

Understanding the Adoption of Convergent Services: The Case of IPTV

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Abstract

Today, many IT innovations that affect our daily lives originate from digital convergence. This study examines the factors influencing consumers' adoption of Internet protocol TV (IPTV), a representative convergent service combining communication and media technologies. Using innovation diffusion theory, we developed an adoption model reflecting the unique characteristics and usage contexts of IPTV. The results indicate that relative advantage, compatibility, trialability, content diversity, monetary value, personal innovativeness, and social influence have significant direct effects on the consumer's adoption of IPTV. In addition, the specific attributes of IPTV—namely, interactivity, content diversity, and monetary value—have significant mediating effects on the consumer's adoption via relative advantage. These results not only provide practical insights into consumer acceptance of new convergent services but also help practitioners plan their marketing strategies more effectively.

Keywords: Digital Convergence, Innovation Diffusion, IPTV; Technology Adoption, User Perception.

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Introduction

The last few decades have witnessed the rapid advancement of information technology (IT) and its tremendous impact on every facet of our daily lives. The trajectory of IT evolution has introduced various types of devices, applications, and services to improve task performance in business organizations and satisfy individual needs for entertainment, rapid communication, and easy information access (Gill, 2008; Hong and Tam, 2006).

Recent IT developments are, to a certain degree, a result of the technological flexibility of IT to produce new devices and services by integrating two or more different existing functions or features—a process known as digital convergence (Gill, 2008; Yoffie, 1997). Digital convergence generally provides the technological foundation to introduce various digital devices and services in the consumer electronic market (Kaluza et al., 1999). Today, digital convergence has become a major technology component that accounts for the emergence of innovative and fascinating digital products and services, thereby creating a sensation among consumers in the market (e.g., the recent growing popularity of smart devices and social networks).

The role of digital convergence reinforces its magnitude as a new dominant paradigm in contemporary IT sectors. For instance, in the telecom and media industries, the Internet has become integrated into media technologies, resulting in a web-based multimedia environment (e.g., voice over IP, music and video streaming on the Internet, and online 3D games). The strategic importance of digital convergence resides in the fact that it enables new ways of doing business across industries, resulting in a major shift in industry dynamics (Yoffie, 1997). In general, digital convergence expedites the combination of previously diverse industry areas related

to digital technologies and plays a significant role in increasing consumer demand for information goods and digital media (Wegberg, 1995). For industries, this changed business environment implies both opportunities (e.g., access to broader markets with convergent products) and challenges (e.g., fiercer competition due to fuzzier industry boundaries) in terms of market survival. In addition, digital convergence can be a major stimulus to changes in consumer behavior related to the consumption of digital contents (e.g., quantity, frequency, timing, and kinds of consumption).

From the research perspective, the transformative impact of digital convergence on the supply and demand sides of IT industries provides another opportunity for researchers to explore more diversified research areas and extend the scope of information system (IS) research to include emerging socio-technological phenomena. Motivated by such research opportunities, the current study basically aims to understand consumers' perception of digital convergence from the IT innovation adoption perspective. In particular, digital convergence in telecom and media industries has predominantly sought to improve individual consumers' experience with digital contents and entertainments (Wegberg, 1995). The study of digital convergence sheds lights on how IT affects our daily lives and how IT is differently adopted for personal purposes—areas that have relatively limited attention in the research to date (Hong and Tam, 2006; Yoo, 2010).

Studies on factors that affect adoption decisions have long been a part of IS research and have provided enriched literature (Jeyaraj, 2006). However, emerging technologies in the market requiring continuous efforts to identify new factors have rarely been conceptualized to explain the relationship with existing theories and empirically examine their impact on consumers' intention

to use new technologies (Karahanna, 2006; Van Slyke et al., 2010). The current study seeks to represent such efforts to understand how users, new technologies, and social systems interact with and affect each other.

Throughout the paper, we focus on two major research questions: (1) What are the factors that determine consumers' adoption of digitally convergent services in telecom and media industries? (2) How do these factors affect consumers' intention to adopt digitally convergent services? To answer these questions, the study focuses on the case of Internet protocol TV (IPTV) – a digitally convergent service that combines the features of telecom, broadcasting, and entertainment industries. The study we suggests that a number of constructs to measure consumers' perception of the use of IPTV and investigate their impact on behavioral intentions to adopt the new digital media service.

We employ the innovation diffusion theory (IDT) as a base theory and develop a conceptual model specific to IPTV adoption. The research model not only embraces key constructs of IDT, but also reflects differentiated characteristics of IPTV (i.e., content diversity, interactivity, and monetary value). The model also includes the individual propensity to absorb innovative technologies (i.e., personal innovativeness) and their tendency to be affected by peer groups (i.e., social influence). Analyzing data samples from a web-based survey, we determined that differentiated characteristics of IPTV positively and significantly influence individuals' behavioral intention to adopt IPTV as well as key IDT constructs. The outcomes imply that unique features of IPTV play a central and important role in delivering the success of IPTV in the market. IPTV service providers need to establish business strategies that fully manipulate such differentiated attributes of IPTV to acquire competitive advantages in the market.

The remainder of this paper proceeds as follows. The next section provides an overview of the research context, including digital convergence and IPTV. We then present the research model with a set of hypotheses. Section 4 describes the research methodology (based on a web-based survey and the PLS method) and the empirical results. Theoretical and managerial implications of the findings are discussed in the Discussion section. Finally, we conclude the paper with a discussion of research limitations and future research directions.

Research Background

The Effect of Digital Convergence

The concept of digital convergence is not new; in fact, it has been discussed for the last two decades. However, it was not until a few years ago that digital convergence began to acquire salient attention, especially from IT industries. Today, most consumer electronics or telecom and media services are equipped with digital technologies closely related with digital convergence.

As indicated in the previous section, the shift in the technology and business environment due to digital convergence has ultimately led to an overall increase in the competition in the related industries and lower profitability as results (Kaluza et al., 1999; Yoffie, 1997). Such strategic challenges motivate the firms to rethink traditional critical success factors of business (e.g., low cost, differentiation, flexibility, and reduced time) and adjust the strategic importance of these factors.

In the digital convergence era, firms have recognized that cost leadership and product differentiation have been relatively less salient, whereas flexibility and reduced time have gained more importance as strategic edges for market survival in convergence industries (Kaluza et al., 1999). In this sense, many firms in telecom and media industries

have devoted their efforts to improving dynamic capabilities to respond to rapidly changing consumer demand and competitors' market movement by introducing new products and services in faster manners with shorter lifecycle periods (Teece, 1997).

In addition to such strategic implications from the managerial perspective, digital convergence has a conceptually significant impact on consumer behavior, especially in terms of the way they purchase and use information goods and entertainment services.

The emerging trend of convergence between the Internet and digital content devices eventually provides a plausible environment in which consumers can have immediate access to a large pool of digitalized content at anywhere and anytime they want. Under such circumstances, consumers are increasingly spending more time (and money) on entertainment services. Accordingly, consumers are looking for sources that provide diversified content to satisfy their preferences. Furthermore, consumers are interested in managing their own media and differentiated user experiences (e.g., more personalization and interactivity).

Thus, from the business perspective, the adoption of new digital convergence has given global consumers the power to demand what they want, when they want, and how they expect to get it. The market power that shifted to consumers provides telecom and media industries with additional pressure to deliver the goods according to consumers' perception of value. From the academic perspective, the emergence of digital convergence in telecom and media industries provides a potential to extend the current theoretical knowledge of IT adoption literature by exploring consumers' perception and their behavioral intention when responding to a new technology development in the market.

IPTV as an Emerging Convergent Service

The research context of the current study is IPTV. In recent years, IPTV has attracted a great deal of attention from individuals and industries and is currently recognized as a potential megatrend affecting telecom and media industries. According to the Multimedia Research Group (2009), the number of IPTV subscribers worldwide reached 28 million in 2009; this number is expected to increase to 83 million by 2013, demonstrating a compound annual growth rate of 31%. In addition, IPTV service revenues are projected to reach \$38 billion by 2013.

The fundamental driver of IPTV is that it enables users to watch TV broadcasts and video content over the Internet network (Harris and Ireland, 2005). IPTV is also equipped with other value-added features, including a large pool of video on demand (VOD) that consumers can repeatedly watch at any time, time-shift TV playback like digital video records (DVRs), and two-way interactivity between users and IPTV set-top box (STB) through the graphical user interface (GUI) on TV screens. These functions set IPTV apart from general public TV broadcasting and traditional cable TV. The differentiated points also emphasize the IPTV's possible role as a networked home media platform on which the exchange of digital content and entertainment predominantly arises within household (Evens, 2010).

The emergence of IPTV in the telecom industry is attributable to several major driving forces (Harris and Ireland, 2005): (1) the development of broadband Internet and video compression technologies; (2) the need of a new business to complement the continuous decline of traditional wired businesses; (3) managerial efforts to increase the average revenue per user (ARPU) through a triple-play (voice, data, and video) business model;

and (4) lucrative revenue opportunities in digital content market. Among these factors, technology development has been a well known direct influencer, but it is also understood that the joint effort of integrating all four factors is required in order for IPTV to be fully materialized.

