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# UNDERSTANDING THE ADOPTION OF MOBILE DATA SERVICES: A VALUE PERSPECTIVE

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## Abstract

Mobile data services (MDS) are wireless value-added pay-per-use services that have attracted increased attention in recent years. In the marketing and information system (IS) disciplines, the ability of a service provider to offer a high level of value to its customers is regarded as a success. In this paper, a theoretical framework is proposed to investigate key drivers in wireless pay-per-use services behavior based on a value perspective. This study examines the role of three evaluation values, derived from marketing and IS literature, in adoption decisions. Potential adopters have no experience with MDS; thus, they likely conceive value based primarily on indirect experience with it, such as through advertisements or communication with peers. Most studies of MDS, however, have given little attention to the types of information sources that affect the formation of value that is obtained using MDS. In this study, the influence of members of social networks and secondary sources are regarded as the major sources of information. The proposed model is empirically tested using survey data collected from 287 potential adopters. The analysis results show that the proposed model, based on the aforementioned view of value, provides a significant explanation of the variance in the level of adoption intention toward MDS in individuals. The results of this study show that utilitarian and social values dominate adoption decisions while the impact of hedonic value in MDS acceptance is weaker than other values. Information from relevant others and from mass media play a critical role in forming the perceptions of value obtained from the use of MDS.

*Keywords:* user loyalty, mobile data service, technology acceptance, perceived value, information source

## 1 INTRODUCTION

MDS researchers note that user acceptance of MDS is not fully explained by the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980), the technology acceptance model (TAM) (Davis, 1989), or the innovation diffusion theory (Rogers, 1995), which are all widely used to explain adoption trends as they pertain to IT products. These perspectives have focused on employee adoption within work places, where IT products are widely conceived as a tool to improve task-related performance. Most systems in organizational settings are either free for users or charge a one-time fee that grants daily usage. In contrast, MDS is charged on a pay-per-use basis. Thus, the success of MDS is likely associated closely with the ability of the service provider to provide superior value to their customers. In the marketing and IS disciplines, perceived value is regarded as a prominent determinant in the formation processes of behavior toward pay-per-use services (Grewal et al., 1998; Bolton and Lemon, 1999). Perceived value is defined as a consumer's overall assessment of the utility of a service based on perceptions of what is received and what is given (Zeithaml, 1988). For MDS, people decide on the

usage of a service by comparing the received and given components. A number of empirical studies on MDS have recognized the importance of perceived value in MDS acceptance (e.g., Kim et al., 2007; Lee et al., 2007). Seen from this point of view, the ability of MDS providers to offer a high level of value would encourage many customers to consider it as an important means of obtaining different types of content regardless of time or location. In a similar vein, this study attempts to develop a research model in terms of value.

Zanna and Rempel (1988) suggested that the attitudes and perceptions of individuals form on the basis of three types of information: information concerning past behavior, affective information, and cognitive information. Given that potential adopters have no experience with MDS, they form their attitudes and perceptions primarily based indirectly through affective and cognitive information (Karahanna et al., 1999). For potential adopters, MDS likely creates uncertainty in terms of its expected value due to relatively superficial information with regard to MDS. In psychology and consumer behavior studies, it has been demonstrated that individuals are generally reluctant when confronted with uncertainty; thus, it follows that they would interact with members of social networks or seek information to reduce their uncertainty in their adoption MDS (Salancik and Pfeffer, 1978; Burkhardt and Brass, 1990). Potential adopters obtain their knowledge about MDS from friends, family, and secondary sources and these beliefs become normative beliefs according to Brown and Venkatesh (2005). Thus, social and secondary source influences fulfill a critical role in the process of the formation of value regarding MDS. In this regard, the influences of relevant others and secondary sources on the perceptions of value of potential adopters are examined.

This study has two objectives. First, it aims to develop a theoretical framework based on the perspective of value. This perspective can offer a better understanding of MDS acceptance by identifying important value dimensions of its adoption. Second, the impacts of social and secondary source influences on potential adopter perceptions of MDS value are investigated. Such findings can clarify the relative importance of social and secondary source influences on the decision-making process.

