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RESEARCH ARTICLE

Can we have fun @ work? The role of intrinsic motivation for utilitarian systems

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Abstract
Since the introduction of the Motivational Technology Acceptance Model in 1992, many researchers have considered both extrinsic and intrinsic motivation as antecedents of intent to use and actual use of a system. However, it has been a long-standing and largely unchallenged assumption that intrinsic motivation (i.e., fun or enjoyment) is a more dominant predictor of hedonic (fun) application use and that extrinsic motivation (i.e., usefulness) is a more dominant predictor of utilitarian (practical) application use. In this article, we probe whether system type serves as a boundary condition (i.e., moderator) for understanding an individual's interaction with information technology. Specifically, we examine whether perceived enjoyment's influence on perceived ease of use, perceived usefulness, intention, and use varies with system type. On the basis of a meta-analytic structural equation modeling analysis of 185 studies between 1992 and February 2011, our findings suggest intrinsic motivation is equally relevant for predicting intentions toward using and actual use of both hedonic and utilitarian systems. Therefore, our meta-analytic results call into question the rigidity of the assumption that system type is a 'boundary condition' for understanding individuals' interaction with information technology. The implications of these results for research and practice are discussed.
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Introduction

Rooted in general motivational theories, information systems (IS) researchers have studied motivation's influence on user acceptance of IS for almost two decades (e.g., Davis *et al*, 1992; Venkatesh *et al*, 2003). Specifically, two different types of motivation are addressed: extrinsic and intrinsic. If users perceive a system as 'instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions' (Davis *et al*, 1992, p. 1112), then their use is *extrinsically motivated*. When users interact with a system 'for no apparent reinforcement other than the process of performing the activity *per se*' (Davis *et al*, 1992, p. 1112), then their use is *intrinsically motivated*.

To better connect extrinsic and intrinsic motivation to system use, some researchers argue that the system's purpose (i.e., utilitarian or hedonic) needs to be considered (e.g., Hirschman & Holbrook, 1982; van der Heijden, 2004; Lin & Bhattacherjee, 2010). *Utilitarian systems* provide value external to the interaction between the user and system (e.g., improved performance) with a primary objective of productive use. Therefore, some researchers argue that the defining features or drivers of these types of systems should be extrinsic, practical reasons such as perceived usefulness

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(Hirschman & Holbrook, 1982; van der Heijden, 2004). In contrast, *hedonic systems* provide value internal to the interaction between the user and system, with the primary objective being a sense of fun. Therefore, the defining drivers of such systems may be intrinsic reasons such as perceived enjoyment (Hirschman & Holbrook, 1982; van der Heijden, 2004; Lin & Bhattacherjee, 2010). More recent research has suggested that there is also a third type of system, *mixed systems*. These systems have combined features from utilitarian and hedonic systems such that productive use and sense of fun can be realized simultaneously; hence, these systems may be driven by both extrinsic (usefulness) and intrinsic (enjoyment) features (Sun & Zhang, 2006).

To demonstrate that motivation's relevance varies with the system's purpose, a number of researchers have examined whether intrinsic motivation is a stronger predictor of intent to use hedonic systems than extrinsic motivation (e.g., van der Heijden, 2004; Shen & Eder, 2008; Lin & Bhattacherjee, 2010). Specifically, many of these researchers, based on results of a single study (often cross-sectional), have concluded that intrinsic motivation is a stronger determinant of intention to use hedonic systems than extrinsic motivation (van der Heijden, 2004; Shen & Eder, 2008), and extrinsic motivation is a stronger determinant of intention to use utilitarian systems than intrinsic motivation (Venkatesh *et al*, 2003). Perhaps due to its intuitive appeal, and evidence found in these empirical studies, the assumption that a system's type influences user acceptance of IS has been widely accepted in the literature.

Despite the long-standing and unchallenged assumption that a system's purpose serves as a boundary condition for the drivers of use, it is necessary to more systematically (and comprehensively) probe whether drivers of hedonic and utilitarian systems' use differ. This is important because dichotomizing systems based on their purpose may lead to ignoring relevant factors that drive use of contemporary information technologies. If one simply accepts the 'system's purpose assumption', one could reasonably focus on intrinsic explanations for hedonic system use and ignore extrinsic explanations (e.g., Okazaki *et al*, 2008; Koo, 2009; Ryu *et al*, 2009). Similarly, one could reasonably focus on extrinsic explanations for utilitarian systems and could ignore less-relevant intrinsic explanations (e.g., Lau & Woods, 2009; Lee *et al*, 2009b; Liu, 2010). However, some research has found evidence that hedonic factors can drive utilitarian system's use. For example, ostensibly utilitarian ERP systems, useful for streamlining business processes (i.e., increasing efficiency and productivity), often offer hedonic pleasure or intrinsic motivation that encourage users to engage in sustained use (King, 2005). Absent a systematic study of the interplay between intrinsic motivation and a system's purpose, this evidence suggests that researchers may leave unexamined the important intrinsic or extrinsic factors that shape users' understanding, interaction with, and use of different types of IS. In light of this observation, our study examines the following research question:

RQ: *Does the nature of the system influence intrinsic motivation's relationship with users' perceptions, intentions, and use of that system?*

We address this question by meta-analyzing existing studies of user acceptance to rigorously examine the assumption that a system's purpose serves as a boundary condition on antecedents to user acceptance and use. This article is organized as follows. We begin by providing a brief review of intrinsic motivation's use in the user acceptance literature and the relationship between system type and user acceptance. Then, we turn to describing our methodology, including criteria used for selecting research studies, our meta-analysis procedure, heuristics for our meta-analysis, and the meta-analytic structural equations modeling. Next, we present our findings. The article concludes with a discussion of limitations, contributions, and implications.

Intrinsic motivation and system use

Intrinsic motivation was first introduced into the technology adoption literature by Davis *et al* (1992). They used motivational theory to explain technology adoption (i.e., the Motivational Technology Acceptance Model or MTAM). They proposed the addition of intrinsic motivation, where extrinsic motivation was adapted from the traditional Technology Acceptance Model (TAM). Intrinsic motivation is defined as 'a behavior [that] is performed by itself, in order to experience pleasure and satisfaction inherent in the activity' (Vallerand, 1997, p. 271). Research suggests that intrinsically motivated users are more likely to find inherent satisfaction, pleasure, and enjoyment in using a system, regardless of the extrinsic benefits afforded through its use (e.g., performance, rewards, or money) (Venkatesh & Speier, 1999; Deng *et al*, 2004; Cocosila *et al*, 2007; Saade, 2007; Li & Hsieh, 2007). When intrinsically motivated, users' affect for the system drives their interaction (i.e., they use a system 'just for the sake of using it' or 'for fun'), and consequently express greater commitment to its use (Venkatesh *et al*, 2002, p. 301; Li & Hsieh, 2007; Saade, 2007); this commitment, in turn, leads to better performance outcomes than extrinsic motivation (Li & Hsieh, 2007). As such, intrinsic motivation (e.g., the 'fun' aspects of beliefs about IS) has been an often-revisited theme in user acceptance research.

