

# The Structure of Compatibility Beliefs In Mobile Entertainment Service Adoption

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## Abstract

Noting that compatibility beliefs are important antecedents of technology adoption, the objective of this study was to assess compatibility beliefs that affect users' intention to adopt a mobile entertainment service (MES). We developed a set of key compatibility beliefs: compatibility with life-style, compatibility with social meaning, and compatibility with past flow experiences. We then defined the key dimensions of each construct and developed operational measures for those dimensions. We tested the theorized effects of each of the compatibility constructs on MES adoption. The results support the effects of compatibility beliefs on users' intentions to adopt MES.

Keywords : Compatibility, Technology Adoption, Mobile Entertainment Service, Life-style, Social Meaning, Flow Experience

## 1. Introduction

In recent years, the use of mobile phones has moved beyond point-to-point voice communications to a variety of content services. Among these mobile content services—communication, information, entertainment, and commerce services—entertainment services are currently the dominant driver of data traffic. Many nations consider this converging market of entertainment and mobile telecommunication industries over mobile networks to be a new driver of national growth [KIPA, 2005]. For example, South Korea, which is now known as the most successful country in terms of the commercialization of mobile networks, is making great efforts toward locally developing entertainment-related products such as mobile games, mobile music including ringtones, mp3, and ringback and mobile movies, including VOD (Video On Demand), and mobile broadcasting.

Against this background, the mobile entertainment market is generally characterized by great uncertainty regarding consumer demand [Lee and Chan-Olmsted, 2006]. Despite growing enthusiasm and hopes for growth, adopters of entertainment services continue to comprise a negligible segment of mobile subscribers overall, and profitability currently poses an important challenge in this market [Ankeny, 2009; Dredge, 2009]. Therefore, in mobile entertainment service business, (1) understanding what compelled the customers to adopt the service and (2) making customers return repeatedly to the service repeatedly is crucial to increasing business value. A key to our understanding of MES adoption is the identification

and assessment of preconditions necessary for the adoption of MES.

Mobile phones are the most commonly used devices for the adoption of mobile entertainment content services. Owing to the personal nature and ‘intimacy’ inherent to the mobile phone, consumers tend to view the mobile channel as a pathway to self-definition, rather than a substitute for traditional channels such as PCs [Evers and Skillen, 2007; Nohira and Leestma, 2001]. Using mobile phones, consumers can express their most personal life desires and interests, a process essential to the fulfillment of one’s identity [Chae and Kim, 2003]. As an illustration of this, solo artist Rob Thomas, quoted at Billboard’s Mobile Entertainment Live event, asserted that his mobile audiences were characterized commonly by the terms ‘playful’ and ‘contemporary’ [Tunzi, 2009].

In addition to the lifestyle accessory aspect of mobile phones, understanding the original functionality of mobile phones is also crucial to the diffusion of MES. Mobile phones that can download entertainment content are, first and foremost, communication devices. Because this communication is frequently conducted in public spaces and requires collective effort, the diffusion of MES is related particularly to social meaning. The emerging mobile society, in general, is described not as merely something that is imposed on people, but as something that people do and produce themselves via everyday social practice and interaction [Moisander and Eriksson, 2006]. Thus, variations in the cultural weave of the mobile society can result in the formation of various consumer identities and provide different wants, desires, and values meaningful to fulfilling those identities.

Forrester Research has determined that Hispanics and African-Americans are more likely than Caucasian-Americans to purchase services, such as downloading ring tones [Laurel, 2004]. These different cultural consumptions of MES constitute a new phenomenon, that might be referred to as “cultural economy” [Du Day, 2004].

Previous studies clearly suggest that the adoption of Mobile Entertainment Services (MES) can be influenced by preconditions such as personal lifestyles and socially constructed meaning. However, these studies ultimately must be regarded as somewhat limited. These MES adoption studies do not provide a comprehensive framework based on a theoretical foundation. Therefore, we remain uncertain as to whether those studies were capable of comprehensively covering all of the important preconditions. The majority of previous MES studies have failed to provide empirical evidence to validate their arguments. Therefore, it remains unclear as to whether their arguments are actually relevant to MES adoption.

Within the IS literature, the preconditions for technology adoption are broadly described as “compatibility” [Karahanna et al., 2006; Hsu and Lu, 2004; Moore and Benbasat, 1991]. Although these studies recognize individual’s compatibility beliefs regarding technology as important to technology adoption, the development of a valid and reliable instrument to measure the compatibility beliefs in MES adoption has yet to be developed. The principal objective of this research was to provide definitional and empirical context for the evaluation of key compatibility beliefs that directly affect the decision to adopt MES. On the basis of previous theoretical and empirical

work, we conceptualized each compatibility belief as a multidimensional construct. We defined the key dimensions of each construct and developed operational measures for those dimensions. We then validated the operational measures, tested the second-order structures of each compatibility construct, and discussed the theoretical effects of each compatibility construct on MES adoption.

This study is important not only because compatibility beliefs affect technology adoption, but also because the results of this study should prove valuable to researchers and service providers alike. The definitional structure of compatibility beliefs provided in this study offers us useful insights not only in terms of theory, but also with regard to the operationalization and empirical testing of key relationships. The service providers implementing the service, given the findings of this research, should be encouraged to focus more deeply on compatibility beliefs, and to determine the manner in which their service strategy can embody compatibility beliefs to increase congruence with potential adopters.