Although IPTV has induced widespread attention in both business and academic fields, this emerging media service is still in its early stages of commercialization and faces fierce competition from incumbent TV service providers. The widespread diffusion of IPTV among potential users largely depends on understanding customers' concerns and identifying the factors that facilitate the use of IPTV. From the research perspective, the processes by which individuals adopt technologies and the factors that influence their usage remain a central focus of IS research and an important managerial problem (Compeau et al., 2007; Venkatesh et al., 2003). Thus, the current study aims to investigate personal perception and motivation associated with individual intention to adopt IPTV.

From the perspective of IPTV service providers, the adoption issue is also critical to their business operations. Providing convergent services comprising TV, telephony, and the Internet would entail a substantial initial investment for service providers. This investment is not only for the underlying network infrastructure but also for provisioning and managing vast data centers needed to provide sophisticated IPTV experience (Agarwal et al., 2007). Thus, service providers need to carefully plan and manage IPTV service deployment to maximize their return on investment while providing high-quality experience for their customers. To realize IPTV's full potential as well as secure competitive advantages in the market, IPTV service providers should understand the critical factors influencing customers'

intentions to use IPTV and plan their marketing strategies accordingly.

Research Model and Hypothesis Development

In this section, we develop a research model to examine the relationship between consumers' perception and their intention to use IPTV. The proposed model incorporates several constructs that represent multidimensional aspects of technology adoption and use such as innovation diffusion, personal characteristics, and social interaction among people.

This interdisciplinary approach to defining our research framework helps us explain consumers' decision-making process of IPTV adoption from diversified theoretical perspectives. The review of previous IT adoption studies (Jeyaraj et al., 2006) and salient features of IPTV (Harris and Ireland, 2005) jointly provides a useful guide for identifying what constructs are relevant to the research model for IPTV adoption at the individual level. The current study focuses on four categories of adoption factors: IPTV-specific features, innovation diffusion, personal innovativeness, and social influence.

We expect IPTV-specific features to play an important role in determining consumers' perception of IPTV use. According to Benbasat and Zmud (2003), user perception of a technology has been known to be related with characteristics and usage context of the IT artifact. IPTV incorporates certain functions that distinguish it from the previous generation of TV broadcasting, such as a large pool of VOD, time-shift DVRs, and two-way interactivity; thus, consumers would likely be affected by the potential utilities of IPTV when deciding whether to adopt it.

Innovation diffusion factors in our model are intended to capture users' perception of technologies in a general sense.

Such general technology perceptions are related with broadly accepted beliefs with regard to technology usage; these beliefs have been studied across various technology contexts (Hong and Tam, 2006). As a variant of IT artifact, IPTV enables a new digital media service that transforms how to design, deliver, and consume information goods and digital contents by leveraging innovative technological features. To universally interpret the use of IPTV among people at the theoretical level, we believe that it is relevant to conceptualize IPTV from the innovation diffusion perspective. Although innovation diffusion studies have been extensively conducted, the cumulated research base in this field provides a valuable reference for new studies. As both previous studies and the current study share the same nature in common—namely, the adoption of IT—it is meaningful to investigate which factors are significant in IPTV compared to those in general contexts.

Technology and service innovation embedded in IPTV implies that customers' prior exposure to similar technologies (Zhu et al., 2006) and their propensity (or capability) to absorb new technologies and services (Cohen and Levinthal, 1990) may play a critical role in IPTV adoption. The degree of such personal innovativeness determines different sets of consumer behaviors that people present when they face a new technology emergence and the moment of adoption decision.

In today's Internet and mobile communications era, potential users of IPTV can be more easily influenced by peer groups surrounding them through frequent interaction with those who have already experienced IPTV. Social influence in the model represents another factor affecting the decision of IPTV adoption from the peer influence perspective. A number of previous studies indicate that social influence plays a significant role in consumer behavior

(Fisher and Price, 1992) and IT adoption (Venkatesh and Brown, 2001). The marketing literature also indicates that informal channels of communication (e.g., word-of-mouth referral) efficiently help consumers choose complex and difficult to evaluate products (Kim and Prabhakar, 2004; Brown and Reingen, 1987).

Taken together, the research model incorporates these four major adoption factors of IPTV. For each factor, in the following subsections, we identify the key constructs and develop related hypotheses that describe the relationship between the constructs and consumers' behavioral intention to adopt IPTV.

IPTV-Specific Features

IPTV-specific features have been associated with the unique characteristics of IPTV and its unique usage contexts. A number of IS researchers have examined the end user's IT adoption and usage behaviors, but IPTV has some specific characteristics that differ from traditional technologies, as previously mentioned. In this study, we focus on three factors that influence individual consumers' adoption intention: (1) content diversity, (2) interactivity, and (3) monetary value. These three constructs are specific to IPTV's unique characteristics in terms of service and technology features.

Content diversity in this study refers to the extent to which IPTV is perceived as providing various types of content and information to its users. As IPTV is an innovative content service model enabled by technology convergence, it provides a variety of multimedia contents through the use of communication and media technologies to satisfy different needs of users, such as online games, multi-channel broadcasting, education programs, Internet search, Internet banking, T-commerce, messenger services, video on demand (VOD), and other interactive services. IPTV uses a

set-top box (STB) that allows users to watch hundreds of channels and order movies through VOD. IPTV also uses broadband ADSL, the same technology that delivers a high-speed Internet connection to the computer. Thus, there is now potential for thousands of channels.

Prior research has determined that content diversity is a salient factor that influences the user's intention to adopt IPTV. DeLone and McLean (1992) categorize six dimensions of IS success¹, and they posit that information quality is one of these six dimensions that affect the level of IS success. According to a number of e-commerce studies, diverse contents have been found to be an important factor in the success of websites (Palmer, 2002). Thus, content diversity has a positive effect on the user's decision process regarding IPTV adoption. Content diversity also has an effect on relative advantage. Without the guarantee of diversified contents, the unique usefulness and advantage of IPTV would be seriously undermined (Hong and Tam, 2006). According to Venkatesh et al. (2003), facilitating factors such as content diversity may support the use of a system. Considering such theoretical arguments, we hypothesize the following:

H1A: The content diversity of IPTV positively affects the consumer's intention to adopt IPTV.

H1B: The content diversity of IPTV positively affects IPTV's relative advantage.

IPTV's interactivity is also a distinctive feature. Interactivity refers to the extent to which users can participate in modifying the format and content of a mediated environment in real time. Unlike conventional TV broadcasting services, IPTV exploits a more interactive multimedia system using streaming technologies via the network. IPTV delivers live and on-demand contents over a broadband

connection, resulting in a more customized and interactive user experience.

The conceptual and empirical findings of previous studies suggest that the interactivity of IPTV may positively influence the user's intention to adopt IPTV. Rafaeli (1988) identified satisfaction as one of the most obvious outcomes of increased interactivity. Teo et al. (2003) found that increased levels of interactivity on websites have a positive effect on satisfaction, effectiveness, efficiency, value, and the overall attitude toward those websites.

The differentiated characteristics of IPTV may also reinforce the relative advantage of using IPTV services and justify consumers' decision about IPTV adoption. Holak and Lehmann (1990) proposed that the unique properties of a technology innovation usually strengthen its relative advantages over its predecessors. This discussion leads to the following hypotheses:

H2A: The interactivity of IPTV positively affects the consumer's intention to adopt IPTV.

H2B: The interactivity of IPTV positively affects on IPTV's relative advantage.

Since IPTV is aimed at personal use, the costs are likely to be assumed by end users. This implies that the price of using IPTV may be an important factor affecting users' adoption decisions. Whether a particular technology is expensive or not usually depends on consumers' cognitive evaluation of the value of using the technology. A number of marketing studies have identified the significant role of the consumer's perceived monetary value in satisfaction and intention to use a particular service (McDougall and Levesque, 2000). Several IS studies have also examined the effect of monetary value on technology adoption, demonstrating that it is an important determining factor. For example,

Lim et al. (2006) showed that economic value increases the level of consumer expectations and satisfaction in the use of mobile Internet services.

In general, IPTV services have been offered by telecommunications and Internet service providers. To compete effectively with their competitors, such as cable and satellite TV operators, telecommunications providers can offer price discounts through bundling, which is defined as the practice of marketing two or more products and/or services in a single package for a special price (Guiltingan, 1987).

Such cost-saving features may reinforce the relative advantage of IPTV over other conventional broadcasting services. As Rogers (1995) mentioned, one of the significant factors justifying the relative advantage of a specific technology is the economic profitability that the technology premises. Along with the above arguments, we propose the following hypotheses:

H3A: Monetary value created through IPTV bundling positively affects the consumer's intention to adopt IPTV.

H3B: Monetary value created through IPTV bundling positively affects IPTV's relative advantage.

