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The role of moderating factors in user technology acceptance

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Abstract

Along with increasing investments in new technologies, user technology acceptance becomes a frequently studied topic in the information systems discipline. The last two decades have seen user acceptance models being proposed, tested, refined, extended and unified. These models have contributed to our understanding of user technology acceptance factors and their relationships. Yet they have also presented two limitations: the relatively low explanatory power and inconsistent influences of the factors across studies. Several researchers have recently started to examine the potential moderating effects that may overcome these limitations. However, studies in this direction are far from being conclusive. This study attempts to provide a systematic analysis of the explanatory and situational limitations of existing technology acceptance studies. Ten moderating factors are identified and categorized into three groups: organizational factors, technological factors and individual factors. An integrative model is subsequently established, followed by corresponding propositions pertaining to the moderating factors.

Keywords: User technology acceptance; Conceptual research; Moderating factors; Research model

1. Introduction

Driven by market competitiveness, business enhancement, service improvement and work efficiency, organizations have invested heavily in information technology with the likelihood of continuing this investment pattern into the foreseeable future (Chau and Hu, 2002). Some estimates show that since the 1980s, 50% of all new capital investment in organizations has been in information technology (Venkatesh et al., 2003). Understanding the factors that influence user technology acceptance and adoption in different contexts continues to be a focal interest in information systems (IS) research.

Several models and theories have been developed to explain user technology acceptance behavior. However, these models have some limitations. The first limitation concerns the explanatory power of the models. Most of the existing studies account for less than 60% of variance explained, especially those using field studies with professional users. Although there may be many other factors that are beyond researchers' reach, the differences in explanatory power between laboratory studies and field studies, and between studies using students and using professionals, imply some complex contextual factors in the real world that should be taken into account (e.g., the influence of organizational factors such as the voluntariness of IT usage). The second limitation of these models is the inconsistent relationships among constructs, making researchers question the generalizability of these models across differing contexts (e.g., Lee et al., 2003; Legris et al., 2003). These limitations call for improvement and refinement of existing studies.

Moderating factors may account for both the limited explanatory power and the inconsistencies between studies. In an early study, Adams et al. (1992) called for more examination of moderating factors. Several recent studies continue to call for the inclusion of some moderating factors (e.g., Lucas and Spitler, 1999; Venkatesh et al., 2003). Agarwal and Prasad (1998) explicitly criticized the absence of moderating influences in technology acceptance model (TAM), and called for more research to investigate moderating effects. Venkatesh et al. (2003) tested eight

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models and found that the predictive validity of six of the eight models significantly increased after the inclusion of moderating variables. Furthermore, they argued, "it is clear that the extensions (moderators) to the various models identified in previous research mostly enhance the predictive validity of the various models beyond the original specifications" (Venkatesh et al., 2003, p. 21). In addition, Chin et al. (2003) empirically examined and confirmed the significant influence of moderating factors in existing models of user technology acceptance.

While stating that "the extensive prior empirical work has suggested a large number of moderators", Venkatesh et al. (2003, p. 21) included only four in their study: experience, voluntariness, gender and age. Based on a careful literature review, we believe that there are more moderating factors with empirical evidence than the four studied. For example, the nature of the tasks may affect users' acceptance of technology, as does the nature of the technology. Few of these moderators were examined either conceptually or empirically in recent efforts. A systematic examination of significant moderating factors should contribute to our better understanding of the dynamics of the user technology acceptance phenomenon.

This study examines the moderating effects in user technology acceptance. It adds to the few studies that take into account the individual and contextual factors in technology acceptance (i.e., Igbaria et al., 1997). The objectives of this paper are three-fold. It first provides an overview of prior literature to disclose the limitations of explanatory powers and the inconsistencies between prior studies. Then the paper highlights the moderating factors that account for both the limitations of the explanatory power and the inconsistencies. Ten moderating factors that have strong empirical evidence are identified and categorized into three groups: organizational factors, technological factors and individual factors. And, finally, the paper proposes a new model with propositions pertaining to the effects of the moderating factors. Readers interested in other aspects of user technology acceptance research summaries, such as research emphases and evolutions, empirical sample sizes and characteristics, most influential authors, and critical comments from several major researchers, are encouraged to read a recent meta analysis by Lee et al. (2003), which lacks discussion of the effects of the moderating factors.

This study calls for more research attention to individual and contextual factors that are often neglected in technology acceptance studies but can be critical in applying theoretical models to specific situations in organizations. The study also provides a basis for further empirical investigation in this research area.

2. Overview of prior literature

A variety of models from different perspectives and at various levels have been developed to explain IT acceptance perceptions and behaviors: TAM (Davis, 1989; Davis et al., 1989), Computer Self-Efficacy (Compeau and Higgins, 1995a, b), Task–Technology Fit (Goodhue, 1995; Goodhue and Thompson, 1995), Motivational Model (Davis et al., 1992) and adapted Theory of Planned Behavior (Mathieson, 1991; Taylor and Todd, 1995b). These models have all been recognized in the ISs discipline. Using TAM as an example, abundant studies have been done to test (Davis, 1989, 1993; Davis et al., 1989; Adams et al., 1992), extend(Venkatesh and Davis, 1996, 2000; Igbaria et al., 1997; Venkatesh, 2000; Viswanath and Davis, 2000), or compare it with other models (Davis et al., 1989; Mathieson, 1991; Taylor and Todd, 1995b; Dishaw and Strong, 1999; Venkatesh and Davis, 2000). Overall, these theoretical models have contributed to our understanding of user acceptance perceptions and behaviors. In a recent study, a unified theory of acceptance and usage of technology was proposed and tested by integrating some of the prior models (Venkatesh et al., 2003).

However, there is still room for improvement. In this research, we focus on two aspects: the explanatory power of prior user technology acceptance research and the inconsistent relationships between studies.

In order to provide a comprehensive picture of the existing studies, we systematically selected published articles on technology acceptance to conduct the analysis. The articles were selected through the following procedure. First, primary IS journals and databases (such as ABI/INFORM, WilsonSelect, JSTOR and ACM Digital Library) were systemically searched using a number of seed articles on user technology acceptance. Second, Social Science Citation Index (SSCI, January 1986–September 2003) was searched for the articles citing the above seed articles. Finally, 55 articles (see Appendix A) were chosen based on the following criteria: (1) The article was published in primary IS journals; (2) The article conducted one or more empirical studies of research; (3) User technology acceptance as well as its components received substantive consideration in the article; and (4) The results were presented in detail, followed by corresponding discussions.

2.1. The limitations of explanatory power

Our examination indicates that the vulnerability of explanatory power lies in two areas: the relatively low explained power and the variation of explanatory power owing to different research methods (i.e., laboratory experiments and field studies).

2.1.1. Limited explanatory power of R^2

Table 1 shows a comparison between TAM and other models. It indicates that as one of the most successful models, TAM's explanatory power is limited.

In one recent study, Venkatesh et al. (2003) compared eight user acceptance models on explanatory power. Their longitudinal studies showed that these models exhibited explanatory powers in the neighborhood of 40%. That is,

Table 1
Comparisons of explanatory powers of TAM and other models

Compared models	Representative studies	Explained variance in TAM	Explained variance in compared models	Is TAM better?
TRA	Davis et al. (1989)	After 1-h introduction: 47% 14 weeks later: 51%	After 1-h introduction: 32% 14 weeks later: 26%	Yes
TPB	Mathieson (1991)	69.3%	60.1%	Yes
	Taylor and Todd (1995a)	52%	57%	No
	Chau and Hu (2002)	42%	37%	Yes
	Chau and Hu (2001)	40%	32%	Yes
TAM2	Venkatesh and Davis (2000)	40%	60%	No
TTF/integrated TAM with TTF	Dishaw and Strong (1999)	36%	41%/51%	No
Extended TAM	Moon and Kim (2001)	Attitude: 0.332 BI: 0.349	Attitude: 0.371 BI: 0.382	No

Table 2
Comparisons of explanatory powers among eight models (source: Venkatesh et al., 2003)

Models	Voluntary context[a]				Mandatory context			
	Time 1[b]	Time 2	Time 3	Avg.	Time 1	Time 2	Time 3	Avg.
TAM/TAM2	0.38	0.36	0.37	0.370	0.39	0.41	0.36	0.387
Theory of reasoned action (TRA)	0.3	0.26	0.19	0.250	0.26	0.26	0.17	0.230
Motivational model (MM)	0.37	0.36	0.37	0.367	0.38	0.4	0.35	0.377
Theory of planned behavior (TPB)/decomposed TPB	0.37	0.25	0.21	0.277	0.34	0.28	0.18	0.267
Combined TAM-TPB (C-TAM-TPB)	0.39	0.36	0.39	0.380	0.36	0.35	0.35	0.353
Model of PC utilization (MPCU)	0.37	0.36	0.38	0.370	0.37	0.4	0.37	0.380
Innovation diffusion theory (IDT)	0.38	0.37	0.39	0.380	0.38	0.42	0.37	0.390
Social cognitive theory (SCT)	0.37	0.36.	0.36	0.363	0.38	0.39	0.36	0.377

[a]Voluntary and mandatory contexts are considered to have different impacts on user technology acceptance.
[b]The time of measurement is considered as an indicator of experience.

these models can explain around 40% of variances in user behavioral intentions (BIs) (Venkatesh et al., 2003). Table 2 shows the explanatory powers of each model at different data collection times, with the average explanatory powers of each model presenting at less than 40%.

