

The Roles of Perceived Enjoyment and Price Perception in Determining Acceptance of Multimedia-on-Demand

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ABSTRACT

This research analyzes factors affecting the adoption of multimedia-on-demand (MOD) service by 542 subscribers of Chunghwa Telecom in Taiwan. The study applies the extended technology acceptance model, taking into account the perceived enjoyment and price perceptions of MOD service. Sample descriptive results indicate that the majority of the MOD service market consists of college-educated business customers. The study uses confirmatory factor analysis (CFA) and a structural equation model (SEM). The study has two major findings. First, perceived enjoyment is a salient endogenous factor affecting consumer attitudes and intentions toward use. This finding means that, in addition to offering a more humanized and simplified interface than cable TV, MOD service providers should offer more useful and entertaining content to attract customers. Second, lower monthly fees and lower prices for paid channels and movies on demand substantially contribute to customer intention toward MOD service use. The results show that a new relationship from perceived usefulness to perceived enjoyment has statistical significance. The interactive characteristics associated with providing more versatile entertainment to customers yields useful insights for the marketing and development strategies of MOD operators.

Keywords: MOD (multimedia on demand) services, extended technology acceptance model, perceived enjoyment, price perceptions

1. INTRODUCTION

With the proliferation of network technology and the ever-increasing use of broadband Internet access, the interactive entertainment service called multimedia-on-demand (MOD), aimed at delivering a variety of digitized content to consumers over the Internet, has evolved from a mere possibility to a reality. Incumbent telecommunications operators provide MOD services through a free set-top box hooked up to the subscriber's TV or computer. Consumers can easily access content through a few clicks of their remote control.

In the system, the user's viewing preferences are automatically recorded, and hours of programming may be downloaded for playback at any time. Consumers do not have to spend much to upgrade their home networks for those services, because MOD services are delivered over the broadband Internet and interactive multimedia infrastructure built by incumbent operators.

In Taiwan, Internet growth has been phenomenal. The number of Internet users exceeded 68.51% of the population by the beginning of 2008, and more than 15.5 million of people have experienced surfing the Internet, with 63.37% of users adopting the broadband network [Taiwan Network Information Center, 2008]. Former state-owned integrated service operator Chunghwa Telecom is the sole provider of MOD services in Taiwan with the dominant Asymmetric Digital Subscriber Line (ASDL) network. It has a total of 4.17 million broadband subscribers with ADSL and Fiber to The Building (FTTB). By the end of June 2007, it had 330,000 MOD subscribers — who use very fast ADSL connections (>2 Megabits per second) to enjoy both MOD services and surfing the Internet — a solid 112% year-on-year increase [Chunghwa Telecom, 2007]. Furthermore, the Internet market has been rapidly moving away from dial-up access to broadband with ADSL subscriptions; in particular, 91.7% of all connections are broadband [Taiwan Network Information Center, 2008].

MOD services are delivered over the broadband Internet. Internet World Stats [2008] indicates that the estimated number of Internet users is 1,463 million and that the world Internet penetration rate is 21.9% for June 2008. The region with more population, and the most Internet users, is Asia with 530 million users and a low penetration rate of 14.0%. Next in size is Europe with 384 million Internet users and a penetration rate of 48.0%. Third in size is North America, with 247 million Internet users and the highest penetration rate of all: 73.4%.

China, the United States, and Japan have the highest number of Internet users – 253 million, 220 million, and 94 million, respectively. Their penetration rates to the population are 19.0%, 72.5% and 73.8%, respectively, and their user growth rates from 2000 to 2007 are 1,024.4%, 130.9%, and 99.7%, respectively.

In sum, so called “late adopters,” such as China, enjoy a high growth rate in the Internet market with a low penetration rate, whereas the markets in the “early adopters,” such as the United States and Japan, present a stable and mature status. In most cases, early adopters are industrial countries with a high gross domestic

product (GDP) per capita, and late adopters are developing countries with a low GDP per capita.

In another targeted bid to fend off its Multi-System Operator (MSO) competition, Verizon in the United States, a leader in broadband, wire line, and wireless communication, launched FiOS TV in 2005, delivering the service on the nation's largest fiber-optic network that extends all the way to customers' homes. FiOS TV service integrates up to 400 all-digital TV and music channels; roughly 30 high-definition (HD) channels, for the standard rate of \$49.95 a month, and the premium package of \$79.95 a month. The launch comes with an aggressive package pricing and incentive program. As of July 2008, Verizon FiOS TV had 1.2 million subscribers across 13 states.

As network technology continues to advance, high-bandwidth access over Internet Protocol (IP) networks are increasingly using different audio and video formats to facilitate consumer on-demand behavior. MOD services give consumers the benefit of choosing versatile, digitized content (including movies, educational programs, news, and karaoke) to be viewed on their TVs or computers, at any time. MOD services are aimed specifically at consumers who prefer on-demand programs, which can be played, recorded, fast-forwarded, and rewound, which is considerably different from current cable TV systems.

2. CONCEPTUAL BACKGROUND

To further understand consumer psychological and behavioral intention to adopt an innovative product or service, prior studies use the technology acceptance model (TAM) to successfully explain or predict an individual's acceptance of information technologies, such as e-mail, voice mail, software packages, or Web surfing [Davis, 1989; Davis, 1993; Davis and Venkatesh, 1996; Igbaria, Schiffman, and Wieckowski, 1994; Karahanna and Straub, 1999]. In this context, MOD services are an extended application of information technologies that consumers accept for the purpose of leisure.

The technology acceptance model (TAM) hypothesizes that users' behavioral intention (BI) to use a technology is determined by their attitude toward that technology (Figure 1). This model, proposed by Davis [1989], was based on the constructs and relationships of the theory of reasoned action (TRA) [Adams, Nelson, and Todd, 1992; Chau, 1996; and Dishaw and Strong, 1999].

Theory of reasoned action posits that an individual's willingness, rational decision-making, attitude, and subjective norms will affect his/her behavioral intention. Subjective norms refer to an individual's belief that she or he should perform a certain behavior because this is expected of him/her by others important to the individual [Fishbein and Aizen, 1975]. According to TRA, attitude and subjective norms independently affect intentions, whereas in the TAM, perceived usefulness (PU) and perceived ease of use (PEOU) are believed to directly affect a person's attitude. Davis [1989] states that the subjective norm does not significantly affect intentions over and above perceived usefulness and perceived ease of use; therefore, he omits it from the original TAM.