Intrinsic motivation has been operationalized in many different ways. Table 1 indicates that the most common operationalization is perceived enjoyment (107 studies used this terminology, where 26 studies looked at enjoyment for mixed systems, 43 examined enjoyment in the context of utilitarian systems, and 38 considered enjoyment for hedonic systems), where a number of studies specifically indicate enjoyment is a type of intrinsic motivation (Cyr *et al*, 2006; Hong & Tam, 2006; Fuller

Table 1 Intrinsic motivation definitions

Intrinsic motivation	*Definition*	*Example operational definitions*	*References*
Intrinsic motivation ($k = 13$)	where 'a behavior is performed by itself, in order to experience pleasure and satisfaction inherent in the activity'		(Vallerand, 1997, p. 271)
Perceived enjoyment ($k = 107$)	the extent to which using the system is perceived to be fun, pleasant, or enjoyable aside from performance consequences or expectations	the extent to which the activity of using an innovation is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated	(Davis *et al*, 1992; Venkatesh, 2000; van der Heijden, 2004; Cyr *et al*, 2006; Hong & Tam, 2006, p. 166; Fuller *et al*, 2010)
Playfulness ($k = 40$)	the degree to which an individual interacts with computers in a spontaneous, inventive, and imaginative manner	the degree of cognitive spontaneity in microcomputer interactions	(Webster & Martocchio, 1992, p. 204; Ahn *et al*, 2007)
Cognitive absorption ($k = 9$)	'a state of deep involvement' with technology exhibited through temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity		(Agarwal & Karahanna, 2000, p. 673)
Flow experience ($k = 15$)	A holistic experience including playfulness, enjoyment, absorption in the activity, control, concentration, curiosity, intrinsic interest, and a match between the task challenge and the individual's skill level	the holistic experience that people feel when they act with total involvement	(Hsu & Lu, 2004; Ha *et al*, 2007, p. 279; Liu *et al*, 2009)

k = number of studies.

et al, 2010). The second most common operationalization is playfulness (40 studies used this terminology). Ahn *et al* (2007) have described playfulness as an intrinsic factor, operationalized as pleasant feelings derived from a user interacting with a system (Webster & Martocchio, 1992; Ahn *et al*, 2007). Cognitive absorption is another 'intrinsic motivation related variable' (Agarwal & Karahanna, 2000, p. 666). In particular, cognitive absorption captures salient beliefs about a user's perception of information technology. It encompasses the intrinsic dimensions of personality such as the consumption of an individual's attentional resources, includes the pleasurable and enjoyable aspect of the system, and incorporates the intrinsic interest and curiosity of the individual (Agarwal & Karahanna, 2000). Similarly, researchers conceptualize flow as a state of subjective enjoyment, playfulness, and absorption experience when a user interacts with a system (Hsu & Lu, 2004; Ha *et al*, 2007; Liu *et al*, 2009). Specifically, Ha *et al* (2007, p. 279) describe flow as 'an end in itself – the activity must be intrinsically rewarding'. Table 1 provides a comprehensive list of intrinsic motivation operationalizations used in the literature and their definitions. Typically, researchers have examined how such intrinsic factors relate to beliefs about, and use of, IS (e.g., Igbaria *et al*, 1995; Venkatesh, 2000; van der Heijden, 2004).

The system type-user acceptance relationship

A number of researchers have suggested that a system's purpose should be considered when evaluating what type of motivation shapes its use (e.g., Venkatesh *et al*, 2003; van der Heijden, 2004; Lin & Bhattacherjee, 2010). These researchers contend systems can be characterized as utilitarian or hedonic. Hedonic systems are designed to give pleasure. Utilitarian systems are designed to enhance productivity. Because of their different purposes, this view suggests that hedonic systems should be viewed as distinct from utilitarian systems (van der Heijden, 2004; Sun & Zhang, 2006).

If systems are indeed distinct, rather than existing on a continuum, it would be important to consider how intrinsic and extrinsic motivation relate to system use. If intrinsic motivation (e.g., perceived enjoyment) is the dominant predictor of hedonic system use, then pleasure or enjoyment will overshadow usefulness' influence on system use when predicting use of leisure, entertainment, or game-based systems. Therefore, the normative implication of this finding would be that examining hedonic systems requires considering intrinsic motivation's influence on system use (van der Heijden, 2004; Bock & Qian, 2008). Consistent with this view, recent studies have directed attention to drivers of hedonic system use (e.g., Sun & Zhang, 2006; Fagan *et al*, 2008; Sun & Zhang, 2008b; Lin & Bhattacherjee, 2010). Specifically, they have examined how intrinsic motivation constructs such as fun or esthetic appeal shape the use of hedonic systems (van der Heijden, 2004; Sun & Zhang, 2006). Conversely, and also of great importance, if extrinsic motivation is a dominant predictor of use for utilitarian systems, then extrinsic

motivation (e.g., perceived usefulness) renders intrinsic motivation markedly less relevant to understanding utilitarian system use (Venkatesh *et al*, 2003; van der Heijden, 2004). Therefore, the influence of extrinsic rewards such as compensation or promotions should be investigated when predicting the use of utilitarian (e.g., work) systems (Davis, 1989; van der Heijden, 2004). Taken together, these findings imply that intrinsic motivation will be more relevant for using hedonic systems and extrinsic motivation will be more relevant for using utilitarian systems.

However, some studies have underscored that intrinsic and extrinsic motivation may be germane to understanding diverse system types, such that intrinsic motivation may be relevant to understanding the acceptance of both utilitarian and hedonic systems (e.g., Davis *et al*, 1992; Childers *et al*, 2001). Since intrinsic motivation exists in relation between tasks and individuals, intrinsic motivation can be defined in terms of the task being interesting or as an individual's satisfaction resulting from task engagement (Ryan & Deci, 2000). This view corresponds to the two explanations for human behaviors (Hull, 1943; Skinner, 1953). In one view, all behaviors are motivated by rewards, where the activity is rewarding in itself for intrinsically motivated tasks (i.e., intrinsic motivation is a 'boundary condition' for the drivers of use). In another view, all behaviors are motivated by psychological drivers, such that intrinsically motivated tasks fulfill psychological needs (e.g., competence, autonomy) and provide satisfaction (Ryan & Deci, 2000); this suggests that intrinsic motivation can be relevant to understanding utilitarian system use because the task of using utilitarian systems can evoke feelings of competence, satisfaction, and happiness.

Similarly, extrinsic motivation may be relevant to understanding decisions to use hedonic systems. Research examining online shopping indicates that consumers derive value from utilitarian system attributes (e.g., time is saved, risk is reduced, the intended goal of making a purchase is accomplished successfully), as well as hedonic system attributes (e.g., the experience is pleasurable, fun and/or enjoyable) (Huang & Liaw, 2005; Lee *et al*, 2006). Research on informational web sites, like sports-related web sites, indicates that users enjoy the visual images provided by the web site while gathering utilitarian information such as their favorite team's game scores (while this is a 'fun' activity, the user is accessing the site to gather specific information that is meeting a particular need to know game scores so the site itself is meeting an extrinsic need for information) (Hur, 2007). Even researchers who believe that utilitarian and hedonic systems have different technological characteristics suggest that their features can be combined to create mixed systems (Sun & Zhang, 2006) or that intrinsic motivation can be used to enhance utilitarian systems indirectly through improving perceptions of ease of use (van der Heijden, 2004; Sun & Zhang, 2008b).

In summary, although many researchers argue that IS type is a critical boundary condition for understanding system use (e.g., van der Heijden, 2004; Lin & Bhattacherjee, 2010), some evidence suggests that this dichotomization of systems into utilitarian or hedonic types may or may not accurately map to what motivates system use (e.g., Malhotra *et al*, 2008). One challenge to making sense of these conflicting findings is that researchers frequently rely on single studies examining single systems to make strong statements about motivation and its ties to system type and use (e.g., van der Heijden, 2004; Lin & Bhattacherjee, 2010). Unfortunately, inferences based on a single study's results can suffer from nontrivial amounts of sampling error (Hunter & Schmidt, 2004). That is, a certain amount of variance across studies is to be expected simply on the basis of chance, given that researchers are using samples of participants. It is unreasonable to expect all (or most) researchers to conduct multiple studies within single papers to examine various moderators such as the difference in system type (e.g., utilitarian *vs* hedonic). Hence, to provide a more rigorous and comprehensive/cumulative assessment of the relationship between system type, acceptance, and use, we conducted a meta-analysis of the motivation and technology use literature. Specifically, we evaluated whether system type was tied to the relative influence of intrinsic motivation across 185 studies. In the following pages, we provide details on the meta-analytic techniques we employed and the results of our evaluation of the system type–user acceptance relationship.

Method

Meta-analysis is a statistical technique designed to systematically combine the results from independent, empirical studies that address similar research questions (Glass, 1981; Hunter & Schmidt, 1990; Lipsey & Wilson, 2001; Hunter & Schmidt, 2004). By investigating and describing patterns found in empirical papers, researchers use meta-analysis to draw more stable and generalizable conclusions from, or resolve inconsistencies in, a literature. Because it offers an opportunity to cumulate a large amount of evidence across many studies from the existing user acceptance literature (e.g., Legris *et al*, 2003; King & He, 2006), meta-analysis is a useful tool for examining the pattern of relationships among intrinsic motivation, system type, and user acceptance. This technique has been used in prior IS research (e.g., Dennis & Wixom, 2001; Joseph *et al*, 2007; Sharma & Yetton, 2007). In our article, we follow the guidelines provided by Hunter & Schmidt (2004).