## 2. Theoretical Background

On the basis of Fishbein and Ajzen’s Theory of Reasoned Action (TRA), a variety of TAM models posit that the technology adoption decision (i.e. individual’s intention to use the technology) is most accurately predicted by an individual’s attitude toward the use of the technology [Kim and Moon, 2007; Hahm et al., 2006; Legris et al., 2002; Agarwal and Karahanna, 2000; Mathieson, 1991; Fishbein and Ajze, 1975]. Although a variety of TAM models utilize different constructs as

the antecedents of attitude, there is a consensus among them that attitude is determined by individual beliefs. Although some previous studies have focused on perceived usefulness and perceived ease of use, they have generally neglected compatibility constructs. Individual's compatibility beliefs about IT significantly influence attitudes and use behavior [Karahanna, 2006]. Karahanna [2006] previously wrote that compatibility is an important belief in regard to technology acceptance behavior.

The earliest study of compatibility was conducted by Rogers, who defined compatibility belief as the degree of consistency of using an innovation with the existing sociocultural values and beliefs, past and present experiences, and needs of potential adopters [Rogers, 1962]. Although Moore and Benbasat [1991] adopted Rogers' definition for instrument development, Tornatzky and Klein [1982] adopted a critical view of this traditional and broad definition, and separated this concept into two types of compatibility: namely, value compatibility and practical compatibility. Whereas value compatibility refers to the fitness of the innovation with the values and norms of the potential adopters, practical compatibility refers to the fitness of the innovation with what people actually do [Tornatzky and Klein, 1982].

In an recent extension of the views of Rogers [1983] and Tornatzky and Klein [1982], Karahanna et al. [2006] further disaggregated compatibility into four distinct constructs: compatibility with values, compatibility with prior experiences, compatibility with existing work practices, and compatibility with preferred work style. Although compatibility with values refers to the way tech-

nology fits with an individual's value system, compatibility with prior experience refers to the individual's prior encounters with technology. Although compatibility with existing work practices is defined as the reality an individual is currently experiencing, compatibility with preferred work style is defined as an individual's self-concept about the way they prefer to work.

Although the work of Karahanna et al. [2006] is recent and rigorous with four distinct compatibilities, the empirical validation of the measure was only limited in its ability to assess the compatibility with organizations and information systems. Unlike the problem solving technologies found in the organizational context, the diffusion of innovative products and services in the mobile channel is clearly related to social meaning. Noting the importance of social dimension in innovation adoption, Davis [1989] has pointed out that the higher the compatibility of an innovation with the potential adopter's socio-cultural value is, the less uncertainty will be perceived by the potential adopters.

Moreover, mobile entertainment services are voluntarily adopted rather than institutionally, and utilized for personal purposes, such as 'killing time'; thus, measuring compatibility with preferred work styles or existing work practices in the study of Karahanna et al. [2006] will be unnecessary. MES adoption is primarily a lifestyle-based decision. In this regard, the analysis of compatibility beliefs necessitates the addition of a consumer psychology perspective, in addition to the social and personal psychology viewpoints utilized in previous research. This justifies the need for our study and makes our study different

from the compatibility research conducted in an organizational context.

In the study of Karahanna et al. [2006], a direct linkage was found to exist between compatibility beliefs and other technology acceptance beliefs in studies of TAM, such as perceived usefulness and ease of use. As opposed to their theoretical models, the perceived usefulness factor was exempted because mobile entertainment services are primarily adopted for entertainment purposes and the possibility of compounding between the definitions of compatibility and perceived usefulness [Karahanna et al., 2006]. We also recognize ease of use as an aspect of compatibility belief that facilitates or constrains technology adoption. Owing to the potential for compounding between these technology acceptance beliefs and compatibility beliefs, we recognize that we must establish the definitional structure of compatibility beliefs in relation to MES adoption, as opposed to focusing on theoretical linkages between compatibility beliefs and technology acceptance beliefs in TAM.

### 3. The Structure of Compatibility Beliefs

Our theory and analysis are predicated on three broad frameworks—self identification, social information processing, and salience of past behavior. From the perspective of self-identification, an individual adopts products or services because he or she is concerned with defining himself or herself in relation to them. The terms ‘self,’ ‘sense of self,’ and ‘identity’ are employed as synonyms for a person’s subjective perception of who he or she is [Belk, 1988]. Among many types of identities—including gender, political, and

life-style identities—life-style identity is associated particularly with the individual’s attitudes toward consumption, and is utilized in a broad range of marketing decisions for the prediction of consumer behavior [Ahuvia, 2005; Wells, 1975]. Defined as the individual’s self-concept as to the kind of life he or she wishes to lead, life-style is expressed not only by consumer’s interests, opinions, values about life [Nelson, 1969; Demby, 1971; Nelson, 1971A; Nelson, 1971B; Plummer, 1971; Plummer, 1971~1972; Pernica, 1974] but also by the individual’s aspiration to transform the self into some new desired form [Ahuvia, 2005]. Within the framework of self-identification, an individual perceiving his or her life-style as being compatible with MES is most likely to adopt MES. For that person, the adoption of MES can be considered a process of self-identification.

Within the social information processing framework, individual attitudes and behaviors are viewed as functions of information from the social environment. In the study of communication media use behavior in organizations, social information processing theory is utilized to assess the manner in which social information influences individual’s attitudes toward communication media and media use behavior in organizations [Fulk et al., 1987]. Perceptions of communication media such as face-to-face, telephone, and written channels, were shown to be affected by social cues from coworkers’ attitudes and actual media use behavior. Similarly, in a study done in organizational context, worker’s job attitude were found to be constructed through coworkers’ overt statements, attitudes, and behaviors [Salancik and

Pfeffer, 1978]. Within social information processing perspective, the acceptance of MES is based on social meaning that is defined as social perception about meaningful and justifiable behavior [Fulk et al., 1987]. That is, an individual perceiving social meaning is compatible with MES, he or she adopts MES.