Although Davis [1989] posits empirical tests of perceived usefulness and perceived ease of use that can act as fundamental determinants of user acceptance of a given information technology (IT) in the TAM, Chau [1996] suggests that perceived usefulness can divide into two distinct forms: near-term usefulness (e.g., improving job performance or enhancing job satisfaction) and long-term usefulness (e.g., improving one's career prospects or social status). His results show that perceived near-term usefulness has more significant influence on the behavioral intention to use a technology than long-term usefulness, and perceived ease of use has a significant effect on perceived usefulness but no significant effect on behavioral intention to use. In other words, whether the technology is easy to use or not, the influence of perceived use on behavioral intention is not direct, but occurs via perceived usefulness.

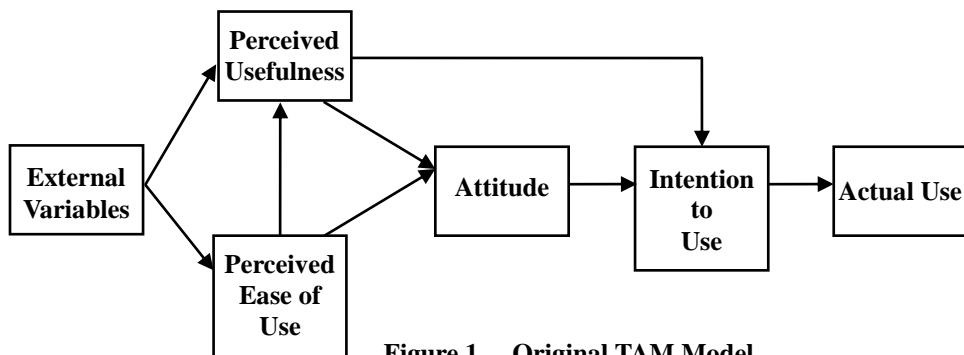


Figure 1. Original TAM Model

Figure 1 shows the original TAM, in which external variables, such as an individual's abilities, the type of information technology, the task, and situational constraints, are important factors for evaluating the consequences of using information technology.

The original TAM incorporated additional variables to produce an extended TAM for predicting consumer adoption of emergence of technology. These constructs include computer playfulness [Moon and Kim, 2001], cognitive absorption [Agarwal and Karahanna, 2000], and product involvement and perceived enjoyment [Koufaris, 2002].

More recently, Burton-Jones and Hubona [2005] introduce additional constructs to the original model as external variables in order to assess their effect on use behavior: i.e., individual differences between users, staff seniority, age, and education level. From a theoretical perspective, the TAM theory needs to be extended to incorporate the aforementioned aspects to achieve greater understanding of the user acceptance process. Nevertheless, Ortega and Martinez and De Hoyos [2006] empirically test the basic constructs of TAM, without any

external variables, in an investigation of the acceptance of online business management.

Two salient beliefs exist in the original TAM – perceived usefulness and perceived ease of use – which propose to mediate the effects of these external variables on attitude and intention to use the information technology. TAM also posits that perceived ease of use influences perceived usefulness because the easier something is to use, the more useful users perceive the item to be.

In a subsequent TAM model, a link between perceived ease of use and behavioral intention toward use is included, although it is not present in the original TAM. Many empirical studies of the TAM include this correlation and find a significant relationship between these two factors [Adams, Nelson, and Todd, 1992; Moore and Benbassat, 1991].

Even though both perceived usefulness and perceived ease of use have been reported to be significantly correlated with use, Davis' findings suggest that perceived usefulness mediates the effect of perceived ease of use on use. The model has a good predictive validity for the use of several information technologies, including e-mail [Adams, Nelson, and Todd, 1992; Gefen and Straub, 1997; Karahanna and Straub, 1999], Word [Chau, 1996], the World Wide Web [Lederer, Maupin, Sena, and Zhuang, 2000; Moon and Kim, 2001; van der Heijden, 2003], online shopping (O'Cass and Fenech, 2003; Shih, 2004; Vijayarathy, 2004), and online business management applications (Ortega, Martinez, and De Hoyos, 2006).

Recent papers by Bruner II and Kumar [2005] and van der Heijden [2003] incorporate a hedonic factor into TAM and treat it as an endogenous variable for greater predictive power. This correlation offers substantial validations of the extended TAM. Investigation of the use of wireless devices and Web sites show that they seem both useful and enjoyable to users. To explicitly construct the role of intrinsic motivation in TAM, van der Heijden [2003] introduces the concept of perceived enjoyment to explain consumers' use of websites. This perception can think of the extent to which enticing consumers' enjoyment is perceived through the activity of using a specific product or service, rather than derives from any of its own performance consequences. Similar to the definition of perceived enjoyment, perceived playfulness, or fun, is also treated as an important hedonic factor antecedent to consumers' attitude toward using a system [Bruner II and Kumar, 2005; Moon and Kim, 2001].

Although TAM has been successfully applied in predicting and explaining consumer acceptance of an innovative product or service, within many extended TAMs or c-TAM models, price perceptions have not been comprehensively discussed. Though Shih [2004] and Wu and Wang [2005] successfully incorporate a cost construct into their revised TAM model for predicting consumer acceptance of a specified service, including equipment cost, transaction cost and time-spending cost, this construct reflects only a few imperative considerations of cost structures for the product itself, prior to consumer acceptance.

It does not explore price perceptions through price comparisons between competitors, or other influential factors. Many researchers argue that consumer perceptions of price fairness are relevant to their satisfaction, performance, or product quality [Bolton, Warlop, and Alba, 2003; Campbell, 1999; Herrmann, Xia, Monroe, and Huber, 2007; Voss, Parasuraman, and Grewal, 1998]. In addition, a cue of past prices or competitor prices may be viewed as a key reference point for their purchase judgments, particularly when a transaction history with an innovative product does not exist [Bolton, Warlop, and Alba, 2003]. From the viewpoint of pricing policy in telecommunications markets, a small variation of charge or cost (e.g., reducing per-minute call charges) could increase the amount of use and positively affect the decision to purchase [Kollmann, 2000].

In this study, we review and incorporate price perceptions into the TAM in order to explore the influence of the price construct, instead of cost construct, on behavioral intention. To date, the incumbent operator provides broadband access to the Internet, bundled with MOD, and provides their users a free set-top box at a certain level of ADSL, indicating that the cost factor seems to be diluted in the charge of MOD services.

3. RESEARCH MODEL AND HYPOTHESES

Figure 2 shows the hypothesized model for the current study.