2.1.2. The difference in explanatory power between experiments and field studies

Among the studies on user technology acceptance, the dominant methods are laboratory experiment and field study. Experiments are typically conducted with students in a university laboratory environment. The predominant concern with the laboratory experiment method involves convenience sampling (students) and the controlled or artificial context/environment (i.e., Legris et al., 2003). Field studies usually survey subjects in real working environments and contexts by utilizing questionnaires at one time or at different points of time. Sometimes, rather than using self-reporting survey, usage is also observed and recorded directly. Table 3 summarizes the explanatory power of existing studies that are grouped into three clusters: experiments, field studies using professional users and field studies using students. Fig. 1 depicts the results in Table 3.

Table 3 and Fig. 1 demonstrate that studies using experiments have relatively higher explanatory powers than field studies, i.e., the prior models work better for laboratory experiments than for field studies. One suggested reason is "the relatively uncontrolled environment of the field setting" (Lucas and Spitler, 1999). Therefore, the difference in explanatory power between field studies and experiments calls for the inclusion of additional factors that reflect real world settings and conditions. Hu et al. (1999) explicitly called for "a contingency approach that incorporates additional factors relevant to physicians' decisions to accept telemedicine technology".

Also notable is the general trend that even in field studies, there seem to be some differences in explanatory power. As Fig. 1 indicates, besides a few exceptions with extremely low explanatory powers (some of them were discussed by the authors in the original studies, as noted in Table 3), the field studies using students as subjects have

Table 3
Explanatory power of existing studies

Codes	Article ID	Technology	Subjects	Explanatory power (R^2)	Comments
Experiments					
	Davis et al. (1989)	Text-editor	Students		
1	Immediately after introduction			0.47	
2	14 weeks later			0.51	
	Davis (1989)				
3	Study 1	Email, text-editor	Students	0.31(email)/0.46(text-editor)	
4	Study 2	Graphics software		0.51/0.71 for two graphics software	
5	Mathieson (1991)	Spreadsheet	Students	0.697	
	Davis et al. (1992)		Students		Study 1 is a field study that is listed below in the Field Studies section.
6	Study 2	Two graphics systems		0.79	
7	Davis and Venkatesh (1996)	WrodPerfect and Lotus	Students	0.44	
8	Venkatesh and Davis (1996)	WordPerfect	Students	0.58	We exclude experiments 2 and 3 because only experiment 1 has the R^2 square for BI.
	Gefen and Straub (2000)	Web site (ABC.com)	Students		The relatively low R^2 values may due to the "free stimulation experimental method" used, in which subjects are placed in a real-word situation (a website).
9	Task 1			0.20	
10	Task 2			0.18	
Field studies using knowledge workers or general users as subjects					
1	Thompson et al. (1991)	Personal computer	Knowledge workers	0.24	
	Adams et al. (1992) (Study 1)	WordPerfect, Lotus and Harvard Graphics	General users		Actual usage is used as the dependent variable.
2	Email			0.155	
3	V-mail			0.17	
	Davis (1993)		Employees		Usage is the dependent variable.
4	Model 1			0.308	
5	Model 2			0.361	
	Subramanian (1994)		Employees		Usage, rather than behavioral intention is used as the dependent variable.
6		V-mail		0.353	
7		Customer dial up system		0.258	
8	Igbaria et al. (1996)	Microcomputer	Employees	0.28	Usage is used as the dependent variable.
9	Gefen and Straub (1997)	Email	Knowledge workers	0.34	Usage is used as the dependent variable.
10	Igbaria et al. (1997)	Personal computing	Knowledge workers	0.25	Usage is used as the dependent variable.
	Jackson et al. (1997)	Spreadsheet, database, word processor, graphics	Knowledge workers		
11	Model 1			0.38	
12	Model 2			0.17	
	Straub et al. (1997)	Email	Knowledge workers		
13	US			0.10	These three studies use actual usage, rather than behavioral intention, as dependent variable. The cultural issues may account for the low explanatory power in Japan. The authors argued that the model be successful in explaining the US and Swiss experience but not the Japanese experience.

14	Swiss			0.10	
15	Japan			0.01	
16	Gefen and Keil (1998)	Configuration software	Sales	0.20	Usage is used as the dependent variable.
	Agarwal and Prasad (1999a, b)	Word processing spreadsheet graphics	General employees		
17	Model 1			0.29	
18	Model 2			0.26	
19	Dishaw and Strong (1999)	Software maintenance tools	Programmers	0.27	
20	Hu et al. (1999)	Telemedicine software	Physicians	0.44	
21	Karahanna and Straub (1999)	Email	Employees	0.24	Actual usage is the dependent variable.
	Karahanna et al. (1999)	Windows	Employees		
22	Potential Adopters			0.384	
23	Users			0.236	
24	Lucas and Spitler (1999)	Multifunctional workstation	Brokers and sales assistants	0.33	Usage is the dependent variable.
	Teo et al. (1999)	Internet	General Internet users		Usage is used as the dependent variable. Furthermore, the authors identify three indicators of Internet usage: frequency of Internet usage, daily Internet usage and diversity of Internet usage, each leading to a new structure. The low explanatory powers due to (1) Internet is new; (2) it is not the only source of entertainment or information available (Teo et al., 1999); (3) the general users have various experience with the Internet.
25	Usage: frequency			0.17	
26	Usage: time of usage			0.06	
27	Usage: diversity			0.11	
	Lederer et al. (2000)	World Wide Web	General Web users		Usage (as dependent variable) is measured by two items: frequency and time of usage. The reason for the low explanatory power may be the diversity of the subjects who were selected through the websites in various industries.
28	Usage (scale of 1–7)			0.15	
29	Usage (time of usage)			0.04	
30	Venkatesh (2000)		Professionals	0.35	
31	Venkatesh and Davis (2000)	Four different systems in four organizations	General employees	0.49	It s a result pooled across studies and time periods. Separately, the BI is explained from 37% to 52%.
	Venkatesh and Morris (2000)	Data and information retrieval	Employees from five organizations		
32	Time 1			0.41	
33	Time 2			0.40	
34	Time 3			0.41	
35	Bhattacherjee (2001)	On-line banking	On-line customers	0.41	
36	Chau and Hu (2001)	Telemedicine	Physicians	0.40	
	Mathieson et al. (2001)	Database package	General users		
37	Test 1			0.40	
38	Test 2			0.33	
39	Test 3			0.44	
40	Chau and Hu (2002)	Telemedicine	Physicians	0.43	
41	Heijden (2003)	Website	General users	0.447	Perceived enjoyment is combined with PU and PEOU.
42	Venkatesh et al. (2003)	On-line meeting manager; database application, portfolio analyzer; proprietary accounting systems.	General employees	0.38	

Table 3 (*continued*)

Codes	Article ID	Technology	Subjects	Explanatory power (R^2)	Comments
Field studies using students as subjects					
	Adams et al. (1992) (Study 2)	WordPerfect; Lotus 1-2-3; Harvard Graphics	Students		Actual usage is used as the dependent variable.
1	WordPerfect			0.04	The abnormally low explanatory power for WordPerfect dues to that the use of word processors in general has become a de facto standard and therefore the subjective norms plays an important role here.
2	Lotus 1-2-3			0.35	
3	Harvard Graphics			0.30	
	Davis et al. (1992)		Students		Study 2 is a laboratory study that was listed earlier under Experiments.
4	Study 1	A word processing program		0.68	
	Chin and Gopal (1995)	V-mail	Students		Compatibility and enjoyment are also included in the models.
5	Regression model			0.65	
6	Molar Model			0.57	
7	Molecular Model			0.54	
8	Taylor and Todd (1995a)	University computing	Students	0.52	
	Taylor and Todd (1995b)	University computing	Students		Perceived behavior control is also included as an antecedent of BI and actual usage.
9	Experienced users			0.43	
10	Inexperienced users			0.60	
	Szajna (1996)	Email	Students		
11	Pre-implementation model			0.52	
12	Post-implementation model			0.14	
	Agarwal and Karahanna (2000)	World Wide Web	Students		
13	Test 1			0.48	
14	Test 2			0.51	
15	Hong et al. (2001)	Digital library	Students	0.52	
16	Moon and Kim (2001)	World Wide Web	Students	0.394	
17	Gefen et al. (2003)	On-line shopping	Students	0.62	This paper also includes trust as an independent variable.