Data collection

We searched for published and unpublished articles since 1992 (Davis *et al*'s introduction of intrinsic motivation into the user acceptance literature), which included at least one intrinsic motivation operationalization presented in Table 1 and one construct used in the TAM (e.g., perceived usefulness, perceived ease of use, or intent to use). Following the techniques of Hunter & Schmidt (2004) and Sharma & Yetton (2007), we performed

multiple literature searches targeting a variety of journals (e.g., *IS*, *computer science*, *education*), conference proceedings, and interdisciplinary dissertations and theses. We used keyword searches using terms such as 'intrinsic motivation', 'perceived enjoyment', 'playfulness', and 'cognitive absorption' in Science Direct, Web of Science, Academic Search Premier, Business Source Premier, Computer Science Index, Computer Source, Psychology and Behavioral Sciences Collection, PsycINFO, the AIS Electronic Library, and ProQuest Dissertations & Theses to identify a complete list of studies that included intrinsic motivation in their model to examine user acceptance of IS. Conference proceedings and dissertations/theses were included in the search (Rosenthal, 1979). This comprehensive search strategy was designed to increase the power of our meta-analysis by maximizing the number of studies we collected in addition to reducing source bias (Sharma & Yetton, 2007).

Titles, abstracts, and author's keywords for over 2000 studies were examined to determine whether they should be included in the meta-analysis. Of these studies, 253 papers were downloaded and looked at in depth because they seemed most relevant to our study. We then evaluated these 253 studies based on four criteria to determine whether or not they should be included in our meta-analysis.

First, the study had to use at least one intrinsic motivation construct, and the research subjects had to report their individual impressions of the system rather than responding for the organization (or a group/team) as a whole. We restricted this meta-analysis to studies including intrinsic motivation because studies looking only at extrinsic motivation have already been meta-analyzed (e.g., Lee *et al*, 2003; Legris *et al*, 2003; King & He, 2006; Sabherwal *et al*, 2006; Schepers & Wetzels, 2007; He & King, 2008; Wu & Lederer, 2009). Fifty-four studies did not meet this inclusion criterion (e.g., Lau & Woods, 2009; Lee *et al*, 2009b) (see '1. Intrinsic motivation criterion' in Table 2).

Second, at least one of the original TAM constructs (i.e., perceived usefulness, perceived ease of use, behavioral intent, or actual use) had to be included in the study. This ensured that our meta-analysis would highlight whether or not intrinsic motivation is related to other technology adoption constructs (Legris *et al*, 2003). Thirteen studies did not meet this inclusion criterion (e.g., Webster & Martocchio, 1992; Serenko & Turel, 2007) (see '2. TAM construct criterion' in Table 2).

Third, the study had to be empirical (i.e., zero-order correlation coefficients or the data to convert existing statistics should be available). If the correlations were not presented in the article, we contacted the authors to try to obtain this information. A total of nine articles were excluded based on this criterion (e.g., Lee *et al*, 2009a; Shin, 2009c) (see '3. Reporting of results criterion' in Table 2).

Finally, the article had to report independent correlations. This means that when multiple articles used the same data set, only the latest article was coded to avoid biasing the study through multiple-counting (Bobko & Roth, 2003). Five studies were excluded based on this criterion (e.g., Venkatesh & Speier, 1999; Hwang, 2010a) (see '4. Same data set criterion' in Table 2). However, one journal article could contribute more than one set of correlation coefficients if independent samples were used. Six journal articles, two conference papers, and two dissertations contributed multiple independent data sets.

The search criteria resulted in 172 papers, or 185 individual data sets, for the meta-analysis; this is indicated by the reporting of sample sizes in the Appendix where 10 papers included 2 or more studies. Our meta-analysis included 123 journal articles, 12 dissertations, and 37 conference papers. The Appendix provides details on the articles selected in this study, the intrinsic motivation, the system type used in the study, and the sample size.

Table 2 Number and percentage of excluded papers by inclusion criteria

Inclusion criteria	*k*	*Percentage*
Total # of papers identified for inclusion	253	
Papers passing all inclusion criteria	172	68
Papers not passing inclusion criteria	81	32
1. Intrinsic motivation criterion	54	*66.7*
2. TAM construct criterion	13	*16*
3. Reporting of results criterion	9	*11.1*
4. Same data set criterion	5	*6.2*

Note: Percentages for the studies not passing inclusion criteria (in italics) reflect the percent of excluded studies ($k = 81$) due to each criterion.

Coding

We collected basic article information such as the author name(s), journal name, and year of publication. For unpublished studies, we coded 'conference' or 'dissertation'; for 'year of publication', we coded the year of the conference or the year the dissertation was approved by the individual's committee.

We also collected the system type used. Since researchers use a wide variety of system types in their studies, we created specific categories for these data collection points to enable consistent coding across the studies: hedonic, utilitarian, and mixed systems. Hedonic systems included games, web entertainment, and communication (e.g., Amoroso *et al*, 2008; Brandyberry *et al*, 2010). Utilitarian systems included studies involving things like work, learning, e-commerce, banking, taxes, and health care (e.g., Henderson *et al*, 1998; Lankton & Wilson, 2007; Goel, 2008). Studies that did not fit into either of these because they examined mobile devices/services, addressed mixed use of systems like search engines or interfaces, or otherwise did not identify the type of web use were coded as mixed systems (e.g., Agarwal & Karahanna, 2000; Hong *et al*, 2008). We used these categories as a guide to classification and carefully read the context of each study

to ensure that we captured the actual intention of the study (e.g., a study examining web-based purchasing could be classified as utilitarian if it is for business purposes, such as ordering a motor for mining equipment).

Finally, we collected the variable names and relevant statistics (e.g., correlations, reliabilities, and sample sizes). For reliabilities, we coded either internal consistency reliabilities or Cronbach's α. If both reliabilities were available, we coded Cronbach's α (Schwab, 1999).

To verify the system type coding, the 71 studies from 2009 to 2011 were selected for independent coding by another author. The inter-rater agreement between these two authors was high (88.73% agreement). Any disagreements were resolved through discussion and the coding heuristics were updated appropriately.

Once coding was complete, we grouped the MTAM constructs (i.e., intrinsic and extrinsic motivation, behavioral intent, ease of use, and use) for each study. Some studies included multiple measures of a construct in their study (e.g., Guo & Klein, 2009; Lee & Chen, 2010; Liu & Li, 2011). For those studies, we created a composite correlation using Hunter & Schmidt's (2004) formula (1) and a composite reliability using Mosier's (1943) formula (2) where r = correlation; n = sample size; w = weight of the variable; s = standard deviation.

$$r_{xy} = \frac{\Sigma r_{xy_i}}{\sqrt{n + n(n-1)\bar{r}_{y_i y_j}}} \tag{1}$$

$$r_{xx'} = 1 - \frac{\left(\Sigma w_j^2 s_j^2\right) - \left(\Sigma w_j^2 s_j^2 r_{jj'}\right)}{\left(\Sigma w_j^2 s_j^2\right) + 2\left(\Sigma w_j w_k s_j s_k r_{jk}\right)} \tag{2}$$

Analysis

We used the meta-analytic structural equation modeling (MASEM) procedure, utilized by Joseph *et al* (2007), to examine structural models that integrate intrinsic motivation into TAM. The purpose of this analysis was to determine whether the system type influences intrinsic motivation's relationship with the TAM constructs. In other words, our goal was to determine whether intrinsic motivation has a stronger relationship with intent to use and actual use for hedonic systems than for utilitarian systems.

The first step in this procedure is to calculate the corrected population correlation estimates between all the constructs in our meta-analysis using the Schmidt-Le program (Schmidt & Le, 2005, v1.1 October). Our estimates were corrected for measurement error because this error downwardly biases population correlation estimates. To do so, we corrected the correlations for unreliability by using an artifact distribution of internal consistency measures of reliability (Hunter & Schmidt, 2004). Internal consistency estimates of reliability generally produce a conservative correction for unreliability of the correlations (Hunter & Schmidt, 2004). The result of this step is a meta-analytically derived correlation matrix, which is required to conduct our MASEM analysis. The numbers in Table 3 represent the corrected population correlation estimate ($\hat{\rho}$) for the relationship between intrinsic motivation and each TAM construct. This number represents the cumulated/integrated correlations corrected by the reliabilities from each study. The corresponding k is the number of studies included in the analysis.

