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Determinants of customer acceptance of multi-service network: An implication for IP-based technologies

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ABSTRACT

Using a modified TAM as a conceptual framework and SEM for analysis, we determined the factors influencing the adoption of Internet Protocol Television by surveying 320 consumers. The modifications involved new constructs that incorporated user-perceived control and security in the model. The perceived quality of the content and system were found to have a significant effect on perceived usefulness and perceived playfulness. In addition, perceived control was found to have a significant effect on both extrinsic and intrinsic motivation. A significant relationship was also found between consumer-perceived security and intention. Also consumers regarded price as a main driver for switching TV services. We discuss the significance of this observation in the context of the emerging trend of technology convergence and importance in acquiring customer preference and other strategies.

1. Introduction

Internet Protocol Television (IPTV) has emerged as a multi-service network for carrying broadband services. Despite its innovative functionalities and convenience, it is still not a major threat to older technologies. Its evolution has had to focus on overcoming four obstacles:

1. Bandwidth limitations, because simultaneous video streams, especially in an expanding HDTV environment, has demanded high bandwidth.
2. Cable operators, broadcasters, phone companies, and the telecommunication industry have provided major competition.
3. The carriers have had to consider how to achieve high-performance, stable operations and inter-operations of integrated parts in the network, in order to ensure high-quality service.
4. Customers have had to be convinced that it is in their interest to adopt IPTV, because it offers better features, such as content, price, interoperability, search, etc.

Consequently, industries are now focusing on users' motivations and experiences: how they feel about new technologies and how they use the technology. User acceptance is tied directly to user experience, which is in turn related to motivation.

From the user acceptance perspective, we took a micro-based approach focusing on customers' motivations in order to identify forces that drove the development of IPTV services. Diffusion of new technologies resulted from a series of individual decisions to begin using them; such decisions were often the result of a comparison of possible benefits against the uncertain costs of adoption. Understanding the factors affecting this choice was thus essential.

We thus decided to develop a theoretical and empirical analysis that explained factors influencing potential user adoption of IPTV.

2. Overview of today's IPTV

IPTV is the set of multimedia services, such as television, video, audio, text, graphics, and data delivered over IP-based networks managed to provide the required level of quality of service, security, interactivity and reliability. Digital television service is delivered using IP over a network infrastructure, which includes delivery by a broadband connection. For residential customers, IPTV is provided in a form of Video-on-Demand and can be bundled with Internet services such as VoIP and Web access. The commercial bundling of IPTV, VoIP, and Internet access is called as Triple Play service. Recently, Quadruple Play was introduced by adding mobility to Triple Play.

Market research firms expect that global IPTV subscribers will grow to 53 million by 2009 in the USA, and that in the meantime

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service providers will rapidly increase the amount of IPTV content and transport equipment. Most telecom broadband network operators are planning to offer IPTV. While it is at different stages of product definition, field trials, or early deployments, it is apparent that IPTV is poised to become the framework of incremental revenues of fiber deployment. In addition to the quest for better revenue, rapid progress in IPTV has been fueled by the competition between telcos, cable operators, and new network entrants of home entertainment.

While most developed countries have deployed IPTV, the world's leading markets for IPTV are the U.S., South Korea, Hong Kong, Japan, Italy, and Belgium. In the U.S., big telcos like SBC Communications, BellSouth, and Verizon have already started launching IPTV systems, but their strategies vary. For example, Verizon plans to adopt a hybrid model combining traditional cable and IPTV technologies while SBC and BellSouth want to launch full-fledged IPTV networks. One global driver of IPTV is Microsoft, which has been pushing its Microsoft TV IPTV Edition software in hopes of dominating the nascent IPTV market. Microsoft has been trying to break into the TV business for years with limited success. South Korea is one of the most advanced broadband markets, with availability and subscriber levels for high-speed DSL broadband that lead the world. The competitive atmosphere is also becoming tense as operators try to gain a place in the market.

By deploying IPTV services, providers can derive additional revenue through their subscriber access networks in less time, at lower cost, and from a larger market. The service providers can bundle their services based on Internet protocols. In addition, the IPTV platform gives providers an open platform for delivering advanced entertainment services with the dual benefit of responding to the cable threat with a superior offering, while opening revenue opportunities not available on cable TV platforms.