In the salience theory of behavior, salience is defined as “a property of stimulus, or of previous experiences associated with a stimulus, that causes an organism to focus its attention toward that stimulus [Rumbaugh, 2007].” Reliably paired stimuli in time or space, or both, attract a subject’s attention [Lou, 2006] and establish associations among the stimuli. Rumbaugh et al. [2007] coined the term, ‘temporal and spacial contiguity of stimuli’, to describe the effective arrangement of stimuli that determines the probability of attention-attracting and entailed associations. In the relevant literature concerning management, salience theory holds that individual attitudes toward action are determined, in part, by information about past behavior that is salient at the time at which the attitude is generated [Freedman and Fraser, 1996; Bem, 1972; Pliner et al., 1974; Reingen and Kernan, 1977; Scott, 1976; Tybout and Yalch, 1980]. Tybout and Yalch [1980] were specifically referring to the notion that information about past behavior guides future action “only to the extent that they are highly available or easily retrieved as a function of recent processing (p. 407).” That is, the most salient cues are likely to serve as a basis for subsequent behavior.

Similarly, in the relevant IS literature, the personal innovativeness construct specifically addresses the notion that individual attitudes toward

technology use can be predicted by their past experiences with the technology. Individuals are described as innovative if they are early adopters of an innovation [Rogers and Shoemaker, 1971; Agarwal and Prasad, 1988], and personal innovativeness was proposed to affect technology acceptance behavior through its relationships with perceptions of the innovation. Another construct that is frequently cited to describe past experiences with technology is the flow construct [Csikszentmihalyi, 1977]. According to Csikszentmihalyi [1977], flow is “the process of optimal experience.” In the flow state, people become so absorbed in their activity that their awareness narrows to the activity itself, and the individual loses self-consciousness. In an empirical study conducted by Csikszentmihalyi [1977], the flow state was identified as a significant predictor of technology use. Flow experiences with a target technology are considered predictive of the use of the target technology [Agarwal and Karahanna, 2000]. Both personal innovativeness and flow constructs collectively affirm the critical function performed by past experiences in shaping individual attitudes and behaviors toward the information technology. However, considering that the personal innovativeness construct has been criticized as having little predictive power in specific innovations such as IT, owing to the fact that it covers a broad spectrum of innovation [Goldsmith and Hofacker, 1991; Agarwal and Prasad, 1998; Legris et al., 2002], this study adopts an individual’s past flow experiences as a predictor of his or her MES adoption behavior. One who perceives oneself to have achieved flow experiences in the past using innovative devices and

services is likely to adopt MES.

Together, the perspectives of self-identification, social information processing, and the salience of past behavior provide a useful theoretical foundation for the grouping of potential compatibility factors of MES adoption into three dimensions - compatibility with life-style, compatibility with social meaning, and compatibility with past flow experiences. The following sections further develop the content and theoretical grounding of these dimensions.

### 3.1 Compatibility with Life-style

Holt [1997] demonstrated that life-style encompasses not only the types of activities or things that are loved, but also the economic thresholds (i.e. frugality) associated with those activities or things. In that study, life-style consumption was posited as an additive phenomenon and was framed as consisting of (1) ends-itself focus versus (2) means-ends focus. Ends-itself consumption occurs when "some consumption experience is appreciated as an end in itself-for its own sake-as self-justifying [Holbrook, 1996]". Means-ends consumption relates to "extrinsic value (that) pertains to a means-ends relationship wherein consumption is prized based on a comparison of performance with expectations [Holbrook, 1996]." Whereas ends-itself consumption is associated with inherent satisfaction derived from products and services [Vallerand, 1997; Webster, 1992], means-ends consumption is associated with satisfaction on the basis of a comparison of performance with expectations [Holbrook, 1996]. Adopting Holbrook's metaphor, this study

holds that the compatibility of lifestyle consists of two dimensions: (1) pleasure focus and (2) economic-value focus. One advantage of this is that it frames consumption as a continuous variable. Rather than something simply being pleasure-focused or economic-value focused, consumptions range from intensely pleasure-focused, to marginally pleasure-focused, to intensely economic-value focus.

**Pleasure Focus** Lifestyle with pleasure focus is defined as self-concept with regard to the type of life one wishes to lead, based on pleasure. Lifestyle with pleasure focus is generally represented in the form: 'I like'. For example, the life-style of shotgun ammunition users is expressed in phrases such as 'I like hunting' and 'I like to go camping' [Wells, 1975]. Lifestyle with pleasure focus is related to the inherent satisfaction derived from a specific activity [Vallerand, 1997]. The performance of the activities an individual loves is considered to extend and strengthen their sense of identity [Ahuvia, 2005; Belk, 1988] and is linked to key events and episodes in his or her life [Ahuvia, 2005]. For example, in Ahuvia's paper [2005], the love of Cindy for her love of cooking with exotic ingredients is associated with practical creativity and functionality derived from her upbringing on a Nebraska ranch and with aesthetic creativity based on a trendy upscale urban professional lifestyle at the present time.

**Economic-value Focus** Lifestyle with economic-value focus is defined as the individual's self-concept regarding the type of life he or she wishes to lead, on the basis of economic value. The value of services or products is considered to be perceived differently by different individuals.

Consumers make decisions on the basis of their perceived value of the products or services offered. As indicated by the statement, "I am willing to take a little longer to get the same end if it will cost us less money. (p. 87, [Lastovicka et al., 1999])", the individual's cost-consciousness and frugality are regarded as lifestyle criteria. In an example of the product-specific lifestyle profile by Young [1973] of the Ford Pinto, the potential Pinto buyers' lifestyle profile is represented by statements such as "I am more practical in car selection" [Wells, 1975]. In accordance with the results of the study, the Pinto is branded as an economical means of transportation, carrying with it images of economy and practicality.

