Technology Adoption Decisions in the Household: A Seven-Model Comparison

Susan A. Brown
Department of Management Information Systems, University of Arizona, 1130 East Helen Street, Tucson, AZ 85721-0108. E-mail: suebrown@eller.arizona.edu

Viswanath Venkatesh
Department of Information Systems, University of Arkansas, 228 Business Building, Fayetteville, AR 72701. E-mail: vvenkatesh@vvenkatesh.us

Hartmut Hoehle
Department of Information Systems, University of Arkansas, 228 Business Building, Fayetteville, AR 72701. E-mail: hartmut@hartmuthoehle.com

We identified 7 theoretical models that have been used to explain technology adoption and use. We then examined the boundary conditions of these models of technology adoption when applied to the household context using longitudinal empirical data from households regarding their purchase and use decisions related to household technologies. We conducted 2 studies and collected 1,247 responses from U.S. households for the first study and 2,064 responses from U.S. households for the second study. Those households that had adopted household technologies were surveyed regarding their use behavior. Potential adopters (i.e., those who had currently not adopted) were surveyed regarding their purchase intentions. This allowed us to identify the most influential factors affecting a household's decision to adopt and use technologies. The results show that the model of adoption of technology in the household provided the richest explanation and explained best why households purchase and use technologies.

Introduction

More and more technologies are developed specifically with the household in mind including televisions (TVs), multimedia entertainment centers, game consoles, and personal computers (PCs) (Gartner Group, 2012, October 10; Heng, 2009, August 28). Game consoles represent an interesting household technology and they have become widely used by households. As a result of the interest in game consoles, vendors have begun to specifically tailor products for households (Sherr & Wingfield, 2011, May 7). For example, many games developed for Nintendo's Wii are made for families, rather than individual gamers. Wii controllers allow gamers to interact with the console through movement, which provides an entirely new gaming experience that has become widely used by gamers of all ages. Sony has also changed its console strategy and started to sell controllers that sense motion and position in front of the TV, enabling users of all ages to interact with the consoles (Sony, 2011, April 15). Since 2010, Sony has sold more than 50 million PlayStation move motion controllers (Sony, 2011, April 15). Likewise, Microsoft introduced Kinect devices that can be attached to Xbox gaming consoles. Kinect devices allow users to control the game through movements, where gamers can play using body gestures. One month after Microsoft rolled out Kinect devices, the company sold more than 2.5 million units (Albanesius, 2011, January 6).

The console gaming industry is only one example of the trends taking place in the household appliance, audio-visual, and computer industries (Forrester Research, 2012, August 13; Gartner Group, 2012, October 10; Sherr & Wingfield, 2011, May 7). Another example is the TV industry, where manufacturers have recognized that it is beneficial to design more interactive models (e.g., by integrating Internet-based applications, such as Skype and Facebook, into current TV models) (Heng, 2009, August 28). Advances in consumer technologies have resulted in many being commonly used and shared by several household members, which has

Received May 20, 2013; revised March 22, 2014; accepted March 23, 2014

 • Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/asi.23305

implications for use and purchase decision making (Ngobo, 2011). If purchasing technologies used exclusively by individuals, the purchase decision is a cognitive process that can be made solely by individuals without consulting others. Purchasing technology in a household context is significantly different from individual-level adoption, and the complex interactions and negotiations among household members, such as the decision maker's spouse or children, are expected to add significantly to the purchase decision complexity and can be influential for the decision outcome (Brenner & Bilgin, 2011; Dholakia, 2006; Kurt, Inman, & Argo, 2011; Ngobo, 2011; Salovaara, Helfenstein, & Oulasvirta, 2011; Van Rijnsoever & Donders, 2009; Wilcox, Block, & Eisenstein, 2011).

The volume of household technology adoption, combined with the wide variety of uses for household technology, provides opportunities for research. For example, Deutsche Bank reports that the computer gaming industry generates a global turnover of more than 40 billion U.S. dollars (Heng, 2009, August 28). Similarly, Gartner reports that, in 2010, more than 100 million PCs were sold to households in developed countries (Gartner Group, 2010, October 13). Forrester Research (2012, August 13) found that more than 2.5 billion households across the world use PCs on a regular basis to access the Internet. It is estimated that approximately 1 billion additional households around the world will purchase PCs and access the Internet by 2015 (Forrester Research, 2012, August 13).

Technology adoption and use is one of the richest streams of research in information systems (IS) literature (Benbasat & Barki, 2007; Chau & Hu, 2001; Hsieh, Rai, & Keil, 2008; Kim, 2010; Rai & Bajwa, 1997; Rai & Patnayakuni, 1996; Ye, Seo, Desouza, Sangareddy, & Jha, 2008). In this stream, there are several model comparison articles (see, e.g., Hong, Thong, & Tam, 2006; Taylor & Todd, 1995; Thompson, Compeau, & Higgins, 2006; Venkatesh, Morris, Davis, & Davis, 2003). About a decade ago, Venkatesh et al. (2003) provided a summary of several technology adoption models that had been studied in the literature. They then synthesized these models into a more concise unified theory of acceptance and use of technology (UTAUT) for the context of employee adoption and use of technology. Our aim is to follow in this tradition and test various technology adoption and use models that can be meaningfully applied to the context of household adoption and use of technology. We identified seven models appropriate for such a comparison, namely: (i) theory of reasoned action (TRA); (ii) technology acceptance model (TAM); (iii) theory of planned behavior (TPB); (iv) decomposed theory of planned behavior (DTPB); (v) model of adoption of technology in households (MATH); (vi) motivational model (MM); and (vii) innovation diffusion theory (IDT).

Apart from MATH, all models were developed for contexts other than household technology adoption. Comparing such a contextually specific model with more general models is an important empirical question that has a bearing on the broader issue of the usefulness of a general theory versus a contextual theory, especially for the particular phenomenon being investigated (Hong, Chan, Thong, Chasalow, & Dhillon, 2014; Johns, 2006; Lee & Baskerville, 2003). On the one hand, if a general model does fairly well and is comparable to a contextually specific model in terms of predicting the outcomes of interest, this would suggest that the context, although important, may not necessarily be as unique or possess specific attributes that would cause the general theory to break down. On the other hand, if a general model is predictive, but the contextually-specific model has much greater explanatory power, it would underscore the unique aspects of the particular context.

Ultimately, the balance between general versus context-specific theory is an important one. Whereas general theory provides explanations that typically make it easy to understand new phenomena and establish the scientific validity and generalizability of an existing theory, context-specific theories provide much more actionable guidance to practitioners. Therefore, knowing how well existing general and context-specific theories explain a particular phenomenon holds significant scientific and practical interest. Thus, the current work seeks to accomplish two major objectives:

Model comparison and boundary conditions: We compare the models in the context of household technology adoption as a way of examining the generalizability of these models (Hong et al., 2014; Johns, 2006; Lee & Baskerville, 2003). This is important for three reasons. First, although MATH was developed for the household context, it has not been compared to other models of technology adoption, raising questions regarding its predictive superiority. Second, such a comprehensive comparison has not been conducted to date for the household context. Third, such a comparison will provide important information to researchers and practitioners about the model that is best suited to explain and predict technology adoption and use in the context of households.

Purchase decision versus use decision: The study of individual technology adoption in the workplace has tended not to focus on purchase decisions because employees typically are not concerned with the cost or purchase processes (Holton & Fuller, 2008; Hu, Chau, Sheng, & Tam, 1999; Hu, Clark, & Ma, 2003; Kim, Ferrin, & Rao, 2008; Kim & Gupta, 2009; Van der Heijden, 2006; Van Rijnsoever & Castaldi, 2009; Zhang & Li, 2006). Similarly, studies researching technology adoption at the individual level have traditionally focused on the use or continued use of technology (Bhattacherjee, 2001a; Burton-Jones & Straub, 2006; Chakraborty, Hu, & Cui, 2008; Hong et al., 2006; Hsieh, Rai, & Xu, 2011; Sun, 2012; Thong, Hong, & Tam, 2006; Williams, Dwivedi, Lal, & Schwarz, 2009). Most of these studies included individuals who already owned the technology or had access to it (e.g., in corporate environments) at the time of the study. However, consumer psychology has found that purchase decisions and consumption decisions are systematically different because critical factors, such as cost considerations, may apply to purchase decisions, but be unrelated to use behavior (e.g., when employees use technology as part of their job) (Brenner & Bilgin, 2011;

DOI: 10.1002/asi

Chau & Hu, 2001; Joshi & Rai, 2000; Ngobo, 2011; Wilcox et al., 2011). Therefore, we investigate both purchase and use decisions as a way of examining the generalizability of the models to more complex decision-making situations than previously investigated.

Technology Adoption and Use

Models of Adoption Appropriate for the Context of This Study

Individual adoption and use of a variety of technologies, ranging from PCs in general to specific software packages, have been studied extensively in previous research (e.g., Cenfetelli & Schwarz, 2011; Djamasbi, Strong, & Dishaw, 2010; Hong et al., 2006; Hwang & Kim, 2007; Thompson et al., 2006). As noted earlier, several theoretical perspectives from psychology, management information systems (MIS), marketing, and sociology have been used in previous research.

In general, theories from psychology are aimed at understanding and predicting human behavior in a variety of domains related to everyday life, ranging from brushing teeth to choice of partners. These theories include TRA (Fishbein & Ajzen, 1975), TPB (Ajzen, 1991), and MM (Davis, Bagozzi, & Warshaw, 1992). Previous research has drawn from this theory base and developed models tailored specifically to study individual adoption and use of technologies. TAM was developed by adapting TRA to the context of individual technology adoption and use (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Similarly, TPB has been tailored to the technology adoption context by combining it with some TAM constructs in the DTPB (Taylor & Todd, 1995). In the case of TRA and TPB, the belief structure needs to be generated from each context of study; in the case of TAM and DTPB, the belief structure suited to individual technology adoption and use was developed by a careful theoretical synthesis of previous research and is thus purported to hold across different contexts. Finally, MM has been adopted and applied to study technology acceptance in the workplace (Venkatesh & Speier, 1999).

Another model, this one with a basis in sociology, that has featured prominently in explaining individual adoption and use decisions is IDT (Rogers, 1995). IDT was developed in the 1960s to study innovations in a broad sense and has been employed to study the adoption and diffusion of a wide range of technological innovations over the years (Rogers, 1995). Moore and Benbasat (1991) identified the core set of characteristics relevant to technology adoption, and, subsequently, there have been applications of IDT to study individual adoption and use decisions (e.g., Agarwal & Prasad, 1998a; Agarwal & Prasad, 1998b; Karahanna, Straub, & Chervany, 1999; Rai & Patnayakuni, 1996).