Table 3 Meta-analytic correlation values for the antecedents of user acceptance

	Enjoyment	*Ease of use*	*Intent*	*Use*
Ease of use	0.47 (k = 119)	—		
Intent	0.56 (k = 110)	0.49 (k = 70)	—	
Use	0.34 (k = 34)	0.30 (k = 22)	0.48 (k = 18)	—
Usefulness	0.57 (k = 138)	0.56 (k = 103)	0.61 (k = 82)	0.30 (k = 21)

k = number of studies

Note: To ensure consistent labeling of our constructs, we conceptualized the poles as (a) utilitarian *vs* hedonic value, (b) extrinsic *vs* intrinsic motivation, and (c) perceived usefulness *vs* perceived enjoyment. As such, our tables and figures are labeled with enjoyment to consistently represent the conceptual level analyzed in our study. In summary, we consider intrinsic motivation and enjoyment as conceptually representing the same concept and use them interchangeably.

Second, we split the data by the system type (hedonic, utilitarian, or mixed) as illustrated in Table 4. This table indicates that we had correlations to test the relationships in MTAM (Davis *et al*, 1992; Venkatesh *et al*, 2003), which includes the core technology acceptance constructs (e.g., perceived usefulness, perceived ease of use, intent, and use) and perceived enjoyment (see Figure 1). It also suggests the assumption that system type is a 'boundary condition' for understanding individuals' interaction with information technology may not hold, since the correlations for intrinsic motivation with the other TAM constructs in utilitarian systems are higher than or equal to correlations for hedonic systems. To further statistically test these issues, we used MASEM as described in the next section.

Meta-analytic structural equation modeling

Similar to Joseph *et al* (2007), we used the procedures suggested by MacCallum *et al* (1996) to assess the robustness of our covariance matrix. We analyzed our model using EQS 6.1 (Byrne, 2006). We used the standardized root-mean-square residual (SRMR), root-mean-square-error of approximation (RMSEA), Bentler–Bonett normed fit index (NFI), comparative fit index (CFI), and goodness of it index (GFI) to evaluate the model fit. Following the traditional cutoffs for these indices, acceptable fit is indicated by an SRMR less than 0.08

Table 4 Meta-analytic correlation values for the antecedents of user acceptance: Split by system type

	Enjoyment		*Ease of use*		*Intent*		*Use*					
Ease of use	0.42	0.52	**0.46**									
	$k=30$	$k=64$	**k = 25**									
	$N=11,765$	$N=19,825$	**N = 9675**									
Intent	0.54	0.56	**0.56**	0.47	0.48	**0.55**						
	$k=26$	$k=50$	**k = 34**	$k=20$	$k=37$	**k = 13**						
	$N=10,505$	$N=16,120$	**N = 12,855**	$N=8634$	$N=11,247$	**N = 4959**	—					
Use	0.54	0.30	**0.24**	0.23	0.23	**0.45**	0.42	0.48	**0.58**			
	$k=12$	$k=13$	**k = 9**	$k=7$	$k=9$	**k = 6**	$k=9$	$k=4$	**k = 5**			
	$N=3865$	$N=3678$	**N = 5945**	$N=2324$	$N=2450$	**N = 2096**	$N=3266$	$N=801$	**N = 1735**	—		
Usefulness	0.53	0.59	**0.56**	0.49	0.63	**0.53**	0.63	0.60	**0.58**	0.43	0.43	**0.19**
	$k=27$	$k=72$	**k = 39**	$k=23$	$k=57$	**k = 23**	$k=19$	$k=41$	**k = 22**	$k=6$	$k=9$	**k = 6**
	$N=11,577$	$N=21,017$	**N = 17,072**	$N=10,578$	$N=17,979$	**N = 9036**	$N=8168$	$N=12,254$	**N = 8243**	$N=1994$	$N=2393$	**N = 4780**

k = number of studies; N = total sample size for all studies.
Plain = Mixed Systems; *Italicized* = *Utilitarian Systems*; **Bold** = **Hedonic Systems**.

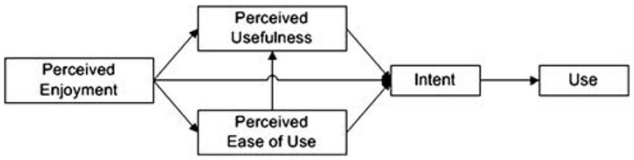

Figure 1 MTAM model for MASEM.

Table 5 MASEM results

Model	*SRMR*	*RMSEA*	*NFI*	*CFI*	*GFI*	χ^2	*DF*
Full	0.03	0.05	0.99	0.99	0.99	5.33	3
Mixed	0.09	0.25	0.88	0.89	0.93	72.05	3
Utilitarian	0.04	0.12	0.97	0.98	0.98	13.54	3
Hedonic	0.05	0.21	0.93	0.93	0.95	55.64	3

Note: Full = all system types are included in the analysis.

(Hu & Bentler, 1999), RMSEA less than 0.06 (Hu & Bentler, 1999), NFI and GFI above 0.90 (Bentler & Bonett, 1980; Lance *et al*, 2006), and CFI above 0.95 (Hu & Bentler, 1999; Lance *et al*, 2006).

Results of the MASEM showed that our conceptual, partially mediated model (SRMR = 0.03, RMSEA = 0.05, NFI = 0.99, CFI = 0.99, GFI = 0.99, $\chi^2 = 5.33$, DF = 3) fits the data for the full data set. This is also true for our mixed, utilitarian, and hedonic systems data sets (see Table 5 for details).

In our model, enjoyment had both direct and indirect relationships with intent. The effects of these relationships are mediated by usefulness and ease of use (the Sobel test is described in detail in the next section). Figure 2 shows that usefulness ($\beta = 0.36$, $P < 0.05$), enjoyment ($\beta = 0.28$, $P < 0.05$), and ease of use ($\beta = 0.16$, $P < 0.05$) are all positively related to intent. This figure also shows that enjoyment indirectly effects intent through usefulness ($\beta = 0.38$, $P < 0.05$) and ease of use ($\beta = 0.47$, $P < 0.05$), as suggested in the literature (Sun & Zhang, 2006). As shown in Figures 3–5, the other three models for our system type data sets did not have statistically different results. This is confirmed by the *t*-test we performed to compare the mixed, hedonic, and utilitarian models shown in Table 6.

Sobel test for mediation

Before testing for mediation, the direct effects from the independent variable (enjoyment) to the dependent variables (usefulness, ease of use, and intent) should be significant (using the approach of Baron & Kenny, 1986). This initial condition was met for all relationships as illustrated in Figures 2–5. To test for the mediation of enjoyment, we calculated Sobel's (1982) test for mediation using the formula shown in Eq. (3). The results shown in Table 7 indicate enjoyment does have a mediation effect through usefulness and ease of use for

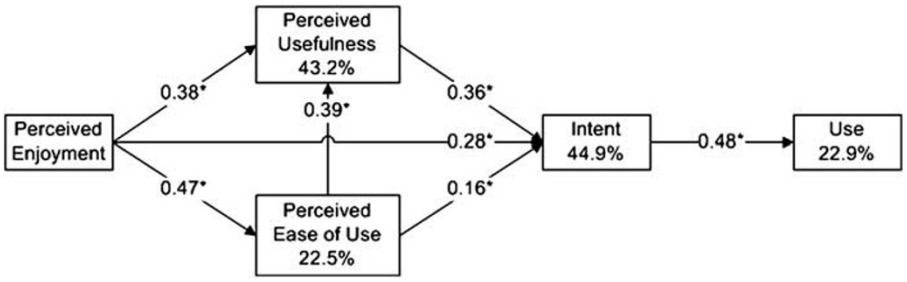

Figure 2 Results of the meta-analytic structural equations modeling: full data (simple average $n = 332$).
Note: Full = all system types are included in the analysis.

