, we develop a hypothesis in which perceived hedonic value has a positive influence on perceived utilitarian value.

The assumption in which perceived

control (PC) affects intention to DMB usage is reasonable. If a user does not have the resources or the ability to access and use the service-even so DMB services supply very useful and interesting information-one may not be able to decide to accept it. This perceived control extends perceived behavior control in previous researches [1, 2, 31]. So to speak, the concept covers not only the perceived behavior control but also the ease of use in TAM. According to Venkatesh and Davis's study [33], the easier a technology is to use, the more useful it is perceived to be, and the more positive attitude and intention there are for IT usage. In other words, ease of use has indirect influence on intention through perceived usefulness. Besides, Heijden [19] verified ease of use has indirect influence on behavior intention to use through perceived enjoyment.

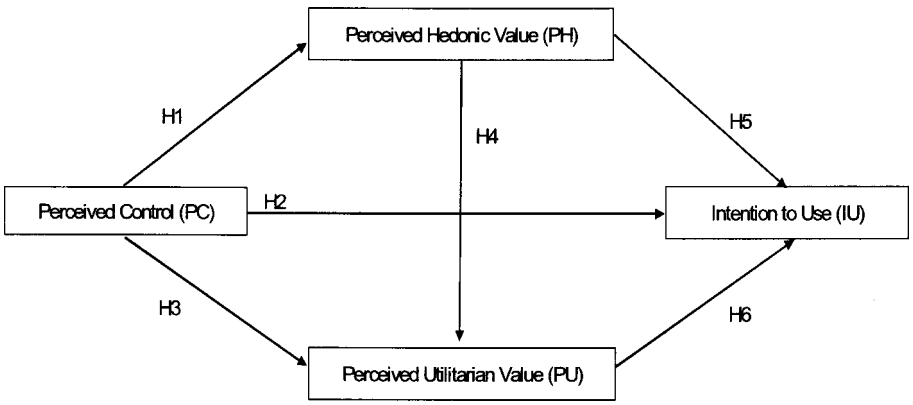
Based on these research studies, hypotheses are developed as the following.

H1 : PC will have a positive influence on PH.
H2 : PC will have a positive influence on IU.
H3 : PC will have a positive influence on PU.
H4 : PH will have a positive influence on PU.
H5 : PH will have a positive influence on IU.
H6 : PU will have a positive influence on IU.

3.2 Variables and Measurements

Perceived hedonic value refers to psychological rewards, the extent to which pleasure and gratification are brought from using DMB service. Perceived utilitarian value is external benefits, such as improving task performance. To measure the constructs, we have modified and used Heijden's instruments [19] for PH and Venkatesh and Davis's instruments [33] for PU.

Perceived control is comprehensively conceptualized by including the ease of use in TAM and the perceived behavior control proposed by Tayler and Todd [31] : That is



〈Figure 1〉 Research Model

〈Table 1〉 Research Variables and Measurements

Research Variables	Measurements	
Perceived hedonic value	DMB service is enjoyable/disgusting.	PH1
	DMB service is exciting/dull.	PH2
	DMB service is pleasant/unpleasant.	PH3
	DMB service is interesting/boring.	PH4
Perceived utilitarian value	Using DMB service improves my performance in my job.	PU1
	Using DMB service in my job increases my productivity.	PU2
	Using DMB service enhances my effectiveness in my job.	PU3
	I find DMB service to be useful in my job.	PU4
	I find DMB service to be helpful in my job.	PU5
Perceived control	It is easy to learn how to use DMB service.	PC1
	I find DMB service to be easy to use.	PC2
	I have the sufficient ability to make use of DMB service.	PC3
	Using DMB service is entirely within my control.	PC4
	I have the resources and knowledge necessary to use DMB service.	PC5
Intention to use	I intend to use DMB service soon.	IU1
	I plan to use DMB service soon.	IU2

the perceived level of ability to use DMB without any monetary, technical, or environment obstacles.

A dependent variable in our model is the intention to DMB usage. The goal of theories explaining technology acceptance is to predict whether or not one uses a new system or technology. Because it has been verified that there is a very strong correlation between behavior intention and actual behavior, we focus on intention to use and measure it by using the instruments proposed by Venkatesh et al. [34].