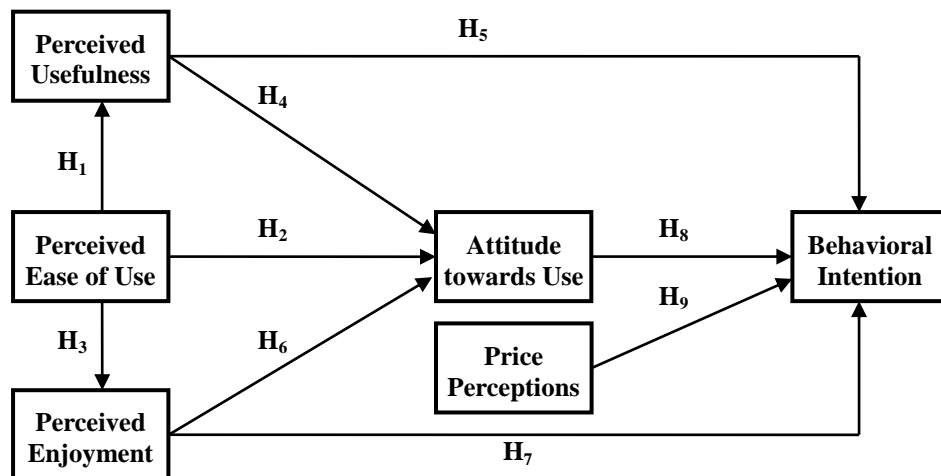


Figure 2. The Research Model

Given the TAM concept that Davis [1989] develops to predict and explain consumers' intentions toward adopting information systems, we incorporate two underlying constructs of perceived enjoyment and price perception into the

original TAM model in an attempt to add our knowledge by undertaking an in-depth conceptual and empirical examination. These constructs may significantly affect consumers' attitudes or behaviors, and may provide a more effective means to predict consumer intentions when adopting MOD.

3.1. Perceived Ease of Use (PEOU)

The IT literature empirically verifies the effects of perceived ease of use on both perceived usefulness and attitude in TAM research [Davis, 1993; Venkatesh and Davis, 2000]. A stronger relationship exists between perceived ease of use and perceived usefulness as the two salient beliefs [Adams, Nelson, and Todd, 1992; Segars and Grover, 1993]. Further, several studies employ different use measures and find that they have a close correlation with attitude, consistent with the original TAM [Adams, Nelson, and Todd, 1992; Burton-Jones and Hubona, 2003]. Recently, researchers report that perceived ease of use has a significant effect on perceived usefulness, perceived enjoyment (playfulness), and attitude toward adoption for a specified source [Moon and Kim, 2001; van der Heijden, 2003]. That is, the easier a system is to use, the more this is associated with enjoyment. This, in turn, leads to the creation of positive favorable attitudes toward using it. Here, we define ease of use as the extent to which consumers' adoption of MOD is perceived as easy or effortless. Accordingly, the study hypothesizes that:

H₁: Perceived ease of use positively affects perceived usefulness.

H₂: Perceived ease of use positively affects attitude toward MOD.

H₃: Perceived ease of use positively affects perceived enjoyment.

3.2. Perceived Usefulness (PU)

The motivation theory argues that, if an individual perceives an activity to be beneficial to achieve valued outcomes, he or she will be more likely to accept the new technology. Instead, Davis [1989] defines perceived usefulness as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context. Based on his definition, Adams and Nelson and Todd [1992], and Davis [1989] find perceived usefulness to be a major determinant of use behavior and intention. Subramanian [1994] reaffirms two salient belief measurements (perceived usefulness and perceived ease of use), using a new data set for two different technologies, and finds that PU, instead of PEOU, has a direct effect on use behavior employing structural equation modeling (SEM).

Several recent studies examine the correlation between perceived usefulness and attitude and behavioral intention in evaluating consumer acceptance of an innovative product [Moon and Kim, 2001; Vijayasarathy, 2004; van der Heijden, 2003]. Their results show that the effects of these relationships derived from

perceived usefulness, not perceived ease of use, as expected by the original TAM. In this study, we define perceived usefulness (PU) as the degree to which an individual perceives that use of MOD improves his or her efficiency or makes it easier to enjoy media content. Therefore, the study posits:

H₄: Perceived usefulness positively affects attitude toward MOD.

H₅: Perceived usefulness positively affects behavioral intention to use MOD.

3.3. Perceived Enjoyment (PE)

To further model the role of intrinsic motivation in the TAM, Moon and Kim [2001] and van der Heijden [2003] view perceived enjoyment as an intrinsic source of motivation, referring to the performance of an activity for no apparent reason other than the process of performance itself. Their research demonstrates that perceived enjoyment has an effect on both attitude and consumers' behavioral intention toward using a specified source. Similar to the construct of perceived enjoyment, a system perceived to be easy to use will be conceived as more fun to use, leading to a stronger linkage between perceived fun and attitude toward specific products but having no significant effect on consumers' behavioral intention [Bruner II and Kumar, 2005].

An individual can experience immediate enjoyment or fun from using a specific system, and perceive any active involvement in using new technology to be enjoyable in its own right [Davis, 1989; Igbaria, Schiffman, and Wieckowski, 1994]. Prior studies of WWW and mobile commerce incorporate perceived enjoyment into the TAM to gain a more accurate prediction of user acceptance toward a specific source, primarily because a product or service used and associated with enjoyment contributes to the causal relationship [(Bruner II and Kumar, 2005; Moon and Kim, 2001; van der Heijden, 2003].

This study defines perceived enjoyment as the degree to which a person believes that adoption of MOD is interesting and associates adoption with enjoyment. Therefore, the study hypothesizes that:

H₆: Perceived enjoyment positively affects attitude toward MOD.

H₇: Perceived enjoyment positively affects behavioral intention to use MOD.

3.4. Attitude Toward Use (ATU)

The TAM posits that actual use of a specified system will be determined by an individual's behavioral intention, which is jointly determined by an individual's attitude toward using a system [Davis, 1989]. Previous empirical studies show that an individual's attitude is influenced by various antecedent factors or external variables, which may be system features, training, documentation, compatibility, and user support [Davis, 1989; Lucas and Spitler,

1999; Vijayasathy, 2004]. MOD features can be viewed as a hybrid of TV and computer technologies. Consumers who frequently watch live TV and video discs easily form a favorable attitude toward using them.

A stronger relationship occurs between attitude and behavior on the evaluation of an innovative technology in similar situations [Lederer, Maupin, Sena, and Zhuang, 2000; Moon and Kim, 2001; O'Css and Fenech, 2003; van der Heijden, 2003]. In this research, attitude can perceive to mediate the influences of the two beliefs and perceived enjoyment on the intention toward using MOD and defines it as the degree to which an individual's attitude is favorably or unfavorably disposed toward using MOD. Accordingly, the study hypothesizes that:

H₃: Attitude toward use positively affects behavioral intention to use MOD.