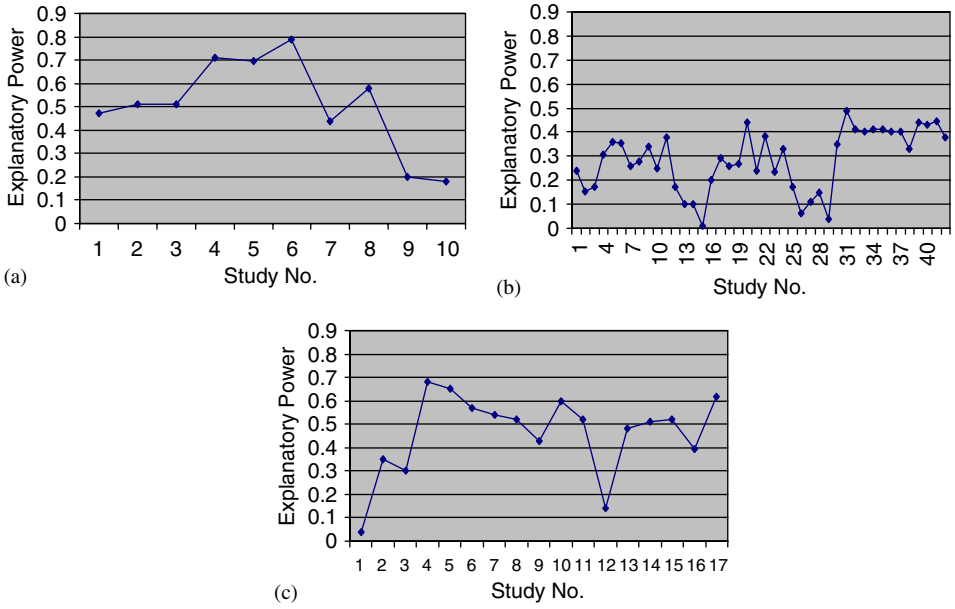

Fig. 1. Explanatory powers of existing studies: (a) experiments (10 studies); (b) field studies using professionals (42 studies); (c) field studies using students (17 studies).

higher explanatory powers than the field studies using general users (such as knowledge workers and other professionals). Under the assumption that employees face more complex and differing factors in real contexts than students do, the difference also calls for additional factors that may explain more variance in user acceptance.

2.2. Inconsistencies of major relationships

While quite a number of factors pertaining to user acceptance have been identified, we will focus on the major constructs based on prior findings, including subjective norm (SN), perceived usefulness (PU), perceived ease of use (PEOU), attitude (AT), behavioral intension (BI) and actual usage. Among these constructs, SN is the least studied construct in existing models. We decided to include it in our study because it is considered an important factor in several models (e.g., theory of reasoned action (TRA), TPB, Model of PC Utilization), has been included in the TAM2 model, receives empirical supports, and is viewed as a "core construct" (Venkatesh et al., 2003).

The abundant empirical evidence suggests the main relationships, as shown in Table 4 and Fig. 2. Among the 54 articles examined in this paper, 48 of them contributed a total of 72 empirical tests/studies. The other six, although useful for our arguments in other sections of this study, did not test these main relationships. Table 4 summarizes the review of these main relationships, which shows two major patterns. First, the constructs studied are varied. For example, some studies use AT while others use BI or actual usage as the indicator of user acceptance. Second, some main relationships are inconsistent. For example, PEOU has significant effects on BI in some studies but not in others.

By summarizing the data in Table 4 into the picture in Fig. 2, some interesting findings start to emerge. First, most of the relationships are statistically significant in prior studies, indicating certain robustness of TAM. Second, its relationships are not completely consistent in prior studies. All relationships except for the one between SN and PU have controversial results. Third, the robustness levels of the relationships are different. For example, the impacts of PU on AT, on BI and on usage seem more robust than those of PEOU. Next, we will discuss these relationships in detail.

2.2.1. Perceived usefulness

Usefulness is defined as "the degree to which a person believes that using a particular technology will enhance his performance" (Davis, 1989, p. 320). There are several similar counterpart constructs in other models, such as the outcome expectation in the Computer Self-Efficacy model and the extrinsic motivation in the Motivational Model. These similar concepts confirm from different angles that PU plays an important role in forming a user's AT or BI.

PU has been confirmed as an important, if not the most important, factor that influences user technology acceptance and therefore has received a great deal of attention from prior researchers. Almost all (71 out of 72) of the prior studies test the effects of PU (Table 4). Fig. 2 indicates that PU has significant influence on AT, BI or Usage, with few exceptions.

In TAM2, PU's antecedents, including SN, image, job relevance, output quality and result demonstrability, are identified (Venkatesh and Davis, 2000). In all, 40–60% of its variance (in four longitudinal studies) is explained. SN is empirically confirmed to be the most influential determinant of PU, especially when users have little

Table 4
Main relationships in prior studies

Article ID	PU			PEOU			EOU → PU	User acceptance factors			SN's effects
	PU → AT	PU → BI	PU → usage	EOU → AT	EOU → BI	EOU → usage		AT → BI	BI → usage	AT → usage	
Davis et al. (1989)											SN has no significant effect on BI.
Post-training	Yes	Yes			Yes		Yes	Yes	Yes		
14 weeks later	Yes	Yes			No		Yes	No	Yes		
Davis (1989)											
Software 1			Yes			Yes	Yes				
Software 2			Yes			Yes	Yes				
Thompson et al. (1991)			Yes			Yes					SN has significant effects on usage.
Mathieson (1991)	Yes	Yes		Yes				Yes			SN has no significant effect on BI.
Adams et al. (1992)											
Study 1											
Email			Yes			Yes					
V-mail			Yes			Yes					
Study 2											
WordPerfect			No			Yes					
Lotus 1-2-3			Yes			Yes					
Harvard Graphics			No			Yes					
Davis et al. (1992)											
Study 1		Yes			No		Yes		Yes		
Study 2		Yes			No		Yes				
Davis (1993)	Yes		Yes	Yes			Yes			Yes	
Segars and Grover (1993)							Yes				
Subramanian (1994)											
V-mail			Yes			No	No				
Customer dial up system			Yes			No	No				
Szajna (1994)			Yes			Yes					
Chin and Gopal (1995)		Yes			Yes						
Taylor and Todd (1995b)	Yes	Yes		Yes			Yes	No	Yes	No	SN has significant influence on BI.
Taylor and Todd (1995a)											SN has significant influences on BI for both experienced and inexperienced users.
Experienced users	Yes	Yes		No			Yes	No	Yes		
Inexperienced users	Yes	Yes		Yes			Yes	No	Yes		
Chau (1996a)		Yes			No		Yes				
Davis and Venkatesh (1996)		Yes			Yes		Yes				
Venkatesh and Davis (1996)		Yes			Yes		Yes				
Hendrickson and Collins (1996)			Yes			Yes	Yes				
Igbaria et al. (1996)			Yes			Yes	Yes				SN has significant effects on self-report usage.
Szajna (1996)											
Pre-implementation		Yes			No		Yes		Yes/No		

Post-implementation		Yes	Yes		No		Yes		Yes	
Venkatesh and Davis (1996)		Yes			Yes		Yes			
Gefen and Straub (1997)			Yes			Yes				SN has significant impacts on PU. Women perceive SN and PU more than man do.
Igbaria et al. (1997)			Yes			Yes	Yes			
Jackson et al. (1997)										
Model 1	No	No		Yes			No	No		
Model 2					Yes					
Straub et al. (1997)										
US		Yes			No					
Swiss		Yes			No					
Japan		No			No					
Gefen and Keil (1998)			Yes			No	Yes			
Agarwal and Prasad (1999a, b)										
Model 1	Yes	Yes		Yes			Yes	Yes		
Model 2	Yes	Yes		Yes			Yes	Yes		
Dishaw and Strong (1999)	Yes	Yes	Yes	No			Yes	Yes	Yes	SN does not have a significant influence on BI. Sample is not a reason since they use professionals rather than students.
Hu et al. (1999)	Yes	Yes		No			No	Yes		
Karahanna and Straub (1999)			Yes			No	Yes			SN has significant effects on PU but no direct impacts on usage.
Karahanna et al. (1999)										SN has significant effects on BI for potential adopters but not for users
Potential adopters	Yes			Yes				No		BI for potential adopters but not for users
Users	Yes			No				Yes		
Lucas and Spitler (1999)		No	No		No	No	Yes			SN has significant effects on user acceptance factors.
Teo et al. (1999)							Yes			
Usage: frequency			Yes			Yes				
Usage: time of usage			Yes			Yes				
Usage: diversity			Yes			Yes				
Agarwal and Karahanna (2000)										
Test 1		Yes			Yes		No			
Test 2		Yes			Yes		Yes			
Gefen and Straub (2000)										
Task 1		Yes			Yes		Yes			
Taks 2		Yes			No		Yes			
Lederer et al. (2000)										
Usage (scale of 1–7):			Yes			Yes				
Usage (time of usage):			Yes			No				
Venkatesh (2000)		Yes			Yes		Yes			
Venkatesh and Davis (2000)		Yes			Yes		Yes		Yes	SN has significant influence on BI in mandatory, but not voluntary settings. SN has more influence on PU in the early stages.