### 3.2 Compatibility with Social Meaning

The compatibility of social meaning sets bounds to two dimensions: (1) social norms and (2) perceived critical mass. Whereas social norms involve expectations as to what behavior is appropriate within a given group [Fulk, 1993], perceived critical mass refers to the perceived number of people required to trigger a phenomenon [Li et al., 2005].

**Social Norms** From the perspective of social psychology, an individual inherits a set of norms by being part of a given society or group [Fulk, 1993]. Social norms are defined as the rules used by a group with regard to appropriate and inappropriate values, beliefs, attitudes, and behaviors. These rules may be either explicit or implicit. Although failure to comply with the rules can result in severe punishments such as isolation from the group, compliance with the rules results

in rewards, most notably including acceptance and popularity within a particular group [Hexmoor, 2006].

Studies of innovation diffusion have suggested that user adoption decisions are affected by social norms beyond an individual's decision style and the characteristics of the IT. When the adoption of innovation is perceived as compliant with the rules, the intention to engage in this particular action will accordingly increase. Hsu and Lu [2004] have suggested that social norms exert a direct impact on the adoption of online games, as users tend to feel obligated to participate because they wish to belong to a community. Lee [2005] also suggested that Koreans' adoption of ICT (Information Communication Technology) has social normative implications. Taylor and Todd [1995] and Venkatesh [2000] detected a significant effect of social norms on behavioral intentions. The benefits of innovation adoption include the enhancement of one's image or status in one's relevant social system.

**Perceived Critical Mass** Oliver et al. [1985] defined critical mass as "a small segment of the population that chooses to make big contributions to the collective action" (p. 524). As a number of people adopt the innovation, the innovation is perceived as having more value. The intention to engage in this particular action will accordingly increase. That is, the value of technology to a user is considered to be increased when the number of its adopters increases [Hsu and Lu, 2004]. In previous research, perceived critical mass has been shown to be related positively to behavioral intentions to adopt communication technology. In the study of interactive media in information



and communication technologies, a critical mass of users is considered to be associated with the effective use of interactive media [Markus, 1987; Kraut et al., 1998; Li et al., 2005]. Similarly, in the context of organizational innovation adoption, the rationalization of individuals' behavior is constrained not only by what others think, but also by the perceived number of users in the social environment [Nelson, 1971].

### 3.3 Compatibility with Past Flow Experience

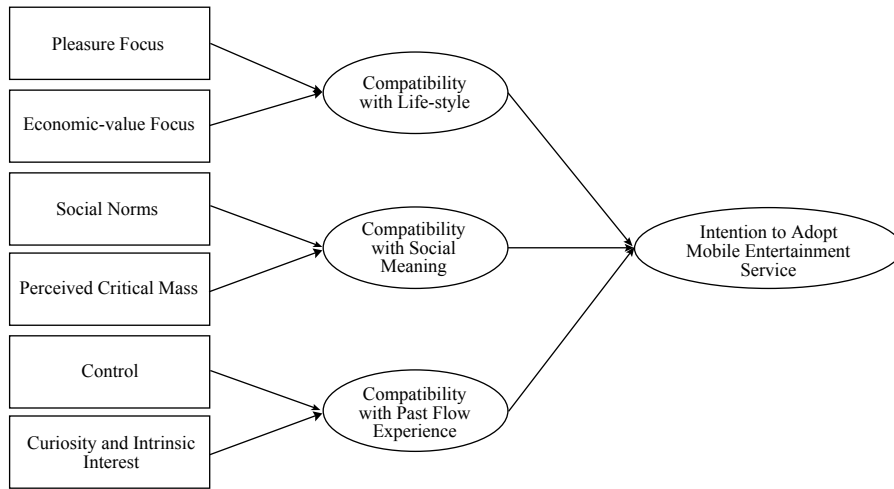
Building upon the results reported by Trevino and Webster [Trevino and Webster, 1992] and Webster et al. [1993], we conceptualize flow as a two-dimensional construct composed of: (1) control and (2) a combination of curiosity and intrinsic interest. In accordance with the suggestions of Webster et al. [1993], curiosity and intrinsic interest are treated as one dimension. Flow is viewed as formative in nature, with each first-order dimension representing an aspect of flow. Tan and Chou [2008] have suggested that the multi-dimensional construct indicates that the first-order dimensions "must be examined cumulatively instead of being treated as isolated functionalities" (p. 660).

**Control** The control dimension captures the individual's perception that he or she exercises control over the interaction with hardware and software [Trevino and Webster, 1992; Webster et al., 1993; Hoffman and Novak, 1996; Agarwal and Karahanna, 2000]. Control indicates a balance between the skills and challenges inherent to the interaction [Csikszentmihalyi, 1977; Holt, 1997]. When the skills of individuals are balanced with

the challenges they encounter while interacting with hardware and software, the attention becomes both ordered and fully invested. As a consequence of this, a person in a state of flow is focused completely. In this study, we noted that past experiences with being skillful and being able to cope with challenges in interaction with electronic devices (such as computer, PDA, and mobile phone) and innovative services (such as e-learning, mobile commerce, and internet shopping), could affect the intention to adopt MES.

**Curiosity and Intrinsic Interest** In addition to control, a combination of curiosity and intrinsic interest is regarded as an important dimension of the flow experience [Trevino and Webster, 1992; Webster et al., 1993; Hoffman and Novak, 1996; Agarwal and Karahanna, 2000]. While curiosity refers to a heightened arousal of sensory or cognitive curiosity, intrinsic interests involve the individual's perceptions that hardware and software are intrinsically interesting and enjoyable [Deci, 1975; Trevino and Webster, 1992; Csikszentmihalyi and Csikszentmihalyi, 1998]. Curiosity and intrinsic interests are generally associated with intrinsic motivation. As opposed to extrinsic motivation, which entails the performance of an activity for external rewards, intrinsic motivation involves the performance of an activity for no apparent reward beyond the activity itself [Csikszentmihalyi, 1990; Shappard, 1998]. In this study, we noted that past experiences with curiosity and intrinsic interest in using electronic devices and innovative services could affect the intention to adopt MES.