The last model of interest is one of the few models that specifically focused on household adoption (i.e., MATH) (Brown & Venkatesh, 2005; Venkatesh & Brown, 2001). MATH was derived by integrating the TPB and IDT. To develop MATH, Venkatesh and Brown (2001) surveyed households regarding their PC adoption and use behavior. Specifically, open-ended responses were coded based on constructs from TPB and IDT, with additional constructs emerging from the data. The resulting model was similar in spirit to the DTPB (Taylor & Todd, 1995). In keeping with the general conceptual underpinnings of previous technology adoption research, MATH developed the underlying attitudinal, normative, and control beliefs that predict household adoption and use. It is in explaining the underlying belief structure where MATH departs from previous research, because MATH provides a belief structure that is tailored to the context of technology adoption in the household (Brown & Venkatesh, 2005). Figure 1 shows the theoretical models studied in this research.

Although the models drew from diverse perspectives, there is some overlap. For example, TRA is a subset of TPB because the latter model extended TRA by including the concept of behavioral control. TAM and IDT have overlap, for example, in relative advantage and perceived usefulness (Davis, 1989; Moore & Benbasat, 1991). Moore and Benbasat (1991) used the perceived usefulness scales originally developed by Davis (1989) to measure the relative advantage construct. MM and TAM have conceptual and empirical similarities—that is, extrinsic motivation can be measured using items for perceived usefulness in the original TAM article (Davis, 1989; Davis et al., 1992). Finally, MATH builds on TPB and IDT (see Brown & Venkatesh, 2005). The model was developed based on the underlying attitudinal, normative, and control beliefs that were proposed by TPB. Table 1 shows the core constructs contributing to each model and the areas of overlap across the models.

The overlap indicates a possible triangulation of results from diverse theoretical perspectives. Furthermore, although there are some shared constructs, the different perspectives are distinct in that they also propose unique constructs. Appendix A provides a more detailed view of the contributing theories and constructs.

Model Comparison and Boundary Conditions

There is an established tradition in MIS research in general, and the technology adoption stream in particular, of comparing research models that have been developed and tested in earlier work (Cao, Ewing, & Thompson, 2012; Chau & Hu, 2001; Hong et al., 2006; Luo, Chea, & Chen, 2011; Mathieson, 1991; Taylor & Todd, 1995; Thompson et al., 2006; Venkatesh et al., 2003). Mathieson (1991) compared TAM and TPB. Subsequently, Taylor and Todd (1995) studied TAM and two versions of TPB. More recently, as mentioned earlier, in one of the more comprehensive reviews in technology acceptance research, Venkatesh et al. (2003) benchmarked eight competing models of technology adoption that were appropriate for testing technology adoption in the workplace. The results showed that UTAUT

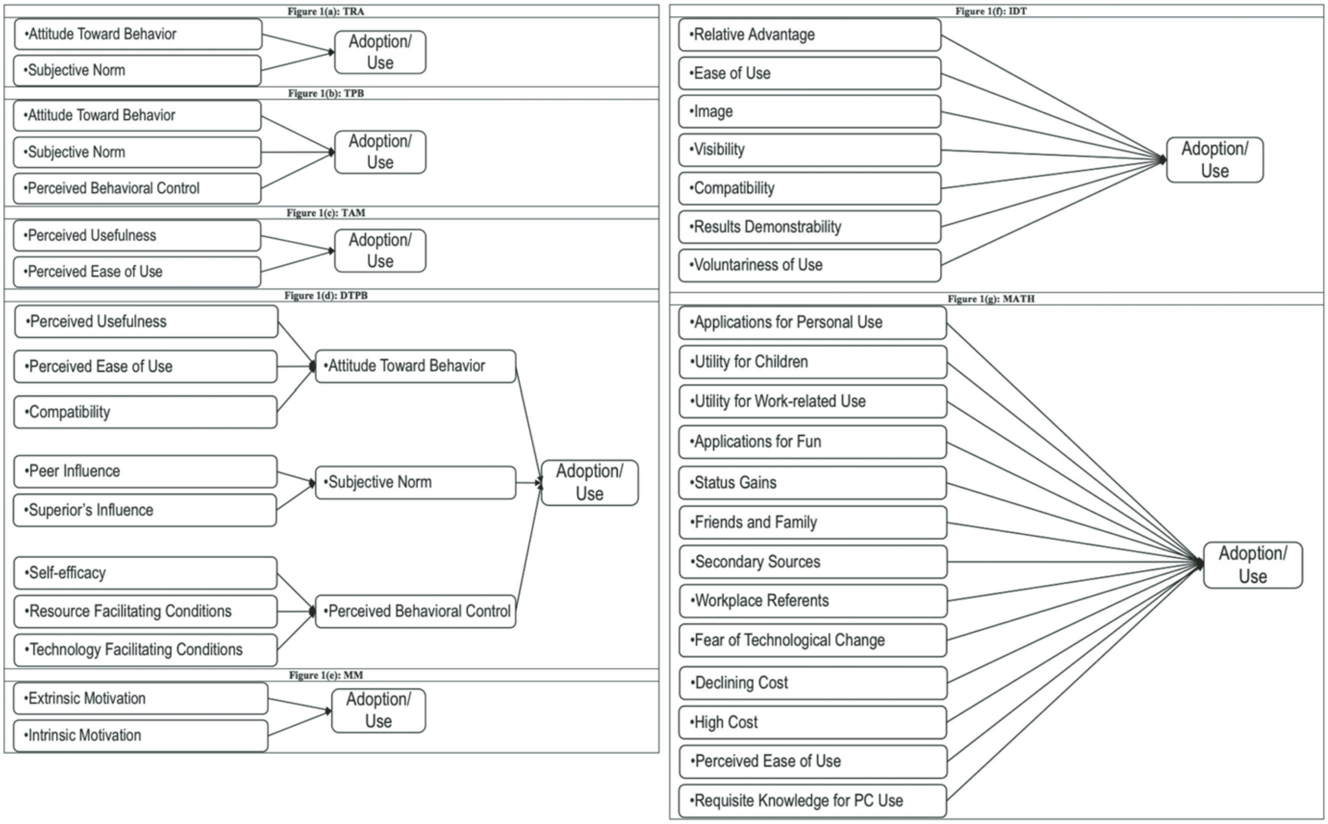

FIG. 1. Visualization of the models tested in our research.

TABLE 1. Underlying core constructs of the models tested in our research.

	TRA	TAM	MM	TPB	DTPB	IDT	MATH
Attitude	X			X	X		
Subjective norm	X			X	X		
Perceived behavioral control				X	X		
Perceived usefulness/extrinsic motivation		X	X		X		
Perceived ease of use/ease of use		X			X	X	X
Compatibility					X	X	
Peer influence					X		
Superior influence					X		
Efficacy/requisite knowledge for PC use					X		X
Resource facilitating conditions					X		
Technology facilitating conditions					X		
Intrinsic motivation			X				
Relative advantage						X	
Image/status gains						X	X
Visibility						X	
Result demonstrability						X	
Voluntariness of use						X	
Applications for personal use							X
Utility for children							X
Utility for work-related use							X
Applications for fun							X
Influence from friends and family							X
Information from secondary sources							X
Rapid change in technology (fear of obsolescence)							X
Declining cost							X
High cost							X

DOI: 10.1002/asi

outperformed the models tested and explained more than 70% of the variance in intention to use technology. Similarly, Hong et al. (2006) contrasted three models of continued information technology (IT) use behavior, including the IS continuance (ISC) model (Bhattacherjee, 2001a), TAM (Davis et al., 1989), and a newly developed extended expectation-confirmation model. Of the three models, the extended expectation-confirmation model explained the most variance in the continued intention-to-use construct (67%), although TAM fitted the data best (Hong et al., 2006).

We conduct a comparison of models that can be meaningfully applied to technology adoption in the household context. Some models, although useful for understanding technology adoption, are not easily applied to the household context. For example, UTAUT suggests that age, gender, and experience with technology moderate key causal relationships in the research model. These moderators are challenging to test in a household context because they vary across household members. Thus, UTAUT seemed inappropriate for the household context. Similarly, the ISC model (Bhattacherjee, 2001a, 2001b; Lin & Bhattacherjee, 2010) was designed to explain continued IT use. A key focus of our study is the initial technology adoption and purchase decision. Thus, the ISC model was not considered. Based on our assessment, the models shown in Figure 1 were most appropriate for the purpose of this study. Benchmarking the listed models is an important contribution to research because it examines the generalizability (external validity) of the existing models to a new context (Hong et al., 2014; Johns, 2006; Lee & Baskerville, 2003). Models that generalize better to new settings and contexts are generally considered more scientifically robust. However, lack of support or weaknesses in models will help us understand the boundary conditions of the model(s) that can then serve as important information for scientists to modify and extend the models to the household technology adoption context (Johns, 2006; Lee & Baskerville, 2003).

Purchase Versus Use

In choosing a dependent variable for the current research, we examined technology adoption research and also research in the reference disciplines, particularly psychology. The predominant dependent variables in previous research are intention and use. In the current research, we have two major categories of households to be studied: those that currently have not adopted household technologies (i.e., potential adopters) and those that currently own household technologies (i.e., adopters). For the adopters, the behavior of interest is actually their use of household technologies. Because the household technology adoption decision has already been made in these households, asking adopters about the factors that influenced their original purchase decision would likely result in significant retrospective biases, including the inability to report accurately. Thus, we considered intention to purchase as an inappropriate dependent variable for households that already owned household technologies. Although some technology acceptance research has employed intention as a dependent variable, even in cases where the behavior is well rehearsed (Bhattacherjee, 2001a; Djamasbi et al., 2010; Lee, 2009; Luo et al., 2011; Pavlou & Fygenson, 2006; Thompson, Higgins, & Howell, 1991), much research in psychology (Aarts & Dijksterhuis, 2000; Gollwitzer & Sheeran, 2006; Ouellette & Wood, 1998; Sheeran, 2002) and technology acceptance (Ortiz de Guinea & Markus, 2009; Palvia, Pinjani, Cannoy, & Jacks, 2011) has demonstrated that intentions are typically important only in the context of new behaviors and are not predictive for well-rehearsed, routinized behaviors. Therefore, we employ use behavior as the dependent variable for those that have already adopted a particular household technology.

For those that have not yet adopted household technologies, psychology theories typically suggest that intention is the appropriate dependent variable to use (Ajzen, 1991; Fishbein & Ajzen, 1975; Sheppard, Hartwick, & Warshaw, 1988). Because potential adopters have not yet acquired a given household technology, understanding the factors that influence their intention to adopt is more appropriate. We note that intention to purchase fundamentally differs from use, in that intention involves monetary commitment from the household to purchase the technology.

Research Method

Study Context

Despite being originally designed as workstations (e.g., for running office applications), PCs are used by households for a variety of tasks today. For example, households use PCs as workstations, game stations, TV receivers, digital video recorders, and home theater control centers. Recent market research shows that more than 12 million U.S. households use PCs as a hub for digital photos, music, and videos (Leichtman Group, 2011). These developments are particularly driven by online video and music on demand services, such as Netflix, Hulu, and Apple's iTunes store. Likewise, many PCs are used for gaming and vendors often simultaneously release PC versions for Xbox, Wii, and PlayStation games. This allows PC users to play and interact with game console owners online. This shows that PC use has diversified significantly over the last few years, and market research predicts that households will continue to adopt PCs (Gartner Group, 2012, October 10). Thus, it is important to understand why households purchase and use PCs. Given the nature of PCs, their use, and diffusion, the adoption and use of PCs in households represents an appropriate context to conduct our study comparing different models of technology adoption and use.