Table 4 (*continued*)

Article ID	PU			PEOU			EOU → PU	User acceptance factors			SN's effects		
	PU → AT	PU → BI	PU → usage	EOU → AT	EOU → BI	EOU → usage		AT → BI	BI → usage	AT → usage			
Venkatesh and Morris (2000)											SN → BI:		
Time 1		Yes			Yes		Yes					Men	Women
Time 2		Yes			Yes		Yes				Short	No	Yes
Time 3		Yes			Yes		Yes				Long	No	No
Bhattacherjee (2001)		Yes											
Chau and Hu (2001)	Yes	Yes		No	No		No	Yes			SN has no significant impacts on BI.		
Hong et al. (2001)		Yes			Yes		Yes						
Moon and Kim (2001)	Yes	Yes		Yes			Yes	Yes	Yes				
Mathieson et al. (2001)													
Test 1	Yes	No		Yes			Yes	Yes	Yes				
Test 2	Yes	No		Yes			Yes	Yes	Yes				
Test 3	Yes	No		No			Yes	Yes	Yes				
Chau and Hu (2002)	Yes	Yes		No			No	Yes			SN has no significant effect on BI.		
Chen et al. (2002)	Yes	No		Yes			Yes	Yes	Yes				
Gefen et al. (2003)		Yes			Yes		Yes						
Heijden (2003)	Yes	Yes		Yes	Yes		Yes	Yes	Yes				
Venkatesh et al. (2003)		Yes			Yes						SN does not significantly influence BI.		
Heijden (2004)		Yes			Yes		Yes						

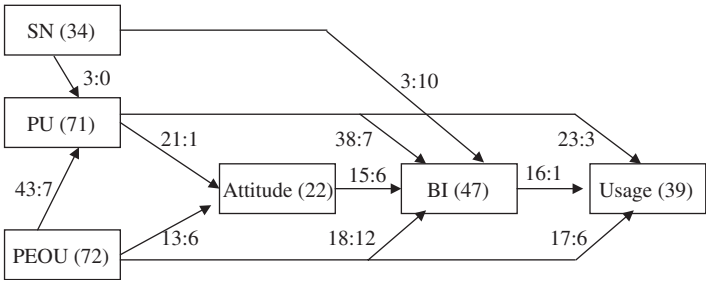

Fig. 2. Summary of relationships (number of studies *w*/significant linkages: number of studies *w*/insignificant linkages). *Note*: (1) The number following each factor is the total number of studies (not articles) in which this factor is studied. (2) BI: behavioral intention; SN: subjective norm; PU: perceived usefulness; PEOU: perceived ease of use.

experience with the technology (Venkatesh and Davis, 2000).

2.2.2. Perceived ease of use

PEOU refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). Unlike PU, the effects of PEOU on AT, BI and usage are quite inconsistent. Fig. 2 indicates that among the studies we reviewed, 18 studies show significant and 12 non-significant impact of PEOU on BI. This result is consistent with what Lee et al. (2003) claimed, that compared with PU, PEOU is an unstable measure in predicting BI.

These inconsistencies suggest that some factors may moderate the linkages between PEOU and the other three constructs: AT, BI and Usage. Igbaria et al. (1997) argued that experience might be one of the moderating factors. Subramanian (1994) stated two reasons for the inconsistent PEOU effects. The first addressed the complexity of the systems being studied: some (such as voice mail (v-mail) and customer dial-up systems) were relatively easier to use than some other software packages or systems, such as Harvard Graphics or spreadsheets (Subramanian, 1994), and it happened that in the latter case, PEOU was found significant (Adams et al., 1992). The second reason was the users' experience. Additionally, Venkatesh and Morris (2000) found that gender also has a moderating effect on the PEOU-related linkages.

PEOU has shown a significant effect on PU in the majority of studies (Davis, 1989; Davis et al., 1989; Mathieson, 1991; Taylor and Todd, 1995a, b; Szajna, 1996; Venkatesh and Davis, 2000). As Fig. 2 shows, in 43 out of 50 studies, PEOU→PU links appear significant. Exceptions were found in Chau and Hu's (2002) research, where PEOU has no effect on PU. The authors attributed this to the fact that professional users (physicians in their study) were different from general users in terms of intellectual capacity (Chau and Hu, 2002). Professional users like physicians have relatively high intellectual capacity and therefore are less likely to depend on ease of use to form their intentions. Studies have also shown that experience may be another factor moderating the relationship between PEOU and PU. The more experienced the users are, the less the effect of PEOU on PU (Szajna, 1996).

2.2.3. Dependent variables: attitude, behavior intention and usage

The strong BI→Usage link has received empirical support from a large number of studies (Davis et al., 1989; Taylor and Todd, 1995a, b; Szajna, 1996; Venkatesh and Davis, 2000). As indicated in Fig. 2, 16 out of 17 studies considering the BI→Usage link show significant results. BI has been found to be a better predictor of systems usage than competing predictors such as realism of expectations, motivational force, value and user satisfaction (Venkatesh and Davis, 1996).

Compared with BI, the results about AT are not so consistent. As Table 4 and Fig. 2 show, AT's significant effects on BI were shown in 15 studies, but in the other six. AT was omitted from the final TAM because the PU→BI link seemed more significant (Davis et al., 1989). This can be explained in that if a system is perceived to be useful, people may have a high BI even though they do not have a positive AT toward it (Davis et al., 1989). Another explanation is that AT is a complex construct with multiple components. Triandis (1980) argued for the separation of the affective (which has a like/dislike connotation) and cognitive components of AT. To do this, Triandis (1980, p. 211) introduced "affect", which was defined as "the feelings of joy, elation, or pleasure, or depression, disgust, displeasure, or hate associated by an individual with a particular act". Many existing models focus mainly on cognitive factors, which only constitute part of AT.

2.2.4. Subjective norm's effects

SN refers to "a person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein and Ajzen, 1975). SN has three major mechanisms through which it exerts its influence: compliance, internalization and identification. Compliance is reflected in the direct SN–BI relationship, while internalization and identification alter a user's belief structure, such as PU. Therefore, SN has been found to play two separate and different roles: one as the antecedent of BI and the other as the antecedent of PU.

Table 5
Inconsistencies in research results of SN

Relationships	Representative works		Possible reasons
	Significant	Non-significant	
SN→PU	Gefen and Straub (1997), Karahanna and Straub (1999) and Venkatesh and Davis (2000)	Venkatesh and Davis (2000)	Experience (Venkatesh and Davis, 2000)
	Venkatesh and Morris (2000)	Venkatesh and Morris (2000)	Gender (Venkatesh and Morris, 2000)
SN→BI	Taylor and Todd (1995a)	Davis et al. (1989)	Experience (Venkatesh and Davis, 2000; Venkatesh et al., 2003)
	Lucas and Spitler (1999)	Mathieson (1991)	Gender (Venkatesh and Morris, 2000; Venkatesh et al., 2003)
	Venkatesh and Davis (2000)	Dishaw and Strong (1999)	User professions (Mathieson, 1991; Chau and Hu, 2002) Type of technology (Davis et al., 1989)
	Venkatesh and Morris (2000)	Chau and Hu (2001)	Voluntariness (Venkatesh and Davis, 2000; Venkatesh et al., 2003)
	Venkatesh et al. (2003)	Chau and Hu (2002) Venkatesh and Morris (2000) Venkatesh et al. (2003)	Age (Venkatesh et al., 2003)

Note: Some articles appear in both "significant" and "non-significant" categories because SN shows different effects in different conditions in them (i.e., more than one studies).

Fig. 2 depicts that only three out of 13 studies have a significant SN→BI relationship. Table 5 summarizes the prior research, in which the impacts of SN on BI and PU are inconsistent. The reasons accounting for such inconsistencies are also indicated. As presented in Table 5, the influence of SN is very complex and "subject to a wide range of contingent influences" (Venkatesh et al., 2003).

In summary, this survey of the literature discloses the limitations of explanatory powers and inconsistencies of the main constructs in prior user technology acceptance studies. These limitations and inconsistencies call for additional consideration regarding individual and contextual differences as described above. In the next section, we further explore the moderating effects in the context of a proposed integrated model and propositions.