Innovation Diffusion

The innovation diffusion literature attempts to understand and explain how innovations are spread across a population of potential adopters over time (Rogers, 1995) and its application in the individual (Venkatesh et al., 2003; Moore and Benbasat, 1991) or organizational (Tornatzky and Klein, 1982) context. One fundamental focus of this line of investigation is the attributes of innovations and their value to both the individual and the organization. Innovation diffusion theory (IDT), developed in the context of individual adopters, considers the diffusion of an innovation as a

social process of communication, where potential adopters become aware of the innovation and consider its adoption (Rogers, 1995). Drawing from multiple studies of innovations in diverse fields, Rogers (1995) proposed that relative advantage, compatibility, complexity, trialability, and observability are key factors typically influencing an individual's adoption behavior.

Previous studies have further developed IDT by applying a more complicated group of constructs to explain perceived characteristics of innovation (Compeau et al., 2007). For instance, Moore and Benbasat (1991) refined the theoretical and operational definitions of Rogers' innovation characteristics into a set of eight conceptual constructs. They included the relative advantage (or perceived usefulness), image, compatibility, complexity (or ease of use), trialability, visibility, result demonstrability, and voluntariness of use. In recent years, some IS researchers have elaborated upon the work of Moore and Benbasat (1991) by establishing a more extended theoretical model for innovation adoption. For example, Karahanna et al. (2006) reconceptualized compatibility beliefs in technology adoption research.

The basic idea behind IDT is the notion that potential users' perceptions of the characteristics of an innovation influence their intention to adopt and use a specific technology. Considering our conceptual view of IPTV as a digitally convergent service driven by technology innovation, we recognize that perceived characteristics of innovation proposed by IDT are more suitable for investigating the potential adopter's behavioral intention to adopt IPTV.

As Rogers' (1995) meta-analysis is based on studies of adoption by individuals, we used the innovation diffusion attributes proposed by Rogers as the dominant factors influencing the potential adopter's decision-making process.

Among these characteristics of innovation, we selected four attributes—namely, relative advantage, compatibility, ease of use, and trialability—as the focal constructs explaining the rate of IPTV adoption. We excluded observability, which is defined as the degree to which the results of an innovation are visible to others, from this study as IPTV has been recently introduced in the market and is currently in a relatively early stage of adoption and diffusion. In addition, the construct was eliminated after the factor analysis because of its overlapping characteristics with the social influence construct.

Relative advantage is defined as the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 1995). Thus, if a potential user perceives that adopting IPTV will be more useful than not, he/she will have positive attitudinal belief toward IPTV (Choi et al., 2003). Relative advantage encompasses a variety of benefits that potential adopters can obtain from a particular innovation, such as economic profitability and desirable social status. In addition, in this study, relative advantage presents the utilitarian aspect of user acceptance (Heijden, 2004). To the extent that an individual believes that using IPTV will provide more fun and enjoyment with their avocation, he/she will be more likely to adopt IPTV in the future (Van Slyke et al., 2010).

IS literature has long examined the influence of relative advantage on adoption intention (Agarwal and Karahanna, 2000; Venkatesh et al., 2003). This line of research has found relative advantage to be one of the best predictors of the rate of innovation adoption (Karahanna et al., 1999). Considering that IPTV is a tool or an IT environment facilitating the user's personal goal achievement (e.g., entertainment and information gathering), it is hypothesized that relative advantage would directly

affect the user's intention to adopt IPTV. Thus we propose the following hypothesis:

H4: The relative advantage of IPTV positively affects the consumer's intention to adopt IPTV.

Complexity is defined as the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 1995). The concept of complexity is analogous to that of *ease of use* in TAM. The conceptual difference between these two is that ease of use suggests low cognitive effort required for using the innovation, whereas complexity connotes the opposite (Karahanna et al., 2006). Reflecting such a comment, in this study, we translate complexity into perceived ease of use and apply it to our research model because comparing the saliency of each construct with the same effect direction (i.e., to examine whether all of the constructs have a significant positive effect on adoption intention) is more relevant. Perceived ease of use is defined as the degree to which a technology innovation is perceived as being easy to understand and use (Davis et al., 1989).

Ease of use has been widely studied in the IS literature. Outcomes of examining its influence on adoption intention have been mixed, with some studies finding support (e.g., Van Slyke et al., 2010) and others not finding such support (e.g., Karahanna et al., 1999). However, in the case of IPTV, we expect that perceived ease of use will have a positive impact on adoption intention based on the assumption that, if potential users find IPTV to be difficult to learn to use, they will most likely be reluctant to adopt it. The link between perceived ease of use and relative advantage has been established in a number of technology acceptance studies (Venkatesh et al., 2003). Thus, it is reasonable to anticipate that an individual will recognize many more advantages in an innovation

that is shown to be easy to use (Compeau et al., 2007; Van Slyke et al., 2010). Indeed, perceived ease of use has been found to influence adoption intention in two ways (Davis et al., 1989): by directly affecting intention and by indirectly affecting intention through relative advantage. Following the established findings in prior research, we propose the following hypotheses:

H5A: The ease of use of IPTV positively affects the consumer's intention to adopt IPTV.

H5B: The ease of use of IPTV positively affects IPTV's relative advantage.

Compatibility is defined as the degree to which an innovation is perceived as being consistent with the existing values, past experience, and needs of potential adopters (Rogers, 1995). In the IS literature, the influence of compatibility on technology innovation adoption has been widely examined. Although many studies have found a positive relationship between compatibility and behavioral intention (Van Slyke et al., 2010), the overall results have been equivocal. One reason for the mixed results can be that compatibility encompasses a variety of concepts such as prior experience, work or life style, desires, and inherent values (Karahanna et al., 2006).

The underlying idea behind compatibility is that an innovation that is more compatible is less uncertain to a potential adopter and fits the adopter's situation more closely. Thus, for IPTV to be widely spread across a population of potential users in the market, it is important that the characteristics of IPTV fit well with the past experience and desires of potential users. For this reason, perceived compatibility provides a useful theoretical background through which we may view this concept of fit (Van Slyke et al., 2010). Based on the fact that the fundamental nature of IPTV is to provide video and audio contents that satisfy a potential user's desire to re-

fresh his or her life with entertainment and acquire needed information, we may reasonably expect that perceived compatibility directly influences behavioral intention to adopt IPTV. To verify the influence of compatibility toward adoption intention, we propose the following hypothesis:

H6: *The compatibility of IPTV positively affects the consumer's intention to adopt IPTV.*

Trialability is defined as the degree to which an innovation may be experienced on a limited basis (Rogers, 1995). Trialability implies the perception that potential users have sufficient opportunities to try out an innovation before adopting it (Karahanna et al., 1999). According to Compeau et al. (2007), this construct reflects the characteristics of the technology itself (i.e., is it something that can be used on a trial basis?) and those of the implementation process by which it is introduced (i.e., did the organization choose to allow trial opportunities?). New technology innovations that can be tried by potential users are usually adopted more rapidly than those that are not offered on a trial basis. In the case of IPTV, we expect that, if an individual can try out IPTV before deciding to adopt it, he/she will possibly develop strong confidence in the technology depending on the quality of IPTV (Venkatesh, 2001). Rogers (1995) noted that personal testing of an innovation (a product or a service) is one way for individuals to understand how the innovation works and dispel uncertainties in the innovation. Trialability is a viable construct that can explain the variance of the IPTV adoption rate for the early stage of its commercialization and for those users who have little information about the true features and values of IPTV. Thus, we propose the following hypothesis:

H7: The trialability of IPTV positively affects the consumer's intention to adopt IPTV.

Personal Innovativeness

As previously mentioned, technology and service innovations such as IPTV highlight the importance of personal characteristics such as an individual's prior exposure to similar technology innovations (Zhu et al., 2006) and the individual's propensity to absorb new types of technologies and services, which are reflected in the decision-making process related to new technology and service adoption (Cohen and Levinthal, 1990). In this sense, *personal innovativeness* has been known to play an important role in encouraging plausible consumer behavior for the adoption of IT (Fisher and Price, 1992). Agarwal and Prasad (1998) defined personal innovativeness as "the willingness of an individual to try out any new information technology." They also noted that personal innovativeness can control the recognized result with respect to the adoption of IT. As each person has his or her own level of personal innovativeness, the impact of this factor basically leads to different degrees of perceived benefits and expectations, ultimately generating different adoption outcomes (Krugman, 1985). As such, personal innovativeness can be a viable factor that examines the variance of the individual adoption level of IPTV. Thus, we establish the following hypothesis:

H8: Personal innovativeness positively affects the consumer's intention to adopt IPTV.