However, IPTV also has several potential problems and challenges: the most serious concern is security of the content, services, and infrastructure. Unlike traditional television services, IPTV is not a closed system and is subject to threats from hackers, etc.

3. Theoretical background

3.1. Customers' attitude toward converged multi-service network

TAM is an adaptation of the theory of reasoned action (TRA) specifically tailored to model user acceptance of IT. To provide an explanation and prediction of the determinants of IPTV adoption, our motivational model used two constructs: *intrinsic* and *extrinsic motivation*. Intrinsic motivation can be defined, per Teo et al. [16] as the performance of an activity for no apparent reinforcement other than the process of performing the activity *per se*. In contrast, extrinsic motivation was seen as the performance of an activity because it was perceived as instrumental in achieving valued outcomes distinct from the activity itself. Perceived usefulness can be an example of extrinsic motivation, while perceived fun, playfulness, and enjoyment are intrinsic. Shin [15] developed a more comprehensive version to reflect mobile Internet context. His model employed perceived playfulness, content quality, system quality, Internet experience, and perceived price level, in addition to perceived usefulness and ease of use.

Cconvergence is the synergistic combination of voice (and telephony features), data (and productivity applications), and video on a single network. These technologies are now able to share resources and interact, creating new efficiencies. Nysveen et al. [12] investigated the consumers' intention to use mobile Internet service and examined three factors affecting usage intention: motivational and attitudinal influence, and perceived control. Fogelgren-Pedersen [4] found that connection stability and geographic coverage were two of the significant variables of perceived relative advantage in wireless broadband. Also Yu et al. [19] found that the perceived enhanced utility of mobile services was a strong value motivating use of t-commerce. While these studies found significant perceived variables, they still did not find variables specific to emerging technologies.

The question remained: what peculiar variables in convergence technologies were different from those in other services? We needed to understand user behavior associated with multiple, synchronous, *ad hoc*, and ubiquitous connections. One of the distinctive features of convergence was that it offered different content (voice, texts, video, broadcasts, etc.) in a simplified, convergent, and computer-mediated system that enabled individuals to interact, play, communicate, collaborate, and share information in many different ways.

However, many consumers are concerned with security issues, and providers have begun enhancing system security. The model should therefore incorporate new factors to improve its explanatory utility [10]. Our study therefore proposed motivational variables specific to IPTV from a content and conduit framework. Reflecting the most distinctive competitive advantage of controllability off IPTV, perceived control was included as an antecedent variable affecting both motivations. In addition, perceived security was included as a factor directly affecting intention.

3.1.1. Theory of reasoned action

TRA assumes that a person's performance of a specified behavior is determined by his or her behavioral intention to perform it, and that this, in turn, is jointly determined by the person's attitudes and subjective norms. The best predictor of behavior is intention, which is the cognitive representation of a person's readiness to perform a behavior and is considered to be its immediate antecedent.

Accordingly, attitude toward behavior was defined as an individual's positive or negative feeling about performing the target behavior while subjective norm referred to a person's perception that most people who were important to him or her think that he or she should or should not perform the behavior in question. In addition, a person's attitude toward a behavior is determined by the salient beliefs and evaluations.

H1. Attitude is positively related to the intention to use IPTV.

3.1.2. Perceived usefulness

Perceived usefulness has generally been found to have a stronger influence than perceived ease of use [7]. In our study, perceived usefulness was *the degree to which a person believed that a particular system would enhance his or her job performance*. It also therefore meant that the technology could be used advantageously.

H2. Perceived usefulness is positively related to intention to use IPTV.

H3. Perceived usefulness is positively related to attitude toward IPTV.

3.1.3. Perceived playfulness

A number of studies have investigated the effect of perceived playfulness on computer usage. A research project analyzing the antecedents of perceived playfulness showed that speed, content, variety and focused attention were the most important factors. Lessons learned from human computer interaction, acceptance and usage surveys could be adapted to IPTV.

Venkatesh [17] conceptualized enjoyment as an antecedent of ease of use; its effect increased as users gained more experience