As illustrated in <Figure 1>, a synthesis of the previous discussion indicates that the in-



〈Figure 1〉 Research Model

tention to adopt MES may be influenced by three key compatibility beliefs. Each compatibility belief is defined as a multidimensional construct.

## 4. Research Methodology and Results

### 4.1 Sample and Data Collection

The study was conducted in South Korea, a country that is well-known for its development of mobile internet services. The questionnaires were distributed to a convenience sample consisting of South Korean college students and working adults. 170 questionnaires were given to college students from two different schools, including undergraduate and graduate students. 135 questionnaires were returned, 131 of which were ultimately considered usable for analysis. 147 questionnaires were given to working adults from a variety of industries, who held different positions in their companies. 138 of these were considered usable for analysis. A total of 269 questionnaires were utilized for this study. <Table 1> presents

a profile of the respondents.

The demographic characteristics of the sample are highlighted in <Table 1>. The majority (65.7%) of the sample is between the ages of 19~30, and 52.1% of the sample population was male. 70.2% of the sample population was highly educated (Bachelor's or Master's degree).

### 4.2 Measures

Churchill [1999] suggested that previous research suffered from obvious deficiencies and was insufficient to address the interested constructs; thus, he asserted, it was necessary to create more meaningful measures. Owing to the lack of empirical investigations into the subject of mobile entertainment services, the item measures were largely adapted from theoretical statements provided in the literature for the purposes of this study. First, existing variables measuring compatibility were reviewed to fit the characteristics of MES. Second, an initial set of items was constructed for three dimensions of compatibility.

〈Table 1〉 Sample Characteristics

	Frequency	Percent (%)
<b>Gender</b>		
Male	140	52.1
Female	129	47.9
<b>Age</b>		
19~24	84	31.2
25~30	93	34.5
31~40	57	21.1
41~50	25	9.2
Over 51	10	3.7
<b>Education</b>		
High school graduate	80	29.7
Bachelor's degree	116	43.1
Graduate degree	73	27.1
<b>Experience in MES use</b>		
No experience	91	33.8
Under 3 months	42	15.6
3 months - 1/2 year	37	13.7
1/2 year - 1year	36	13.3
Over 1 year	63	23.4
<b>Expenditure for cell phone use per month</b>		
Under 20,000 Won	11	4.0
₩20,000 ~ ₩40,000	64	23.8
₩40,000 ~ ₩60,000	107	39.7
₩60,000 ~ ₩80,000	60	22.3
₩80,000 ~ ₩100,000	16	5.9
Over 100,000 Won	11	4.0

USD \$1 = ₩975.70; EUR 1 = ₩1546.29 in April 2008.

These items were reviewed by experts in the field of study to determine whether each item captures the intended dimensions. The items were then modified to fit the conceptual definition of each of the dimensions.

The scales used to measure the pleasure focus dimension of lifestyle were reconstructed on the basis of Rogers [1983]'s study on compatibility;

Hsu et al. [2007]'s study regarding the compatibility of the service with adopters' values and lifestyles in the domain of multimedia message service; and Karahanna et al. [2006]'s study on compatibility with values and beliefs. Two items were developed to capture the economic-value focus dimension of lifestyle compatibility by modifying Roger [1983]'s measure of compatibility with sociocultural values and beliefs.

The items used to measure the social norms and perceived critical mass were based on the studies of Rogers [1983], Hsu and Lu [2004], and Moore and Benbasat [1991]. Because MES is utilized principally for entertainment purposes rather than to obtain benefits in working environments, the statements in previous studies were either modified or dropped to fit the objectives of this study.

Scales for the measurement of compatibility with past flow experience were primarily adapted from previous studies. Among four items used to measure the control dimension, two items measuring 'being easy to remember' were constructed in accordance with the recommendations of Moore and Benbasat [1991]; and two items measuring 'being able to cope with the challenge' were added from Csikszentmihalyi's study [1977]. Among four items measuring curiosity and intrinsic interest, two items measuring intrinsic interest were based on the studies of Csikszentmihalyi and Csikszentmihalyi [1988] and Trevino and Webster [2000]. The remaining two items used to measure curiosity were based on the study conducted by Trevino and Webster [1992].

The items measuring behavioral intention to

adopt MES were primarily adapted from the innovation adoption studies of Roger [1962], Moore and Benbasat [1991], Agarwal and Karahanna [2000], and Hsu and Lu [2004]. The items were then modified to conform to the context of mobile services. Items regarding the perception of the service, future intention to adopt, and willingness to recommend have been utilized to assess the aspects of intention.

In order to determine whether each of the items captured the intended dimensions, the items were reviewed by six experts in the relevant field of study—two from academia, and four from the mobile industry. Professors in the Marketing and MIS departments attempted to determine whether each of the statements captured the intended dimensions. The wordings of the statements and the format of the questionnaire were revised on the basis of the comments. Then, in order to ensure that the questionnaire conformed to the context of mobile entertainment services, four experts working for mobile handset manufacturers and mobile content developers were brought in for the pre-test. They were instructed to provide their advice as to whether or not the items were relevant to the industry and how the statements might be improved. On the basis of the comments, the items were modified.