Social Influence

Social influence, in this study, refers to the degree to which an individual perceives that important peers believe he or she should use the innovation (Venkatesh, 2003). Information can be transferred from one individual to another,

and an individual can be influenced by others easily. Social influence is driven by social factors and subjective norms. Thompson et al. (1991) suggested that social factors are "the individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations." Subjective norms refer to an individual's perception that most people who are important to him or her think that he or she should or should not perform the behavior in question (Davis et al., 1989). Subjective norms reflect an element of social influence, which is often cited as a determinant of behavior (Schepers and Wetzels, 2007). From the institutional theory perspective, subjective norms relate to normative isomorphism (DiMaggio and Powell, 1983). Normative pressures arise from individuals' interactions in different settings, such as educational settings or professional/personal networks. Social influence that leads an individual to use a technology has been found to directly affect adoption intention (Hong and Tam, 2006).

Another conceptual view of IPTV adoption is the "herding behavior" phenomenon, which refers to potential users' propensity to follow the decision-making efforts of their predecessors. Potential users with little IPTV experience generally do not possess enough information to make an informed decision regarding when and how they would adopt IPTV. This implies that decision-making efforts with respect to IPTV adoption may depend on observational learning or social learning, in which consumers tend to follow decisions of others rather than using their internal information (Banerjee, 1992). Therefore, we hypothesize the following:

H9: The social influence of IPTV positively affects the consumer's intention to adopt IPTV.

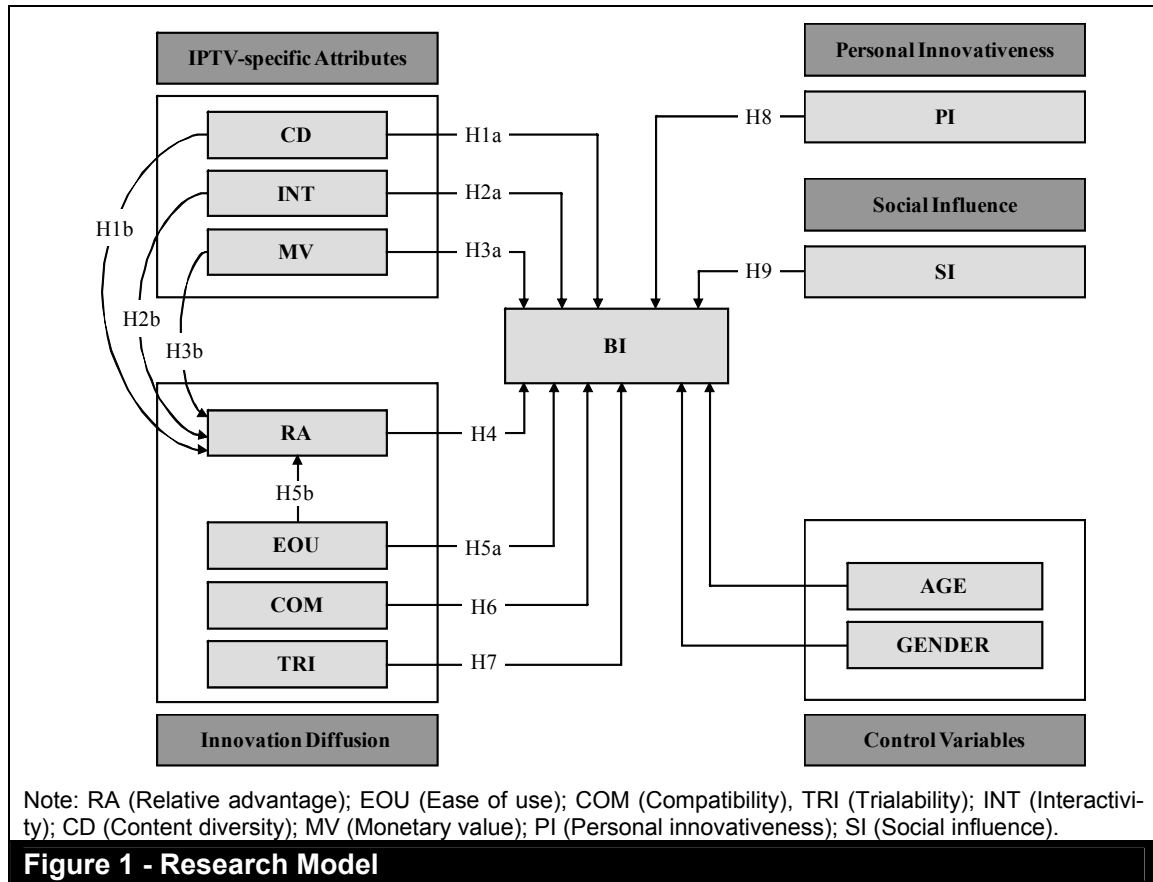


Figure 1 - Research Model

Control Variables

To fully account for the differences in users' perceptions of IPTV adoption, we included two control variables characterizing the research respondents: *gender* and *age*. As suggested by prior research, we selected these variables due to their potential impact on technology innovation adoption (Gefen and Straub, 1997). The research model is depicted in Figure 1, along with the main constructs of the theoretical framework.

Research Method and Data

Instrument Development

We used a web-based survey method to test our model. The survey instrument was developed by identifying appropriate measurements during a comprehensive literature review. Some modifications were made to the existing scale to

make it more suitable for the context of IPTV adoption (see Appendix 1 for further details). As the target subjects for the study were potential users of IPTV in Korea, the questionnaire was translated into Korean and reviewed by third-party experts to obtain a good level of translation equivalence. The translated Korean questionnaire was then pretested by conducting focus group interviews to examine content validity and face validity. All of the exogenous constructs in the model were operationalized as reflective constructs. We believe that Korea is a suitable place for research on IPTV adoption because the country has one of the highest penetration rates in the world in terms of broadband Internet. In addition, Koreans are generally familiar with various types of IT products and services.

Table 1 - Demographic Statistics					
Measure	Value	Percent	Measure	Value	Percent
Gender	Male	75.8	Content download (per month)	None	26.8
	Female	24.2		1-4	52.5
Age	20-29	48.0		5-10	10.6
	30-39	38.4		11-20	6.6
	40-49	11.6	>20	3.5	
	>50	2.0	Occupation	College Student	48.0
Marital Status	Single	60.1		Office worker/ entrepreneur	43.4
	Married	39.9		Housewife	1.0
Average time watching TV (per day)	<1 hour	49.0		Specialist/Freelance	7.6
	1-3 hour	46.5	Education	High school	1.5
	3-5 hour	4.5		Undergraduate	38.9
Average time of Internet use (per day)	<1 hour	8.6		Bachelor degree	12.6
	1-3 hour	50.5		Graduate student	34.3
	3-5 hour	26.3	Master/Doctoral degree	12.6	
	5-10 hour	12.6	Note: Total number of respondents is 198.		

Data Collection

The research model was empirically tested by using data from an online survey. The sample data were collected from a dedicated website. The online survey consisted of three main sections: inquiries about prior IPTV experience, adoption factors and intention, and respondent demographics. Before starting the survey, all respondents were informed, through written explanations on the cover page about the identity and various features of IPTV that differ from conventional broadcasting services. This step ensured that all respondents had a minimum knowledge of IPTV while completing the survey. At the beginning of the questionnaire, the survey participants were asked whether they had prior experience with IPTV services. As the study was restricted to those who had no experience with IPTV services, the respondents who chose "No" were then asked to answer a set of questions associated with the adoption issues of IPTV services using a seven-point Likert scale (ranging from "strongly disagree" to "strongly agree"). Finally, respond-

ents' demographic information was collected.

Descriptive Statistics

Our sample data of 198 respondents included more male respondents than females (male: 75.8%, female: 24.2%). The respondents were mostly in their twenties (48%) and thirties (38.4%). The overwhelming majority (95.5%) of respondents watched television fewer than 3 hours a day. In addition, 76.8% spent an average of 1 to 5 hours a day using the Internet, and 73.2% had downloaded contents such as movies and dramas through the Internet. Approximately 20% downloaded more than 5 items per month. These results indicate that most of the respondents were young male consumers who were familiar with the Internet environment and interested in digital multimedia contents, although they had no prior experience with IPTV services. The detailed descriptive statistics related to the respondents' characteristics are reported in Table 1.

Power Analysis

We conducted Cohen's (1988) power analysis to calculate both the priori expected sample size and the post hoc power values of our partial least squares (PLS) model. This was done because PLS was performed using an iterative regression analysis. Hence, the power analysis of the multiple regression analysis was also applicable to PLS. PLS estimates a structural model in a block-by-block manner. To ensure that every block of our model had adequate power, we calculated the expected sample size and the power values block by block.

Our research model had two dependent variables: behavioral intention to adopt IPTV and relative advantage. Thus, two priori power analyses and all post hoc power analyses were conducted. The expected sample size was 54 (alpha value = 0.05; number of predictors = 1; anticipated effect size = 0.15; desired statistical power 0.8) or 67 (alpha value = 0.05; number of predictors = 2; anticipated effect size = 0.15; desired statistical power 0.8), whereas the power values from post hoc analyses approximated to 1 for the high R². Thus, we concluded that our model had adequate power for further analysis.