3. An integrated model and propositions

Prior studies imply great potential regarding the addition of moderating factors to enhance explanatory power. As previously mentioned, studies using student subjects have more explanatory power than those using professionals, which usually have more complex contexts. This is reasonable in that the more complex the context, the more influencing factors are involved in variances, and therefore a given model with only limited factors studied has less explanatory power. In other words, when we face a more complex context, we need additional factors to capture the complexity of the context. Chin et al. (2003) empirically confirmed that the inclusions of moderating factors could enhance the model's explanatory power, although the effect is limited. A prime example is research conducted by Venkatesh et al. (2003) where they compared explanatory power between models with and without moderators, as summarized in Table 6. In general, the explanatory power of the models increases with the inclusion of moderators. For example, when including gender as a moderating variable, the explanatory power (predictive validity) of TAM increases to 52% compared to approximately 35% without moderators. Similarly, when including experience and voluntariness as moderating variables, the explanatory power of TAM2 also increases to 53% from about 35% without moderators (Venkatesh et al., 2003). Thus, the inclusion of moderators leads to enhancing a model's explanatory power, making investigating moderating effects worthwhile.

The consideration of moderating factors may also contribute to overcoming the inconsistencies in previous studies. As mentioned above, in order to understand why the main relationships shown in Table 4, Fig. 2 and Table 5 are inconsistent, several reasons have been investigated. These reasons, however, are underdeveloped and therefore need more conceptualization and formalization.

Based on the discussion so far, we propose an integrated model as depicted in Fig. 3. Besides the commonly studied constructs, such as PU, PEOU, SN, BI and Usage, moderating factors are highlighted in this model. Ten moderating factors are identified from prior studies and are categorized into three groups: organizational factors, technology factors and individual factors. The development of the propositions about the moderating factors follows.

Table 6
Comparisons of explanatory power between models with and without moderators (adapted from Venkatesh et al., 2003)

	Explanatory power w/out moderators						Explanatory power w/moderators
	Voluntary settings			Mandatory settings			
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3	
TAM/TAM2	0.38	0.36	0.37	0.39	0.41	0.36	0.52 (TAM) 0.53 (TAM2)
Theory of reasoned action (TRA)	0.30	0.26	0.19	0.26	0.26	0.17	0.36
Motivational model (MM)	0.37	0.36	0.37	0.38	0.40	0.35	0.38
Theory of planned behavior (TPB)/decomposed TPB	0.37	0.25	0.21	0.34	0.28	0.18	0.36 (TPB) 0.47 (DTPB)
Combined TAM-TPB (C-TAM-TPB)	0.39	0.36	0.39	0.36	0.35	0.35	0.39
Model of PC utilization (MPCU)	0.37	0.36	0.38	0.37	0.40	0.37	0.47
Innovation diffusion theory (IDT)	0.38	0.37	0.39	0.38	0.42	0.37	0.40
Social cognitive theory (SCT)	0.37	0.36	0.36	0.38	0.39	0.36	0.36

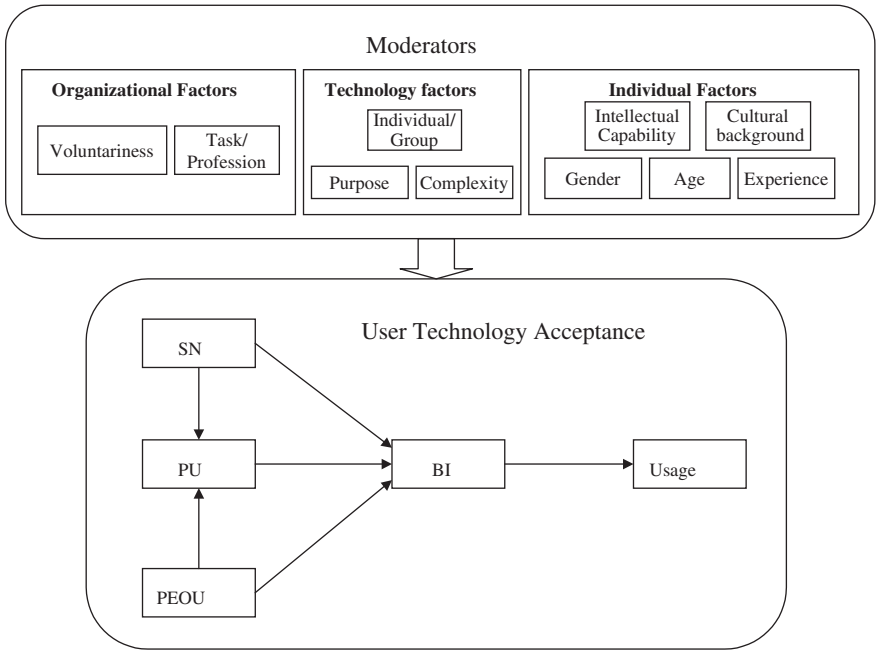

Fig. 3. An integrated model (including moderators). BI: behavioral intention; SN: subjective norm; PU: perceived usefulness; PEOU: perceived ease of use.

3.1. Propositions for organizational moderators

Two factors are identified as organizational moderators: voluntariness and the nature of tasks and profession. They both have gained much attention in the literature reviewed.

3.1.1. Voluntariness

Voluntariness is defined as the extent to which potential adopters perceive the adoption decision to be non-mandatory (Moore and Izak, 1991; Venkatesh and Davis, 2000). Based on prior studies, voluntariness moderates merely the SN→BI relationship. As mentioned above, prior studies suggested that it is possible for social influence to affect usage in two ways: directly through compliance, or indirectly through its effect on beliefs (such as PU) and AT due to internalization and identification processes (Karahanna and Straub, 1999). The "compliance" here is closely related to the level of voluntariness. Users have to "comply" with the managerial or organizational demands or rules in a mandatory, but not in a voluntary, context. That is to say, compliance means a direct influence of SN on BI and usually exists in mandatory contexts. Based on these arguments, Venkatesh and Davis considered the voluntary context as the reason for the insignificant SN→BI relationship existing in prior studies. They then retested the role of voluntariness, especially its influence on the SN→BI relationship (Venkatesh and Davis, 2000). Their studies confirmed that SN had a significant direct effect on intentions for the mandatory but not for the voluntary usage context, and therefore voluntariness was considered

as a moderating factor of SN→BI relationship (Venkatesh and Davis, 2000). Venkatesh et al. (2003) retested and confirmed this influence again in their latest work. Therefore, we propose the following:

P1-1. *The influence of SN on BI is stronger in mandatory contexts than in voluntary contexts.*

Furthermore, Karahanna and Straub (1999) argued that the influence of "compliance" might become insignificant over time. In Venkatesh and Davis's (2000) research, the influence of the SN became smaller over time in both the studies in the mandatory context, which might imply that along with internalization, the effect of mandatory contexts might become smaller. That is to say, users may depend more on their own beliefs (through internalization), rather than others' opinions. Venkatesh et al. (2003) empirically found the same results. So we propose that:

P1-2. *The moderating effects of voluntariness wear off over time.*

It is noteworthy that many prior studies considered the accumulated experience as the reason for the insignificant influence of SN on intentions as proposed above. Thus, it is still uncertain that over time which of the two factors (accumulated experience or the smaller compliance) accounts for the insignificant relationship between SN and user acceptance. More empirical evidence is required.

3.1.2. The nature of tasks and professions

A variety of dimensions of tasks have been proposed (Goodhue, 1995), among which the most commonly used ones are routine vs. non-routine tasks, and tasks interdependent on other organizational tasks. Goodhue and Thompson (1995) suggested this dimension by conceptualizing and combining two previously defined characteristics of task, variety and difficulty (Goodhue, 1995). The authors hypothesized and subsequently empirically confirmed the effects of this dimension on user evaluation of technology. They argued that users who usually deal with a great variety of issues (non-routine) or ad hoc tasks would need to acquire new types of information from existing technology, and therefore were more likely to be frustrated by frequently identifying unfamiliar data and determining how to access and interpret it (Goodhue, 1995). With the limited cognitive capacity a user has, the demand of dealing with non-routine tasks can be high and would leave less capacity to deal with the challenges faced with using the system. Thus, high PEOU would be very important for the user to accept the system. On the other hand, ease with routine tasks may provide a user with more capacity to deal with using the system, thus a low PEOU would be less overwhelming. Thus, we propose that:

P1-3. *PEOU has more influence on BI for users dealing with non-routine tasks than for those dealing with routine tasks.*

Another dimension is interdependence of tasks. Users engaged in tasks that are interdependent with other organizational units will need to identify, access and integrate data from a variety of systems, and they are more likely to be frustrated by the incompatibilities in data and access routines for these systems, and overall by the high cognitive demand (Goodhue, 1995). The "wearing off" effects of PEOU seem weaker for them.

Similarly, Chau and Hu (2002, p. 213) also argued that a high level of autonomy might cause limited impacts of PEOU. Some professions require collaboration and others may require professional autonomy. This dimension may influence the effects of social influence (SNs). For example, Chau and Hu (2002) attributed insignificant peer influence to the personal autonomy of the physicians used in their study. They argued that "specialized training and high autonomy encourage independent thinking and decision-making, which may jointly contribute to a physician's tendency to respect but place relatively less weight on peers' opinions in AT development or making a technology acceptance decision" (Chau and Hu, 2002, p. 214). Therefore,

P1-4. *The impact of PEOU on BI is weaker for highly independent tasks/professions than for less independent tasks/professions.*

P1-5. *The impact of SN on BI is weaker for highly independent tasks/professions than for less independent tasks/professions.*

3.2. Propositions for technological moderators

Most of the studies used common technologies, such as email, v-mail, word processing software and spreadsheets, while others used specific technologies, such as customer dial-up systems (Subramanian, 1994), database management systems (DBMSs) (Szajna, 1994), managerial systems (Venkatesh and Davis, 2000), telemedicine technology (Chau and Hu, 2002) and information retrieval systems (Venkatesh and Morris, 2000).