## **2 LITERATURE REVIEW**

Kim et al. (2007) considered MDS users as service consumers because they evaluate MDS value based on its benefits and costs. The value-based theory was developed based on the theory of consumer choice and decision making from a maximization view of monetary value. This line of reasoning identified perceived usefulness and perceived enjoyment as the benefit components of monetary value, and considers perceived fees and technicality as sacrifice components. User acceptance of MDS is largely explained by perceptions of the monetary value of MDS. Hong and Tam (2006) developed a model consisting of five sets of adoption factors: general technology perceptions, technology-specific perceptions, user psychographics, social influence, and demographics. They empirically showed that the antecedents of MDS adoption not only differ from those of traditional IT in the work place, but that they also depend on the nature of MDS and its usage context. In their study, the monetary value of MDS has a strong effect on the adoption of MDS. Hong et al. (2006) and Lee et al. (2007) also found that the perception of monetary value plays a critical role in MDS adoption regardless of different mobile data categories and different cultural profiles.

Prior studies concerning MDS have recognized the importance of user perceptions of monetary value on behavioral intentions to employ MDS. However, previous research on MDS has observed only the monetary value dimension of MDS among the perceived values. Both marketing and the IS disciplines have proved that perceived value is multi-dimensional and can be measured by a variety of instruments. In the marketing domain, Sweeney and Soutar (2001) conceptualize perceived value as four distinct value dimensions: quality, emotional, monetary, and social. Quality value is a functional value that captures the utility resulting from instrumental value. Emotional value is the utility derived from the affective feelings of customers that the service generates. Monetary value is a functional dimension connected to the monetary benefits and costs involving in using the service. Social value is

the public recognition that would be achieved as a result of using the service. In light of this, Turel et al. (2007) examined user acceptance rates of short messaging services (SMS). Research in IS has shown that three evaluation criteria are key factors to determinate adoption intentions toward IT (Vanketesh and Brown, 2001; Brown and Vanketesh, 2005). First, utilitarian value relates to the effectiveness and efficiency resulting from the use of an IT application. Second, hedonic value represents the fun or pleasure derived from using the IT application. Third, social value is defined as enhancement of the social image of the user through the use of the IT application. Comparing IS perspective with marketing perspective in terms of perceived value, utilitarian value is associated with functional values such as quality and monetary value while hedonic and social value are included in both perspectives.

Although several differences exist in the dimensions of perceived value between marketing and IS disciplines, utilitarian, hedonic, and social value cover a broad set of perceived values that individuals regard important in the use of pay-per-use services. While previous studies on MDS have focused on the monetary value dimension of MDS, this study attempts to extend the research framework into a broader perspective of value, including not only utilitarian but also hedonic and social value. A broad view of value can provide further knowledge regarding the determinants of MDS adoption.

### **3 THEORETICAL MODEL AND HYPOTHESES**

#### **3.1 Antecedents of Adoption Intention**

##### *Utilitarian Value*

Utilitarian value is related to a functional dimension; thus, the adoption of MDS can be understood as a means of accomplishing some task-related end (Holbrook and Batra, 1987). As MDS is charged as a pay-as-you-go scheme, users may make a rational, calculated evaluation of the functional benefits of the adoption of MDS. Essentially, there are three types of charges in MDS (Barnes and Huff, 2003): a monthly subscription fee, a packet transmission fee, and a content fee. Packet transmission fees are calculated based on the volume of data transmitted, and the content fees are charged based on the amount of content used. Potential adopters cannot easily judge the level of an imposed fee as MDS fees are typically charged according to the volume of data transmitted and the amount of content used. This uncertain information concerning the fee increases the overall concern about fees, implying that users are more likely to rely on a utilitarian perspective. Several studies on MDS have confirmed the saliency of utilitarian values in explaining MDS acceptance (e.g., Kim et al., 2007; Lee et al., 2007). Thus, it is expected that utilitarian value fulfills a dominant role in adopting MDS.