As variables show in <Table 1>, they present a potential user's whole perception, where we do not consider specific functions of DMB.

3.3 Data Collection

To examine the hypotheses developed in the previous section, we conducted a survey via e mails and interviews from August 1 to September 10, 2005. The first page of the questionnaire presented a brief explanation about DMB channels provided TU Media which offered commercial service in Korea during survey days.[1] Data was collected from teenagers to those in their sixties in five major cities in Korea: Seoul, Daejeon, Gwangju, Daegu, and Busan.

1) Because T-DMB service was started on December 1, 2005, in Korea, and the technical characteristics of DMB service were not the focus of our consideration, the information about S-DMB was offered to subjects at the time of data collection.

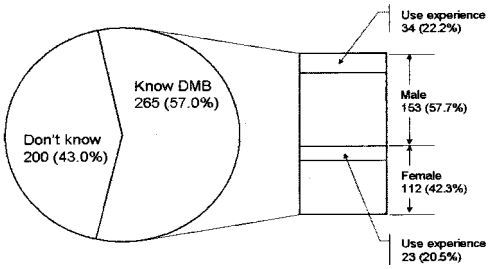
Among total 700 questionnaires, 513 were retrieved. The available 465 questionnaires among them were used for analysis. Respondents consisted of 241 males (51.8%) and 224 females (48.2%), and thus gender composition was balanced. Of these respondents, the percentage of teenagers was 23.9%, those in their twenties 30.1%, those in their thirties 32.0%, those in their forties 7.7%, and those over fifties 6.2%. We did not focus on a particular age group by design, but the result is likely to reflect on the nature of study area and survey methodology. In other words, as young respondents participated more willingly and positively in the survey, more significant data was secured from them.

〈Table 2〉 Demographics

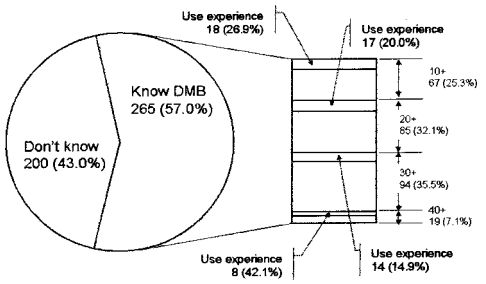
Variables		N	%
Gender	Male	241	51.8
	Female	224	48.2
Age (years)	10-19	111	23.9
	20-29	140	30.1
	30-39	149	32.0
	40+	65	14.0

Before testing the hypotheses, we investigated overall perception of potential users and whether respondents use DMB or not. <Figure 2> shows the results.

For a particular question which asked them what function they wanted to see the most on a future cellular phone, the respondents mostly chose entertainment functions, such as the camera, MP3, and movie. However, only 7.0% selected DMB service. Females were more susceptive to DMB service than males (female 6.7%, male .9%). The younger a person is, the stronger the desire one has for using DMB (teenagers 8.5%, those in their twenties 6.4%, those in their thirties 6.1%, and those over forties 2.8%).



(a) By Gender



(b) By Age

〈Figure 2〉 Overall Perception of Potential Users and Service Usage Conditions

We confirm that the potential user's perception on DMB service is very low. To revitalize related market, marketing strategies, which can improve lower level of individual perception and bring DMB into

〈Table 3〉 Reliability Analysis

	# of Initial item	# of final item	Final Cronbach's α
Perceived hedonic value	4	4	.923
Perceived utilitarian value	5	5	.963
Perceived control	5	4	.884
Intention to use	2	2	.896

relief, should be the focus above other methods.

4. Empirical Analysis

4.1 Reliability and Validity

Reliability was accessed by computing Cronbach's α. The first analysis showed that the coefficient value of perceived control can be improved if PC4 is deleted. Thus, we deleted the item and did a reanalysis with 15 items. As shown in <Table 3>, all coefficient values exceeded the recommended value of .7 [18].