3.5. Price Perceptions (PP)

Price perceives as an important cue in evaluating a consumer's pre-purchase decision. Specifically, consumers tend to consider the relevant relationship between price and their expectations by comparing it with their previous experiences. Relationships linked to price focus on product quality, performance, and consumer satisfaction that matches an expectation of price fairness for a product or service [Herrmann, Xia, Monroe, and Huber, 2007; Huber, Herrmann, and Wricke, 2001; Voss, Parasuraman, and Grewal, 1998]. If consumer perceptions of performance or quality for a product or service exceed his or her expectations, then their perceptions of the listed price would lead to a favorable attitude toward accepting it, and the price would be perceived to be fair because the consumer's value perception of a product or service exceeds his or her perceived sacrifice [Herrmann, Xia, Monroe, and Huber, 2007].

On the other hand, Bolton and Warlop and Alba [2003] emphasize that consumer perceptions of price fairness are derived from past prices, competitors' price, and vendor costs, which elicit perceptions of a product's current price and represents an individual's assessment of whether a product or service price is reasonable or acceptable. Campbell [1999] shows that consumers' perception of price unfairness tends to lower their shopping intention, primarily because a pricing decision by the firm is perceived as unfair compared with a counterpart product or service. Further, Wu and Wang [2005] examine that cost (i.e., equipment costs, access cost, and transaction fees) resulting from the product itself has a negative significant effect on behavioral intention toward use. In our study, given that the incumbent operator offers a free set-top box to subscribers, such a reduction in the cost of MOD use will be viewed by potential consumers as more competitive than traditional media competitors, such as cable TV or ISP operators who provide data transmission services over the Internet. Hence, we define a competitive price as the extent to which, given that the operator offers an innovative function or service different from the offering of other homogenous products, consumer perception of the price of a product or service is that that reasonable price is reasonable, and directly affects their willingness to purchase.

Therefore, the study hypothesizes that:

H₉: Price perceptions positively affect behavioral intention to use MOD.

3.6. Behavioral Intention (BI)

Fishbein and Ajzen [1975] state that attitude is an individual's predisposition to react in a consistently favorable or unfavorable manner to a given object. They argue that attitude toward use is an individual's evaluation of the desirability of a specific system application. Behavioral intention to use is a measure of a person's likelihood to purchase or adopt a product or service, whereas the TAM model focuses on actual use to represent a self-reported measure of time or frequency of adopting the application [Davis, 1989]. However, it is not easy or practical to obtain an objective measurement of an individual's intention to engage in a behavior. Research shows that both theoretical and empirical support exists for the powerful correlation between intention to engage in a behavior and actual behavior [Cho, 2006; Dabholkar and Bagozzi, 2002; Vijayarathy, 2004]. To maintain instrument brevity, we adopt behavioral intention as a surrogate for the merging of behavioral intention and actual use in the research model, and define it as an individual's intention to use MOD.

4. METHOD

The primary research objectives of this study are to test the hypothesized model, a revised version of the TAM, and to predict customer perceptions toward use of MOD services in Taiwan. To date, approximately 330,000 subscribers [Chunghwa Telecomm, 2007], located in the metropolitan areas of Taiwan, have purchased MOD services, which are based on broadband ADSL. To gain a better understanding of user acceptance of these services, we aim at ADSL subscribers of Chunghua Telecom, the sole provider of the MOD service in Taiwan. Furthermore, the sampling of target groups focuses entirely on those areas where residents would be highly likely to accept MOD services.

4.1. Measures Development

This study develops a questionnaire to measure the validity and reliability of four constructs adopted from TAM: two salient beliefs (perceived usefulness and perceived ease of use), attitude toward using a specific system, and behavioral intention. Davis [1989] explores the relationships between constructs to improve the prediction of user acceptance of information technology. We introduce other constructs, such as hedonic factor and intrinsic motivation, and confirm instruments using them. Perceived enjoyment, with a higher correlation to the TAM, supports predicting a specific system [Moon and Kim, 2001; van der Heijden, 2003]. However, no systematic empirical investigation of consumer perceptions of price fairness for an innovative product or service has been incorporated into the TAM model.

4.2. Data Collection and Sample Statistics

The appendix to this study presents the constructs and their measured items. The study derives all items in the instrument from the IT, online shopping, Web site use, and innovative product literature. To confirm the questionnaire's content validity and reliability, we conduct a pilot test. A total of 45 individuals, all either graduate students from National Cheng Kung University or managers of telecom firms, review the wording or discover any misleading expressions in the questionnaire contents. Examination of the original questionnaire revealed that certain semantic expressions about the measured variables of perceived usefulness and price perceptions needed to be slightly revised for consistency.

Following the pilot test, the study includes a questionnaire survey that consists of three main parts. The first part describes the features of the MOD services provided by Chunghwa Telecom, including a free set-top box for its subscribers and a variety of digitized content (movies, pay-channels, educational programs, news, and karaoke). The second part asks questions relating to customers' perceptions, attitude, and intentions toward adopting MOD. The third part elicits personal demographic information. We mix together these items to minimize bias due to response consistency [Davis and Venkatesh, 1996]. The instruments were prepared in Chinese, and the items being reproduced for this article are English translations. Respondents express their agreement or disagreement with a statement on a seven-point Likert-type scale ranging from *strongly disagree* (1) to *strongly agree* (7).

The data collection instrument in this research is based on existing ADSL subscribers of Chunghwa Telecom, who can access both the Internet network and MOD over a phone line. The participants are focused on Chunghwa's household users, in order to improve the representativeness of the sample. Adult participants who requested ADSL installation and repair service at customer service centers of Chunghwa Telecom are randomly selected and interviewed. They are informed that their responses remain anonymous and confidential and are used for academic purposes only. During the six-week survey period, a total of 660 respondents filled out the questionnaire. After screening the returned questionnaires for usability and reliability, we collect 542 valid questionnaires after eliminating 118 because of missing data.

Table 1 gives the demographic profile of the 542 survey respondents. Of the total, 281 (52%) are male and 261 (48%) are female, a fairly equal gender distribution. The majority of respondents are below age 40 (cumulative up to 60%), and more than half of respondents (61%) have at least a college level education. Of the total, 46.49% are in the service industry. Most respondents use the Internet 1-2 hours (35%) per day or 2-3 hours (24%) per day.