*H1: Utilitarian value has a positive influence on adoption intention.*

##### *Hedonic Value*

Hedonic value reflects enjoyment, pleasure, and anxiety related to the use of MDS (Holbrook and Hirschman, 1982). As MDS technology is used for personal needs more than it is for workplace purposes, the entertainment potential of MDS is expected to have a strong influence on the adoption decision. Van der Heijden (2004) showed that hedonic value has a stronger impact on adoption intention as it pertains to PC games compared to utilitarian value. Similar to video games and PC games, MDS provides both online and casual games as well as entertainment services such as MP3 music and digital comic books. Thus, research suggests that potential adopters who perceive MDS as enjoyable and emotionally fulfilling are more likely to adopt MDS.

*H2: Hedonic value has a positive influence on adoption intention.*

### *Social Value*

Several investigations in the IS domain reported that the desire to gain status is an important determinant prompting adoption intention (Fisher and Price, 1992). Specifically, it has been suggested that the desire for social outcomes is driven by the resultant reference power, which gives the actor performing the behavior power within her or his social group (e.g., Rogers, 1995; Brown and Venkatesh, 2005). Social value is justified by their consistent predictive power of adoption toward innovative IT. Individuals can enhance their status by adopting MDS, as MDS may be perceived as trendy and innovative. Such enhanced status enables them to serve as role models for those who come later and allows them membership into a particular social class. Thus, it is expected that social value will serve as a critical criterion in the choice of a potential adopter.

*H3: Social value has a positive influence on adoption intention.*

## 3.2 Antecedents of Perceived Value

### *Social Influences*

Social influences are defined as the extent to which members of a social network influence the behavior of one another (Rice et al., 1990). The UTAUT model recognizes the prominent role of the social influences in employee adoption processes within organizational settings. Social influences in the UTAUT model are interactions and communication with managerial personnel, supervisors, and peer worker in an effort to understand the value of a specific type of IT in a work place. Brown and Venkatesh (2005) showed that relevant others such as friends, family, and other important connections serve as the key predictors of the adoption decision of a home PC. For potential adopters of MDS, it may be difficult to judge the level of value. For this reason, the opinions, decisions, and behaviors of other people can help to form perceptions of value of MDS by potential adopters. Moreover, using a type of MDS that is widely accepted by group members is a means of enhancing membership thorough increased interactions within the group; thus, potential adopters can achieve improved status within a social group (Hong and Tam, 2006). For these reasons, it is hypothesized the value of MDS is influenced by the views of social proximal referents.

*H4a: Social influences have a positive influence on utilitarian value.*

*H4b: Social influences have a positive influence on hedonic value.*

*H4c: Social influences have a positive influence on social value.*

### *Secondary Source Influences*

Secondary source influences are the extent to which information from TV, newspapers, the Internet and other secondary sources influences behavior (Venkatesh and Brown, 2001). Prior research in marketing and IS areas has found that secondary source influences are an important factor when considering whether to adopt a new product or service (e.g., Hoch and Ha, 1986); as secondary sources are one major source of information and knowledge about MDS, many service providers have worked to enhance the value of their services through marketing strategies such as advertisements and promotions. In the marketing discipline, it is assumed that secondary sources are fundamental media that can transfer messages and offer information about a target product or service. Thus, perceptions of value can be affected by the message conveyed through mass media, such as advertisements and news.

- H5a: Secondary source influences have a positive influence on utilitarian value.*
- H5b: Secondary source influences have a positive influence on hedonic value.*
- H5c: Secondary source influences have a positive influence on social value.*

The overall research model is presented in Figure 1.