Empirical Analysis and Results

Common Method Bias

Before testing the hypotheses test, we assessed common method bias attributed to our self-reported survey data. We adopted both Harman's (1976) single factor analysis and Podsakoff et al.'s (2003) approach. In Harman's approach, all of the construct items were cast into principal component factor analysis, which yielded nine factors with eigenvalues greater than 1.0, accounting for 78.82% of the total variance. The first factor captured only 39.81% of the variance in the data, indicating the absence

of a substantial amount of common method variance in the data.

Using Podsakoff et al.'s (2003) approach, we included in the PLS model a common method factor whose indicators included all of the principal constructs' indicators and calculated each indicator's variance substantively explained by the principal construct and the method. The results demonstrated that the average substantively explained variance was 0.744, whereas the average method-based variance was 0.022. The ratio of the substantive variance to the method variance was approximately 42:1. Given this small magnitude of method variance, we concluded that the method was suitable for this research.

Instrument Validity and Reliability

In this study, we conducted an exploratory factor analysis to check the validity of the measurement model. As seen in Table 2, the measurements of each construct had similar factor loading values (e.g., the measurements of COM1, COM2, COM3, COM4, and COM5 possessed similar factor loading values ranging from 0.8953 to 0.9565) and showed the highest values for the corresponding construct. The results imply that the existing measurement item groups represented the concept (content) of related constructs in a valid manner. Table 2 shows the factor loadings of the measurement items.

Internal consistency reliability was assessed by examining Cronbach's alpha. Hair et al. (1998) suggested that the minimum acceptance level for the Cronbach's alpha should be 0.70. The alpha values for each construct in this study are presented in Table 3. The values ranged from 0.791 to 0.971, thereby exceeding the recommended lowest limit. Convergent validity was also assessed by examining the composite reliability and the average variance extracted (AVE) from the measures (Hair et al., 1998). As shown in Table 3, the

	CD	INT	MV	RA	EOU	COM	TRI	PI	SI
CD1	0.864	0.544	0.287	0.389	0.076	0.300	0.198	0.241	0.298
CD2	0.914	0.501	0.371	0.491	0.148	0.466	0.241	0.218	0.425
CD3	0.819	0.459	0.314	0.353	0.091	0.250	0.101	0.195	0.247
INT1	0.418	0.772	0.418	0.499	0.246	0.315	0.265	0.318	0.325
INT2	0.395	0.803	0.395	0.362	0.187	0.180	0.254	0.318	0.276
INT3	0.534	0.806	0.534	0.400	0.153	0.213	0.240	0.290	0.387
INT4	0.481	0.817	0.481	0.316	0.137	0.165	0.239	0.261	0.361
INT5	0.493	0.683	0.493	0.175	0.225	0.130	0.186	0.277	0.245
INT6	0.367	0.765	0.367	0.233	0.191	0.153	0.187	0.276	0.234
INT7	0.423	0.643	0.423	0.148	0.153	0.033	0.066	0.207	0.162
INT8	0.420	0.768	0.420	0.340	0.201	0.156	0.217	0.217	0.195
MV1	0.315	0.348	0.899	0.290	0.211	0.304	0.107	0.232	0.314
MV2	0.300	0.327	0.912	0.285	0.163	0.301	0.119	0.233	0.338
MV3	0.397	0.358	0.917	0.408	0.136	0.439	0.222	0.221	0.449
RA1	0.409	0.372	0.311	0.880	0.064	0.575	0.377	0.275	0.456
RA2	0.407	0.364	0.336	0.901	0.185	0.640	0.372	0.338	0.425
RA3	0.399	0.313	0.264	0.877	0.154	0.548	0.356	0.196	0.327
RA4	0.384	0.323	0.299	0.839	0.223	0.543	0.328	0.211	0.339
RA5	0.466	0.515	0.377	0.810	0.194	0.421	0.303	0.291	0.348
EOU1	0.084	0.223	0.188	0.163	0.955	0.158	0.134	0.438	0.094
EOU2	0.094	0.208	0.160	0.166	0.967	0.142	0.089	0.467	0.078
EOU3	0.140	0.224	0.172	0.165	0.964	0.152	0.112	0.474	0.116
EOU4	0.150	0.276	0.177	0.218	0.948	0.139	0.120	0.470	0.055
COM1	0.378	0.201	0.374	0.630	0.160	0.939	0.356	0.214	0.444
COM2	0.409	0.218	0.367	0.605	0.153	0.957	0.306	0.215	0.464
COM3	0.341	0.225	0.390	0.583	0.114	0.920	0.281	0.155	0.490
COM4	0.360	0.228	0.309	0.594	0.151	0.931	0.378	0.248	0.411
COM5	0.382	0.261	0.392	0.524	0.131	0.895	0.339	0.255	0.491
TRI1	0.193	0.250	0.180	0.357	0.092	0.364	0.961	0.285	0.202
TRI2	0.217	0.301	0.151	0.417	0.137	0.322	0.956	0.289	0.273
PI1	0.273	0.397	0.182	0.316	0.315	0.178	0.355	0.824	0.118
PI2	0.158	0.274	0.154	0.203	0.392	0.087	0.223	0.821	0.087
PI3	0.183	0.253	0.244	0.281	0.505	0.247	0.214	0.861	0.185
PI4	0.187	0.242	0.228	0.185	0.373	0.228	0.171	0.764	0.244
SI1	0.398	0.376	0.324	0.416	0.056	0.390	0.277	0.148	0.890
SI2	0.308	0.310	0.419	0.392	0.099	0.500	0.182	0.208	0.928

CD (Content diversity); INT (Interactivity); MV (Monetary value); RA (Relative advantage); EOU (Ease of use); COM (Compatibility), TRI (Triability); PI (Personal innovativeness); SI (Social influence);

Construct	Cronbach's Alpha	Composite Reliability	AVE
Content diversity	0.834	0.900	0.751
Interactivity	0.896	0.915	0.577
Monetary value	0.890	0.935	0.827
Relative advantage	0.914	0.935	0.743
Ease of use	0.971	0.978	0.918
Compatibility	0.960	0.969	0.862
Trialability	0.911	0.957	0.918
Personal innovativeness	0.827	0.890	0.670
Social influence	0.791	0.905	0.826

	CD	INT	MV	RA	EOU	COM	TRI	PI	SI
CD	0.866								
INT	0.576	0.759							
MV	0.378	0.380	0.909						
RA	0.481	0.442	0.370	0.862					
EOU	0.126	0.246	0.182	0.189	0.958				
COM	0.404	0.244	0.394	0.632	0.153	0.928			
TRI	-0.214	-0.286	-0.173	0.403	0.119	0.358	0.958		
PI	0.250	0.361	0.251	0.308	0.484	0.235	-0.299	0.818	
SI	0.383	0.373	0.413	0.442	0.088	0.495	-0.247	0.199	0.908

Note: Diagonal shading shows the square root of AVE.
 CD (Content diversity); INT (Interactivity); MV (Monetary value); RA (Relative advantage); EOU (Ease of use); COM (Compatibility); TRI (Trialability); PI (Personal innovativeness); SI (Social influence);

values of AVE for each construct all surpassed the acceptable threshold value (i.e., 0.50) while the composite reliability values ranged from 0.890 to 0.978, thereby exceeding the recommended value (i.e., 0.70). We also examined the correlation of each construct (Table 4). The results indicated that the square root of AVE for each construct was greater than the correlations between itself and all other constructs, implying that discriminant validity existed for each construct. In addition, the variance of each construct was larger with itself than with other constructs and exceeded

the acceptable level of 0.5 (Fornell and Larcker, 1981).

Hypothesis Testing

A structural equation analysis was performed to test the model. As an analysis technique, the PLS method was applied to validate our research model (Compeau and Higgins, 1995; Aubert et al., 1994; Chin and Gopal, 1995). The primary reason for using PLS in the current study is three fold. First, the study has an exploratory feature that aims to explore relatively new nomological relationships among IPTV-related constructs (e.g., interactivity and content

diversity). It has been known that PLS is better suited for finding the fundamental relations between latent variables, although this method can also be used for theory confirmation (Chin et al. 1996). Second, the PLS method is applicable to both small and medium sample sizes. Since the sample size of the current study is 198, which is a relatively smaller sample scale compared to other IT adoption studies, PLS is a relevant alternative with which to test our research model (Compeau and Higgins, 1995; Aubert et al., 1994; Chin and Gopal, 1995). Finally, PLS is frequently used in IS research because of its flexibility to model latent constructs under conditions of non-normality (Chin et al. 2003). To examine the statistical significance of structural paths to which the latent variables were linked, hypothesis testing was performed by bootstrapping to calculate the t-values.

Table 5 indicates that most of the causal relationships in the research model were supported as hypothesized. In terms of the IPTV-specific features, the direct

effects of content diversity (H1a) and monetary value (H3a) on adoption intention were found to be significant. From the innovation diffusion perspective, the strong effects of relative advantage (H4), compatibility (H6), and trialability (H7) on adoption intention were noticeable. The constructs representing personal innovativeness (H8) and social influence (H9) were found to have influence on adoption intention, but the levels of significance of personal innovativeness were relatively weak compared with the other constructs.