Multiple-item measures were utilized for all the variables, in order to improve the reliability and validity of the measures. Multiple-item measures are generally thought to enhance confidence that the constructs of interest are being accurately assessed, thus rendering the measurement of the variable more consistent. All items were measured using a five-point Likert scale,

ranging from “strongly disagree” (1) to “strongly agree” (5) that provides the advantage of standardizing and quantifying the relative effects. The specific items for each dimension are provided in the appendix.

#### 4.3 Checks for Statistical Assumptions

Multivariate normality is a statistical assumption of confirmatory factor modeling that requires testing. Owing to the difficulty of assessing multivariate normality, Bollen [1989] recommended that univariate normality be tested among the variables instead. Thus, we evaluated the moments around the mean of each variate’s distribution to test univariate normality among variables. Our results revealed no serious departures in univariate normality among the variables. Model identification is another assumption of confirmatory factor modeling. AMOS is used as a simple test for identification during the estimation process, and alerts the user of possible identification problems. We experienced no such warnings, which can be considered strong evidence of model identification.

Consistent with the two-step approach advocated by Anderson and Gerbing [1998], we estimated a measurement model prior to examining the structural model relationships. We utilized AMOS 5.0 with covariances as the input for the estimation of the model.

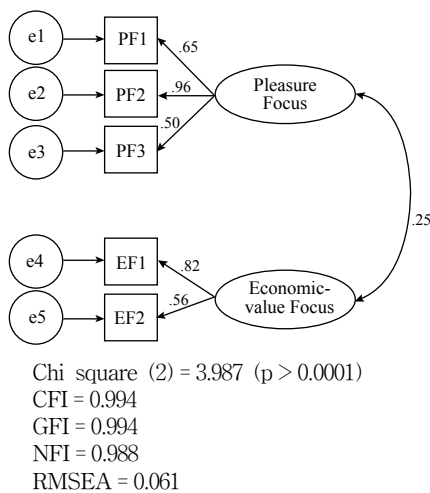
#### 4.4 Measurement Validation

In order to evaluate the strength of measurement between the items and associated constructs, four measurement models are estimated:

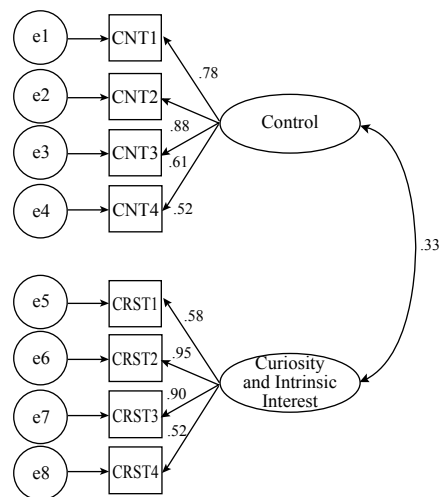
(1) a measurement model of compatibility with lifestyle <Figure 2>, (2) a measurement model of compatibility with social meaning <Figure 3>, (3) a measurement model of compatibility with past flow experience <Figure 4>, and (4) a measurement model of intention to adopt <Figure 5>.

The first model evaluates the convergent and

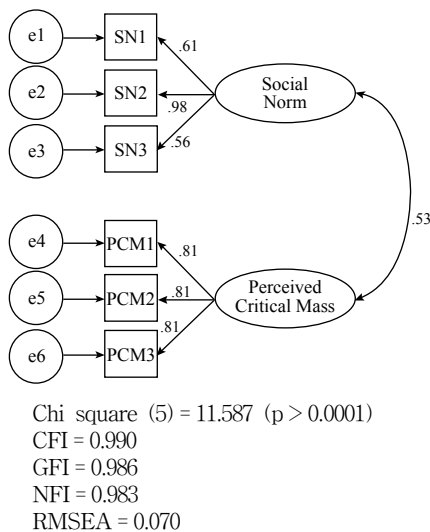
discriminant validity of the 5 survey questions for compatibility with lifestyle. As is shown in <Figure 2>, the model clearly indicates that the questions were categorized into two groups - pleasure focus and economic-value focus. The comparative fit index (CFI), goodness-of-fit index (GFI), normed-fit index (NFI), and root mean square error of approximation (RMSEA) values



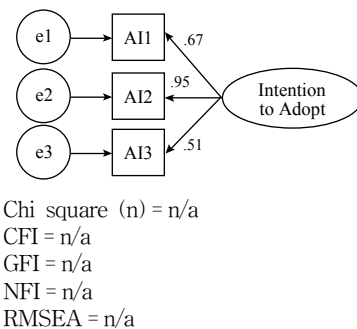
<Figure 2> A Measurement Model of Compatibility with Life-Style



<Figure 4> A Measurement Model of Compatibility with Past Flow Experience



<Figure 3> A Measurement Model of Compatibility with Social Meaning



<Figure 5> A Measurement Model of Intention to Adopt

were .994, .994, .988, and .061 respectively. Considered collectively, the indices of the measurement model appear to evidence a reasonable fit [Kar, 1996]. The estimated correlation between pleasure focus and economic-value focus is below the suggested cutoff of 0.90 [Bagozzi, 1980; Fornell, C. and Larcker, 1981; Bagozzi and Founell, 1982; Fornell and Bookstein, 1982], which implies distinctness in construct content or discriminant validity.

The second model evaluates the convergent and discriminant validity of the 6 survey questions for compatibility with social meaning. As shown in <Figure 3>, the model clearly demonstrates that the questions were categorized into two groups—social norm and perceived critical mass. Similar to the previous model, the fit indices are quite high and suggest good model fit. The estimated correlation between the social norm and perceived critical mass is below the suggested cutoff of 0.90 [Bagozzi, 1980; Fornell, C. and Larcker, 1981; Bagozzi and Founell, 1982; Fornell, C. and Bookstein, 1982], which implies distinctness in construct content or discriminant validity.