We designed two studies to gather data regarding PC adoption and use decisions in U.S. households and conducted a longitudinal nationwide survey with the assistance of two independent market research firms. This ensured that we would obtain two independent samples. The first study

DOI: 10.1002/asi

took place in early 2000, and the market research firm distributed the survey by mail drawn from a random list of 5,400 households. In order to increase the response rate, a $5 gift certificate was offered to all respondents completing the survey and participants were also offered to participate in a lottery for a gift certificate of $500. In order to receive their certificates, respondents provided their address on an information blank that was provided separately from the questionnaire. For the first study, we received 1,247 usable responses, resulting in a response rate of over 24%. The second study was conducted in 2012, and the market research firm recruited participants by phone and asked them to complete the survey online. Approximately 100,000 phone calls were made, resulting in approximately 10,000 households that agreed to participate in our study. Of those, 2,064 households completed the online survey, resulting in a response rate just over 20%. As in the first data collection round, participants received small research incentives as compensation for their participation. For both studies, our data collection procedure was consistent with that described by Brown and Venkatesh (2005). We collected the data for the dependent variables exactly 6 months after the initial survey. Also, to check for nonresponse bias in both samples, responses received in early phases of the data collection were compared to those received during late phases. We found no significant differences in the demographics, means, or correlations.

Measures

Items to measure the constructs were adapted from earlier research. Appendix B lists the constructs, their measures, and the source of measurement.

Results

We first examined how well both samples represented the population of U.S. households. In order to do this, we compared the characteristics of the samples with the characteristics of the population based on the Bureau of the Census for 2000 and 2012, respectively. For each respective year, we compared the sample characteristics to the corresponding characteristics of the population derived from census data. The data were obtained from the U.S. Census Bureau (USCB, 2013, August 15). The results confirmed that the samples were representative of the population in terms of family status, gender, racial background, age, nativity, region, residence, and household income, thus suggesting that the findings of the current research were likely to generalize to the target population (i.e., U.S. households) for both respective years. The descriptive statistics and correlations for the current owners and nonowners samples are shown in Table 2.

For the model estimations, we used partial least squares (PLS). PLS is a component-based structural equation modeling technique that maximizes the variance explained in estimating the specified model. We used SMART-PLS (Version 2.0) (Ringle, Wende, & Becker, 2005) as the specific software package. All constructs were modeled reflectively except use, which was modeled formatively. The measurement model results from PLS supported reliability and convergent and discriminant validity—all internal consistency reliabilities (ICRs) were greater .70 and all average variances extracted (AVEs) were greater than interconstruct correlations (see Table 2). Specifically, 14 model tests were conducted, and therefore 14 measurement models and associated reliabilities, AVEs, and loadings/cross-loadings were examined to ensure acceptable reliability and validity of all scales. The validity was further supported by acceptable loadings (>.65) and low cross-loadings (<.30) in all model tests. Tables 2a and 2b present the descriptive statistics and correlations.

For the analyses, the dependent variable was use behavior for current owners and intention to purchase for nonowners. As is evident from Table 3, all models provided reasonable explanatory power in understanding current use and adoption behavior, with the variance explained ranging from 12% to 56%. MATH explained the most variance, by far, in the dependent variables, ranging from 48% to 56% in both studies. IDT, TPB, and DTPB explained approximately 20% of the variance across the dependent variables in both studies. TRA, TAM, and MM explained approximately 15% of the variance across the dependent variables in both studies. Comparing the results of study 1 and study 2, we note that all models were consistent across the two samples in predicting technology use and purchase intentions. Despite the overall consistency of the results, we found some smaller variations between the first and second study. For example, although MATH was relatively stable across the samples in terms of predicting both dependent variables, our findings show that the effects of some independent variables on the dependent variables changed over time. For example, the significance levels for fear of technological change dropped between the first ($\beta = -.22$; $p < .001$) and second study ($\beta = -.13$; $p < .05$). Also, the effect of declining cost on purchase intention was significant among nonowners in study 1 ($\beta = .15$; $p < .05$), but not in study 2 ($\beta = .10$). Table 3 shows the results of model testing for both studies.

Self-reported data can be subject to common method bias. To check for this potential threat, we examined the data for common method variance using the marker variable technique (see Lindell & Whitney, 2001). We checked the lowest correlation between pairs of items in our data set because it indicates the upper limit of method bias that can be present in the data (Lindell & Whitney, 2001; Malhotra, Kim, & Patil, 2006). An examination of the matrices of item-to-item correlations for all computed models showed a large number of nonsignificant item-to-item correlations in the data set. In addition, as mentioned earlier, we followed the data collection procedure outlined by Brown and Venkatesh (2005) and collected data for the dependent variables at a different time than the independent variables. This alleviated concerns regarding common method variance even further.

DOI: 10.1002/asi

TABLE 2a. Descriptive statistics, ICRs, AVEs, and correlations: first study.

		Current owners				Current nonowners																	
	Theory of Reasoned Action	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3											
1	Attitude	2.54	0.90	0.77	0.71	3.25	0.81	0.76	0.72		.27***	.29***											
2	Subjective norm	2.68	0.89	0.75	0.74	2.46	0.82	0.75	0.71	.21***		.24***											
3	Use/purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.26***	.19**												
	Theory of Planned Behavior	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4										
1	Attitude	2.54	0.90	0.77	0.71	3.25	0.81	0.76	0.72		.27***	.18**	.29***										
2	Subjective norm	2.68	0.89	0.75	0.74	2.46	0.82	0.75	0.71	.21***		.17**	.24***										
3	Perceived behav. control	2.42	0.97	0.74	0.71	2.88	0.86	0.73	0.70	.17**	.19**		.21***										
4	Use/purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.26***	.19**	.24***											
	Technology Acceptance Model	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3											
1	Perceived usefulness	3.81	0.78	0.86	0.80	2.49	0.67	0.89	0.80		.29***	.40***											
2	Perceived ease of use	3.79	0.68	0.86	0.78	3.14	0.85	0.87	0.76	.30***		.21***											
3	Use/purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.34***	.25***												
	Decomposed Theory of Planned Behavior	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4	5	6	7	8	9	10	11	12		
1	Attitude	2.54	0.90	0.77	0.71	3.25	0.81	0.76	0.72		.27***	.18**	.30***	.28***	.19**	.24***	.19**	.02	.06	.15*	.29***		
2	Subjective norm	2.68	0.89	0.75	0.74	2.46	0.82	0.75	0.71	.21***		.17**	.29***	.06	.08	.39***	.30***	.06	.17**	.07	.24***		
3	Perceived behav. control	2.42	0.97	0.74	0.71	2.88	0.86	0.73	0.70	.17**	.19**		.16*	.24***	.02	.08	.11	.33***	.20**	.26***	.21**		
4	Perceived usefulness	3.81	0.78	0.86	0.80	2.49	0.67	0.89	0.80	.26***	.20**	.16*		.29***	.21***	.06	.02	.17**	.04	.04	.40***		
5	Perceived ease of use	3.79	0.68	0.86	0.78	3.14	0.85	0.87	0.76	.22***	.17**	.21***	.30***		.10	.02	.07	.30***	.17**	.16*	.21***		
6	Compatibility	3.51	0.58	0.77	0.71	2.71	0.86	0.76	0.72	.14*	.08	.01	.26***	.02		.05	.08	.02	.07	.04	.15*		
7	Peer influence	2.65	0.56	0.84	0.74	2.75	0.77	0.85	0.79	.20**	.28***	−.11*	.14*	.17**	.19**		.48***	.16*	.01	−.11	.20**		
8	Superior's influence	1.99	0.32	0.83	0.77	1.94	0.58	0.81	0.75	.22***	.21***	.02	.22***	.16*	.08	.46***		.04	.08	−.14*	.22***		
9	Self-efficacy	4.22	0.78	0.80	0.72	2.41	0.60	0.82	0.77	.10	.06	.20**	.08	.34***	.02	.17**	.04		.25***	.25***	.25**		
10	Res. fac. condns.	3.97	0.85	0.76	0.73	3.38	0.75	0.77	0.73	.11	.17**	.24***	−.02	.19**	.21***	.04	.02	.27***		.37***	.17**		
11	Tech. fac. condns.	3.27	0.78	0.75	0.70	3.39	0.67	0.75	0.71	.02	.12	.04	−.07	.22***	−.10	−.02	.01	.20**	.30***		.04		
12	Use/purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.26***	.19**	.24***	.34***	.25***	.29***	.20**	.22***	.21***	.19**	.07			
	Motivational Model	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3											
1	Extrinsic motivation	3.81	0.78	0.86	0.78	2.49	0.67	0.89	0.80		.20**	.40***											
2	Intrinsic motivation	3.98	0.71	0.84	0.72	2.15	0.66	0.81	0.76	.21***		.27***											
3	Use/purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.34***	.24***												
	IDT	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4	5	6	7	8						
1	Relative advantage	3.84	0.66	0.86	0.78	2.90	0.55	0.89	0.80		.29***	.25***	.24***	.24***	.20**	.21***	.42***						
2	Perceived ease of use	3.79	0.68	0.86	0.78	3.14	0.85	0.87	0.76	.30***		.07	.04	.10	.08	.07	.21***						
3	Image	3.31	0.61	0.79	0.73	1.96	0.52	0.78	0.74	.31***	−.11		.50***	.07	.17*	.10	.21*						
4	Visibility	3.34	0.60	0.75	0.72	2.50	0.46	0.75	0.71	.24***	.04	.45***		.08	.04	.04	.10						
5	Compatibility	3.51	0.58	0.79	0.75	2.71	0.86	0.79	0.73	.20**	.02	.21*	.16*		.04	.10	.15*						
6	Res. demonstrability	3.48	0.68	0.74	0.71	2.87	0.59	0.77	0.74	.25***	.18**	.07	.06	.23***		.03	.16*						
7	Percd. voluntariness	4.35	0.30	0.73	0.70	4.55	0.23	0.75	0.71	.31***	.06	.15*	.02	.02	.06		.07						
8	Use/Purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.34***	.25***	.20**	.14*	.29***	.17**	.06							
	Model of Adoption of Technology in Households	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Applns. for personal use	4.55	1.04	0.77	0.72	3.44	1.13	0.79	0.74		.30***	.44***	.21***	.17**	.21***	.22***	.16*	.02	.06	.02	.20**	.24***	.26***
2	Utility for children	4.57	1.20	0.75	0.71	3.88	1.03	0.79	0.74	.29***		.24***	.33***	.20**	.32***	.30***	.16*	−.21***	.10	.03	.02	.01	.27***
3	Utility for work-rel. use	4.77	1.21	0.74	0.73	4.02	0.90	0.84	0.78	.37***	.15*		.26***	.23***	.21***	.04	.20**	−.16*	.14*	−.17**	.21***	.20**	.22**
4	Applns. for fun	4.20	1.05	0.79	0.76	4.17	1.06	0.83	0.78	.21***	.31***	.22***		.02	.24***	.02	.08	.03	.10	.10	.27***	.17**	.25***
5	Status gains	4.01	0.85	0.81	0.75	4.03	0.99	0.80	0.77	.02	.02	.04	.14*		.03	.04	.02	−.21***	.03	.02	.04	.02	.21***
6	Infl. of friends and family	4.03	0.77	0.80	0.73	3.80	1.06	0.77	0.72	.19*	.28***	.19**	.22***	.11		.31***	.67***	.02	.01	.16*	.03	.05	.18**
7	Inf. of secondary sources	4.10	0.77	0.81	0.75	4.14	0.77	0.75	0.72	.22***	.26***	.22***	.02	.08	.23***		.31***	.10	.06	.02	.02	.10	.21***
8	Peer influence	3.22	0.64	0.78	0.74	3.66	0.68	0.79	0.74	.03	.18**	.17**	.22***	.27***	.68***	.35***		−.20**	.01	.10	.04	.19**	.20**
9	Fear of tech. change	3.03	0.60	0.79	0.73	4.03	0.90	0.74	0.71	.05	.03	.16*	−.04	−.20**	−.16*	.02	.01		.42***	.27***	−.20**	−.25***	−.35***
10	Declining cost	3.88	0.93	0.76	0.72	4.78	0.84	0.73	0.70	.04	.02	.02	−.02	.02	.04	.08	.02	.35***		.40***	.12	.18*	.18**
11	High cost	2.90	0.70	0.75	0.72	4.06	0.76	0.79	0.74	.01	.00	.15*	−.17**	.08	−.03	.08	.16*	.21***	.37***		.00	.02	.24***
12	Perceived ease of use	3.79	0.68	0.86	0.78	3.14	0.85	0.78	0.76	.22***	.08	.18*	.20**	.18**	.01	.02	.02	−.22***	.04	.12		.34***	.21***
13	Requisite knowledge	4.80	0.77	0.75	0.74	4.13	0.74	0.73	0.71	.17**	.03	.15*	.15*	.02	.15*	.01	.15*	−.21***	.02	.11	.31***		.27***
14	Use/Purchase	5.17	3.89	NA	NA	4.17	1.51	0.79	0.71	.28***	.30***	.22***	.20**	.20**	.15*	.21***	.20**	.12	.10	.17**	.25***	.20**	