The two control variables, age and gender, presented contrasting outcomes; the effect of age on adoption intention was found to be significant, whereas in the case of gender, the causal relationship with respect to IPTV adoption was not statistically supported.

The influence of ease of use (EOU) on both adoption intention (H5a) and relative advantage (H5b) turned out to be insignificant. These results are not consistent with prior adoption studies,

Table 5 - Summary of Empirical Results

Hypothesis	Relationship	Coefficient	t-value	Result	R ²
H1a	CD → BI	0.130**	2.061	Supported	0.651
H2a	INT → BI	0.006	0.159	Not supported	
H3a	MV → BI	0.208***	3.319	Supported	
H4	RA → BI	0.243***	3.091	Supported	
H5a	EOU → BI	-0.065	-1.401	Not supported	
H6	COM → BI	0.179**	2.529	Supported	
H7	TRI → BI	0.173***	2.971	Supported	
H8	PI → BI	0.086*	1.668	Supported	
H9	SI → BI	0.178**	2.395	Supported	
H1b	CD → RA	0.299***	3.135	Supported	0.304
H2b	INT → RA	0.186**	2.171	Supported	
H3b	MV → RA	0.173***	2.705	Supported	
H5b	EOU → RA	0.074	1.370	Not supported	

Note: * p<0.1, ** p<0.05, *** p<0.01.

CD (Content diversity); INT (Interactivity); MV (Monetary value); RA (Relative advantage); EOU (Ease of use); COM (Compatibility); TRI (Trialability); PI (Personal innovativeness); SI (Social influence);

where ease of use directly affects intention or indirectly affects intention through relative advantage. We attribute these insignificant results to the relatively early stage of commercialization of IPTV in the market. Most IPTV contents are provided through graphical user interface (GUI), which IPTV users need to get used to operating and navigating. On one hand, many people have become accustomed to traditional TV broadcasting, which provides a simple practice of use, such as turning on the TV and watching it. To such ordinary potential users, differentiated features of IPTV such as watching VOD by navigating the on-screen menu can be perceived as somewhat complicated. On the other hand, this GUI-based IPTV feature can be logically recognized as one of the advantageous characteristics compared to traditional TV broadcasting. The situation could possibly produce mixed results of insignificance for EOU and significance for relative advantage (RA).

In addition, the empirical validation did not support the direct effect of interactivity (H2A) on adoption intention. Related to the insignificant effect of EOU on adoption intention, the underlying reason for this result is that, within our sample, people perceive the interactive feature of IPTV as a factor indicating that IPTV use is more difficult, which contradicts our expectation that interactivity stimulates people's interest in experiencing new technology features, leading to increased adoption intention.

However, the effects of content diversity (H1b) interactivity (H2b), and monetary value (H3b) on relative advantage were found to be strongly significant. Considering the aggregated effects of each construct, IPTV-specific features explained 30.4% of the total variance in relative advantage ($R^2 = 0.304$), while 65.1% of the total variance in IPTV adoption was explained by all other constructs ($R^2 = 0.651$).

Mediating Effects

The strong statistical support for Hypotheses 4 and 2b indicates that a mediating effect of relative advantage exists between interactivity and IPTV adoption. Following the test procedure that Baron and Kenny (1986) proposed, we performed a mediating effect test dedicated to a set of independent variables (IV; interactivity), mediators (M; relative advantage), and dependent variables (DV; adoption intention).

First, we determined whether the IV (interactivity) would significantly affect the DV (IPTV adoption). We conducted a simple regression analysis with interactivity predicting IPTV adoption to test for the path from the IV to the DV; the results demonstrated a significant causal relationship between interactivity and IPTV adoption. The first condition was met.

The next step determined whether the IV (interactivity) would have a significant effect on the M (relative advantage). We again conducted a simple regression analysis with interactivity predicting relative advantage. The analysis results indicated that interactivity positively affected relative advantage with a path coefficient value of 0.463 ($t=3.014$), which was significant at the 0.01 level. Thus, the second condition was also met.

The final step determined whether the relationship between the IV (interactivity) and the DV (IPTV adoption) would be significant when both the IV and M were linked to the DV. The underlying premise was that the M would significantly affect DV despite the insignificant relationship between the IV and DV. We conducted a multiple regression analysis with interactivity and relative advantage predicting IPTV adoption to test the significance of the path from the IV to the DV. The results showed that, when both the IV and M were linked to the DV, the causal relationship between

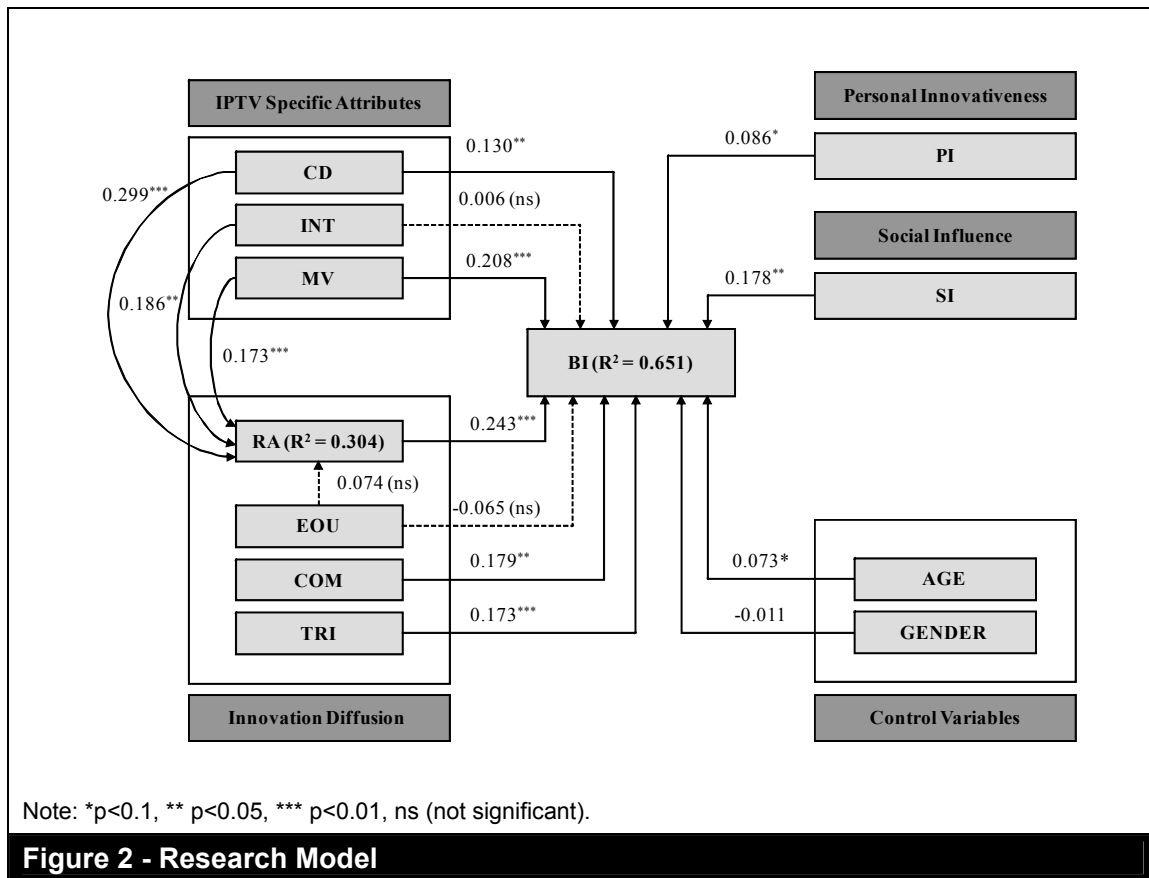


Figure 2 - Research Model

the IV (interactivity) and the DV (IPTV adoption) was insignificant (the path coefficient value was 0.188 with $t=1.256$). Taken together, the results suggested that interactivity has a full mediating effect on IPTV adoption via relative advantage (Baron and Kenny, 1986).

Discussion

In this study, we investigated the adoption of IPTV, a disruptive technology that supports various lifestyle demands such as entertainment, information gathering, and e-commerce through IPTV networks. We developed and empirically validated the adoption model, incorporating the innovation diffusion context as well as the unique features of IPTV and the personal characteristics of potential users. Figure 2 illustrates the major statistical results of this study. In this section, we discuss the theoretical and managerial implications.

Theoretical Implications

The results of this study have a number of implications for research. First, the current study supports the relevance of IPTV-specific features as major determinants for examining consumers' behavioral intention for other digitally convergent services in subsequent studies. As the major findings of this study, CD and MV turned out to have significant direct effects on adoption intention. These results reflect consumers' expectation that—given the potential to improve ROI of consuming entertainment services (e.g., more content with reasonable cost)—IPTV should be a prominent alternative that complements incumbent TV broadcasting services. Regarding the research aspect, previous studies examining the impact of both content diversity (CD) and monetary value (MV) on behavioral intention have been limited in IT adoption research.