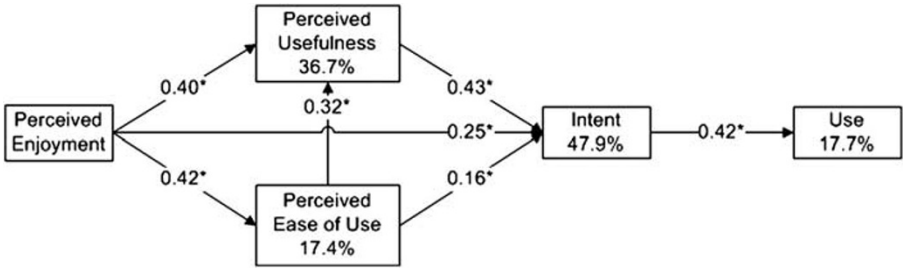

Figure 3 Results of the meta-analytic structural equations modeling: mixed (simple average $n = 366$).

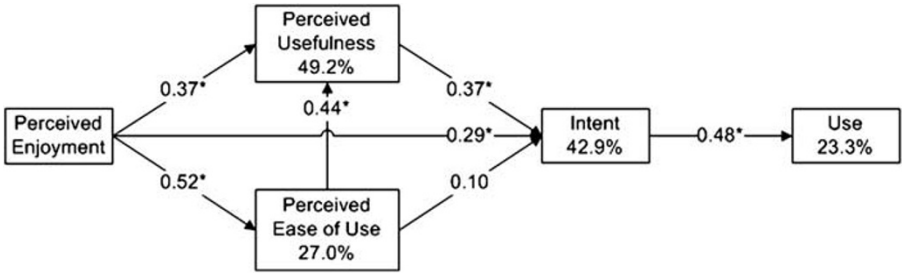

Figure 4 Results of the meta-analytic structural equations modeling: utilitarian (simple average $n = 269$).

all system types except for enjoyment to ease of use for utilitarian systems. Therefore, we conclude that enjoyment has an indirect effect on intent, except in utilitarian systems where enjoyment only has an indirect effect through usefulness.

$$z\text{-}value = (a \times b) / \sqrt{(b^2 \times s_a^2 + a^2 \times s_b^2)} \qquad (3)$$

Discussion

This study explored the assumption that system type serves as a boundary condition (i.e., moderator) for the relevance of intrinsic motivation's influence on individuals' interaction with information technology. To do so, we used meta-analytic techniques to glean insight from 185 studies into whether system type moderates motivation's

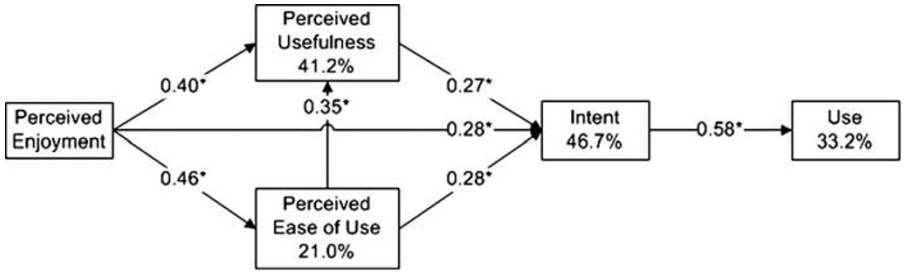

Figure 5 Results of the meta-analytic structural equations modeling: hedonic (simple average $n = 407$).

Table 6 ***t*-test comparing the mixed, hedonic, and utilitarian models**

Model pair	*Mean of the paired difference*	*Standard deviation*	*Standard mean error*	*t*	*DF*	*Significance*
Utilitarian *vs* Hedonic	0.038	0.029	0.014	2.611	3	0.08
Utilitarian *vs* Mixed	0.015	0.154	0.077	0.195	3	0.86
Hedonic *vs* Mixed	0.053	0.165	0.083	0.636	3	0.57

Table 7 Sobel test

Relationship (system type)	*z-value*	*P-value*	*a*	*b*	s_a	s_b
Enjoyment → Usefulness → Intent (Full)	5.11	<0.001	0.38	0.36	0.05	0.05
Enjoyment → Usefulness → Intent (Mixed)	6.24	<0.001	0.40	0.43	0.05	0.05
Enjoyment → Usefulness → Intent (Hedonic)	4.91	<0.001	0.40	0.27	0.04	0.05
Enjoyment → Usefulness → Intent (Utilitarian)	4.47	<0.001	0.37	0.37	0.05	0.07
Enjoyment → EOU → Intent (Full)	3.01	<0.001	0.47	0.16	0.05	0.05
Enjoyment → EOU → Intent (Mixed)	3.28	<0.001	0.42	0.16	0.05	0.04
Enjoyment → EOU → Intent (Hedonic)	5.39	<0.001	0.46	0.28	0.04	0.04
Enjoyment → EOU → Intent (Utilitarian)	1.62	0.053	0.52	0.10	0.05	0.06

$a = \beta$ coefficient of the independent variable to the mediator variable; $b = \beta$ coefficient of the mediator variable to the dependent variable; s = standard error of the beta coefficient.

relevance to beliefs, attitudes, intentions toward IS use, and actual IS use. Our findings support that (a) intrinsic motivation exerts a pervasive, and often times fairly strong (several mean corrected correlations >0.50), influence on constructs thought to predict information technology use in the extant literature, (b) intrinsic motivation appears to exert a similar influence on decision making for both hedonic and utilitarian systems' use, and (c) absent intrinsic motivation, we will likely lack important information necessary to predict utilitarian system use. Thus, our findings do not support assertions that intrinsic motivation is more important to hedonic systems. In fact, our results suggest that intrinsic motivation is important for all system types, which appears to contradict the long-standing and unchallenged assumption that utilitarian systems are accepted through extrinsic motivation and that hedonic systems are accepted through intrinsic motivation. We discuss our contributions in detail in the following paragraphs.

We found that intrinsic motivation exerted a pervasive influence (across system types) on factors that lead to system use. Intrinsic motivation (e.g., enjoyment) is correlated with oft-cited drivers of adoption and use such as usefulness, ease of use, and intention to use the technology (per the 'Full' model presented in Table 5 and Figure 2). This finding suggests that designing intrinsically motivating technologies is an important means for IS developers to engage users. This is consistent with Davis *et al*'s (1992) seminal finding that intrinsic motivation constructs, such as perceived enjoyment, shape users' initial interactions with information technology. This suggests that understanding the implications of

intrinsic motivation may remain an enduring topic for researchers interested in examining the breadth of individual behaviors that occur throughout the user acceptance process.

More importantly, our MASEM analysis of MTAM for each system type shed light on intrinsic motivation's relationship with system type. Specifically, we found that the relationship between intrinsic motivation and the traditional TAM constructs was similar across system types. Therefore, we argue that enjoyment is often just as important in utilitarian systems as in hedonic systems for encouraging users to view the system as easy to use or useful. In addition, our analysis supports the notion that the enjoyment–intent relationship is partially mediated through usefulness and ease of use. Because these results did not significantly vary across models estimated by system type, this further supports our basic argument that intrinsic motivation is salient to understanding individuals' interaction with all types of information technology.

We also found that the relationship between intent and use was particularly strong in hedonic systems (Table 4: $\hat{\rho} = 0.58$) but significant across all system types. Since our results indicated that the relationship between intrinsic motivation and intent was significant across system types, and that the relationship between intent and use was also significant across system types, this suggests intrinsic motivation is important and relevant to understanding individuals' intent to use and actual use of hedonic, utilitarian, and mixed systems. When individuals find enjoyment or grow absorbed in using a system, our findings suggest they are likely to report greater usage of hedonic, utilitarian, and mixed systems. This implies that researchers would be mistaken if they failed to investigate the relationship from intrinsic motivation to individuals' interaction with different system types (such as mixed and utilitarian systems).

In summary, our analysis suggests that intrinsic motivation is important to understanding individuals' interaction with all types of information technology, not just hedonic systems. This is important because it underscores the need to examine and re-examine how intrinsic motivation influences a range of behaviors across different system types. For example, additional work is necessary to examine questions such as: Does intrinsic motivation demonstrate different relationships with habit formation and exploration of new technologies? Although extrinsic motivation was not the focus of our study, our analysis suggests that usefulness is an important driver of intentions to use hedonic systems. For researchers seeking to understand why individuals play games, use social networking tools, and other hedonic or mixed system types, this suggests, at a minimum, that they should control/monitor for the influence of usefulness on intention toward a technology and actual use of a technology.