Notes. Below-diagonal elements are correlations for current owners with a dependent variable of use behavior. Above-diagonal elements are correlations for current nonowners with a dependent variable of adoption behavior.
*$p < .05$; **$p < .01$; ***$p < .001$.
[a]Note that a 7-point Likert scale was used for the perceptual measures in this study.

DOI: 10.1002/asi

TABLE 2b. Descriptive statistics, ICRs, AVEs, and correlations: second study.

		Current owners				Current nonowners																	
	Theory of Reasoned Action	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3											
1	Attitude	2.75	0.88	0.77	0.70	3.21	0.80	0.79	0.75		.29***	.31***											
2	Subjective norm	2.88	0.77	0.75	0.73	2.31	0.80	0.82	0.73	.23***		.27***											
3	Use/purchase	8.87	4.12	NA	NA	4.66	1.32	0.85	0.77	.28***	.20**												
	Theory of Planned Behavior	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4										
1	Attitude	2.75	0.88	0.77	0.70	3.21	0.80	0.77	0.70		.29***	.25***	.31***										
2	Subjective norm	2.88	0.77	0.75	0.73	2.31	0.80	0.75	0.73	.23***		.17**	.27***										
3	Perceived behav. control	2.66	0.69	0.73	0.71	2.93	0.85	0.78	0.73	.22***	.15*		.25***										
4	Use/purchase	8.87	4.12	NA	NA	4.66	1.32	0.85	0.77	.28***	.20**	.23***											
	Technology Acceptance Model	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3											
1	Perceived usefulness	4.15	1.01	0.86	0.77	2.85	1.01	0.89	0.76		.31***	.44***											
2	Perceived ease of use	4.15	1.04	0.88	0.79	3.35	0.85	0.85	0.76	.32**		.17**											
3	Use/purchase	8.87	4.12	NA	NA	4.66	1.32	0.85	0.77	.35***	.26***												
	Decomposed Theory of Planned Behavior	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4	5	6	7	8	9	10	11	12		
1	Attitude	2.75	0.88	0.77	0.70	3.21	0.80	0.79	0.75		.29***	.31***	.31***	.31***	.24***	.29***	.20**	.06	.10	.17**	.31***		
2	Subjective norm	2.88	0.77	0.75	0.73	2.31	0.80	0.82	0.73	.23***			.30***	.04	.10	.34***	.44***	.03	.20**	.10	.29***		
3	Perceived behav. control	2.66	0.69	0.73	0.71	2.93	0.85	0.78	0.73	.28***	.20**		.17**	.29***	.05	.10	.07	.37***	.24***	.30***	.25***		
4	Perceived usefulness	4.15	1.01	0.86	0.77	2.85	1.01	0.89	0.76	.28***	.21***	.15*		.31***	.31***	.04	.08	.21***	.09	.11*	.44***		
5	Perceived ease of use	4.15	1.04	0.88	0.79	3.35	0.85	0.85	0.76	.24***	.19**	.17**	.32***		.14*	.07	.06	.34***	.20**	.17*	.24***		
6	Compatibility	3.67	0.59	0.77	0.73	2.75	1.01	0.84	0.71	.12*	.06	.05	.29***	.07		.08	.10	.05	.10	.07	.20**		
7	Peer influence	2.78	0.57	0.75	0.73	2.85	0.91	0.85	0.73	.22***	.34***	−.13*	.15*	.20**	.24***		.55***	.19**	.05	.14*	.24***		
8	Superior's influence	1.57	0.25	0.76	0.75	1.50	0.69	0.80	0.74	.29***	.28***	.07	.24***	.39***	.13*	.51***		.05	.10	−.17**	.24***		
9	Self-efficacy	4.29	0.84	0.78	0.73	2.80	0.67	0.82	0.75	.07	.09	.24***	.10	.24***	.04	.15*	.05		.28***	.28***	.31***		
10	Res. fac. condns.	4.10	0.88	0.79	0.71	3.51	0.83	0.83	0.76	.05	.20**	.29***	−.07	.21***	.24***	.06	.04	.30***		.40***	.21***		
11	Tech. fac. condns.	3.29	0.77	0.75	0.71	3.64	0.75	0.78	0.73	.08	.17**	.08	−.10	.25***	−.13*	−.05	.04	.21***	.34***		.10		
12	Use/Purchase	8.87	4.12	NA	NA	4.66	1.32	0.85	0.77	.28***	.20**	.23***	.35***	.26***	.31***	.24***	.24***	.23***	.21***	.10			
	Motivational Model	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3											
1	Extrinsic motivation	4.15	1.04	0.86	0.77	2.85	1.01	0.89	0.76		.24***	.44***											
2	Intrinsic motivation	4.13	0.85	0.75	0.70	2.08	0.75	0.73	0.71	.24***		.20**											
3	Use/purchase	8.87	4.12	NA	NA	4.66	1.32	0.85	0.77	.35***	.23***												
	IDT	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4	5	6	7	8						
1	Relative advantage	4.15	1.01	0.86	0.77	2.85	1.01	0.89	0.76		.31***	.28***	.30***	.31***	.25***	.29***	.44***						
2	Perceived ease of use	4.15	1.04	0.88	0.79	3.35	0.85	0.85	0.76	.32***		.10	.14*	.14*	.14*	.19**	.24***						
3	Image	3.87	0.75	0.75	0.73	1.95	0.80	0.75	0.73	.26***	−.17**		.55***	.10	.20**	.12*	.29***						
4	Visibility	3.41	0.80	0.75	0.71	2.41	0.83	0.75	0.73	.26***	.08	.57***		.13*	.07*	.13*	.13*						
5	Compatibility	3.67	0.59	0.77	0.73	2.75	1.01	0.84	0.71	.29***	.07	.24***	.19**		.08	.15*	.20**						
6	Res. demonstrability	3.51	0.71	0.78	0.73	3.14	0.64	0.77	0.71	.28***	.26***	.13*	.07	.24***		.07	.24***						
7	Percd. voluntariness	4.48	0.35	0.77	0.73	4.66	0.32	0.75	0.73	.34***	.10	.17**	.08	.08	.10		.08						
8	Use/Purchase	8.87	4.12	NA	NA	1.32	4.66	0.85	0.77	.35***	.26***	.14*	.16**	.31***	.14*	.10							
	Model of Adoption of Technology in Households	M	SD	ICR	AVE	M	SD	ICR	AVE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Applns. for personal use	4.44	1.01	0.77	0.70	3.13	1.05	0.78	0.71		.33***	.47***	.26***	.20**	.24***	.28***	.20**	.04	.13*	.10	.24***	.29***	.30***
2	Utility for children	4.59	1.24	0.74	0.71	3.75	0.85	0.73	0.71	.31***		.29***	.37***	.21***	.35***	.31***	.24***	−.24***	.08	.06	.08	.06	.30***
3	Utility for work-rel. use	4.60	1.01	0.73	0.71	3.66	0.75	0.79	0.71	.40***	.16*		.39***	.27***	.24***	.07	.23***	−.21***	.15*	−.24***	.26***	.28***	.26***
4	Applns. for fun	4.30	0.88	0.81	0.75	3.28	1.02	0.77	0.72	.28***	.34***	.24***		.08	.28***	.05	.14*	.08	.13*	.07	.31***	.19**	.29***
5	Status gains	3.87	0.75	0.75	0.73	3.91	1.05	0.75	0.74	.05	.08	.10	.17**		.07	.06	.10	−.24***	.07	.08	.10	.10	.29***
6	Infl. of friends and family	3.75	0.76	0.76	0.71	2.78	1.03	0.84	0.78	.24***	.31***	.21***	.24***	.14*		.35***	.71***	.07	.05	.15*	.05	.10	.24***
7	Inf. of secondary sources	3.91	0.84	0.73	0.70	4.01	0.80	0.75	0.71	.28***	.29***	.27***	.10	.15*	.29***		.34***	.14*	.10	.06	.08	.17**	.27***
8	Peer influence	2.78	0.57	0.75	0.73	2.85	0.91	0.85	0.73	.13*	.24***	.20**	.28***	.31***	.65***	.37***		−.28***	.08	.16*	.07	.24***	.24***
9	Fear of tech. change	3.10	0.67	0.73	0.71	4.08	0.75	0.76	0.73	.07	.08	.19**	−.08	−.24***	−.17**	.05	.08		.44***	.30***	−.25***	−.29***	−.38***
10	Declining cost	3.65	0.88	0.75	0.71	4.13	0.73	0.83	0.73	.08	.10	.05	−.06	.07	.05	.06	.13*	.41***		.44***	.19**	.24***	.28***
11	High cost	3.12	0.84	0.76	0.72	4.01	0.70	0.80	0.74	.05	.14*	.19**	−.24***	.10	−.05	.08	.20**	.24***	.40***		.10	.07	.24***
12	Perceived ease of use	4.15	1.04	0.88	0.79	3.35	0.85	0.85	0.76	.29***	.13*	.24***	.25***	.23***	.10	.10	.13*	−.28***	.07	.13*		.41***	.24***
13	Requisite knowledge	4.32	0.28	0.75	0.73	2.85	0.85	0.75	0.77	.15*	.16**	.28***	.17**	.10	−.16*	.13*	−.14*	−.29***	.08	.16*	.34***		.29***
14	Use/purchase	8.87	4.12	NA	NA	4.66	1.32	0.85	0.77	.34***	.34***	.24***	.24***	.14***	.19**	.24***	.24***	.15*	.05	.20**	.26***	.24***	

Notes. Below-diagonal elements are correlations for current owners with a dependent variable of use behavior.
Above-diagonal elements are correlations for current nonowners with a dependent variable of adoption behavior.
$^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.
[a]Note that a 7-point scale was used for the perceptual measures in this study.