The significant results that support these factors can be used as valid instruments for consumers' technology-specific perceptions.

On the other hand, the direct effect of interactivity (INT) on IPTV adoption was found to be insignificant. A presumed reason for this result, as mentioned, may be related with the strong effect of RA. Given the early phase of IPTV commercialization, consumers are likely to recognize INT as rather a part of the relative advantage of IPTV use than an independent unique feature of IPTV. The significant effect of INT on RA (i.e., indirect effect of the construct on behavioral intention) supports our explanation regarding the limited cognition of INT from potential users.

Although the current study did not validate a significant direct effect of INT on consumers' intention, applying all three IPTV-specific features to the study provides useful research implications. Recently, as the boundary of IT development and application has expanded beyond the organizational work environment and into personal lives (Yoo, 2010), established research frameworks of IT adoption (e.g., innovation diffusion and TAM) have been refined in order for these models to more accurately reflect users' perceptions of personal IT artifacts, such as digital content devices. Thus, IPTV-specific features like CD, INT, and MV can be relevant constructs for capturing consumers' differentiated usage context and their perceptions through iterative empirical tests for various personalized (non-work purpose) IT contexts. Altogether, the significant direct and indirect impacts of CD, INT, and MV support the need to include constructs that reflect the core properties of the IT artifact and usage context in IS research (Benbasat and Zmud, 2003).

Second, among the four constructs related to the innovation diffusion perspec-

tive, relative advantage (RA), compatibility (COM), and trialability (TRI) had significant and positive effects on IPTV adoption. These results indicate that some of the innovation diffusion constructs are valid influencers of consumers' behavioral intention across various technology contexts. In particular, a strong effect of RA on adoption intention is consistent with previous IT adoption studies. According to these studies, RA has been reported to be the most influencing factor affecting users' decision-making related to technology adoption. Thus, the result of RA in the current study consequently reinforces the role of the construct as a universal instrument to capture consumers' general technology perception.

However, ease of use (EOU) was found to be insignificant. Like RA, EOU has been considered a salient factor for consumers' IT adoption decision. In the case of IT adoption for personal purpose, Van der Heijden (2004) emphasized that EOU is the most important factor for determining consumers' intention to adopt. Hong and Tam (2006), in their study on mobile data services, also empirically demonstrated that EOU along with perceived enjoyment is a stronger determinant of intention than RA is. The contrasting result of EOU in the current study indicates that the level of effort to learn IPTV is not significantly associated with users' intention to adopt. Compared to RA, the insignificant effect of EOU exemplifies the relatively weak role of the construct in explaining consumer behavior related to the IPTV adoption.

A presumed reason for this argument is that customers have been exposed to a variety of IT artifacts for the last two decades. They have recently become more familiar with similar digital products and services (e.g., PDA, MP3 players, and Internet video streaming) and have acquired their own self-efficacy with respect to learning how to use IPTV (Karahanna et al. 1999). The other pos-

sible explanation is that—due to fierce competition with conventional TV services— IPTV service providers actively offer pre-trial promotions for potential customers, thereby offering more opportunities to appreciate IPTV before subscribing to the service (see Managerial Implications for detail).

However, interpreting such a result should be done with caution as the current study was conducted during the early stage of IPTV commercialization, when people are usually more intrigued by IPTV's differentiated features. In addition, the study's sample includes many male respondents in their twenties, who are relatively more familiar with technology artifacts; such a tendency can be significantly reflected in the results. Thus, in the future, follow-up studies should recheck the validity of EOU as an adoption determinant with a larger sample and at a more mature commercialization stage.

Taken together, the insignificant effect of EOU allows us to suggest that, with new styles of IS—especially with hedonic and utilitarian features for individuals— the role and significance of traditional TAM-based constructs can be changed. Thus, in the presence of digitally convergent products and services, IS researchers must explore new constructs more aligned with contemporary digital products and empirically examine their validity to explain consumers' behavioral intention to adopt and use.

Third, personal innovativeness (PI), which reflects individuals' intrinsic motivation and personal value, was found to exert a direct effect on adoption intention. As a representative of personal characteristics, PI has not been extensively investigated in previous IT adoption research as most prior IT adoption studies were conducted in organizational work environments, where the use of specific information systems is mandatory regardless of personal preferences

or capabilities. The results of our study indicate that PI is a salient determinant of IPTV adoption in some extents although the construct was found to have a weak effect. Similar to the cases of CD, INT, and MV, the significant effect of PI implies that, in studying IT use related to personal purposes, constructs related to personal traits (e.g., PI) should be used because, unlike IT in organizations, the level of the adoption of personal information systems is more likely to draw on individuals' preferences and attitudes toward technologies, which mostly originate from their personal characteristics. To this end, IS researchers need to delve into broader literature on consumer behavior and psychology to develop more sophisticated and robust research models that accurately reflect personal characteristics on IT adoption issues.

Finally, the current study presents the significant direct effect of social influence (SI) on IPTV adoption. The result is consistent with previous studies in consumer behavior (Engel et al., 2001; Fisher and Price, 1992) and IT adoption (Hong and Tam, 2006; Karahanna and Straub, 1999; Venkatesh and Brown 2001). The empirical evidence supporting SI effect emphasizes the important role of the factor in predicting how consumers specify their ideas on IPTV adoption while they are interacting with their community members. In turn, the result implies that, in the decision-making process with respect to IPTV adoption, there may exist social network effects that are attributable to peer influence. In particular, as previously stated, the recent development of Internet technologies has facilitated communications among people (even with unknown persons) without temporal and spatial limitations. The phenomenon usually makes consumers more dependent on others' opinions and thus more vulnerable to SI when making decisions about technology adoption (Lu et al., 2005). Consider-

ing the growing importance of the IT-driven social network environment in our contemporary society, IS researchers are increasingly motivated to examine the salience of SI as a major determinant of adoption intention.

Managerial Implications

Our research findings also have implications for managers involved in the development of service offerings and business strategies for IPTV market deployment. First, the salient effect of content diversity on adoption intention implies that the capability of IPTV service providers to supply diverse digital contents, including videos, audio clips, web browsing, interactive games, and T-commerce, is critical to the acquisition of a stable customer base and sources of revenues. France provides a good example. The country has the largest IPTV customer base (approximately 6.2 million subscribers in 4Q 2009) in Europe. The market is currently dominated by three major service providers: Orange, Free TV, and Nuef Cegetel. Since the initial launch of IPTV services by Free TV in 2003, all three companies have devoted their efforts to establishing business relationships with various content developers, such as movie distributors and sports broadcasters, to diversify their service offerings. As a result of such efforts, Free TV, the leader of the French IPTV market, delivers more than 200 channels (Newsblaze.com, 2007).

Second, our results indicate that one of the key issues that service providers need to resolve is the delivery of diverse digital content at reasonable (or acceptable) prices. As latecomers in the TV broadcasting market, IPTV service providers need to secure price competitiveness to fully exploit their growth potential. However, a comparative price advantage does not always refer to low prices or painful price cuts; stratified price plans synchronized with strategically bundled channel packages could

stimulate potential users' specialized interests (i.e., customers with different preferences for movies, educational channels, or sports) and lead to higher subscription rates. For example, Now TV, operated by PCCW in Hong Kong, had 0.7 million subscribers in 2008, accounting for approximately 10% of Hong Kong's total population. The service provider defeated competitors such as Hong Kong cable TV and Galaxy satellite TV with respect to the number of subscribers. The key factor behind its business success has been that Now TV offered its subscribers more freedom in choosing channels, allowing them to select channels from approximately 160 available pooled channels according to their preferences and interests. Linked with such diversified channel choices, the subscription fees also vary from HKD 15 to HKD 248, depending on the number and type of channel that customers choose. In addition, the company provides 12 types of pre-defined channel packages. Such user-centric marketing strategies have consequently encouraged potential users' positive perception of IPTV services and lowered psychological barriers associated with comparative financial value (Chetham, 2005).

Third, the strong effect of trialability on IPTV adoption implies that service providers need to offer adequate trial opportunities to make potential users more comfortable with the technology, which would in turn promote their services. From the perspective of consumer behavior, users tend to reserve their purchase decisions until they have acquired sufficient information and understand the related features. Such a propensity occasionally mitigates service providers' sales efforts and results in inefficient marketing ROI. To avoid this problem and improve their returns on marketing activities, IPTV service providers should develop a range of communication channels beyond their own websites;

such channels may facilitate the distribution of information on IPTV service features and encourage potential subscribers' learning-by-experiencing efforts. For instance, Qook TV, former Mega TV operated by KT in Korea, established a business relationship with SCEK (Sony Computer Entertainment Korea), which exclusively distributes Playstation 3 in Korea. The main purpose of the partnership between these two companies focus on installing Qook TV's IPTV player software within Playstation 3. Thus, when individuals buy Playstation 3, they can watch some TV program previews with the help of the embedded software and navigate the menu system of KT's Qook TV. In addition, users can subscribe to Qook TV through the Playstation 3 network. By exploiting such marketing activities beyond its website, Qook TV expects to communicate with more potential users and generate more opportunities to turn interested customers into actual subscribers (The Korea Times, 2007).