Few previous studies focused on the effects of different technologies. However, based on our analysis, the main relationships may differ across technologies. For example, Adams et al. (1992) studied two groups of technologies and found different relationships of user acceptance constructs. Based on the analysis of the collected articles, we try to identify the following technological moderating factors.

3.2.1. Technological complexity

One dimension of technology is complexity. Subramanian (1994) attributed the insignificant effects of PEOU on BI to the nature of the systems in the study. The author argued that one reason for the insignificant effect of PEOU was that both v-mail and customer dial-up systems used in the study were communication technologies that are much easier to use than software packages such as Harvard Graphics and spreadsheets (Subramanian, 1994). Similarly,

Teo et al. (1999) attributed the insignificant effects of PEOU on BI to the simplicity of the technology used in their study, the Internet. The authors argued that since the Internet was relatively easy to use, the learning process, in which PEOU was confirmed to have significant influence on BI, was quickly completed. Therefore, we propose that:

P2-1. *The influence of PEOU on BI is stronger for technologies that are more complex.*

P2-2. *The influence of PEOU on PU is stronger for technologies that are more complex.*

3.2.2. The purpose of using technology: work-oriented vs. entertainment-oriented

Some researchers noted that the purpose of using technology could have different impacts on user acceptance. For example, Lederer et al. (2000) listed that one of the limitations of their studies was the assumption that the technology in question was used in work places and different from technologies for games or chatting. Similarly, Moon and Kim (2001) compared two groups of users viewing WWW as work-oriented and entertainment-oriented, respectively. They confirmed empirically that PU has a more significant effect for users who use the Internet as work-oriented technology than for those using the Internet as entertainment-oriented technology. Using similar logic, Amoako-Gyampah and Salam (2003) conducted a study on ERP implementation environment and found an insignificant effect of PEOU. Then they attributed the insignificant effect of PEOU to the fact that ERP users are more concerned with the larger goal of how an ERP system supports business processes, implying that technologies like ERP systems are so work-oriented that they will be used no matter whether they are easy to use or not. More recently, Heijden (2004) studied user acceptance of hedonic systems, which provide self-fulfilling value to the user, in contrast to utilitarian systems, which aim to provide instrumental value to the user. They found that PEOU is a stronger determinant of intention to use a hedonic IS than PU. Based on the above discussions, we propose that:

P2-3. *PU has more influence on BI for work-oriented technologies than for entertainment-oriented technologies.*

P2-4. *PEOU has less influence on BI for work-oriented technologies than for entertainment-oriented technologies.*

3.2.3. Individual vs. group technologies

Both individual and group technologies have been investigated in prior studies (Table 3). Unlike individual technology, which aims to improve individual productivity, group technology (groupware) aims to facilitate group coordination and to support cooperation and collaboration among a group of users. User acceptance of groupware is therefore different from that of individual technology due to the unique features of groupware (Lou et al., 2000). SN's effects may be different for individual technologies such as word processing software and group technologies such as email or v-mail. For example, Davis et al. (1989) argued that the lack of a significant SN → BI effect might be due to the technology used in the study. They argued that word processing was fairly personal and individual and may be driven less by social influences compared to other technologies such as email, project management or group decision support systems, and therefore, SN may have less effect in such technological contexts (Davis et al., 1989). Users who have adopted the technology have the incentive to enlist more users for the technology, and they may be eager to promote the technology by sharing their experience with and offering help to potential adopters (Lou et al., 2000). Such unsolicited help from many peers due to the unique features of groupware may convince a potential user that it would not take a lot of time and effort to learn and use the groupware, which promotes their intention to use it. Based on the above discussion, we propose that:

P2-5. *SN has more influence on BI for group technologies than for individual technologies.*

P2-6. *SN has more influence on PU for group technologies than for individual technologies.*

3.3. Propositions for individual moderators

Individual differences are usually user factors that include demographic variables and situational variables that account for differences attributable to circumstances such as experience and training (Agarwal and Prasad, 1999b). Many technology acceptance studies neglect moderating effects of individual factors, although some do admit that the absence of such characteristics is one of their work's limitations (e.g., Davis et al., 1989). The inconsistencies existing in prior studies imply that perceptions are not equally efficacious in developing usage intentions for everyone (Venkatesh, 2000). The TRA, e.g., indirectly acknowledges such individual differences by asking potential users to assess the importance of each belief (Agarwal and Prasad, 1998).

Review of the articles yields the following individual factors that may have moderating effects: (1) gender; (2) intellectual capabilities; (3) experience; (4) age and (5) cultural background. Next we will discuss each factor in detail.

3.3.1. Gender

Gender has been generally missing from IT behavioral research (Gefen and Straub, 1997). Nonetheless, research has shown that decision-making processes by woman and men are different (Venkatesh and Morris, 2000). Studies

suggested that women and men are different in terms of information processing, using different socially constructed cognitive structures (Venkatesh and Morris, 2000). For example, female and male are different in characteristics they consider important in evaluating products and processing strategies used at recognition of advertisements (Meyers-Levy and Maheswaran, 1991). Gender differences also occur across cultures (Gefen and Straub, 1997).

Three major gender differences are critical for user acceptance research. First, men are more "pragmatic" than women. Compared to women, men are more task-oriented (Minton and Schneider, 1980) and motivated by achievement needs (Hoffman, 1972). This is directly related to usefulness perception. Second, compared to men, women have higher computer anxiety and lower computer self-efficacy. This difference is closely related to PEOU in that higher computer self-efficacy leads to lowering of ease of use perception (Venkatesh and Morris, 2000). Third, women have a greater awareness of others' feelings compared to men, and are therefore more likely to be influenced by others (Venkatesh and Morris, 2000). This difference is directly related to the influence of SNs.

Correspondingly, in their research, Venkatesh and Morris (2000) argued that men are more driven by PU, while women are more motivated by PEOU and SN. The influence of PU on BI (β) was 0.61, 0.62 and 0.62 at three points of measurement for men and 0.30, 0.32 and 0.36 for women. Therefore, men and women are significantly different in terms of PU→BI relationship. As for the effects of PEOU on BI, this study also confirmed that women were more influenced by ease of use than men, with β values of 0.33, 0.31 and 0.36 for women and 0.10, 0.01 and 0.05 for men, respectively. They also argued that the PEOU→PU relationship is identical for male and female both pre- and post-usage (with accumulated experience). Furthermore, SN had no effect on men's decisions at any point in time, while it did matter for women at the initial stage of technology introduction.

Gefen and Straub (1997) also made some arguments about the importance of SNs for women, indicating that "women would use e-mail for more interactive exchanges and more context building exchanges than men would because of feminine discourse tendencies to use communication for rapport and cooperative behavior".

Similarly, Venkatesh et al. (2003) argued that gender might moderate the relationship between (1) PU and BI; (2) PEOU and BI; and (3) SN and BI. After including gender as a moderator, the explanatory power of TAM significantly increased to 52%.

These findings suggest that gender moderates the effects of PU→BI, PEOU→BI and SN→BI. Therefore, we propose the following propositions.

P3-1. *The effects of PU on BI are stronger for males than for females.*

P3-2. *The effects of PEOU on BI are stronger for females than for males.*

P3-3. *The effects of SN on BI are stronger for females than for males.*

3.3.2. Individual intellectual capabilities

The individual competence factor has received some attention in prior studies. For example, Lederer et al. (2000) noticed their subjects were "educated" and called for research on "less educated" users, which might have "provided additional validation of TAM and interesting insights about ease of use and usefulness".

A related concept is "profession". Many prior studies have explored the role of profession and considered it an explicit indicator of a user's general competence and mental/cognitive capacities (e.g., Chau and Hu, 2002). The majority of prior studies use general people as research subjects. Existing models, however, may not succeed in demonstrating consistency across professions. For example, Hu et al. (1999, p. 106) argued that "TAM may not be appropriate for user populations that have considerably above-average general competence and intellectual capacity". In their study, PEOU had no significant influence on usefulness and BI for physicians. As for the SU–BI relationship, individual capacities may also moderate the SN's influence on user acceptance. Chau and Hu (2001) argued that the insignificant effects of SN on BI in their study were due to the professional nature of the samples, physicians in hospitals who had higher intellectual capacity. Dishaw and Strong (1999), however, argued that the professions might not account for the insignificant effect of SN on BI, since they used professionals in their study and got results similar to the ones using students as subjects. We consider the conflicting results to be due to the usage of explicit indicators rather than latent variables. That is to say, professions are just the explicit indicator. What really matters is the latent variable, one's general competence and intellectual capacity, such as learning ability. If prior results about the effects of professions were re-interpreted, the professionals would have higher competence and mental/cognitive capacities, and subsequently would have different beliefs or perceptions about a specific technology.