TABLE 3. Results of model testing.

			Study 1				Study 2			
			Current owners		Current nonowners		Current owners		Current nonowners	
Theory/model	DV[a]	IV	R^2	β	R^2	β	R^2	β	R^2	β
TRA	Use/purchase	Attitude	.16	.27***	.12	.21**	.17	.29***	.15	24***
		Subjective norm		.20*		.22**		.21***		.20**
TPB	Use/purchase	Attitude	.19	.26***	.20	.27***	.19	.28***	.22	.31***
		Subjective norm		.20*		.21**		.17**		.15*
		Perceived behavioral control		.18*		.19**		.16**		.20**
DTPB	Use/purchase	Attitude	.19	.26***	.20	.27***	.20	.25***	.19	.31***
		Subjective norm		.20*		.21**		.17**		.18**
		Perceived behavioral control		.18*		.19**		.21***		.16**
	Attitude	Perceived usefulness	.12	.20**	.12	.17*	.15	.24***	.21	.21***
		Perceived ease of use		.16*		.20**		.15*		.27***
		Compatibility		.06		.07		.10		.14*
	Subjective norm	Peer influence	.10	.23***	.10	.22***	.15	.29***	.17	.30***
		Superior's influence		.15*		.14*		.16*		.17**
	Perceived behavioral control	Self-efficacy	.11	.24***	.11	.22***	.10	.13*	.17	.14*
		Resource facilitating conditions		.18*		.14*		.20**		.24***
		Technology facilitating conditions		.05		.05		.10		.17**
TAM	Use/purchase	Perceived usefulness	.15	.27***	.15	.30***	.15	.30***	.15	.31***
		Perceived ease of use		.18**		.16*		.15*		.14*
MM	Use/purchase	Extrinsic motivation	.16	.28***	.16	.30***	.17	.28***	.16	.26***
		Intrinsic motivation		.19*		.14*		.21***		.20**
IDT	Use/purchase	Relative advantage	.24	.19**	.22	.16*	.22	.20**	.17	.15*
		Ease of use		.16*		.15*		.15*		.14*
		Image		.16*		.14*		.14*		.13*
		Visibility		.05		.04		.01*		.05
		Compatibility		.14*		.14*		.06*		.02
		Result demonstrability		.08		.05		.05		.08
		Voluntariness of use		.10		.04		.04		.10
MATH	Use/purchase	Applications for personal use	.50	.33***	.51	.28***	.48	.31***	.56	.30***
		Utility for children		.17*		.10		.16**		.14*
		Utility for work-related use		.15*		.21**		.16**		.24***
		Applications for fun		.28***		.17*		.34***		.21***
		Status gains		.08		.10		.10		.05
		Friends and family		.10		.17*		.13*		.13*
		Secondary sources		.10		.17*		.05		.19**
		Workplace referents		.08		.08		.08		.02
		Fear of technological change		.05		−.22***		.07		−.13*
		Declining cost		.07		.15*		.10		.10
		High cost		.05		−.16*		.10		−.13*
		Perceived ease of use		.08		.16*		.13*		.10
		Requisite knowledge for PC use		.08		.08		.08		.06

Notes: [a] Use was the dependent variable for all current owners. Purchase was the dependent variable for all current non-owners.
DV = Dependent Variable, IV = Independent Variable.
$*p < .05$; $**p < .01$; $***p < .001$.

Discussion

This research sought to accomplish two objectives. The first was to empirically benchmark the identified models to explain the household decision to adopt and use technology. The second objective was to investigate both purchase and use decisions as a means of examining the generalizability of the models to more complex decision-making situations than previously investigated. Based on two nation-wide longitudinal studies of 1,247 and 2,064 U.S. households, the examined models performed well in terms of explaining household technology purchase and use decisions. This research presents an important step in examining the generalizability and thus the boundary conditions of existing theoretical models.

MATH outperformed the remaining models and explained, by far, the most variance in both dependent variables (e.g., the model explained 50% in intention to use and 51% in the intention to purchase variable during the first study and 48% in intention to use and 56% in the intention to purchase variable during the second study). This was not unexpected, given that MATH was specifically developed to explain technology adoption at the household level. Although the remaining models explained less variance in the dependent variables, the findings provide two critical insights. First, all models were stable across both studies in predicting variance in the outcome

DOI: 10.1002/asi

variables. Second, each model predicted both outcome variables, namely, technology use and intention to purchase. We also note that all models differ in terms of their richness in explaining household technology adoption and use, and the most fine-grained model (i.e., MATH) provides the richest view among the seven models.

Theoretical Implications

Our work advances the existing body of knowledge in several ways. First, MATH is most comprehensive in its identification of household-specific beliefs and it outperformed the remaining technology adoption and acceptance models. One of MATH's strengths lies in identifying and developing the role of hedonism (i.e., applications for fun), because MATH departs from a more utilitarian perspective that has characterized the results from the significant body of earlier technology acceptance research in workplace settings (Loeb, Rai, Ramaprasad, & Sharma, 1998; Venkatesh et al., 2003). For example, we found that current household technology owners seem to emphasize the aspect of fun when using technology, because the findings for MATH showed that hedonism plays a significant role for those who have already adopted household technologies. In contrast, we found that those who have not yet adopted household technologies seem to be driven by utilitarian aspects (e.g., utility for work-related use and utility for children) as well as social outcomes. These findings suggest that households initially emphasize utilitarian aspects of household technology, and hedonic aspects become more important once the purchase decision has been made. We also found that MATH outperformed the remaining models in explaining fear of obsolescence in household technology adoption. Our results showed that fear of obsolescence is the most influential barrier for nonowners. The range in prices across the various household technologies, coupled with the rate at which new versions appear on the market (e.g., Apple products typically cycle annually), is a significant inhibitor to household adoption. In recent years, costs have declined considerably, but the rate at which a new technology becomes an old technology appears to be still too rapid for some consumers, even today.

Second, and related to our first contribution, our findings showed that a context-specific model specifically tailored for explaining household technology adoption outperformed the general models in terms of explaining variance in the outcome of interest. Some could argue that MATH outperforming the remaining models is not particularly surprising, given that the model was developed to be tailored to the household context, but there is an important broader implication. Our findings suggest that context-specific models do indeed offer richer insights, compared to more general models, which calls into question the conventional wisdom about generalizability being the most critical criterion for theory development; rather, it suggests that, consistent with more recent views, a focus on the context can be more fruitful (see, e.g., Johns, 2006). Our findings answer several calls for context-specific theories (Alvesson & Kärreman, 2007; Bamberger, 2008; Brown, Dennis, & Venkatesh, 2010; Johns, 2006; Van der Heijden, 2004; Venkatesh, Thong, & Xu, 2012) because there is "a general tendency to seek causal explanations at lower rather than higher levels of analysis, a tactic referred to unflatteringly as explanatory reductionism" (Johns, 2006, p. 403).

Third, because of our longitudinal research design, we observed interesting results related to the stability of the models tested. Recent research has called for longitudinal research to test the generalizability of behavioral models over expanded periods of time (see Ancona, Okhuysen, & Perlow, 2001; Harrison, Price, & Bell, 1998; Lee & Hubona, 2009). Overall, the results presented here show that the findings were largely stable across both studies, independent of studying household technology adoption or use behavior. Despite this, we also observed subtle differences related to household technology adoption behavior over time. These differences seem to reflect changes in the environment, including changes in the household technology industry. For example, the results for MATH showed that declining costs of household technologies were important for a household's decision to purchase PCs in 2000, but it was not significant in 2012. A possible explanation for this is that the overall cost of PCs has dropped significantly in the last decade, suggesting the possibility of a pricing threshold, below which consumers may be less sensitive. It is also important to note that the fear of technological change had a greater effect on purchase intention in study 1, when compared to the results of study 2. A reasonable explanation is that, in general, household members have become more computer literate and skillful with technology in recent years. Likewise, the results for MATH showed that perceived ease of use and the compatibility of household technologies were relevant factors for households' adoption decisions in 2000, but seemed less relevant in 2012. Over the last decade, user interfaces have improved significantly and today's PCs are also compatible with alternative household technologies, including game consoles, TVs, and audio-visual equipment.

Fourth, our work also emphasizes that the factors leading to adoption of technology and the factors leading to use of technology at the household level are not fully overlapping. For example, our findings showed that high costs were a negative influence for nonowners of household technologies. For current owners, high costs were insignificant and not influential for their decision to use household technologies. Likewise, our findings suggest that individuals' fear of technological change is an important factor that nonowners consider, whereas it seems to be less relevant to household technology owners. These findings illustrate that both concepts (technology adoption and technology use in the context of household technologies) are conceptually dissimilar and should be treated as such. Despite the fact that IS adoption and acceptance models are recurrently used to explain technology adoption and acceptance (Kim & Gupta, 2009; Van der Heijden, 2006) and technology use (Loeb et al., 1998; Venkatesh et al., 2003), our work highlights that it is critical to distinguish more clearly between the two concepts.

DOI: 10.1002/asi

Fifth, although this research focuses on household technologies, our findings have relevance to organizational-level adoption and management of IT. We propose that an organization faces many of the same issues faced by a household. Though individual theories of adoption might not be immediately applicable to the organization (Rogers, 1995), some theoretical components presented here are. For instance, though the individual adopter in an organization may not be immediately concerned with cost, the organization is. Likewise, obsolescence may not be a factor for the individual adopter in the organization, but it is very likely a concern at the organizational level. Thus, we propose that the factors presented here that do not map directly onto existing workplace technology acceptance models, possibly represent the difference between the factors considered by individuals and those considered by organizations.