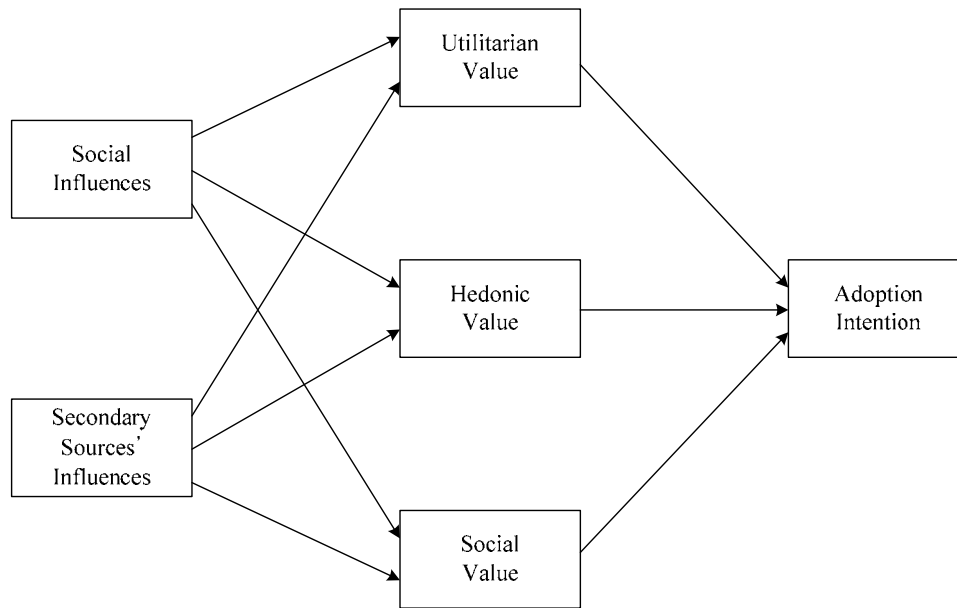


Figure 1 Research Model

## 4 RESEARCH METHODOLOGY

From prior studies concerning marketing and IS, constructs that have been used and validated by other researchers are adopted in this study. The question items were reworded to suit the target MDS context. Each question was measured on a seven-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree). In the data collection, several teachers, professors, informants were asked to gather data from the students in their classes or employees at their companies. Small gifts were given to the respondents. Approximately 1400 questionnaires were distributed in the first two weeks of November of 2006. In this study, potential users are defined as people who have never used MDS but who may be experienced with SMS. The final sample numbered 287. The age of the respondents in the final sample ranged from 13 to 57 years. The sample demographics are presented in Table 1.

## 5 DATA ANALYSIS AND RESULTS

### 5.1 Confirmatory factor analysis

A confirmatory factor analysis (CFA) using partial least squares (PLS) via the software PLS Graph Version 3.0 was conducted to test the measurement model. Frequently used in IS research, PLS is particularly useful for this study because it is robust to relatively lean sample sizes (Chin, 1998). First,

to check reliability, composite reliability (CR) and the average variance extracted (AVE) values were calculated (Fornell and Larcker, 1981). The reliability was deemed acceptable if the CR value was 0.70 or higher and the AVE value was 0.50 or higher. All factors met both criteria for acceptable reliability. Second, convergent validity can be established if item loadings are 0.60 or higher (Chin et al, 1997). The lowest loading of this study was 0.83, satisfying the convergent validity prerequisites. Third, to examine discriminant validity, the shared variances between factors were compared with the AVE values of individual factors (Chin et al, 1997). The diagonal in Table 2 contains the square root of the AVE values. All AVE values were greater than the off-diagonal elements in the corresponding rows and columns, which confirmed discriminant validity.

Table 1 Sample Demographics

Demographic	Item	Subjects	
		Frequency	Percentage
Gender	Male	180	63%
	Female	107	37%
Age	<20	43	15%
	20~25	91	32%
	26~30	84	29%
	>30	69	24%