The third model evaluates the convergent and discriminant validity of the 8 survey questions used to assess compatibility with past flow experience. As shown in <Figure 4>, the model clearly reveals that the questions were categorized into two groups - control and curiosity and intrinsic interest. The comparative fit index (CFI), goodness-of-fit index (GFI), normed-fit index (NFI), and root mean square error of approximation (RMSEA) values were .984, .975, .965, and .054, respectively, indicating that the measurement model fits the data well. Although the

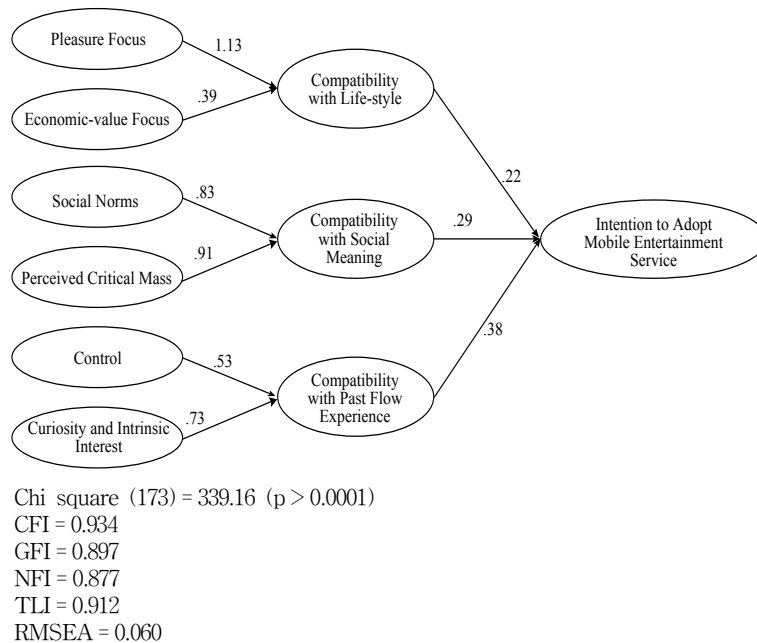
chi-square index is significant ( $\chi^2 = 28.381$ ,  $p > .01$ ), the model evidences sufficient validity to warrant further analysis. Importantly, the estimated correlation between the control and the curiosity and intrinsic interest implies distinctness in construct content or discriminant validity.

The fourth model evaluates the convergent and discriminant validity of the 3 survey questions for intention to adopt. As shown in <Figure 5>, this model has 1 degree of freedom, which indicates that the model is not appropriate for the calculation of the fit index. However, the results of confirmatory factor analysis demonstrate the high loadings of each item.

#### 4.5 Assessment of the Structural Equation Model

As theorized, distinct causal paths from the three types of compatibility predict alternative outcomes with regard to intention to adopt MES. As shown in <Figure 6>, the hypothesized model appears to provide a reasonable fit. The observed chi-square index is significant ( $\chi^2_{173} = 339.16$ ,  $p < .01$ ) and the associated fit indices exceed the levels recommended. Additionally, the path coefficients of the estimated model support the theorized relationships of <Figure 1> in direction and magnitude.

Particularly strong links of the model in <Figure 6> include the paths between the measured social norm and perceived critical mass and their formative, unobserved construct of social meaning. The results imply that social meaning is an additive phenomenon, in accordance with our expectations. These results are mirrored by the loading patterns between the unobserved di-



<Figure 6> A Structural Model of Intention to Adopt MES

mension of lifestyle and its measured dimensions of pleasure-focus and economic-value focus; as well as the pattern of loadings between the unobserved dimension of past flow experience and its measured dimensions of control; and curiosity and intrinsic interest.

With regard to associative order and interpretation, these formative constructs are predicted by, or are a function of, their underlying dimensions. Therefore, the construct can be interpreted as a mathematical composite of its dimensions. The underlying dimensions must be cumulatively assessed [Tan and Chou, 2008]. Importantly, no single dimension of each compatibility is adequate to describe the phenomenon. Chin and Gopal [1995] have suggested that the relative weight of each underlying dimension is reflective of its relative importance toward the higher order construct. Although, in <Figure 6>,

pleasure focus is shown to be much more weighed than economic-value focus, economic-value focus should not be ignored to define the second order construct of life-style compatibility.

As is also illustrated in <Figure 6>, the paths between the three compatibility beliefs and the intention to adopt MES are positive. Such results appear to underscore the importance of tightly aligned past flow experiences ( $\beta = 0.38$   $p < 0.01$ ), lifestyle ( $\beta = 0.22$   $p < 0.01$ ), and social meaning ( $\beta = .29$   $p < 0.01$ ) in creating conditions conducive to MES adoption. It is worth noting that the mathematical manifestation of these relationships is consistent with developed theoretical perspective outlined in the earlier sections of this paper. These results contribute to this study by providing a more precise definitional aspect of these dimensions and some insight into the magnitude of their association. The strength of item loadings,

consistency in directional path, and match to theory appear to imply strongly that the model depicted in <Figure 1> provides valid insights into the relationship between MES adoption and the three types of compatibility.

Caution should be exercised in applying the results of this study, for several reasons. First, the model should not be generalized and utilized in other mobile applications. This study focused primarily on mobile entertainment services. As other mobile applications evidence different features, the findings of this study should not be used to attempt to predict the compatibility of other mobile service categories.

Second, although this study focused on the compatibility dimensions from the consumer, social and personal psychology viewpoints, other technological characteristics may markedly affect the intention to adopt MES. Future research will be necessary for the incorporation of other variables into the research model.