Construct validity was evaluated through factor analysis. We applied Varimax rotation for 15 items except for PC4 which had been deleted in prior to the reliability test. Factor loadings for all variables were greater than .5 and four

〈Table 4〉 Factor Analysis

Variables		factor 1	factor 2	factor 3	factor 4
Perceived hedonic value	PH1	.833			
	PH2	.855			
	PH3	.809			
	PH4	.822			
Perceived utilitarian value	PU1		.829		
	PU2		.824		
	PU3		.823		
	PU4		.705		
	PU5		.573		
Perceived control	PC1			.833	
	PC2			.847	
	PC3			.819	
	PC5			.725	
Intention to use	IU1				.811
	IU2				.866
Eigen Value		3.689	3.565	3.165	1.946
Variance (%)		24.591	23.765	21.099	12.974

〈Table 5〉 Correlation Matrix

	Mean	*Std. Dev.*	*PH*	*PU*	*PC*	*IU*
PH	4.17	1.65	1.00			
PU	3.68	1.47	.74	1.00		
PC	4.39	1.58	.54	.55	1.00	
IU	3.21	1.62	.66	.54	.45	1.00

Note) All coefficients are significant at the level of $p < .01$.

factors were extracted (Refer to <Table 4>). The result supports convergent and discriminant validity. To verify it statistically, we performed the confirmatory factor analysis (CFA) by Amos 5. The purpose of this analysis is to delete factors obstructing unidimensionality.

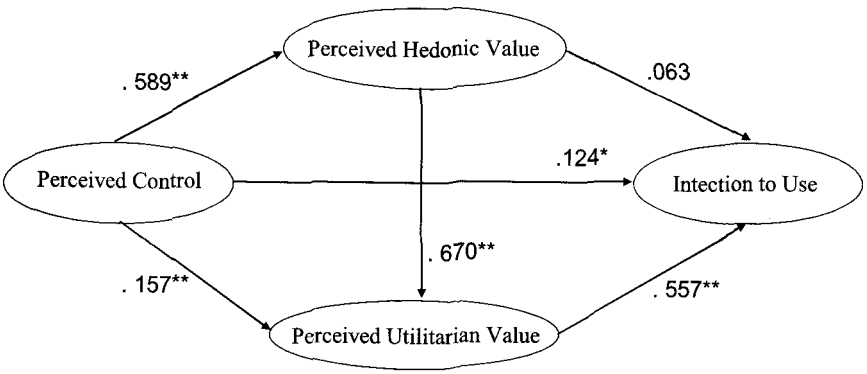
First, we ran CFA for all exogenous variables (GFI = .903, AGFI = .866, RMR = .125, NFI = .945), then did it again after deleting PC4 of which loading value was low consistently in the reliability analysis (GFI = .913, AGFI = .876, RMR = .121, NFI = .954). The goodness of second analysis was better, and hence we examined the hypotheses based on the second.

4.2 Hypothesis Testing

To test our proposed hypotheses, we analyzed the correlation and structural equation model. All hypotheses were supported by correlation analysis (Refer to <Table 5>).

Correlation analysis, however, cannot reflect interaction effect sufficiently between variables and cause information loss as summarizing multiple measurements into a single item as the mean. Even though the correlation coefficient is statistically significant, we cannot know the direction of effect between the two constructs. In structural equation modeling, this is taken into account when the correlations among the latent variables are examined; hence their "true" correlation is reflected. This provides an added benefit in that the correlations among the measured variables are an indication of their reliability, and structural equation modeling can correct for this [30]. Consequently, because a structural equation model considers effects of all variables and investigates causal relation, it is generally evaluated that the result from the model is more reliable than the result form correlation analysis. Thus, we analyzed a structural equation model using Amos to ensure reliability of this research and to verify our hypotheses.

We evaluated the overall research model. The indexes of goodness are $\chi^2 = 320.774$, df = 84, RMSEA = .078 ($\leq .08$), NFI = .954



Note) ** Significant at the level of p < .01.
* Significant at the level of p < .05.

〈Figure 3〉 Structural Equation Model

(≥ .9), CFI = .965 (≥ .9), GFI = .913 (≥ .9), AGFI = .83 (≥ .8), where they satisfy the criterion of goodness.[2]

Then, we inspected the result of the hypotheses test. Referring to <Figure 3>, only Hypothesis 5, "perceived hedonic value will have a positive influence on intention to use." was rejected.