Limitations

Before we highlight the contributions of our study, we acknowledge its limitations. Although we conducted an in-depth review of the literature, we identified a lower-than-desired number of studies for a few relationships. Specifically, those relationships with *k*-values below 10 can create more sense of uncertainty in interpreting our conclusions (Switzer *et al*, 1992). In particular, this means we can't be as sure that these few studies actually represent the population as a whole, and we acknowledge that the corrected population correlation estimate resulting from the meta-analysis may, in fact, be higher or lower than our results indicate. To give us more confidence in our results, we ran a separate analysis using the lower values of the credibility intervals for the intent–use relationships. We found that our models were not sensitive to using this lower estimate; as such, we have confidence in our results and assert that the potentially unstable values are less an issue (MacKinnon *et al*, 2002; Roth *et al*, 2011). However, as the literature continues to grow, we believe that it may be useful for researchers to revisit relationships among intrinsic motivation, system type, and technology acceptance constructs in the future.

Further, it is important to note our research-restricted attention to studies that examined motivation, user acceptance, and use of information technology. When coding the studies, we included data that referenced intrinsic motivation as represented by researchers who called the construct 'intrinsic motivation' and by researchers who used other titles (e.g., perceived enjoyment) that matched our conceptual/theoretical definition (see Table 1). By including a wider sample of studies, we may have introduced potential noise into our data set such that correlations were attenuated (Hunter & Schmidt, 2004). Nonetheless, we found support for relationships in our MASEM. As the literature expands, it would be useful to revisit the issue of what researchers titled their construct(s) and whether intrinsic motivation, perceived enjoyment, and other labels or frames of reference yield different meta-analytic results.

Third, we acknowledge that the coding of system type is somewhat subjective. To further validate our findings, we solicited aid from three doctoral students to independently code the system type for 71 studies from 2009 to 2011. Studies coded differently by at least two coders (35 studies) were then classified as mixed systems. Analyzing this sub-sample of studies coded more conservatively, we found no significant difference between these results and those reported in our full analysis. Therefore, we feel this adds credibility to our findings.

Finally, our study must be interpreted within the boundaries of the extant literature on technology acceptance and use. While our study rigorously assesses the state of the current literature, our findings should not be interpreted as precluding alternative explanations for the relationships among variables that lead to technology acceptance and use. For example, emotional valence or affect (e.g., general liking of a system) might lead to generally positive or negative attitudes toward a system. If true, researchers might need to reconsider whether it is affect or an associated construct (e.g., enjoyment,

usefulness) that drives system use (Venkatesh, 2000; Beaudry & Pinsonneault, 2010). To address this limitation of the literature, future research will need to probe whether overarching meta-constructs, such as affect or trust in technology, provide greater explanatory power for system use than constructs examined in this study.

Contributions

Our meta-analysis offers rich direction for practitioners and researchers interested in system design. For example, web sites are often designed as either hedonic or utilitarian systems (e.g., entertainment *vs* work related) (Auger, 2005; Lin & Bhattacherjee, 2010). By integrating features designed to attract users (e.g., an animated banner) (Noiwan & Norcio, 2006) and giving users the ability to dynamically obtain high quality information (e.g., search functions) (Cyr *et al*, 2006), system designers may create higher levels of intrinsic and extrinsic motivation. In turn, motivated users may feel that the system is easier to use and more useful such that they may be more likely to report intentions to use a system (Davis *et al*, 1989; Sun & Zhang, 2006). Hence, our finding suggests that organizations should consider hedonic and utilitarian features when designing systems as a means to increase intent, motivation, and actual use of IS.

Our findings also suggest that researchers and practitioners should examine how intrinsic motivation engages users of utilitarian systems (e.g., ERP systems). While IS use is often mandatory for users, it is critical for system designers to look beyond simply enabling task performance and to consider creating systems that evoke feelings of enjoyment, comfort, respect, and compassion (Cockton, 2002). Embedding hedonic features in utilitarian systems acknowledges that users don't just think and act, but also have feelings. By considering the emotional responses of users to systems, designers may take action to manage frustration experienced while learning or using complex IS (Klein *et al*, 2002). Research on hedonic systems suggests that this is accomplished by infusing appealing visual layouts like graphics, colors, and sounds (Ives, 1982; Klein *et al*, 2002; van der Heijden, 2004), adding affective components like emoticons (Axelrod & Hone, 2006; Sun & Zhang, 2006), or by creating Internet sites or newsgroups that allow users to complain in public (Klein *et al*, 2002). Future research should examine whether such additions to utilitarian systems create positive emotional states for users and encourage use of systems. If utilitarian systems can be designed to 'evoke' positive emotions, then users' productivity and learning may increase (Klein *et al*, 2002). Our expectation, based on this meta-analysis, is these additions should have a positive influence on user beliefs, attitudes, and behavior at early and late stages of the user acceptance process. However, we do not mean to imply utilitarian features should be neglected in favor of hedonic features. Instead, we suggest that system designers and programmers take an open-minded approach to adding hedonic characteristics to utilitarian systems to improve employee moods, increase user satisfaction, and encourage involvement through experimentation (Webster & Martocchio, 1992; Jasperson *et al*, 2005).

Our findings are consistent with the current trend in marketing research where researchers focus on how image (i.e., hedonic features) and quality (i.e., utilitarian features) influence the customer's decision to purchase a product (Wang *et al*, 2007; Chitturi *et al*, 2008; Homer, 2008; Teller *et al*, 2008). It is also consistent with the IS field's approach to ease of use, as demonstrated by researchers' acknowledgement that ease of use is critical in systems of all different types but is particularly important in hedonic systems (e.g., van der Heijden, 2004; Shen & Eder, 2008). This suggests that ease of use and intrinsic motivation are characteristics germane to understanding utilitarian and hedonic systems. Through the aggressive pursuit of research that yields nuanced views of intrinsic motivation's influence, IS researchers can develop a broader nomological net that deepens understanding of how different system features influence the use of IS despite the nature of the system.

Our findings underscore a need for research that examines the interplay of different forms of motivation and system use. While our study establishes that perceived enjoyment and perceived usefulness predict use of a utilitarian system, it does not speak to the relationship between intrinsic and extrinsic factors. For example, it is possible that perceived enjoyment 'magnifies' or 'boosts' perceived usefulness' relationship with intentions and actual use of a system (Venkatesh & Speier, 1999). It could be that intrinsic factors have a multiplicative effect on extrinsic motivation's relationship with system use. By addressing such issues, research could yield insight into the conditions under which utilitarian and hedonic attributes serve as primary or secondary drivers of system use.

Finally, research has left unexamined how utilitarian attributes (e.g., functionality, usefulness) relate to the formation of intrinsic feelings such as perceived enjoyment. For example, it may be that users who perceive a system as possessing the appropriate functionality will be 'primed' to feel more enjoyment when engaging in system use. Through additional research on intrinsic motivation, scholars may foster a deeper understanding of the sources of intrinsic motivation and its consequences for well-established constructs such as user satisfaction (Dickinger *et al*, 2008). In order to conduct such research, scholars will need to advance new theories about not only the interplay between, but also the sources of, intrinsic and extrinsic motivation in the broader context of system use.

Conclusion

This article was motivated by a desire to evaluate the assumption that intrinsic motivation was a more salient predictor of hedonic system use than of utilitarian system use. Because single study results can suffer from nontrivial

amounts of sampling error (Hunter & Schmidt, 2004) and to address concerns tied to moderators such as the difference in system type (e.g., utilitarian *vs* hedonic), we conducted a meta-analysis of the motivation and technology use literature. We found intrinsic motivation predicts use of hedonic and utilitarian systems. Contrary to the existing assumptions surrounding the relationship between system type and user acceptance, our study suggests that the hedonic nature of IS is not a boundary condition for studying user acceptance. Rather, intrinsic motivation is important for understanding acceptance and use of both hedonic *and* utilitarian systems. In fact, our findings imply that intrinsic motivation is central to understanding individuals' interactions with utilitarian systems. This suggests that the dichotomous view advocated by many researchers may not capture the complexities of contemporary IS, which are designed for both utility/productive use and pleasure/long-term use. To more fully understand how organizations can reap high return on investments from individuals' use of IS, researchers and practitioners should examine intrinsic motivation across a variety of systems and contexts.