Many similar concepts have been identified, of which absorptive capacity is closely related to intellectual capability. Absorptive capacity is defined as the ability to recognize the value of new external knowledge, assimilate it, and apply it to commercial ends (Cohen and Levinthal, 1990). It is a multidimensional concept and can be applied at different levels. At the level of the individual, absorptive capacity refers to memory development, in which accumulated prior knowledge enables the ability to store new knowledge into one's memory and to recall and use it (Cohen and Levinthal, 1990). An important underpinning of absorptive capacity is that prior knowledge can facilitate the absorption of new knowledge. On the other hand,

"knowledge diversity also facilitates the innovative process by enabling the individual to make novel associations and linkages" (Cohen and Levinthal, 1990, p. 131).

Thus, we propose the following propositions.

P3-4. *The effects of PU on BI are stronger for those whose have stronger intellectual capacities.*

P3-5. *The effects of PEOU on BI are stronger for those whose have weaker intellectual capacities.*

P3-6. *The effects of SN on BI are stronger for those whose have weaker intellectual capacities.*

3.3.3. Experience

Measurements of experience vary in previous research. Experience is measured by the number of years a user has with computers in general (i.e., Venkatesh and Morris, 2000) and a dummy variable that employs ordinal values (i.e., 0, 1, 2) to capture the increasing levels of user experience with the technology (i.e., Venkatesh et al., 2003). In longitudinal studies, experience is implied in the separation of stages, i.e., pre- and post-implementation (Szajna, 1996), or 1 h after introduction (Time 1) and 14 weeks after introduction (Time 2) (Davis et al., 1989). No specific definition of experience has been provided to date. Considering the key role of experience in understanding the belief–intention–acceptance relationship, researchers might use more finely grained of detail in its conceptualization of experience. Domain specific conceptualization of experience should be addressed.

Although in measurement, the concept of experience in previous studies refers to the same implied meaning: more familiar with and more knowledgeable about the technology of interest. Users may employ the knowledge gained from their prior experience to form their intentions (Fishbein and Ajzen, 1975). Generally speaking, existing models work well for both experienced and inexperienced users. However, prior studies confirmed that the effects of PU, PEOU and SN on BI differ between experienced and inexperienced users. Several prior studies suggested that experience influences relationships between (1) BI and Usage, (2) PU and BI, (3) PEOU and AT (Taylor and Todd, 1995a) and (4) SN and PU (Venkatesh and Davis, 2000; Venkatesh et al., 2003).

In general, PU remains a significant determinant of BI over time (Davis et al., 1989; Venkatesh and Davis, 2000; Venkatesh and Morris, 2000). Venkatesh et al. (2003) did not find a significant moderating effect of experience on "performance expectancy" that was similar to PU in TAM, either. The moderating effect of experience on PEOU → BI relationship is clear and stable. We can refer to knowledge diversity as mentioned in the last subsection. A diverse knowledge background provides a more robust basis for learning because it increases the prospect that incoming information will relate to what is already known (Cohen and Levinthal, 1990). Similarly, when users have more knowledge gained through prior experience with similar technologies, they have more knowledge sources when learning the new IT, and therefore may perceive that ease of use is not a big issue. Almost all the prior studies that studied the moderating effects of experience confirmed that the effect of PEOU on either PU or BI wore off over time (Davis et al., 1989; Adams et al., 1992; Taylor and Todd, 1995a; Venkatesh et al., 2003). Taylor and Todd (1995a) empirically confirmed that BI → Usage is more significant for experienced users than for inexperience users. This is easy to understand since experienced users utilize their prior experience to form their intentions (Fishbein and Ajzen, 1975).

Therefore, we propose that:

P3-7. *PEOU has less influence on BI for experienced users than for inexperienced users.*

P3-8. *PEOU has less influence on PU for experienced users than for inexperienced users.*

P3-9. *BI has more influence on actual usage for experienced users than for inexperienced users.*

As for the SN, experience also moderates its influences on BI and PU. Venkatesh and Davis confirmed that influence of SN on either BI or PU attenuated over time. Users may use their direct experience with a system rather than others' opinions to form their intentions and perceptions of usefulness (Venkatesh and Davis, 2000). In another study, Venkatesh and Morris (2000) found similar effects. While SN did not have significant effects for men at any time, it did have significant influence on intention for women. But the effects became weaker over time. Similarly, Karahanna and Straub (1999) argued that potential adopters (inexperienced) are influenced by SNs more than current users (experienced). Based on their findings, we propose that:

P3-10. *SN has less influence on BI for experienced users than for inexperienced users.*

P3-11. *SN has less influence on PU for experienced users than for inexperienced users.*

It is noteworthy that prior researchers also found another similar concept, computer literacy. Chau (1996b) argued that PEOU has no significant influence because users are "generally more computer-literate than their counterparts five to ten years ago" and subsequently "ease of use may have been less of an issue for this sample than it would have been for the samples used in prior studies". More specifically, along with the interaction with information technologies, users may in general

have more computer self-efficacy (Compeau et al., 1999). The higher the computer self-efficacy, the less the users depend on ease of use (Venkatesh and Morris, 2000). Compared with the experience with specific systems, computer literacy is more like a user's "trait", which is more general and stable. In simple terms, then, we can see computer literacy as an "indirect" experience in conjunction with general information technology, which has effects similar to "direct" experience with specific technologies. Therefore, we propose that computer literacy, while different from experience, has moderating effects similar to those of experience.

3.3.4. Age

Compared with other potential moderating factors such as experience, age received less attention in prior studies. Venkatesh et al. (2003) found young users placed more importance on extrinsic reward (equivalent to PU). Similarly, Morris and Venkatesh (2002) found the same moderating effects of age. In addition, "increased age has been shown to be associated with difficulty in processing complex stimuli and allocating attention to information on the job" (Venkatesh et al., 2003, p. 450), implying that PEOU is a stronger determinant of BI for old users. Because affiliation needs increase with age, it may be that older users are more influenced by social factors (Venkatesh et al., 2003). Psychological research suggests that older workers are more likely to conform to others' opinions and have a relatively lower need for autonomy than younger workers (Evans et al., 1979; Cook and Wall, 1980). We thus propose that:

P3-12. *PU has stronger influence on BI for younger users than for older users.*

P3-13. *PEOU has less influence on BI for younger users than for older users.*

P3-14. *SN has less influence on BI for younger users than for older users.*

P3-15. *SN has less influence on PU for younger users than for older users.*

3.3.5. Cultural background

Another factor given relatively little attention was cultural background. Most research used North Americans as subjects. However, the social and cultural characteristics of European institutions can be studied as distinct from, or perhaps in contrast to, North American or Japanese institutions (Liebenau and Smithson, 1991). Thus, the applicability of research conducted in US universities and companies to businesses in other countries may be challenged (Igbaria et al., 1995). Along with the increasing pace of globalization, the importance of understanding cultural influence is critical.

A widely used definition of culture is provided by Hofstede (1980). Culture is defined as "the collective programming of the mind which distinguishes the members of one group or category of people from another" (Hofstede, 1980, p. 5). Culture is a construct that is not directly accessible to observation but inferable from verbal statements and other behaviors, and useful in predicting other observable and measurable verbal and non-verbal behavior (Hofstede, 1993).

Several dimensions have been proposed (i.e., Hall and Hall, 1990; Hampden-Turner and Trompenaars, 1994; Lessem and Neubauer, 1994; Chen, 1995; Cragg, 1995).[1] Among these dimensions, Hofstede's dimensions are widely used in the field of IS. Four dimensions are suggested including power distance, individualism/collectivism, masculinity/femininity and uncertainty avoidance (Hofstede, 1980).