Future Research

Our research can be leveraged in future studies aiming to investigate the adoption of household technologies. For example, our work indicates that the household technology adoption process is driven by utilitarian motivations, whereas hedonic motivations are particularly important for current household technology owners. Thus, we suggest that future research should continue to disentangle utilitarian and hedonic motivations in purchasing and using household technologies in greater detail. It is also important to note that, apart from MATH, we drew on models that were originally developed to study technology adoption and acceptance at the individual level; these models were not designed to capture complex interactions and negotiations among household members. Future research should extend our work and draw on organizational studies that developed context-specific models to capture interactions among team members (see Sarker & Valacich, 2010). Last, in the current study, we collected data from U.S. households and tested the generalizability of seven models in the context of household adoption. A replication of the study drawing from households in other parts of the world would be interesting in order to discover the influential role of national culture on household technology adoption. Hofstede's (2012) culture scores suggest that national cultures differ significantly across European and Asian countries, and it would be interesting to compare these models with data obtained in a wide variety of countries.

Practical Implications

From a practical perspective, the findings of this research reveal the most essential factors influencing households to use and purchase technologies. By benchmarking seven models, we examined the predictive validity of each model and associated survey instruments (Appendix B). These findings should be interesting for companies manufacturing and/or distributing household technologies. For example, the findings from MATH suggest that current household technology owners and nonowners emphasize personal use and utility for children. Both constructs contributed significantly to consumers' attitudes toward household technologies. Companies marketing household technologies should emphasize the technology's usefulness for the entire household, including children and adults. An example of translating our findings into marketing strategies could be commercials of gaming consoles including children gaming with their parents (e.g., playing sport games on Wii). The findings could also be used to encourage an emphasis on the personal-use aspects of specific household technologies. For example, recent TV models allow owners to browse the Internet and log onto their Facebook and Skype accounts. Given that televisions are normally shared across several household members, TV advertisements could emphasize that the newest models are also useful for personal social networking.

Our findings for MATH and DTPB showed that peer influence was highly significant for current owners and nonowners of household technologies. These findings could be used to encourage an emphasis on the usefulness of specific household technologies for connecting with friends and peers. For example, game console providers could point out that games can be played online and peers and friends can meet online (e.g., in Sony's PSN network). As discussed earlier, our findings also indicated that self-efficacy is an important factor for the household use and purchase decision-making process. Advertisements and commercials could try to positively influence household members' self-efficacy beliefs by emphasizing how approachable and easy to use given household technologies are.

Sales managers could leverage the fact that current owners emphasized hedonic aspects of household technologies, whereas utilitarian aspects were important for nonowners. For instance, sales managers could emphasize the utilitarian aspects (e.g., work, educational, and multimedia functionalities) of household technologies when developing sales strategies for new household technologies that are about to enter the market for the first time. In contrast, applications for fun could be advertised for current household technology owners as part of after-sales strategies. For example, managers advertising computer games could develop sales strategies that target current PlayStation owners. Such initiatives should focus on the hedonic aspects of computer games.

Conclusion

We benchmarked seven existing models of technology adoption to the context of household technology and found that, although all were acceptable, TPB, DTPB, and MATH outperformed the remaining models in terms of explained variance, and MATH provided the richest description. The present work provides a foundation for future investigation of technologies in homes as the diffusion of technology in society continues. From a practical perspective, organizations, particularly in the household technology industry, stand to benefit from this knowledge as they plan their marketing strategies for those who have adopted and for future owners who have not yet adopted.

DOI: 10.1002/asi

References

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behaviour. Journal of Personality and Social Psychology, 78(1), 53–63.

Agarwal, R., & Prasad, J. (1998a). A conceptual and operational definition of personal innovativeness in the domain of information technology. Information Systems Research, 9(2), 204–215.

Agarwal, R., & Prasad, J. (1998b). The antecedents and consequents of user perceptions in information technology adoption. Decision Support Systems, 22(1), 15–29.

Ajzen, I. (1991). The theory of planned behaviour. Organizational Behavior and Human Decision Processes, 50(2), 179–211.

Albanesius, C. (2011, January 6). Microsoft Kinect sales hit 8M. Retrieved from http://www.pcmag.com/article2/0,2817,2375254,00.asp

Alvesson, M., & Kärreman, D. (2007). Constructing mystery: Empirical matters in theory development. Academy of Management Review, 32(4), 1265–1281.

Ancona, D.G., Okhuysen, G.A., & Perlow, L.A. (2001). Taking time to integrate temporal research. Academy of Management Review, 26(4), 512–529.

Bamberger, P. (2008). From the editors beyond contextualization: Using context theories to narrow the micro-macro gap in management research. Academy of Management Journal, 51(5), 839–846.

Benbasat, I., & Barki, H. (2007). Quo vadis TAM? Journal of the Association for Information Systems, 8(4), 211–218.

Bhattacherjee, A. (2001a). An empirical analysis of the antecedents of electronic commerce service continuance. Decision Support Systems, 32(2), 201–214.

Bhattacherjee, A. (2001b). Understanding information systems continuance: An expectation-confirmation model. MIS Quarterly, 25(3), 351–370.

Brenner, L., & Bilgin, B. (2011). Preference, projection, and packing: Support theory models of judgments of others' preferences. Organizational Behavior and Human Decision Processes, 115(1), 121–132.

Brown, S.A., & Venkatesh, V. (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. MIS Quarterly, 29(3), 399–426.

Brown, S.A., Dennis, A.R., & Venkatesh, V. (2010). Predicting collaboration technology use: Integrating technology adoption and collaboration research. Journal of Management Information Systems, 27(2), 9–54.

Burton-Jones, A., & Straub, D. (2006). Reconceptualizing system usage: An approach and empirical test. Information Systems Research, 17(3), 228–246.

Cao, Q., Ewing, B.T., & Thompson, M.A. (2012). Forecasting medical cost inflation rates: A model comparison approach. Decision Support Systems, 53(1), 154–160.

Cenfetelli, R.T., & Schwarz, A. (2011). Identifying and testing the inhibitors of technology usage intentions. Information Systems Research, 22(4), 1–19.

Chakraborty, I., Hu, P.J., & Cui, D. (2008). Examining the effects of cognitive style in individuals' technology use decision making. Decision Support Systems, 45(2), 228–241.

Chau, P.Y.K., & Hu, P.J. (2001). Information technology acceptance by individual professionals: A model comparison approach. Decision Sciences, 32(4), 699–719.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–339.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982–1002.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. Journal of Applied Social Psychology, 22(14), 1111–1132.

Dholakia, R.R. (2006). Gender and IT in the household: Evolving patterns of internet use in the United States. Information Society, 22(4), 231–240.

Djamasbi, S., Strong, D.M., & Dishaw, M. (2010). Affect and acceptance: Examining the effects of positive mood on the technology acceptance model. Decision Support Systems, 48(2), 383–394.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behavior: An introduction to theory and research. Reading, MA: Addison-Wesley.

Forrester Research. (2012, August 13). Forrester research world online population forecast, 2012 to 2017 (global). Retrieved from http://www.forrester.com/Forrester+Research+World+Online+Population+Forecast+2012+To+2017+Global/fulltext/-/E-RES81381?intcmp=blog:forrlink

Gartner Group. (2010, October 13) Worldwide PC shipments grew 7.6 percent in third quarter of 2010. Retrieved from http://www.gartner.com/it/page.jsp?id=1451742

Gartner Group. (2012, October 10). Gartner says worldwide PC shipments declined 8 percent in third quarter of 2012 as the market prepares for the launch of Windows 8. Retrieved from http://www.gartner.com/it/page.jsp?id=2194017

Gollwitzer, P.M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. Advances in Experimental Social Psychology, 38, 69–119.

Harrison, D.A., Price, K.H., & Bell, M.P. (1998). Beyond relational demography: Time and the effects of surface- and deep-level diversity on work group cohesion. Academy of Management Journal, 41(1), 96–107.

Heng, S. (2009, August 28). A serious business with plenty to play for the PC, console and mobile gaming sector. Retrieved from http://mpra.ub.uni-muenchen.de/16988/1/Games_e.pdf

Hofstede, G. (2012). Geert Hofstede national culture—Countries cultural values. Retrieved from http://geert-hofstede.com/

Holton, D.F., & Fuller, R.M. (2008). Unintended consequences of electronic monitoring of instant messaging. IEEE Transactions on Professional Communication, 51(4), 381–395.

Hong, W., Chan, F.K., Thong, J.Y., Chasalow, L.C., & Dhillon, G. (2014). A framework and guidelines for context-specific theorizing in information systems research. Information Systems Research, 25(1), 111–136.

Hong, S., Thong, J.Y.L., & Tam, K.Y. (2006). Understanding continued information technology usage behavior: A comparison of three models in the context of mobile internet. Decision Support Systems, 42(3), 1819–1834.

Hsieh, J.J.P.A., Rai, A., & Keil, M. (2008). Understanding digital inequality: A theory of planned behavior perspective. MIS Quarterly, 32(1), 97–126.

Hsieh, J.J.P.A., Rai, A., & Xu, S.X. (2011). Extracting business value from IT: A sensemaking perspective of post-adoptive use. Management Science, 57(11), 2018–2039.

Hu, P.J., Chau, P.Y.K., Sheng, O.R.L., & Tam, K.Y. (1999). Examining technology acceptance model using physician acceptance of telemedicine technology. Journal of Management Information Systems, 16(2), 91–112.

Hu, P.J., Clark, T.H.K., & Ma, W.W. (2003). Examining technology acceptance by school teachers: A longitudinal study. Information and Management, 41(2), 227–241.

Hwang, Y., & Kim, D. (2007). Customer self-service systems: The effects of perceived Web quality with service contents on enjoyment, anxiety, and e-trust. Decision Support Systems, 43(3), 746–760.

Johns, G. (2006). The essential impact of context on organizational behaviour. Academy of Management Review, 31(2), 386–408.

Joshi, K., & Rai, A. (2000). Impact of the quality of information products on information system users' job satisfaction: An empirical investigation. Information Systems Journal, 10(4), 323–345.

Karahanna, E., Straub, D., & Chervany, N.L. (1999). Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs. MIS Quarterly, 23(2), 183–213.

Kim, D.J., Ferrin, D.L., & Rao, H.R. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust,perceived risk, and their antecedents. Decision Support Systems, 44(2), 544–564.

Kim, H.-W., & Gupta, S. (2009). A comparison of purchase decision calculus between potential and repeat customers of an online store. Decision Support Systems, 47(4), 477–487.

DOI: 10.1002/asi

Kim, Y.M. (2010). The adoption of university library Web site resources: A multigroup analysis. Journal of the American Society for Information Science and Technology, 61(5), 978–993.

Kurt, D., Inman, J.J., & Argo, J.J. (2011). The influence of friends on consumer spending: The role of agency-communion orientation and self-monitoring. Journal of Marketing Research, 48(4), 741–754.

Lee, A.S., & Baskerville, R.L. (2003). Generalizing generalizability in information systems research. Information Systems Research, 14(3), 221–243.

Lee, A.S., & Hubona, G.S. (2009). A scientific basis for rigor in information systems research. MIS Quarterly, 33(2), 237–262.

Lee, M.-C. (2009). Predicting and explaining the adoption of online trading: An empirical study in Taiwan. Decision Support Systems, 47(2), 133–142.