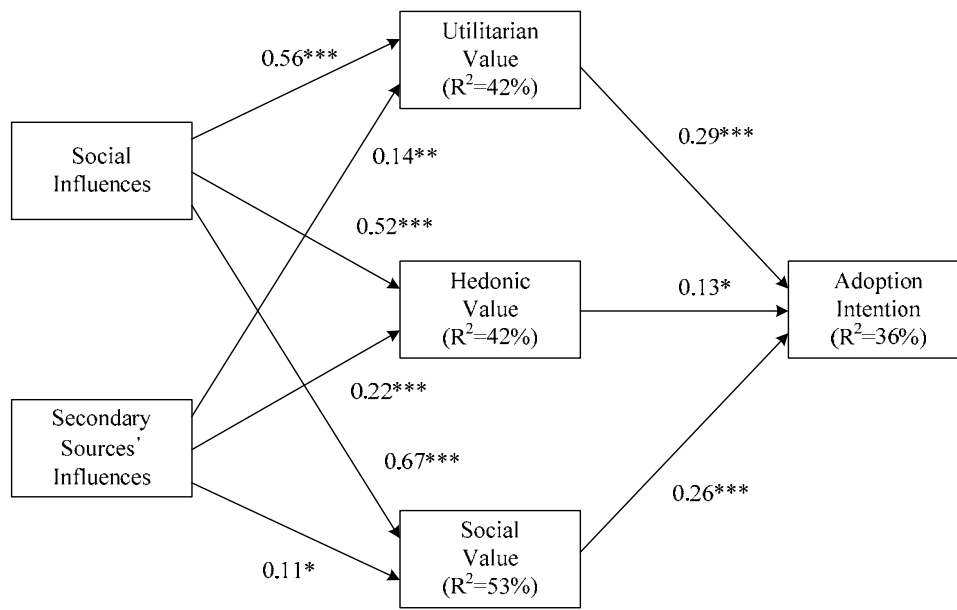
Table 2 Correlation Matrix and Discriminant Assessment

	1	2	3	4	5	6
1. ADI	0.943					
2. UTV	0.547	0.871				
3. HEV	0.501	0.707	0.900			
4. SOV	0.528	0.642	0.641	0.917		
5. SOI	0.556	0.635	0.622	0.721	0.883	
6. SSI	0.369	0.420	0.469	0.437	0.491	0.849

Note: ADI (Adoption Intention); UTV (Utilitarian Value); HEV (Hedonic Value); SOV (Social Value); SOI (Social Influences); SSI (Secondary Sources' Influences); Diagonal elements are the square root of AVE.

## 5.2 Hypothesis Testing

A structural equation analysis was performed to confirm the hypothesized relationships among the study constructs. The results of the structural equation model are presented in Figure 2.



\*\* p<0.10; \*: p<0.05; \*\*\*: p<0.01

Figure 2 Analysis Results

Utilitarian value ( $\beta = 0.29$ ,  $t = 3.78$ ), hedonic value ( $\beta = 0.13$ ,  $t = 1.77$ ) and social value ( $\beta = 0.26$ ,  $t = 3.47$ ) are found to have a significant effect on adoption intention, resulting the acceptance of H1, H2 and H3. Hedonic value has the weakest effect on adoption intention. The utilitarian, hedonic, and social values explain 36% of the variance in adoption intention. Interpersonal influences have a significantly positive effect on utilitarian value ( $\beta = 0.56$ ,  $t = 11.11$ ), hedonic value ( $\beta = 0.52$ ,  $t = 12.54$ ), and social value ( $\beta = 0.67$ ,  $t = 15.31$ ). Thus, H4a, H4b, and H4c are accepted. Similarly, the analysis reveals that external sources' influences have a significant effect on utilitarian value ( $\beta = 0.14$ ,  $t = 2.64$ ), hedonic value ( $\beta = 0.22$ ,  $t = 4.31$ ), and social value ( $\beta = 0.11$ ,  $t = 2.25$ ). Thus, H5a, H5b, and H5c are supported.

Table 3 Summary of the results

	Effect	Cause	Coefficient	T-value	Hypothesis
H1	Adoption intention	Utilitarian value	0.29	3.78***	Accepted
H2	Adoption intention	Hedonic value	0.13	1.77*	Accepted
H3	Adoption intention	Social value	0.26	3.47***	Accepted
H4a	Utilitarian value	Social influence	0.56	11.11***	Accepted
H4b	Hedonic value	Social influence	0.52	12.54***	Accepted
H4c	Social value	Social influence	0.67	15.31***	Accepted
H5a	Utilitarian value	Sec. Sou. influence	0.14	2.64***	Accepted
H5b	Hedonic value	Sec. Sou. influence	0.22	4.31***	Accepted
H5c	Social value	Sec. Sou. influence	0.11	2.25**	Accepted