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Appendix

Table A1 Studies included in the meta-analysis

Study (source)	*Intrinsic motivation studied*	*System*	*System type*	*Sample size*
(Agarwal & Karahanna, 2000)	Playfulness	Unspecified web use	M	288
(Ahn & [90]Kim, 2010)	Enjoyment	Mobile tour information	U	279
(Ahn *et al*, 2007)	Playfulness	Online retailing	U	942
(Amoako-Gyampah, 2007)	Intrinsic involvement	SAP	U	571
(Amoroso *et al*, 2008)	Enjoyment getting/giving music	Music sharing via web	H	439
(Anandarajan *et al*, 2000)	Internet playfulness	Employee Internet use	U	40
(Bock & Qian, 2008)	Intrinsic rewards	Knowledge repositories	U	141
(Brandyberry *et al*, 2010)	Hedonic need	Social network sites	H	1327
(Brown & Venkatesh, 2005)	Applications for fun	Household use – mix of work/play	M	746
(Celik, 2008)	Perceived playfulness	Internet banking	U	161
(Chandra *et al*, 2009)	Cognitive absorption, perceived playfulness	Virtual world collaboration	H	197
(Chang, 2010)	Perceived playfulness	Online auction	U	478
(Chang, 2008)	Perceived playfulness	Online auctions	U	388
(Chatzoglou *et al*, 2009)	Enjoyment	Web-based training	U	287
(Chu & Lu, 2007)	Perceived playfulness	Online music purchasing	H	302
(Cocosila & Archer, 2010)	Intrinsic motivation	Mobile information and communication technology – health promotion	U	50
(Cocosila *et al*, 2007)	Intrinsic motivation	Short message services	M	98
(Collier, 2006)	Hedonic value	Self-service technology – automated box Office	U	329
(Correa, 2010)	Intrinsic motivation	Online content creation – blogs, social networking, IM	H	3139
(Cyr *et al*, 2006)	Enjoyment	Mobile commerce	U	60
(Cyr *et al*, 2007)	Enjoy	e-service	U	185
(Davis *et al*, 2009)	Computer playfulness	Multi-tasking at work	U	83
(Davis *et al*, 2007)	Playfulness	Excel adoption	U	111
(Deng *et al*, 2004)	Intrinsic motivation	Computer design work	U	153
(de Souza Dias, 1998)	Enjoyment	Computers in the workplace	U	79
(Elliott & Fu, 2008)	Enjoyment	Portable media player	H	312
(Fagan *et al*, 2008)	Perceived enjoyment	Computers in the workplace	U	172
(Fuller *et al*, 2010)	Enjoyment	Virtual co-creation	U	727
(George *et al*, 2006)	Enjoyment	Tablet PC – collaborative learning	U	33
(Gerow *et al*, 2010)	Cognitive absorption	Non-class Internet use	H	451
(Goel, 2008)	Cognitive absorption	Situated learning in virtual world	U	378
(Gu *et al*, 2010)	Perceived hedonic usefulness	Instant-messaging – mixed use	M	318
(Guo & Klein, 2009)	Concentration, pleasure	Online shopping	U	354
(Gupta & Kim, 2004)	Arousal, pleasure	Web-based virtual communities – e-commerce	U	275
(Ha & Stoel, 2009)	Enjoyment	Online shopping	U	298
(Ha *et al*, 2007)	Flow experience, perceived enjoyment	Mobile games	H	1011
(Hassanein & Head, 2007)	Enjoyment	e-commerce	U	78
(Heerink *et al*, 2009)	Perceived enjoyment	Social robot	H	30
(Heilman, 1997)	Enjoyment	Computers in the workplace	U	140
(Henderson *et al*, 1998)	Enjoyment	e-commerce	U	57
(Hill & Troshani, 2009)	Enjoyment	Mobile services	M	593
(Hong & Tam, 2006)	Perceived enjoyment	Mobile data services	M	808
(Hong *et al*, 2008)	Perceived enjoyment	Mobile data services	M	811
(Hsu & Chiu, 2004)	Perceived playfulness	Taxes through e-file service	U	149
(Hsu & Lu, 2004)	Flow experience	Online games	H	233
(Hsu & Lu, 2007)	Perceived enjoyment	Online games	H	356
(Hsu & Lin, 2008)	Enjoyment	Blogging	H	212
(Huang & Liaw, 2005)	Perceived liking	Web surveys	U	279
(Hur, 2007)	Perceived enjoyment	Sport web site	H	337

Table A1 Continued

Study (source)	*Intrinsic motivation studied*	*System*	*System type*	*Sample size*
(Hwang, 2010b)	Enjoyment	e-commerce	U	322
(Hwang, 2005)	Enjoyment	e-commerce	U	69
(Igbaria *et al*, 1995)	Perceived enjoyment	Computers in the workplace	U	450
(Igbaria *et al*, 1996)	Perceived fun, perceived enjoyment	Computers in the workplace	U	471
(Jashapara & Tai, 2011)	Computer playfulness	e-learning systems	U	403
(Jia *et al*, 2007)	Cognitive absorption, computer playfulness	Unspecified web use	M	283
(Jiang, 2004)	Enjoyment	e-commerce	U	176
(Jung *et al*, 2009)	Concentration	Mobile TV users	H	208
(Kamis *et al*, 2010)	Shopping enjoyment	e-commerce	U	230
(Kang & Lee, 2010)	Perceived enjoyment	Social networking sites	H	254
(Kang *et al*, 2009)	Perceived enjoyment	Social networking	H	349
(Kefi *et al*, 2010)	Hedonic outcome	Social networking sites (Facebook)	H	293
(Kiili, 2005)	Flow	Educational games	H	18
(Kim, 2010)	Perceived enjoyment	Mobile data service	M	207
(Kim *et al*, 2008)	Perceived enjoyment	Short message services	M	195
(King, 1999)	Enjoyment, playfulness Flow measure	Unspecified web use	M	54
(Ko *et al*, 2009)	Enjoyment	Mobile Internet service (m-commerce)	U	511
(Koh & Kim, 2007)	Emotion	e-servicescape/e-scape	U	490
(Koo, 2009)	Concentration, perceived enjoyment	Online games	H	576
(Korzaan & Rutner, 2003)	Playfulness	e-commerce	U	346
(Koufaris, 2002)	Concentration, enjoyment	Online purchasing	U	280
(Lankton & Wilson, 2007)	Enjoyment expectations	Online healthcare	U	111
(Lai & Chen, 2011)	Perceived enjoyment	Teaching blogs	H	325
(Lee & Chen, 2010)	Concentration, enjoyment	e-commerce	U	288
(Lee & Chang, 2011)	Perceived enjoyment	Online mass customization	U	749
(Lee *et al*, 2005)	Perceived enjoyment	Internet-based learning	U	544
(Lee *et al*, 2006)	Hedonic shopping orientation, perceived enjoyment	Online retailing	U	206
(Lee *et al*, 2007a)	Perceived playfulness	Blogging	H	59
(Lee *et al*, 2007b)	Perceived enjoyment	Multimedia messaging services	M	207
(Lewis, 1999)	Enjoyment, playfulness	Web to support teaching	U	223
(Li *et al*, 2009)	Intrinsic motivation	Customer support IS	U	193, 244
(Li *et al*, 2010)	Perceived enjoyment	Instant messaging	H	273, 341
(Li & Hsieh, 2007)	Intrinsic motivation	Customer relationship management	U	346
(Li *et al*, 2005)	Perceived enjoyment	Instant messaging	H	273
(Liaw & Huang, 2003)	Perceived enjoyment	Search engines	M	114
(Lin, 2009)	Cognitive absorption	Virtual community (yahoo)	H	172
(Lin & Bhattacherjee, 2010)	Perceived enjoyment	Online video games	H	485
(Lin *et al*, 2005)	Perceived playfulness	Web portal	H	254
(Liu & Li, 2010)	Perceived enjoyment	Mobile Internet use	M	736
(Liu & Li, 2011)	Cognitive concentration, perceived enjoyment	Mobile gaming	H	267
(Liu *et al*, 2009)	Concentration	e-learning	U	102
(Loiacono *et al*, 2002)	Entertainment	e-commerce	U	646
(Lu *et al*, 2010)	Perceived enjoyment	Short messaging service	M	262
(Lu & Su, 2009)	Enjoyment	Mobile shopping	U	369
(Lu *et al*, 2009)	Concentration, perceived enjoyment	Instant messaging	H	250
(Luo *et al*, 2010)	Enjoyment, perceived playfulness	Enterprise instant messaging	U	140
(Luo *et al*, 2006)	Entertainment	Online newspapers	M	132
(Mahatanankoon, 2007)	Individual playfulness	Text-messaging/m-commerce	M	246
(Mantymaki, 2009)	Enjoyment	Social virtual worlds	H	965
(Martinez-Torres *et al*, 2008)	Enjoyment	e-learning	U	220
(Miguel, 2004)	Enjoyment	Unspecified web use	M	338, 359
(Min, 2006)	Perceived enjoyment	Mobile data communication services	M	673
(Modjeska, 2000)	Enjoyment	Virtual reality via web browser	M	16, 36, 40, 60
(Moon *et al*, 2006)	Enjoyment of the blog	Blogging	H	172
(Morosan & Jeong, 2008)	Perceived playfulness	Online hotel reservations	U	914