Conclusion

This study has investigated customers' behavioral intention to adopt the emerging digitally convergent service in telecom and media industry (i.e., IPTV) from diverse theoretical perspectives. To this end, we presented an integrative research model that collectively embraces the innovation diffusion theory, digital convergence features, personal characteristics, and social influences. Based on the empirical analysis using the PLS method, our results indicate that several contextual factors proposed by the research model have significant direct and indirect effects on the adoption intention (see Table 5 for a summary of empirical results). On one hand, such findings suggest that—from the innovation diffusion perspective—digitally convergent services like IPTV are regarded as advantageous, compatible, and triable to potential users. On the other hand, the results imply that other than traditional

TAM-based constructs, IPTV-specific features are also found to be potential major influencers that explain consumer behavior related to digitally convergent services.

The salient role of CD, MV, and INT suggested in the current study is actually associated with the distinction between digitally convergent services and other IS research contexts. Thus far, many previous IS studies have dealt with IT artifacts intended to improve work productivity in organizations for business purposes. For this business-related IS, the primary focus was on understanding characteristics of technology features, developing constructs measuring individual and/or organizational perception of the features, and testing the effects on behavioral intention. Thus, TAM-based constructs have been recognized as reliable factors. In recent years, technology development has brought out new styles of IS, such as digital convergence, which aims to provide diverse digitalized services to satisfy individuals' needs for communications and entertainment. For such individual-purpose IS, customers tend to focus on personal values derived from technology use (i.e., what values can I appreciate?) as well as technology functions (i.e., what functions does the technology provide?). In line with these different natures, the results in the current study emphasize the important position of digitally convergent features. Thus the uniqueness of our study is eventually to articulate distinctive factors that capture individuals' perceived values related to digitally convergent services and empirically validate their roles and effects on consumer behavior related to the new IS-enabled service.

The current study also includes some important contributions to IS literature. First, the study sheds light on understanding how potential users react to digital convergence that provides digitally integrated diverse features for individ-

ual purposes and personal values. Specifically, we address a novel trend in telecom and media industry—IPTV—one of the latest digital content services that comprises several innovative features such as a large selection of VOD, time-shift TV playback, and two-way interactive GUI. We conceptualized these distinctive characteristics, incorporated them into our research framework, and tested their influences on consumer behavior. Taken together, our approach expands the boundary of IS research toward up-to-date industry movement and focuses academic attention on the latest issues in technology innovation adoption and use.

Second, we studied the adoption of IPTV, a disruptive technology innovation that may significantly transform value chains of the related industry, including content design and creation, TV service delivery, service interface with consumers, and service billing. In general, previous studies of IT adoption have focused on either particular applications (e.g., EDI and ATM) or end-user products (e.g., spreadsheet packages). Thus, by studying customers' perception of IPTV that possibly intrigue a paradigm shift of business operations in media and telecom industry, we can make an incremental contribution by enriching and diversifying the technology adoption literature.

Third, the study proposes some novel constructs (i.e., CD, MV, and INT) that articulate customers' personal values from using digitally convergent services. Although these factors have been rarely examined in prior studies, they reflect the unique usage context of digital convergence and have potential to become major determinants that affect customers' behavioral intention to adopt digitally convergent services according to our results. In this regard, our study somewhat contributes to IS literature by adding differentiated research perspectives

of the technology innovation adoption with newly proposed constructs.

Finally, as IPTV is not mature in terms of technology and commercialization, our proposed model of the IPTV adoption may serve as a practical guide to the subjective evaluation of the value of IPTV and the projection of the technology's evolutionary path.

As an exploratory study, our research has some limitations. First, IPTV is a relatively new concept to potential users in the real world. As potential users may interpret IPTV differently, our view of IPTV may be different from their perspectives. In this regard, the research model proposed in this study may not fully reflect the real world standpoint because of the gap between the theoretical and real-world levels. Second, although we maintained a structured and systematic view of IPTV adoption, the research model does not embrace other significant theories and perspectives that may be useful for studying IPTV adoption. Finally, because the size of our sample was relatively small and most of the respondents were men, any generalization of the results should be implemented with caution.

Such weaknesses of our study imply that there remain untapped research areas as IPTV evolves over time. First, for the overall improvement of the framework application, the study's model should be further refined by developing more concrete measurements and constructs for IPTV adoption. As mentioned in the previous section, recent IT adoption studies seek to apply more sophisticated constructs to measure individual perception of technology innovations. For instance, Karahanna et al. (2006) focused on disaggregating the content of compatibility into four different constructs: compatibility with preferred work style, existing work practice, prior experience, and values. Van Slyke et al. (2010) also applied an elaborate con-

cept of compatibility in their empirical study on users' adoption of distance learning. Second, the economic value of IPTV should be examined empirically. Concerns have emerged among both industry experts and academia about the economic effectiveness of the new digital content service model. Thus, future research clarifying the economic aspects of IPTV deployment in the real-world context is warranted. Third, an examination of the user characteristics favorable and suitable to IPTV would be beneficial to both researchers and business practitioners. Similarly, practitioners and researchers can identify customer segmentations based on consumer behavior of watching IPTV (i.e., when, what, how long, and how frequently they watch IPTV). The results from behavior-based customer segmen-

tations, if properly identified, can provide useful and salient business implications that help telecom businesses build their marketing promotions and product bundles.

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Appendix

Appendix 1 - List of Model Constructs and Items			
Construct	Item	Question	Sources
Content Diversity	CD1	I expect that IPTV would offer various types of contents.	DeLone and McLean (1992)
	CD2	I expect that IPTV service providers would possess diverse, high-quality contents.	
	CD3	Overall, using IPTV would enable me to watch diverse contents.	
Interactivity	INT1	IPTV would provide interactive solutions to users' diversified service requests.	McMillan and Hwang (2002)
	INT2	I expect that IPTV would enable two-way communication between users and service providers.	
	INT3	I expect that IPTV would offer information on available contents in a real-time basis.	
	INT4	I expect that IPTV would provide information corresponding to users' requests in a real-time basis.	
	INT5	IPTV would enable immediate access to available contents.	
	INT6	IPTV would enable me to participate more actively in presenting my idea on contents to service providers.	
	INT7	IPTV would enable me to interact with other users in a real-time basis.	
	INT8	Overall, IPTV would offer a more interactive environment.	
Monetary Value	MV1	I expect that IPTV would be reasonably priced.	Zeithaml (1998)
	MV2	I believe that at current prices, IPTV would be good value.	
	MV3	Overall, IPTV would offer good economic values for the money.	
Relative Advantage	RA1	Using IPTV would improve the quality of my leisure time.	Karahanna et al. (1999); Moore and Benbasat (1991)
	RA2	Using IPTV would make my rest more comfortable.	
	RA3	Using IPTV would provide me with more entertainment features.	
	RA4	Using IPTV would make my spare time more enjoyable.	
	RA5	Overall, the advantages of using IPTV would outweigh those of other alternatives such as cable TV and satellite TV.	
Ease of Use	EOU1	I would learn the functions of IPTV within a short period of time.	Agarwal and Prasad (1998); Moore and Benbasat (1991)
	EOU2	I would find IPTV to be easy.	
	EOU3	It would be easy for me to become familiar with the use of IPTV.	
	EOU4	Overall, using IPTV would not be frustrating.	
Compatibility	COM1	Using IPTV would fit my preference for entertainment.	Agarwal and Prasad (1998); Moore and Benbasat (1991)
	COM2	Using IPTV would fit well with the way I spend my time for leisure.	
	COM3	Using IPTV would fit into my lifestyle.	
	COM4	I would find IPTV to be compatible with my rest.	
	COM5	Overall, IPTV would be compatible with all aspects of my daily life.	
Trialability	TRI1	I would like to use IPTV on a free trial basis for at least a month.	Karahanna et al. (1999); Moore and Benbasat (1991)
	TRI2	Before deciding on whether to adopt IPTV, I would like to try it out.	
Personal Innovativeness	PI1	When I encounter a tricky problem, I like to resolve it.	Agarwal and Prasad (1998)
	PI2	I like to experiment with new information technologies.	
	PI3	Among my peers, I am usually the first to try new technologies.	
	PI4	Overall, I am interested in adopting new ideas or technologies.	
Social Influence	SI1	People who are important to me would want me to use IPTV.	Karahanna et al. (1999)
	SI2	People who influence my behavior would think that I should use IPTV.	
Behavioral Intentions	BI1	I expect that IPTV would be worth using.	Karahanna et al. (1999)
	BI2	I intend to use IPTV in the future.	
	BI3	I expect that I would use IPTV in the future.	