Table 1. Demographic Profile of 542 Survey Respondents

	Frequency	Percent (%)	Cumulative (%)
Gender			
Male	281	51.84	51.84
Female	261	48.16	100.00
Age			
Less than 20	48	8.85	8.85
21 – 30	105	19.38	28.22
31 – 40	171	31.54	59.76
41 – 50	128	23.62	82.92
Over 51	90	16.61	100.00
Education level			
High school graduate	197	36.34	36.34
College education	330	60.88	97.22
Master or above	15	2.78	100.00
Industry employed			
Student	58	10.70	10.70
Manufacturing	42	7.75	18.45
Services	252	46.49	64.94
Office clerk	60	11.08	76.02
Information systems	13	2.40	78.42
Housekeeper	41	7.56	85.98
Others	76	14.02	100.00
Individual monthly income (NT\$)			
Less than 10,000	58	10.70	10.70
10,000 – 19,999	25	4.62	15.32
20,000 – 29,999	71	13.09	28.41
30,000 – 39,999	142	26.19	54.60
40,000 – 49,999	109	20.12	74.72
Over 50,000	137	25.28	100.00
Average hours using the Internet (per day)			
Less than 1 hour	65	11.99	11.99
1 – 2 hours	192	35.42	47.41
2 – 3 hours	130	23.99	71.40
3 – 4 hours	78	14.39	85.79
Over 4 hours	77	14.21	100.00
Purchase of Multimedia-on-demand			
Yes	48	8.86	8.86
No	494	91.14	100.00

5. RESULTS

This section discusses results pertaining to the measurement model (5.1), the reliability and validity of measures (5.2), and the structural model (5.3).

5.1. Measurement Model

The analyses include a two-step approach to test the hypothesized model [Anderson and Gerbing, 1988]. First, we purify the measurement model by eliminating measured variables that do not exhibit a good fit in an initial confirmatory factor analysis (CFA). Second, we fit a theoretical final model, via a series of revised models, to the initial measurement model. Of primary interest in the measurement model is the extent to which a hypothesized model matches the sample data. Given findings of an inadequate fit, the next step is to detect what does not fit in the measurement model. Ideally, the evaluation of a model fit should derive from several criteria that can assess a model fit from a diversity of perspectives. We further subject the measures to the confirmatory factor analysis through LISREL 8.54. We use the covariance matrix as input for the confirmatory factor analysis.

Given the known problems of the χ^2 test as an assessment of a model fit, a variety of fit indices are currently available to researchers wishing to assess the fit of their research model. Root mean squared error of approximation (RMSEA) and standardized root mean squared residual (SRMR) are commonly used in evaluating the residual value that derives from the fitting of the covariance matrix of the hypothesized model to the covariance matrix of the sample data. Generally, for these two indices, Browne and Cudeck [1993] suggest that values less than 0.05 indicate a good fit, and values as high as 0.08 represent reasonable errors of approximation in the population. In the evaluation of a model fit, other widely used indices are normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI) [Jöreskog and Sörbom, 1996]. In general, the higher values of these model-fit indices indicate a better fitting hypothesized model, and these generally use the 0.90 rule as indicating a good fit to the data.

The results of the LISREL output reveal that the chi-square goodness-of-fit statistic for 236 of degrees of freedom was 487.15, $p < 0.01$. The significant χ^2 indicates that the hypothesized model does not reflect the pattern between the unrestricted sample covariance matrix and the restricted covariance matrix [Byrne, 1998]. However, Jöreskog and Sörbom [1996] note that an estimation of significant χ^2 should be regarded as a measure of fit, rather than a rule of thumb for evaluating a measurement model because it might not be realistic to assume that the hypothesized model held exactly in the population.

Thus, researchers recommend many complete examinations of the model-fit indices. Marsh and Hovecar [1985] suggest that the $\chi^2 / \text{degrees of freedom}$ ratio between 2 and 5 indicate a good fit to the data ($\chi^2 / \text{df} = 2.06$), when other model-fit indices are within the bounds that indicate a good fit to the data (NNFI, NFI, CFI, AGFI > 0.9 ; GFI > 0.8 ; SRMR, RMSEA < 0.08). The results of these fits

demonstrate that the RMSEA and SRMR are 0.044 and 0.033, respectively, all of which are below the standard of 0.05 recommended by Browne and Cudeck [1993]. Next, other model-fit indices are consistent in pointing to an acceptable fit of the hypothesized model to the data [NFI = 0.99, NNFI = 0.99, CFI = 0.93, GFI = 0.94, and AGFI = 0.91].

5.2. Reliability and Validity of Measures

For estimation of the measurement model, we adopt the confirmatory factor analysis based on the revised model to evaluate the psychometric properties of the multi-item scales used to test the hypotheses (Table 1).

Table 2. Measurement Model and Confirmatory Factor Analysis by LISREL

Constructs	Construct Loading				Individual Reliability	Composite Reliability
	Measured Variables	Completely Standardized	t-value	Measurement Errors		
Perceived Usefulness	PU1	0.88	—	0.23	0.79	0.94
	PU2	0.92	30.55	0.16	0.85	
	PU3	0.88	29.69	0.22	0.80	
	PU4	0.85	27.16	0.28	0.75	
	PU5	0.82	14.41	0.32	0.72	
Perceived Ease of Use	PEOU1	0.83	—	0.32	0.72	0.90
	PEOU2	0.82	26.25	0.33	0.71	
	PEOU3	0.61	7.89	0.62	0.50	
	PEOU4	0.89	25.24	0.21	0.81	
	PEOU5	0.85	23.85	0.28	0.75	
Perceived Enjoyment	PCE1	0.80	—	0.36	0.69	0.90
	PCE2	0.83	21.59	0.32	0.72	
	PCE3	0.75	13.15	0.44	0.63	
	PCE4	0.80	14.68	0.35	0.70	
	PCE5	0.87	22.66	0.24	0.78	
Attitude	ATU1	0.90	—	0.19	0.83	0.93
	ATU2	0.85	13.57	0.28	0.75	
	ATU3	0.88	13.9	0.22	0.80	
	ATU4	0.86	5 13.58	0.26	0.77	
Behavioral Intention	BI1	0.87	—	0.25	0.78	0.90
	BI2	0.89	23.82	0.20	0.82	
	BI3	0.85	25.66	0.28	0.75	
Price Perceptions	CA1	0.80	—	0.36	0.69	0.91
	CA2	0.92	25.12	0.15	0.86	
	CA3	0.91	24.62	0.18	0.84	

We use construct reliability (CR) as an indicator of convergent validity in conjunction with the measurement model. It is easily computed from the squared sum of factor loadings for each construct and the sum of error variance terms for

a construct. The last column in Table 2 presents the composite reliability for each construct where all of six coefficients were greater than 0.6 or higher, indicating that the measurement model has good internal consistency [Bagozzi and Yi, 1988]. In addition, we use the CFA to estimate the item-construct loadings and t-test statistics for the measurement model. The results show that all the measures load significantly on their respective constructs at a significance level of 0.01, demonstrating adequate convergent validity.