## 6 DISCUSSIONS AND IMPLICATIONS

### 6.1 Theoretical Implications

In this study, a theoretical model based on value perspective was formulated and empirically tested. The research framework provides an in-depth understanding of the key values influencing MDS acceptance. From a literature review of marketing and IS domains, this study suggests that an intention to adopt MDS is dominated by the three evaluation values of utilitarian, hedonic, and social value. In particular, utilitarian value was found to be the strongest predictor of behavior toward MDS, as MDS researchers have posited that the most distinct feature of MDS is the usage fee that is paid in pay-per-use schemes. By demonstrating that these evaluation criteria are the key drivers in an intention to adopt MDS, this research provides preliminary evidence that value perspective succinctly covers a broad set of factors that individuals regard momentous in MDS adoption decisions.

According to motivation theory, perceptions of utilitarian and social values represent extrinsic motivation while perceptions of hedonic value belong to intrinsic motivation (Zanna & Rempel, 1988). Prior research in the IS domain suggests that individuals with high perceptions of extrinsic and intrinsic motivation have greater intention to adopt IS (e.g., Van der Heijden, 2004). This study confirms the saliency of extrinsic motivation in determining MDS acceptance. On the other hand, the influence of intrinsic motivation on adoption intention is weaker than the effect of extrinsic motivation. A possible explanation of this finding may be related to the decision-making processes of potential adopters. Research concerning consumer behavior has suggested that customers search for arguments and reasons to justify their choices. Hedonic consumption delivers benefits primarily based on experiential enjoyment that is obtained from MDS (Millar & Millar, 1996). From this point of view, potential adopters identify their enjoyment based on relatively superficial information from social and secondary sources, implying that it is difficult for them to evaluate hedonic value without any experience with MDS. In addition, according to marketing research, consumers have a guilty conscience about hedonic consumption when deciding whether to purchase new products or use new services (Strahilevitz & Myers, 1998). Thus, for MDS based on usage-based pricing, the use of hedonic services would be associated with a feeling of guilt, implying that perceptions of intrinsic motivation do not affect adoption intention toward MDS.

The influences of indirect experience serve as key elements in conceiving the value obtained from MDS. As potential adopters do not have broad knowledge of MDS, they are likely to communicate with members of social networks such as friends, family, and important others or obtain their information from messages conveyed through secondary sources such as advertisements and news. The analysis results indicate that these influences adequately explain the perceptions of value; they account for 42% of the variance of utilitarian value, 42% of the variance of hedonic value, and 53% of the variance of social value. However, although prior studies suggested that individuals are affected by both social and secondary source influences, researchers have shed little light on the relative impacts of these influences in the initial adoption decision processes. The results of this study suggest that potential adopters consider information from social interactions as more influencing compared to messages from mass media. In line with these findings, psychology and decision making research has suggested that individuals view knowledge from important others as more informative and trustworthy than knowledge from secondary sources (O'Reilly, 1982). Notably, Burnkrant and Consineau (1975) showed that individuals tend to comply with group norms toward a conforming perspective. This study helps MDS researchers to understand the relative importance of the sources of information in the formation processes of MDS acceptance

## 6.2 Practical Implications

This study provides several important implications for MDS practitioners. First, it shows that potential adopters are strongly affected by functional value as obtained from MDS use. MDS practitioners should understand that the perception of value for money has a critical part in accelerating MDS diffusion. Thus, MDS providers should pay more attention to improving the perceptions of the MDS fee by potential adopters, as potential adopters are highly concerned about imposed usage fees. For example, MDS providers can provide potential adopters with some services based on a flat rate that is similar to the fee structure of the stationary Internet, as a flat rate may help them form positive perceptions about MDS. In terms of quality value, MDS practitioners should launch useful and highly personalized services to help potential adopters perform their tasks with little effort.