Table A1 Continued

Study (source)	*Intrinsic motivation studied*	*System*	*System type*	*Sample size*
(Mun *et al*, 2010)	Enjoyment	Digital multimedia broadcasting – portable media	H	350
(Newby & Fisher, 2000)	Enjoyment	Misc non-web for learning	U	208
(Nysveen *et al*, 2005)	Enjoyment	Mobile services	M	2038
(Oh *et al*, 2009)	Playfulness	Virtual stores (e-commerce)	U	278
(Oh & Xu, 2003)	Entertainment	Mobile commerce	H	82
(Okazaki *et al*, 2008)	Perceived fun	Mobile games	H	432
(Park *et al*, 2010)	Entertainment value	Virtual community	H	502
(Park, 2010)	Motivation for entertainment	Voice over IP	U	420
(Pei, 2006)	Playfulness	Unspecified web use	M	219
(Pianesi *et al*, 2009)	Focused attention, personalization, flow	Adaptive museum guides (mobile)	U	115
(Premkumar *et al*, 2008)	Hedonic beliefs	Instant messaging – some non-hedonic	M	309, 338
(Qiu & Benbasat, 2009)	Perceived enjoyment	Online shopping	U	168
(Roca *et al*, 2006)	Cognitive absorption	e-learning in workplace	U	172
(Roca & Gagne, 2008)	Perceived playfulness	e-learning in workplace	U	166
(Rosen & Kluemper, 2008)	Flow	Social networking	H	522
(Rouibah, 2008)	Curiosity, perceived enjoyment	Instant messaging	H	191
(Rouibah & Hamdy, 2009)	Curiosity	Instant messaging	H	609
(Ryu *et al*, 2009)	Perceived enjoyment	Video user-created content	H	290
(Saade & Bahli, 2005)	Cognitive absorption	Online learning	U	102
(Saade, 2007)	Intrinsic motivation	Online learning	U	105
(Sanchez-Franco *et al*, 2009)	Flow	Web-based electronic learning	U	304, 376
(Sanchez-Franco, 2006)	Flow	Unspecified – possibly consumer	M	404, 469
(Serenko *et al*, 2007a)	Computer playfulness, perceived enjoyment	Microsoft Office	U	261
(Serenko *et al*, 2007b)	Enjoyment, escapism	Mobile phone ringtones	H	119
(Serenko, 2008)	Computer playfulness, perceived enjoyment	Interface agents – various environs	M	75
(Shen & Eder, 2009)	Perceived enjoyment, computer playfulness	Virtual worlds (second life) – e-learning	U	77
(Shen & Eder, 2008)	Perceived enjoyment	Second life	H	77
(Shiau & Luo, 2010)	Perceived enjoyment	Blog	H	430
(Shin, 2010)	Flow, perceived enjoyment	Online role-playing games	H	298
(Shin & Shin, 2011)	Perceived enjoyment, perceived playfulness, flow	Social network games	H	280
(Shin, 2007)	Perceived enjoyment	Mobile Internet	M	515
(Shin, 2009a)	Perceived playfulness, perceived enjoyment	IP TV	H	320
(Shin, 2009b)	Perceived enjoyment	IPTV	H	571
(Shin, 2009d)	Perceived enjoyment	Mobile TV	H	527
(Sledgianowski & Kulviwat, 2009)	Perceived playfulness	Social networking (Facebook, Friendster, Myspace)	H	387
(Sledgianowski & Kulviwat, 2008)	Perceived playfulness	Social networking	H	322
(Sorebo *et al*, 2009)	Intrinsic motivation	e-learning technology	U	124
(Srivastava & Chandra, 2010)	Enjoyment, curiosity	Virtual world collaborations	H	197
(Sun, 2010)	Perceived enjoyment	Online marketplaces	U	161
(Sun & Zhang, 2008a)	Computer playfulness	Microsoft Office	U	282
(Sun & Zhang, 2008b)	Computer playfulness, perceived enjoyment	Search engines – mixed	M	161
(Sun & Zhang, 2006)	Perceived enjoyment	Search engine, university web site – specified as not hedonic	U	169, 194
(Tan, 2007)	Cognitive absorption	Multi-media learning/training	U	105
(Tan & Saade, 2008)	Enjoyment	e-learning	U	120, 163
(Tan & Chou, 2008)	Perceived playfulness	Mobile phones	M	149
(Tang & Forster, 2007)	emotional value	mobile auction	U	981
(Tao *et al*, 2009)	Perceived playfulness	Business simulation games	U	185
(Teo, 2001)	Perceived enjoyment	Mixed web use	M	1370
(Terzis & Economides, 2011)	Perceived playfulness	Computer-based assessment	U	173

Table A1 Continued

Study (source)	*Intrinsic motivation studied*	*System*	*System type*	*Sample size*
(Theotokis & Doukidis, 2009)	Flow, enjoyment	Social networking (Facebook)	H	456
(Trevino *et al*, 2000)	Flow	e-mail, fax, workplace	U	528
(Turel *et al*, 2010)	Escapism, enjoyment	Mobile phone ringtones	H	422
(Turel *et al*, 2007)	Perceived emotional value	Short message services	M	222
(van Dolen *et al*, 2007)	Perceived enjoyment	Online commercial group chat	U	212
(van Schaik & Ling, 2011)	Perceived enjoyment	Web-based encyclopedia	U	128
(van Schaik & Ling, 2007)	Intensity of flow	University web site – specify not hedonic	U	103, 127
(Venkatesh & Speier, 1999)	Intrinsic motivation	Database training	U	316
(Venkatesh, 2000)	Computer playfulness, perceived enjoyment	Mix of work systems	U	246
(Venkatesh *et al*, 2002)	Intrinsic motivation	Database training	U	316
(Venkatesh & Bala, 2008)	Computer playfulness, perceived enjoyment	Computers in the workplace	U	156
(Wakefield & Whitten, 2006)	Cognitive absorption, enjoyment, playfulness	Mobile devices	M	185
(Wang, 2010)	Perceived enjoyment	Instant messaging	H	228
(Wang & Yen, 2010)	Enjoyment	Personalized web portal (iGoogle, MyYahoo)	H	183
(Wang *et al*, 2009)	Perceived playfulness	Mobile learning	U	330
(Wang *et al*, 2010b)	Perceived enjoyment	Mobile newspapers	M	192
(Wang *et al*, 2010a)	Perceived enjoyment	Blogs	H	283
(Wang *et al*, 2008)	Arousal, pleasure	Facebook	H	110
(Warr & Bunce, 1995)	Reaction of enjoyment	Job training – mix of non-web computer tools	U	106
(Wu & Li, 2007)	Enjoyment	Online games	H	253
(Yi & Hwang, 2003)	Enjoyment	Blackboard – class mgmt	U	109
(Zhou & Lu, 2011)	Perceived enjoyment	Mobile instant messaging	M	223

System Type: H = Hedonic, U = Utilitarian, M = Mixed.