To assess construct validity, we examine the measurement model of convergent and discriminant validity. We estimate individual factor loadings for the revised model through maximum likelihood estimates of the parameters. The results show that all measured variables of completely standardized factor loadings exceed 0.5, and that they are significant at the 0.01 level [Steenkamp and van Trijp, 1991]. Although some researchers have suggested that all standardized factor loadings should exceed 0.707 or higher [Bagozzi and Yi, 1988; Yang and Yoo, 2004], the standardized factor loading of the third item of the PEOU (PEOU3) is just below the suggested value.

Combined with the results from the average variance extracted (diagonal elements in bold) and the construct reliabilities, shown as both Table 2 and Table 3, these results indicate that all constructs of average variance extracted exceed the 0.50 rule of thumb (ranging from 0.652 for perceived enjoyment to 0.77 for price perceptions), and their composite reliabilities exceeded 0.7, suggesting adequate reliability (ranging from 0.90 for perceived enjoyment to 0.94 for perceived usefulness).

Table 3. Construct Correlations and Average Variance Extracted

	PU	PE	ATU	BI	PEOU	CA
PU	0.74					
PE	0.78	0.65				
ATU	0.78	0.74	0.72			
BI	0.73	0.77	0.81	0.76		
PEOU	0.73	0.77	0.75	0.69	0.64	
PP	0.38	0.39	0.38	0.48	0.51	0.77

Note: The numbers of the off-diagonal represent correlations between the constructs. The numbers of the diagonal (in bold) are the average variance extracted (AVE) by each constructs.

In sum, the evidence supports the convergent validity of the measurement model. Although four loading estimates are below 0.70, these items do not appear to be significantly harming the model fit or internal consistency [Hair, Black, Babin, Anderson, and Tatham, 2006, pp. 805-10].

The analyses include examining the discriminant validity using the average variance extracted (AVE) and interconstruct squared correlation provided by

structural equation model programs, as shown in Table 3. First, average variance extracted estimates for all constructs displayed on a diagonal element (in bold) of the construct correlation matrix exceed 0.50 as Fornell and Larcker [1981] recommend. Next, these results are greater than the squared correlations between constructs (off-diagonal elements) in the corresponding rows and columns. As a result, each construct shares more variance with its items than it shares with other constructs, thereby fully satisfying the requirement for discriminant validity [Bruner II and Kumar, 2005; Fornell and Larcker, 1981; Yang and Yoo, 2004].

5.3. Structural Model

Following the CFA test to attain the best-fitting model, six independent factors constitute the structural model (PU, PEOU, PE, PP, ATU and BI), whereas the independent measurement model comprises 25 indicator variables (the Xs). Having satisfied the requirement arising from the results of the measurement model, we subsequently test the structural relationship using LISREL path analysis [Joreskog and Sorbom, 1996]. All model tests are based on the covariance matrix and use maximum likelihood estimation (MLE) as implemented in LISREL 8.54. All of the standardized parameter estimates for the structural model are presented in Table 4.

Table 4. Model Fits for the Structural Model

Model	χ^2 / df	NFI	NNFI	CFI	GFI	AGFI	SRMR	RMSEA	Path Added
Base	3.48	0.98	0.98	0.99	0.89	0.85	0.061	0.07	--
Final	3.10	0.98	0.99	0.99	0.90	0.87	0.05	0.06	PU→PE

Some model-fits of the initial structural model indicate an acceptable fit to the data, but the RMSEA and SRMR are 0.68 and 0.61, marginally higher than the standard of 0.05 that Browne and Cudeck [1993] recommend, which represents reasonable errors of approximation in the population [Byrne, 1998, p. 112]. Again, the GFI index is somewhat lower, but close to the satisfactory level of 0.90. In evaluating the BE matrix (structural coefficients relating to endogenous constructs) in the output of the LISREL program, the value for the relationship flowing from usefulness to enjoyment, with larger modification indices (94.96), is greater than the suggested value of 3.84 [Bagozzi and Yi, 1988; Byrne, 1988], whereas its accompanying expected change (0.79) is higher than other components. It is linked primarily because it may have a significant path existing in the structure model. As a result, inspection of this new correlation shows that all model-fit indices with the new path added are superior to those of the initial structural model. In addition, some possibilities for direct correlations between constructs for the current study are not ruled out, in order to gain the best model-fit to the data, including three additional paths from PP to PU, PP to ATU, and PP

to PE. Results indicate that none of the possible paths were at significant levels ($t < 1.62$).

Based on the technology acceptance model, this research incorporates two related constructs to further elucidate users' acceptance of MOD. To test the hypothesized relationship, a structural model analysis obtains an examination of all path parameter estimates (completely standardized coefficients), as shown in Figure 3.

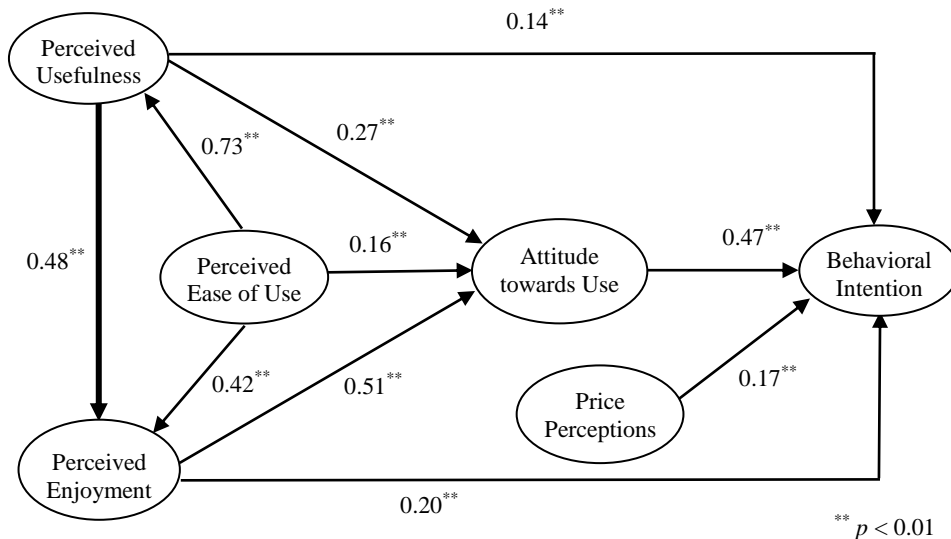


Figure 3. The Result of SEM

In one sense, the results for predicting consumer acceptance of this system are similar to the TAM findings for past applications where ease of use is a stronger predictor of the technology adoptions relative to usefulness and attitude. However, in extending the framework to the consumer use of MOD, we find these two relationships to be consistent with many prior studies of adoption of information technology ($H_1: \gamma = 0.73, t = 16.82$). Next, as predicted, the interactive environment provided by MOD itself significantly increases, supporting H_3 ($\gamma = 0.42, t = 8.30$). This correlation is consistent with the applications of World Wide Web settings [Moon and Kim, 2001; van der Heijden, 2003], and wireless handheld devices [Bruner II and Kumar, 2005].