Second, MDS acceptance is largely explained by social value, implying that this value is a salient factor in deciding whether to adopt MDS. MDS provides users with highly developed mobile services such as mobile banking service, mobile knowledge search service, and digital mobile broadcasting. The use of these services should be shown to enhance their social image. Consumer behavior research has suggested that many new users tend to choose novel products or services in order to gain status by differentiating oneself from others. Hong and Tam (2006) also consider services that help users establish their uniqueness as the major source of MDS revenues. The continuous introduction of new services that improves the status of users is likely to be highly associated with MDS success. Thus, MDS practitioners can attempt to leverage this aspect of MDS adoption behavior.

The perceptions of value were found to be more strongly affected by social influences than by secondary source influences. Recently, individuals have been able to interact with their relevant others easily through social network services and instant messaging services. In addition, they can search for a variety of information through knowledge search services such as Yahoo Answers and Naver Knowledge In. MDS practitioners can work to enhance the potential adopter perceptions of value through several communication channels and via electronic word of mouth, using these types of social network services as well as online advertisements. Due to the salient effect of communication with the relevant others, these strategies provide various benefits to MDS providers that can result from positive word-of-mouth communication. Examples are reductions of marketing costs and a growth in per-user revenue.

## 7 CONCLUSIONS AND LIMITATIONS

This study proposes a theoretical framework based on the three criteria -utilitarian value, hedonic value, and social value- which are all regarded as key drivers in the marketing and IS disciplines. Relevant others and mass media are considered as the major sources of information through which potential adopters can encounter messages or information about MDS. Additionally, this study observes the moderating role of age and gender that factor into adoption decision processes. The proposed model was empirically tested using survey data from 287 potential adopters, and the data was analyzed using PLS. The value perspective contributes to the development of a comprehensive understanding of MDS acceptance. Interpersonal and external sources' influences are justified by their consistent predictive power in forming perceptions of value that can be obtained from MDS.

This study has some limitations. First, it involves a type of snapshot research, as this study may not fully capture the dynamics of adoption decision processes regarding MDS as these dynamics change with time. Although the value perspective derived in this paper was considered in the adoption stage, the research framework can be applied at the stages of post-adoption. Further research should examine how the key factors of the value perspective evolve temporally from longitudinal perspectives. Second, the results of this study should be interpreted carefully, given that data collection in this study is

geographically limited to Korea. Therefore, further study is necessary to replicate the findings through data from several countries to allow for the generalization of the results.

## Appendix A.

Constructs	Item	Question Items	Source
Adoption Intention	ADI1	I intend to use MDS in the future.	Davis (1989)
	ADI2	I expect that I would use MDS in the future.	
	ADI3	I plan to use MDS in the future.	
Utilitarian Value	UTV1	Compared to the fee I need to pay, the use of MDS would offer a good value for the money.	Sirdeshmukh et al. (2002)
	UTV2	Compared to the effort I need to put in, the use of MDS would be beneficial to me.	
	UTV3	Compared to the time I need to spend, the use of MDS would be worthwhile to me.	
	UTV4	Overall, the use of MDS would deliver me good value.	
Hedonic Value	HEV1	MDS would be ones that I enjoy.	Sweeney and Soutar (2001)
	HEV2	MDS would make me want to use them.	
	HEV3	MDS would be ones that I feel relaxed about using.	
	HEV4	The use of MDS would make me feel good.	
Social Value	SOV1	The use of MDS would make people hold me in high regard.	Perse (1990)
	SOV2	The use of MDS would enhance the image that others would have of me.	
	SOV3	The use of MDS would help me to show others who I am.	
	SOV4	The use of MDS would make a good impression on other people.	
Social Influences	SOI1	People who are important to me would want me to use MDS.	Mathieson (1991)
	SOI2	People who influence my behavior would think that I should use MDS.	
	SOI3	I would use MDS due to the recommendations of relevant others.	
Secondary Source Influences	SSI1	Information from mass media would suggest that I should use MDS.	Brown and Venkatesh (2005)
	SSI2	Information that I gather by mass media would encourage me to use MDS.	
	SSI3	Based on what I have heard or seen on mass media, I am encouraged to use MDS.	

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