Perceived control, which refers to technical, monetary, and environmental conditions or ability, affects not only directly but also indirectly the intention to DMB usage through perceived hedonic and utilitarian values. That is, even though a service or a technology is perceived to be very useful and enjoyable, a potential user may hardly accept it if he/she does not have the required resources or opportunities to use it. In particular, the standardized a, We judge that an individual may feel more interested in using the service he/she perceives to have and be satisfied with for usage.

The hypothesis, where perceived hedonic value will have a positive influence on intention to DMB usage, was not accepted. It can be interpreted that it is difficult to raise behavior intention if a service only meets users' pleasurable needs to compensate for effort and cost paid to learn or use DMB. However, we should not neglect the importance of inherent value, such as the fun or enjoyable nature of DMB, because perceived hedonic value affects intention through perceived utilitarian value. Furthermore, the standardized coefficient between perceived hedonic value and utilitarian value is the highest, .670, such that we conclude the indirect effect of perceived hedonic value to be more important than other proposed factors. Users can perceive it as useful and

2) The figures in parentheses are the accepted level of goodness-of-fit indexes.

helpful if they can use multimedia services anywhere on the go for fun.

DMB has the mixed nature of both hedonic and utilitarian values. To efficiently raise intention of its usage, it is required to furnish enjoyable and useful contents and to meet the internal and external conditions that can prompt actual usage.

We compare the importance of perceived control and perceived utilitarian by coefficient value. The value of perceived utilitarian (.557) is higher than that of perceived control (.124). DMB services are offered via already popular and widely used mobile devices, including cellular phones, PDAs, notebooks, and navigators. Thus, potential users can perceive that there are not many difficulties for DMB usage.

5. Conclusion

The advance of digital technologies brings up convergence of telecommunications, broadcasting, and computer industry. As the boundaries among those channels become more ambiguous, the competition among them becomes fiercer.

Existing perspective on convergence of telecommunications and broadcasting has been focused on technical approaches to supply commercial service or regulation to control the market. To rapidly attain the maturity of market, however, it is a matter of importance to clarify the factors which can promote users' adoption either directly or indirectly. Thus, this paper proposes determinants of users' intention for DMB, a new and representative service appeared in convergence environment of telecommunications and broadcasting.

We assumed hedonic and utilitarian values were deeply and cognitively associated with potential users' intention on IT usage, based on motivation theory and technology acceptance models. The motivators in the motivation theory had been redefined as the perceived hedonic and utilitarian values on the basis of TAM researches [19, 33] determining the relative importance of the two main constructs-ease of use and usefulness-in the objective of information technology adoption.

Furthermore, we proposed perceived control as internal and external conditions. Our research model was confirmed by an empirical test. The analysis and discussion led us to the following conclusions:

First, the perceived control has not only direct but also indirect impact on intention to DMB usage through perceived hedonic and utilitarian values. Second, even though the perceived hedonic value does not show a significant impact on intention, it has a positive influence on the dependent variable indirectly through the perceived utilitarian

one.

In order for the DMB service to have relative advantages over existing media and to create unique benefits as an efficient business model, it is required to break from rebroadcasting entertainment programs of traditional terrestrial broadcasting. As the results of this research shows, users do not want nor pursue only enjoyment which is one of characteristics of established broadcasting media. The fresh and specific functions to satisfy perceived usefulness of users should be equipped in the new services like DMB. Enterprises also should offer contents containing useful information matching each user's context (time, place, and individual information, and so on) correctly by making the best use of the merits of mobile environment with interesting design. Especially, considering that DMB is offered through personal devices in contrast with other media, service providers should develop competitiveness in personal and portable broadcasting constructively by customizing contents to individual life-styles.

Since services in convergence of telecommunications and broadcasting do not have identical characteristics (e.g., DMB vs. IP-TV, portable DMB vs. embedded DMB), we did not consider the nature of DMB systems. Nevertheless, further studies are necessary to investigate the specific characteristics of relevant services without damaging the parsimony and generality of the research model. The extraction of relevance research variables and verification can be more easily performed with creation and diffusion of convergence services consistently and diversely.

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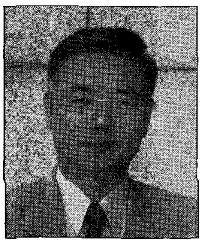

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