In addition, as we inspect the influence of antecedent factors on attitude, three relationships come from current research. First, two constructs (usefulness and ease of use) are viewed as antecedent predictors of attitude in predicting the individual's use of an information system [Davis, 1993; Yang and Yoo, 2004], or innovative products [Bruner II and Kumar, 2005; Hu, Chau, Liu, Olivia, and Tan,

1999; Lucas and Spittler, 1999; Wu and Wang, 2005]. Results indicate that these relationships are positively and significantly related to attitude (H_2 : $\gamma = 0.16$, $t = 3.11$; H_4 : $\beta = 0.27$, $t = 5.19$), respectively, which is consistent with the above-mentioned studies.

Next, H_6 is supported with a close linkage between perceived enjoyment and attitude ($\beta = 0.51$, $t = 8.15$), consistent with prior research [Childer, Carr, Peck, and Carson, 2001; Moon and Kim, 2001; van der Heijden, 2003], where hedonic factor, an intrinsic motivation, reflects the more instrumental aspects of adopting information technology. This finding supports the idea that MOD, with more hedonic design characteristics, and the expanded nature of the more interactive environment, will lead to the development of positive attitudes toward it by consumers.

In evaluating consumer acceptance of MOD, the impact of perceived enjoyment on attitude is about twice as significant as perceived usefulness, and is higher than perceived ease of use. These results appear to indicate that enjoyable contents and interactive interface have a greater effect on consumer attitudes than its simple and accessible functional design. Given this, hedonic factors should receive closer attention from marketers in the future.

Next, for hypotheses 5, 7, and 8, the study investigates the influence of usefulness, attitude, and enjoyment on the behavioral intention toward adopting MOD. The results of these influences on behavioral intention demonstrate that these constructs are significant antecedents to behavioral intention (H_5 : $\beta = 0.14$, $t = 2.60$; H_7 : $\beta = 0.20$, $t = 2.78$; H_8 : $\beta = 0.47$, $t = 6.41$). As argued previously, the influence of attitude on behavioral intention in predicting consumers' acceptance of MOD (H_8) is the most significant of any factor. As such, this finding supports the viability of this assumption in the TAM. There is evidence that, on the basis of intention-based theories, a positive attitude models behavior, and a wide variety of settings support this finding [Bruner II and Kumar, 2005; Dabholkar and Bagozzi, 2002; Vijayasathy, 2004]. On the other hand, the impacts of usefulness on both attitudinal and behavioral intention at each level of significance indicate that usefulness is not only a significant antecedent to both attitude and behavioral. The significance of the correlation between usefulness and behavior has not been supported in many recent studies [Bruner II and Kumar, 2005; Chen, Gillenson, and Sherrell, 2002; Childer, Carr, Peck, and Carson, 2001; O'cass and Fenech, 2003; Vijayasathy, 2004]. This finding implies that the higher usefulness of MOD does not lead to higher consumer behavioral intention to use the service. Similarly, perceived enjoyment has direct effects on attitude (H_6) and behavioral intention (H_7), consistent with the studies of Moon and Kim [2001] and van der Heijden [2003]. In this case, the results of these two relationships support our contention that MOD, with its more enjoyable content, interactive interface, and on-demand functional settings, drive higher hedonic effects that can entice consumer's intrinsic motivation, including positive attitude and/or preference toward using it.

Finally, a positive relationship reveals that price perceptions are significant on consumer behavioral intention (H_9 : $\beta = 0.17$, $t = 5.17$). This result is tenable from both theoretical and empirical viewpoints because the pricing of a product or service may substantially reflect consumer needs, and its essential distinction from previous homogeneous products is its offer of more enjoyable content, especially the free set-top box, which makes consumers feel they are obtaining an extra benefit. In other words, the price of MOD services offers a competitive price based on the tradeoff between its lower potential costs and higher value. A product with higher costs due to equipment investments and time necessary for learning the system or finalizing the transaction would attenuate consumer willingness to adopt such a product [Choi, Choi, Kim, and Yu, 2003; Wu and Wang, 2005]. On the contrary, a product with lower costs, which consumers perceive to have a competitive price, would directly facilitate consumer satisfaction with the pre-purchase process, and eventually lead to an increase in their purchase intention [Bolton, Warlop, and Alba, 2003; Herrmann, Xia, Monroe, and Huber, 2007; Voss, Parasuraman, and Grewal, 1998]. Apparently, the relative advantage of MOD services with more versatile traits will be given higher attention by the potential consumers.

Previous research does not discuss the relatively significant relationship flowing from perceived usefulness to enjoyment (bold line in Figure 3) ($\beta = 0.48$, $t = 9.68$) [Bruner II and Kumar, 2005; Childer, Carr, Peck, and Carson, 2001; Moon and Kim, 2001; van der Heijdem, 2003], whose propositions all conclude perceived hedonic factors to be antecedents that directly affect attitude or behavioral intention. Also, the impact of perceived usefulness on perceived enjoyment is superior to that of PEOU, indicating that, by increasing the efficiency and convenience of function settings, system providers can greatly contribute to the association of enjoyment in MOD services. In other words, users appear to believe that a wide variety of options, ease of use, and interface accessibility with on-screen display can facilitate high consumer acceptance of MOD services.

6. IMPLICATIONS AND LIMITATIONS

The findings have important implications for marketing practices, particularly in the telecommunications industry, where products have characteristics similar to those of information technologies. Some of our findings enhance those of previous studies using TAM to explain or predict consumer acceptance of innovative products (e.g., the finding that perceived enjoyment is an important antecedent factor of attitude). However, because prior empirical research exploring consumer behavioral intention or actual use of a system has not taken the price perceptions factor into account in their hypothesized models, our results on the impact of price perceptions offer new insight into marketing and communication strategies for increasing consumer acceptance.

This study offers several guidelines for marketers developing MOD services. The general implications of this study of the telecommunications industry can be summarized as follows.