## 5. Implications and Conclusions

Implications for both future research and practice can be derived from our findings. First, the implications for theoretical development and future research are presented below. The results of our analysis indicate that compatibility beliefs in MES adoption are complex not only in their conceptual definitions, but also in their operationalization. Via a review of prior theoretical and empirical work, we first conceptualized three distinctive compatibility beliefs and then identified the key dimensions of each of the compatibility constructs. Finally, we developed operational

measures for the key dimensions. In this fashion, we attempted to avoid the underoperationalization of variables associated with complex compatibility beliefs. The item measures developed herein were found to be both reliable and valid, and should provide useful tools for further inquiries into the compatibility perspective of technology adoption. For example, there is a general notion that while in collective cultures individual behavior is driven by social norms more than individual factors, and in individualistic cultures individual behavior is based more on individual factors than on social norms. In future research, examinations of discriminant functions across countries, ethnic groups, gender, and even age should provide us with useful insights into the dynamics of compatibility beliefs and their effects on MES adoption.

In this study, we approached theoretical model development from the perspective of formative effects. The results demonstrate that compatibility is additive in nature. That is, individuals formed an overall perception of each compatibility belief on the basis of both dimensions, rather than on a single dimension. Lifestyle compatibility is the sum of pleasure focus and economic-value focus. Likewise, social meaning compatibility is an additive effect of social norms and critical mass. Past flow experience compatibility is a sum of control and curiosity and intrinsic interest. For researchers seeking to assess the existence or effect of each compatibility belief, these results imply that such measurement should consider magnitude in addition to existence. In other words, the aspects of a compatibility belief may be shown, but may not prove sufficient to completely define the compatibility. For example, an individual may



exhibit some of the characteristic signs of both pleasure-focused and economic-value focused compatibility without exhibiting the second order construct of life-style compatibility. Future research can utilize the formative perspective of modeling to establish empirical thresholds of compatibility beliefs according to gender, ethnic groups, countries, and age group.

Finally, this study has some implications for practitioners, particularly for managers who are responsible for system design and MES diffusion. Whereas the development of task-oriented applications concerns the workstyle characteristics of the users, the development of MES contents and interfaces must be based on an understanding of the lifestyles of users. For example, the lifestyles of MES adopters or potential adopters could be described as follows :

I like having a sense of community, I like cheap thrills (indicating quick tempered, shorter satisfaction span over consumptions) and I like self-expression.

These lifestyle descriptions should be reflected in system designs, including the embedding of group-oriented activities with entertainment contents, quick content changes, and offering more personalized services rather than 'one for all'.

It is also clear that compatibility with past flow experience is important to MES adoption. The usability of MES, which helps users to feel that MES is easy to understand and master, is also important to keep users returning to the service. Additionally, the use of the most appropriate design techniques

and features to create an enhanced level of intrinsic motivation among users are equally important. With regard to social meaning, design features that foster group-oriented activities to get opinion leaders to drive the adoption of the service would be expected to prove effective for the diffusion of MES. Managers also should attempt to convince potential users that MES adoption is a method by which one can earn status and respect. Such beliefs will then likely positively influence their intentions to adopt MES. Finally, design features permitting social interactions with peers by sending mobile contents to friends may also prove effective for the process of MES diffusion.

We believe that many companies launch MES without checking compatibility first to guarantee some measure of success. Compatibility can reduce the risk and uncertainty associated with adoption. Via analyses of theory and empirical testing, this research strongly bolsters the notion that firms may increase the diffusion of MES by focusing on individual's compatibility beliefs with MES.

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## <Appendix> Survey Items

### Compatibility with Life-style

#### *Pleasure Focus*

- PF1. Using MES is compatible with all aspects of my life (Rogers, 1983).
- PF2. I think that using MES fits well with the way I like to spend time (Hsu, 2007).
- PF3. Using the MES goes with what I believe mobile devices should be used for (Karahanna, 2006).

#### *Economical-Value Focus*

- EF1. The price of MES is compatible with the service provided (Rogers, 1983).
- EF2. I am less cost-conscious about the innovative services including MES (Rogers, 1983).

### Compatibility with Social Meaning

#### *Social Norms*

- SN1. Using MES improves my image within the organization (Rogers, 1983).
- SN2. Having MES is a status symbol in my peer group (Rogers, 1983).
- SN3. My friends think that I should use MES (Hsu. and Lu, 2004).

#### *Perceived Critical Mass*

- PCM1. Most people in my class/office use MES frequently (Hsu. and Lu, 2004).
- PCM2. I have seen what others do by using an MES (Moore and Benbasat, 1991).
- PCM3. MES is very visible in my peer group (Moore and Benbasat, 1991).

### Compatibility with Past Flow Experience

#### *Control*

- CNT1. It is easy for me to remember how to use innovative services (Moore and Benbasat, 1991).
- CNT2. It is easy for me to remember how to use electronic devices (Moore and Benbasat, 1991).
- CNT3. My capacity or skills can cope with the challenge of using innovative services (Csikszentmihalyi, 1997).
- CNT4. My capacity or skills can cope with the challenge of using electronic devices (Csikszentmihalyi, 1997).

#### *Curiosity and Intrinsic Interest*

- CRST1. While using innovative services, I found myself being absorbed in the service (Csikszentmihalyi and Csikszentmihalyi, 1988; Venkatesh, 2000).
- CRST2. While using electronic devices, I found myself being absorbed in the devices (Csikszentmihalyi and Csikszentmihalyi, 1988; Venkatesh, 2000).
- CRST3. I was curious when using innovative services (Trevino and Webster, 1992).
- CRST4. I was curious when using electronic devices (Trevino and Webster, 1992).

### Intention to Adopt Mobile Entertainment Service

- AI1. It is worth to adopt mobile entertainment service (MES).
- AI2. I will frequently use MES in the future.
- AI3. I will strongly recommend others to use MES.

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