Leichtman Group. (2011). Nearly 1.3 million add broadband in the first quarter of 2011. Retrieved from http://www.leichtmanresearch.com/research/notes06_2011.pdf

Lin, C.-P., & Bhattacherjee, A. (2010). Extending technology usage models to interactive hedonic technologies: A theoretical model and empirical test. Information Systems Journal, 20(2), 163–181.

Lindell, M.K., & Whitney, D.J. (2001). Accounting for common method variance in cross-sectional research designs. Journal of Applied Psychology, 86(1), 114–121.

Loeb, K.A., Rai, A., Ramaprasad, A., & Sharma, S. (1998). Design, development and implementation of a global information warehouse: A case study at IBM. Information Systems Journal, 8(4), 291–311.

Luo, M., Chea, S., & Chen, J.S. (2011). Web-based information service adoption: A comparison of the motivational model and the uses and gratifications theory. Decision Support Systems, 51(1), 21–30.

Malhotra, N.K., Kim, S.S., & Patil, A. (2006). Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research. Management Science, 52(12), 1865–1883.

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behaviour. Information Systems Research, 2(3), 173–191.

Moore, G.C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. Information Systems Research, 2(3), 192–222.

Ngobo, P.V. (2011). What drives household choice of organic products in grocery stores? Journal of Retailing, 87(1), 90–100.

Ortiz de Guinea, A., & Markus, L. (2009). Why break the habit of a lifetime—Rethinking the roles of intention, habit, and emotion in continuing information technology use. MIS Quarterly, 33(3), 433–444.

Ouellette, J.A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behaviour. Psychological Bulletin, 124(1), 54–74.

Palvia, P., Pinjani, P., Cannoy, S., & Jacks, T. (2011). Contextual constraints in media choice: Beyond information richness. Decision Support Systems, 51(3), 657–670.

Pavlou, P.A., & Fygenson, M. (2006). Understanding and predicting electronic commerce adoption: An extension of the theory of planned behaviour. MIS Quarterly, 30(1), 115–144.

Rai, A., & Bajwa, D.S. (1997). An empirical investigation into factors relating to the adoption of executive information systems: An analysis of EIS for collaboration and decision support. Decision Sciences, 28(4), 939–974.

Rai, A., & Patnayakuni, R. (1996). A structural equation model for CASE adoption behaviour. Journal of Management Information Systems, 13(2), 205–234.

Ringle, C.M., Wende, S., & Becker, J.M. (2005). SmartPLS 2.0. Retrieved from http://www.smartpls.de

Rogers, E. (1995). Diffusion of innovations. New York: The Free Press.

Salovaara, A., Helfenstein, S., & Oulasvirta, A. (2011). Everyday appropriations of information technology: A study of creative uses of digital cameras. Journal of the American Society for Information Science and Technology, 62(12), 2347–2363.

Sarker, S., & Valacich, J.S. (2010). An alternative to methodological individualism: A non-reductionist approach to studying technology adoption by groups. MIS Quarterly, 34(4), 779–808.

Sheeran, P. (2002). Intention, behavior relations: A conceptual and empirical review. European Review of Social Psychology, 12(1), 1–36.

Sheppard, B.H., Hartwick, J., & Warshaw, P.R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. Journal of Consumer Research, 15(3), 325–343.

Sherr, I., & Wingfield, N. (2011, May 7). Play by play: Sony's struggles on breach. Retrieved from http://online.wsj.com/article/SB10001424052748704810504576307322759299038.html

Sony (2011, April 15). PlayStation 3 sales reach 50 million units worldwide. Retrieved from http://asia.playstation.com/my/en/news/pressDetail/225282

Sun, J. (2012). Why different people prefer different systems for different tasks: An activity perspective on technology adoption in a dynamic user environment. Journal of the American Society for Information Science and Technology, 63(1), 48–63.

Taylor, S., & Todd, P.A. (1995). Understanding information technology usage: A test of computing models. Information Systems Research, 6(2), 144–176.

Thompson, R., Compeau, D., & Higgins, C. (2006). Intentions to use information technologies: An integrative model. Journal of Organizational and End User Computing, 18(3), 25–46.

Thompson, R.L., Higgins, C.A., & Howell, J.M. (1991). Personal computing: Toward a conceptual model of utilization. MIS Quarterly, 15(1), 124–143.

Thong, J.Y.L., Hong, S.-J., & Tam, K.Y. (2006). The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance. International Journal of Human-Computer Studies, 64(9), 799–810.

USCB. (2013, August 15). United States census bureau. Retrieved from http://www.census.gov/

Vallerand, R.J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. Advances in Experimental Social Psychology, 29, 271–360.

Van der Heijden, H. (2004). User acceptance of hedonic information systems. MIS Quarterly, 28(4), 695–704.

Van der Heijden, H. (2006). Mobile decision support for in-store purchase decisions. Decision Support Systems, 42(2), 656–663.

Van Rijnsoever, F.J., & Castaldi, C. (2009). Perceived technology clusters and ownership of related technologies: The case of consumer electronics. Journal of the American Society for Information Science and Technology, 60(2), 381–392.

Van Rijnsoever, F.J., & Donders, A.R.T. (2009). The effect of innovativeness on different levels of technology adoption. Journal of the American Society for Information Science and Technology, 60(5), 984–996.

Venkatesh, V., & Brown, S.A. (2001). A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges. MIS Quarterly, 25(1), 71–102.

Venkatesh, V., & Speier, C. (1999). Computer technology training in the workplace: A longitudinal investigation of the effect of mood. Organizational Behavior and Human Decision Processes, 79(1), 1–28.

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), 157–178.

Wilcox, K., Block, L.G., & Eisenstein, E.M. (2011). Leave home without it? The effects of credit card debt and available credit on spending. Journal of Marketing Research, 48(11), 78–90.

Williams, M.D., Dwivedi, Y.K., Lal, B., & Schwarz, A. (2009). Contemporary trends and issues in IT adoption and diffusion research. Journal of Information Technology, 24(1), 1–10.

Ye, C., Seo, D., Desouza, K.C., Sangareddy, S.P., & Jha, S. (2008). Influences of IT substitutes and user experience on post-adoption user switching: An empirical investigation. Journal of the American Society for Information Science and Technology, 59(13), 2115–2132.

Zhang, H., & Li, H. (2006). Factors affecting payment choices in online auctions: A study of eBay traders. Decision Support Systems, 42(2), 1076–1088.

DOI: 10.1002/asi

Appendix

Appendix A. Contributing theories and constructs.[1]

Theory/model and discussion	Core constructs	Definitions
Theory of reasoned action (TRA)		
TRA is one of the fundamental theories in psychology that has been used widely to predict behavior (Fishbein & Ajzen, 1975). Sheppard et al. (1988) present a review of TRA research. In the context of user acceptance of information technology, Davis et al. (1989) tested TRA and found it to explain user acceptance fairly well.	Attitude toward behavior	"is defined as an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (Fishbein & Ajzen, 1975, p. 216).
	Subjective norm	". . . the person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 302).
Theory of planned behavior (TPB)		
TPB was developed by extending TRA (Fishbein & Ajzen, 1975). Ajzen (1991) presented a review of several studies that have successfully used TPB to predict intention and behavior in a wide variety of behaviors. More recently, research has found TPB to be predictive of user acceptance and use behavior (Pavlou & Fygenson, 2006).	Attitude Subjective norm	Adapted from TRA
	Perceived behavioral control	". . . refers to the perceived ease or difficulty of performing the behavior . . ." (Ajzen, 1991, p. 188). The construct has also been defined in the context of IS research as ". . . perceptions of internal and external constraints on behavior" (Ajzen, 1991, p. 149).
Technology acceptance model (TAM)		
TAM was adapted from TRA and tailored to the context of predicting information technology acceptance and use (Davis, 1989; Davis et al., 1989). Though TAM was derived from TRA, the final model of TAM excludes the attitude construct in order to clearly explain intention using the underlying determinants. Since its original development in the mid-1980s, TAM has been applied to a wide range of technologies, and through these several applications and replications, it has emerged as perhaps the most robust model predicting user acceptance. Research has empirically demonstrated that TAM is comparable to TRA (Davis et al., 1989) and TPB (Taylor & Todd, 1995), with TAM possessing the strengths of being more parsimonious and easier to apply because of its generality.	Perceived usefulness	". . . the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320).
	Perceived ease of use	". . . the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320).
Decomposed theory of planned behavior (DTPB)		
DTPB was derived from TPB, and TAM to a certain extent (Taylor & Todd, 1995). Whereas TPB had been applied to technology acceptance, one of its limitations was that it had to be tailored to each specific context. DTPB sought to remedy this by proposing a specific set of beliefs that could be used to study technology acceptance. DTPB uses attitude toward behavior, subjective norm, and perceived behavioral control from TPB and attempts to decompose the underlying belief structure that determines these constructs. The underlying belief structure determining the key constructs includes perceived usefulness and perceived ease of use from TAM. Empirical evidence suggests that DTPB is comparable to TPB and TAM (Taylor & Todd, 1995), but possesses the advantage of providing a deeper understanding of acceptance because of the detailed delineation of as many as eight key underlying determinants of technology acceptance.	Attitude toward behavior	Adapted from TRA/TPB. Attitude ". . . reflects feelings of favourableness or unfavourableness towards using the technology" (Taylor & Todd, 1995, p. 148). The underlying belief structure comprises three constructs: • Perceived usefulness: adapted from TAM. • Perceived ease of use: adapted from TAM. • Compatibility: ". . . is the degree to which the innovation fits with the potential adopter's existing values, previous experience and current needs" (Taylor & Todd, 1995, p. 152).
	Subjective norm	Adapted from TRA/TPB. Subjective norm ". . . reflects perceptions that significant referents desire the individual to perform or not perform a behavior." (Taylor & Todd, 1995, p. 148). The underlying belief structure comprises two social influences: • Peer influence: Part of the decomposed Subjective Norm (Taylor & Todd, 1995, p. 152). • Superior's influence: Part of the decomposed Subjective Norm (Taylor & Todd, 1995, p. 152)
	Perceived behavioral control	Adapted from TRA/TPB. Perceived behavioral control ". . . reflects perceptions of internal and external constraints on behavior" (Taylor & Todd, 1995, p. 149). The control belief structure comprises: • Self-efficacy: ". . . an individual's self-confidence in his/her ability to perform a behavior" (Taylor & Todd, 1995, p. 150). • Resource facilitating conditions: ". . . reflects the availability of resources needed to engage in a behavior, such as . . . time and money" (Taylor & Todd, 1995, p. 150). • Technology facilitating conditions: ". . . reflects the availability of resources needed to engage in a behavior . . . relating to technology compatibility issues that may constrain use" (Taylor & Todd, 1995, p. 150).
Motivational model (MM)		
A great deal of research in psychology has supported a motivational explanation for behavior. Vallerand (1997) presents a thorough review of the core perspectives of this theoretical base. In the context of information technology, Davis et al. (1992) applied motivational theory to study user acceptance and use of new technologies.	Extrinsic motivation	". . . refers to the performance of an activity because it is perceived to be 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).
	Intrinsic motivation	". . . refers to the performance of an activity for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p. 1112).