First, ease of use, usefulness, and enjoyment are important antecedents of consumer attitude toward behavioral intention in the areas of Internet use [Moon and Kim, 2001; van der Heijden, 2003], online shopping [Childer, Carr, Peck, and Carson, 2001], and innovative products [Bruner II and Kumar, 2005; Dabholkar and Bagozzi, 2002]. This research shows that enjoyment perceptions have a higher influence on attitude than perceived usefulness and perceived ease-of-use (structural coefficients of 0.51 for perceived enjoyment, 0.27 for perceived usefulness, and 0.16 for perceived ease-of-use). This finding implies that MOD services, based on the high-speed network infrastructure, must offer consumers easier interfaces and greater functionality, with a wider variety of content, including karaoke and movies.

Second, price perceptions, a relatively important factor, have not been considered in previous studies to elucidate consumer acceptance of innovative products or information technologies, as this construct has been simultaneously dominated by considerations of perceived quality, price fairness, performance and satisfaction [Bolton, Warlop, and Alba, 2003; Herrmann, Xia, Monroe, and Huber, 2007; Huber, Herrmann, and Wricke, 2001; Voss, Parasuraman, and Grewal, 1998]. Research instead has emphasized that higher cost perceptions are elicited by the product itself: tangible costs (equipment, bills) and intangible costs (time spent due to slow Internet speeds), would lower consumer purchase intention [Choi, Choi, Kim, and Yu, 2003; Shih, 2004; Wu and Wang, 2005].

Perceived usefulness has a stronger positive effect on perceived enjoyment. This construct can be viewed as both an important antecedent determinant of attitude and a mediating variable between perceived usefulness, perceived ease-of-use, and attitude [Bruner II and Kumar, 2005; Choi, Choi, Kim, and Yu, 2003; Childer, Carr, Peck, and Carson, 2001; Moon and Kim, 2001; and van der Heijden, 2003]. This relationship has not been explored in previous work. The influence of perceived usefulness on perceived enjoyment has a higher effect on attitude than that of perceived ease-of-use (structure coefficient of 0.48 for perceived usefulness and 0.42 for perceived ease-of-use). This means that, in addition to simplifying the MOD service interface based on perceived ease-of-use and perceived usefulness, a product with more enjoyable and interactive functions may directly affect consumer attitudes.

This study uses the price factor to evaluate whether consumers perceive price to be fair in comparison with the price of homogeneous products, such as cable TV. The results show that price perceptions have a significant effect on consumer behavioral intentions toward using MOD services, almost as high as that of perceived usefulness and slightly less than that of perceived enjoyment (structural coefficients of 0.14 for perceived usefulness and 0.20 for perceived enjoyment). This finding may closely relate to pricing plans under which MOD

services are bundled with ADSL services. This is consistent with the study of Herrmann et al. [2007], arguing that consumers' price perceptions will have a positive effect on their overall satisfaction. That is, consumers may judge the price paid relative to the effectiveness of the product or service. Also, consumers are willing to pay for using the MOD system, possibly because they enjoy surfing broadband service associated with MOD services only for small changes of the charges structure.

In the setting of MOD's tariffs, consumers perceive price fairness relative to other substitutive products and lead to a positive effect on their behavioral intentions. At present, Chunghwa Telecom, the dominant ADSL provider, monopolizes MOD service. By providing its subscribers with a free set-top box, Chunghwa Telecom makes potential consumers more willing to sign up for MOD services. Nevertheless, from the perspective of the overall market structure, the price judgment of most consumers falls into the segment between price-sensitive and price-insensitive. That is, the sensitive group of consumers may tend to respond greatly to a marketing strategy depending on cost savings [Kollmann, 2000]. When Chunghwa Telecom provides its subscribers with higher cost-savings in the purchase of MOD services, the subscribers loyally stay in the Chunghwa ADSL network. Thus, a pricing policy for the telecommunications industry drawn by Kollmann [2000] suggests that giving up fixed basic charges or giving away end-users sets free of charge would directly affect price perceptions and consumer behavioral intention.

Compared with markets in China, Japan and United States, the relatively small-sized but high penetrated Internet market in Taiwan is intermediate among the markets of these top three countries. The findings of our study may be generalizable to other environments, depending on the cultural and business characteristics. For instance, the positive relationship between price perception and behavioral intention in our model may also hold in the Chinese market, but not in the markets of the United States and Japan because of the income effect.

This study has limitations. First, the research focuses on a subset of possible antecedents in predicting the acceptance of MOD services, and these constructs have widely been validated by the relevant research. However, including all potentially influential factors in the research is impossible. Second, the focus of this study is on user acceptance of MOD services, although only 9% of respondents from the population are using MOD services. Thus, the study does not include the relationship between user intention and actual use.

APPENDIX: Research Constructs and Operational Definitions		
Scale Items	Constructs	Sources
PU1 PU2 PU3 PU4 PU5	Perceived Usefulness (PU) 1. Using MOD facilitates the efficacy of my life. 2. Using MOD makes my lifestyle easier. 3. Using MOD simplifies my lifestyle. 4. Using MOD increases the quality of my life. 5. Using MOD is useful for me.	Davis (1993); Chen , Gillenson, and Sherrell, (2002)
PEOU1 PEOU2 PEOU3 PEOU4 PEOU5	Perceived Ease of Use (PEOU) 1. I think MOD is easy to use. 2. Learning to operate MOD is easy for me. 3. My interaction with MOD does not require a lot of mental effort. 4. My interaction with MOD is clear and understandable. 5. It is easy for me to become skillful at using MOD.	Adams, Nelson, and Todd (1992); Igbaria, Schiffman, and Wieckowski (2002)
PE1 PE2 PE3 PE4 PE5	Perceived Enjoyment (PE) 1. Using MOD is interesting. 2. Using MOD makes me feel enjoyable. 3. Using MOD is a good way to spend my leisure time. 4. A variety of services in MOD arouse my curiosity. 5. Using MOD involves me in the enjoyable process.	Moon and Kim (2001); van der Heijden (2003); Childers, Carr, Peck, and Carson. (2001)
ATU1 ATU2 ATU3 ATU4	Attitude (ATU) 1. Using MOD is beneficial for me. 2. Using MOD is desirable for me. 3. Using MOD is a good idea. 4. I will maintain a positive attitude toward using MOD.	Moon and Kim (2001); van der Heijden (2003)
PP1 PP2 PP3	Price Perceptions (PP) 1. I think the monthly rental of MOD services is acceptable. 2. I think the fee for paid-channels of MOD services is acceptable. 3. I think the fee for on-demand programs of MOD services is acceptable.	Voss , Parasuraman, and Grewal (1998); Herrmann , Xia, Monroe, and Huber (2007)
BI1 BI2 BI3	Behavioral Intention (BI) 1. I intend to use MOD. 2. I will use MOD in the future. 3. I will recommend others use MOD.	Hu , Chau, Liu, Olivia, and Tan (1999); Moon and Kim (2001)

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