[1]Appendix A is reproduced from Venkatesh et al. (2003) for the discussion on the following models: TRA, TPB, TAM, DTPB, MM, and IDT. The discussion on the MATH model is reproduced from Brown and Venkatesh (2005).

DOI: 10.1002/asi

Theory/model and discussion	Core constructs	Definitions
Innovative diffusion theory (IDT)		
IDT (Rogers, 1995), originally developed in the 1960s, has its roots in sociology and has been used to study diverse innovations, ranging from agricultural tools to organizational innovation. In MIS, one of the first applications of innovation diffusion theory was by Moore and Benbasat (1991), who adapted innovation characteristics to IT adoption. However, they did not present a test of the proposed characteristics as determinants of adoption. Agarwal and Prasad (1998a) have studied the role of these characteristics in predicting acceptance and found modest support for the predictive validity of innovation characteristics. In terms of overlap with other models, relative advantage and ease of use in IDT are similar to perceived usefulness and perceived ease of use from TAM/DTPB, and compatibility is similar to the construct with the same name used in DTPB.	Relative advantage	". . . the degree to which an innovation is perceived as being better than its precursor" (Moore & Benbasat, 1991, p. 195).
	Ease of use	Defined to be the opposite of complexity—". . . the degree to which an innovation is perceived as being difficult to use" (Moore & Benbasat, 1991, p. 195).
	Image	". . . the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (Moore & Benbasat, 1991, p. 195).
	Visibility	". . . the actual **visibility** of the PWS" (Moore & Benbasat, 1991, p. 203).
	Compatibity	". . . the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters" (Moore & Benbasat, 1991, p. 195).
	Result demonstrability	"One dimension concentrated on the **tangibility** of the results of using the innovation, including their **observability** and **communicability**, and was labeled Result Demonstrability. In other words, the more "amenable to **demonstration** the innovation is, [and] the more visible its advantages are . . . the more likely it is to be adopted" (Moore & Benbasat, 1991, p. 203).
	Voluntariness of use	". . . the degree to which use of the innovation is perceived as being voluntary, or of free will" (Moore & Benbasat, 1991, p. 195).
Model of adoption of technology in households (MATH)		
The MATH model includes factors influencing household technology adoption. The model was developed based on the TPB (Ajzen, 1991) and suggests that attitude, subjective norms, and perceived behavioral control predict household technology adoption (for a discussion, see Brown & Venkatesh, 2005).	Attitudinal beliefs	Attitude is formed from cognitive beliefs and refers to an "individual's positive or negative feeling (evaluative affect) about performing the target behavior" (Fishbein & Ajzen, 1975, p. 216). The attitude construct includes five constructs: • Applications for personal use: "The extent to which using a PC enhances the effectiveness of household activities" (Venkatesh & Brown, 2001, p. 82). • Utility for children: The extent to which using a PC enhances the children's effectiveness in completing homework and other activities (Venkatesh & Brown, 2001). • Utility for work-related use: The extent to which using a PC enhances the effectiveness of performing work-related activities (Venkatesh & Brown, 2001). • Applications for fun: "The pleasure derived from PC use" (Venkatesh & Brown, 2001, p. 82). • Status gains: The increase in prestige that coincides with the purchase of a PC for home use (Venkatesh & Brown, 2001).
	Normative beliefs	Normative beliefs represents the social influences on behavior and refers to the perception about whether others who are important to a person believe that he or she should engage in a particular behavior (Fishbein & Ajzen, 1975). Normative beliefs includes three constructs: • Friends and family influences: "The extent to which members of a social network influence one another's behavior" (Venkatesh & Brown, 2001, p. 82). • Secondary sources' influences: The extent to which information from TV, newspaper, and other secondary sources influences behavior (Venkatesh & Brown, 2001). • Workplace referents influences: The extent to which coworkers influence behavior (Taylor & Todd, 1995).
	Control beliefs	Perceived behavioral control represents the constraints on behavior and refers to the "perceived ease or difficulty of performing a behavior" (Ajzen, 1991, p. 188). • Fear of technological advances: The extent to which rapidly changing technology is associated with fear of obsolescence or apprehension regarding a PC purchase (Venkatesh & Brown, 2001). • Declining cost: The extent to which the cost of a PC is decreasing in such a way that it inhibits adoption (Venkatesh & Brown, 2001). • High cost: The extent to which the current cost of a PC is too high (Venkatesh & Brown, 2001). • Perceived ease of use: The degree to which using the PC is free from effort (Davis, 1989; see also Venkatesh & Brown, 2001). • Requisite knowledge: The individual's belief that he or she has the knowledge necessary to use a PC (Venkatesh & Brown, 2001).

DOI: 10.1002/asi

Appendix B. Constructs, items, and measurement sources.

Construct (measurement source)	Items
Attitude (Davis et al., 1989)	Using a computer at home is a ________ idea. (Bad . . . Good) Using a computer at home is a ________ idea. (Foolish . . . Wise) I ________ the idea of using a computer at home. (Dislike . . . Like) Using a computer at home is ________. (Unpleasant . . . Pleasant)
Subjective norm (Mathieson, 1991; Taylor & Todd, 1995)	People who influence my behavior think that I should use a computer at home. People who are important to me think that I should use a computer at home.
Perceived behavioral control (Mathieson, 1991; Taylor & Todd, 1995)	I have control over using a computer at home. I have the resources necessary to use a computer at home. I have the knowledge necessary to use a computer at home. Given the resources, opportunities, and knowledge it takes to use a computer at home, it would be easy for me to use a computer. A computer is not compatible with other technologies I use at home and work.
Perceived usefulness (Davis et al., 1989)	Using a computer improves my performance at home. Using a computer at home increases my productivity. Using a computer enhances my effectiveness at home. I find a computer to be useful at home.
Perceived ease of use (Davis et al., 1989)	My interaction with a computer is clear and understandable. Interacting with a computer does not require a lot of my mental effort. I find a computer to be easy to use. I find it easy to get a computer to do what I want it to do.
Compatibility (Taylor & Todd, 1995)	Using a computer is compatible with many aspects of my home. I think that using a computer system fits well with the way I do things at home. Using a computer fits into style of activities at home.
Peer influence (Taylor & Todd, 1995)	My coworkers think I should use a computer at home. My friends think I should use a PC at home.
Superior influence (Taylor & Todd, 1995)	My superiors think I should use a computer at home. My boss thinks I should use a PC at home.
Efficacy (Taylor & Todd, 1995)	I feel comfortable using a computer on my own. If I wanted to, I could easily operate a computer on my own. I can use a computer even if no one is around to help me.
Resource facilitating conditions (Taylor & Todd, 1995)	I won't be able to use the computer at home when I need it. The cost of maintaining a computer (e.g., utility cost, additional phone line, repair, and Internet service) at home is high.
Technology facilitating conditions (Taylor & Todd, 1995)	Other equipment and technologies I have at home are not compatible with a computer. The software I use at other places (e.g., work) is not compatible with my computer at home and/or other software I have at home. I have trouble reading my disks on my computer at home.
Extrinsic motivation (Davis et al., 1992)	Operationalized same as perceived usefulness (see Davis, 1989; Davis et al., 1992)
Intrinsic motivation (Davis et al., 1992)	I find using a computer to be enjoyable. The actual process of using a computer is pleasant. I have fun using a computer.
Relative advantage (Moore & Benbasat, 1991)	Using a computer enables me to accomplish tasks more quickly. Using a computer improves the quality of work I do at home. Using a computer makes it easier to perform some activities at home. Using a computer enhances my effectiveness in performing activities at home. Using a computer gives me greater control over different activities at home.
Ease of use (Davis et al., 1989)	See *Perceived Ease of Use* (above)
Image (Moore & Benbasat, 1991)	People who use a computer at home have more prestige than those who do not. People who use a computer at home have a high profile. Using a computer is a status symbol.
Visibility (Moore & Benbasat, 1991)	I have seen what others do using a computer at home. I see a computer at many homes. A computer is not very visible in homes.
Result demonstrability (Moore & Benbasat, 1991)	I have no difficulty telling others about the results of using a computer at home. I believe I could communicate to others the consequences of using a computer at home. The results of using a computer at home are apparent to me. I would have difficulty explaining why using a computer at home may or may not be beneficial.

DOI: 10.1002/asi

Construct (measurement source)	Items
Voluntariness of use (Moore & Benbasat, 1991)	My use of a computer at home is voluntary. No one who holds power over me requires me to use a computer at home. Although it might be helpful, using a computer at home is certainly not compulsory.
Applications for personal use (Brown & Venkatesh, 2005)	I find that the computer has tools for personal productivity. I find that the computer has tools to support household activities. The computer has software that helps with activities in the house.
Utility for children (Brown & Venkatesh, 2005)	The computer provides applications that my kid(s) can use. The computer has useful software for my child (or children). I find the computer to be a useful tool for my child (or children).
Utility for work-related use (Brown & Venkatesh, 2005)	The computer is useful for me to work at home. The computer provides applications related to my job. I am able to work at home more effectively because of software on my computer.
Applications for fun (Brown & Venkatesh, 2005)	The computer provides many applications that are enjoyable. I enjoy playing computer games. My computer has applications that are fun. I am able to use my computer to have fun.
Status gains (Moore & Benbasat, 1991)	Operationalized same as image from innovation diffusion theory (see Moore & Benbasat, 1991)
Influence from friends and family (Brown & Venkatesh, 2005)	My friends think I should use a computer at home. Those in my social circle think I should use a PC at home. My family members think I should use a computer at home. My relatives think I should use a computer at home.
Information from secondary sources (Brown & Venkatesh, 2005)	Information from newspapers suggests that I should use a computer at home. Information that I gather by watching TV encourages me to use a computer at home. Based on what I have heard on the radio, I am encouraged to use a computer at home.
Rapid change in technology (fear of obsolescence) (Brown & Venkatesh, 2005)	The trends in technological advancement are worrisome to me. I fear that today's best home PC will be obsolete fairly soon. I am worried about the rapid advances in computer technology.
Declining cost (Brown & Venkatesh, 2005)	The cost of PCs is constantly declining. I believe the cost of computers will continue to decline in the future. I think we will see better computers for a lower price in the near future.
High cost (Brown & Venkatesh, 2005)	Computers that are available today are too expensive. I think computers are quite pricey. I consider a computer to be a big-ticket item.
Perceived ease of use (Davis et al., 1989)	Same as perceived ease of use from TAM (see above)
Requisite knowledge for PC use (Taylor & Todd, 1995)	Same as efficacy from DTPB (see Taylor & Todd, 1995)
Intention to use (applicable only to current nonowners) (Brown & Venkatesh, 2005)	I intend to adopt a computer at home. I predict that I would adopt a computer at home. I expect to adopt a computer at home in the near future.
Use behavior (applicable only to current owners) (Brown & Venkatesh, 2005)	On average, how much time every day do you spend on a computer at home? _______ hours and _______ minutes Please estimate the average time you spend every day using a computer at home. _______ hours and _______ minutes

DOI: 10.1002/asi