Power distance is defined as the degree of inequality among people which the population of a country considers as normal: from relatively equal (i.e., small power distance) to extremely unequal (large power distance) (Hofstede, 1993). In a society in which people are separated by a large power distance, the leveling effects of certain technologies (i.e., communication technologies) are not desirable. Instead, they may choose media with high social presence such as face-to-face interaction (Straub et al., 1997). In high power distance culture, individuals are not supposed to disagree with their superiors. Subsequently, they are more likely to rely on others' opinions to form their decisions. Based on the discussions above, we propose:

P3-16. *PU has less influence on BI for individuals in high power distance cultures.*

P3-17. *SN has more influence on BI for individuals in high power distance cultures.*

Individualism is defined as the degree to which people in a country prefer to act as individuals rather than as members of groups (Hofstede, 1993). The opposite of individualism is collectivism. In collectivist societies people learn to respect the group to which they belong. According to the social presence theory (Short et al., 1976), people in a low individualism society may be against certain technologies such as communication technologies (i.e., email, v-mail) since they mute the group effects (Straub et al., 1997). Instead, they may choose a medium of high social presence such as face-to-face communication. Therefore, they may perceive such technologies as less useful. On the other hand, it is logical to expect that in a low individualism (high

[1] For a comprehensive review, please refer to Myer and Tan (2002).

collectivism) culture, people are more likely to consider other people's opinions. We thus propose:

P3-18. *PU has more influence on BI for users in high individualism cultures.*

P3-19. *SN has less influence on BI for users in high individualism cultures.*

The third dimension is masculinity, which is defined as the degree to which tough values like assertiveness, performance, success and competition, which in nearly all societies are associated with the role of men, prevail over tender values like the quality of life, maintaining warm personal relationships, service, care for the weak and solidarity, which in nearly all societies are more associated with women's roles (Hofstede, 1993). Based on its definition, masculinity/femininity is closely related to interpersonal relationships. In a society with low masculinity (high femininity), a communicator such as email or v-mail that cannot convey rich social presence may not be preferred and subsequently is considered less useful (Straub et al., 1997). In a high masculinity culture, people are more goal-oriented and the absence of social presence is not a problem. Instead, the effectiveness and efficiency conveyed in new technologies are preferred. On the other hand, in a femininity culture, individuals are more people-oriented and therefore they pay more attention to others' opinions. Therefore, we argue that:

P3-20. *PU has more influence on BI for users in masculinity cultures.*

P3-21. *SN has less influence on BI for users in masculinity cultures.*

Uncertainty avoidance is defined as the degree to which people in a culture prefer structured over unstructured situations (Hofstede, 1993). Structured situations are those in which there are clear rules as to how one should behave (Hofstede, 1993). According to information rich theory (Daft and Lengel, 1984), individuals choose media by matching the information requirements of the task to the information richness of the media (Straub et al., 1997). In societies with high uncertainty avoidance, individuals have higher needs for the richness of technology. Therefore, when other factors are controlled, individuals in such societies are more likely to perceive the technology as less useful. Instead, they would rather use a medium of higher information richness under the same circumstances. On the other hand, individuals in societies with high uncertainty avoidance are more likely to listen to others' opinion in order to reduce the uncertainty. Therefore, we propose that:

P3-22. *PU has less influence on BI for users in a high uncertainty avoidance culture.*

P3-23. *SN has more influence on BI for users in a high uncertainty avoidance culture.*

3.4. Summary

Table 7 summarizes all the moderators and their effects. An examination of Table 7 gives us several interesting findings. First, if we examine the table vertically, all the linkages in the model are more or less subject to the influence of moderating factors, which means moderating factors have profound effects on user technology acceptance. On the one hand, some linkages such as SN → BI and PEOU → BI are influenced by almost all moderating factors. On the other hand, we can see that the BI → Usage link is influenced by just one moderating factor. It may imply that this relationship is very robust and valid across situations, which is consistent with prior studies. Second, if we examine the table horizontally, some factors, such as experience and age, seem to have more effects on user technology acceptance than other factors do. For instance, experience influences all the relationships in the model. Third, we can also observe the interactions among moderating factors. For example, P1-2 suggests that the moderating influence of voluntariness wears off along with accumulated user experience. It implies the interaction between voluntariness and experience. On the whole, Table 7 suggests that moderating factors influence most of the relationships and therefore should be considered when studying user technology acceptance.

4. Conclusions

Although they have received considerable empirical validation and confirmation, existing user acceptance models still have room for improvement. Their limited explanatory power and inconsistent relationships call for taking additional factors into account. Researchers have suggested models be tested in field settings with organizational and technological factors considered (Lucas and Spitler, 1999; e.g., Sun and Zhang, 2004). This present study is an attempt to move in this direction. By including the moderators in user acceptance models, we hope to lessen the limitations of low explanatory power and inconsistencies existing in prior studies. It is noteworthy that the influence of including moderating factors on R^2 is statistically limited (Chin et al., 2003). However, by taking moderating factors into account, we are more confident in explaining and describing the meanings of existing models.

This paper draws several implications for both researchers. First, this study suggests that research on moderating factors is of great value. This is consistent with suggestions from existing studies that contexts could play an important role in user technology acceptance (Davis et al., 1989; Taylor and Todd, 1995a; Szajna, 1996). It is noteworthy that the major function of moderating factors is explaining the inconsistencies by identifying the situational differences. Its effect in enhancing R^2 is modest. This observation is consistent with prior empirical study (Chin et al., 2003).

Table 7
Summary of moderating effects

	SN→PU	SN→BI	PEOU→PU	PEOU→BI	PU→BI	BI→Usage	Other
Organizational factors							
Voluntariness of IT use		1–1. Strong in mandatory contexts than in voluntary contexts					1–2. The voluntariness effect wears off over time
Nature of task and profession		1–5. Weaker for highly independent tasks/ professions		1–3. Stronger for non-routine tasks than for routine tasks 1–4. Weaker for highly independent tasks/professions			
Technology factors							
Technology complexity			2–2. Stronger for complex technologies	2–1. Stronger for complex technologies			
Purpose of using IT (work-oriented vs. entertainment-oriented)				2–4. Weaker for work-oriented technologies	2–3. Stronger for work-oriented technologies		
Individual vs. group technologies	2–6. Stronger for group technologies	2–5. Stronger for group technologies					
Individual factors							
Gender		3–3. Stronger for female		3–2. Stronger for female	3–1. Stronger for male		
Intellectual capacity		3–6. Stronger for those whose have weaker intellectual capacities		3–5. Stronger for those whose have weaker intellectual capacities	3–4. Stronger for those whose have stronger intellectual capacities		
Experience	3–11. Stronger for inexperienced users	3–10. Stronger for inexperienced users	3–8. Stronger for inexperienced users	3–7. Stronger for inexperienced users		3–9. Stronger for experienced users	
Age	3–15. Weaker for younger users	3–14. Weaker for younger users		3–13. Weaker for younger users	3–12. Stronger for younger users		
Cultural background		3–17. Stronger for individuals in high power distance culture 3–19. Weaker for users in high individualism culture 3–21. Weaker for users in masculinity culture 3–23. Stronger for users in a high uncertainty avoidance culture			3–16. Weaker for individuals in high power distance culture 3–18. Stronger for users in high individualism culture 3–20. Stronger for users in masculinity culture 3–22. Weaker for users in a high uncertainty avoidance culture		

Second, research should pay more attention to less studied issues. For instance, few studies have empirically examined cultural issues associated with user technology acceptance. The mechanisms through which the culture exerts its influence are still unclear (e.g., Straub et al., 1997). Therefore, future research may focus on "how" questions by identifying the major cultural dimensions and their corresponding relationships with user technology acceptance.

Third, compared to the moderating effects of individual factors, those effects of organizational factors such as the nature of tasks, and technological factors such as technology complexity, have not received sufficient attention so far and thus leave room for further investigation.

We should also notice the interactions among these moderating factors. We cannot simply say that women always pay attention to the influence of SNs. For women who have a lot of experience with the technology of interest, it may not be true. Therefore, we should consider all the major moderating factors simultaneously. It is, however, too early to reach any conclusions about which effects are more robust. More empirical tests are needed to address the interactions among these moderating factors.

Finally, from a methodological perspective, studies of user acceptance may need a methodological shift in order to gain richer understanding of less studied factors. So far, almost all the prior studies use quantitative research methodology and usually from a positivist perspective. Qualitative methodology, especially from an interpretive perspective, however, is informative and may be another useful alternative that can give researchers new insights (Lee et al., 2003). Among these methodologies, a good example is grounded theory (Glaser and Strauss, 1967), which allows a focus on contextual and process elements as well as the action of key players (users) associated with contextual change (Orlikowski, 1993). Although successfully used in IS in general, these methodologies, such as grounded theory, are rarely used in research on user technology acceptance. In addition, the nature of user technology acceptance calls for periodic examinations of the determining factors along with the development of information technology. New technologies often involve factors that have rarely been considered before. For example, trust, which is not a traditionally considered factor, may influence users' intentions to use on-line shopping (Gefen et al., 2003) or mobile commerce (Siau et al., 2003). These methodological perspectives can help us identify the potential factors inductively.

For practitioners, this research also has several implications in that the findings and propositions can be easily translated into practice. First, practitioners should pay particular attention to the inclusion of individual and contextual factors when using these models to predict user acceptance of technologies. Practitioners should realize that existing models are conditional and therefore simply provide a basis for understanding user technology acceptance. To predict user acceptance of a specific system, individual and contextual factors should be taken into account.

Second, the findings have implications for designing training programs. Training programs should highlight the influence of individual and contextual factors. For example, for men, the training program should emphasize usefulness; while for women, ease of use and SNs (such as peer influence) should be emphasized. Further, trainers should pay attention to the evolution of trainees' perceptions and the influence of SNs. Specifically, in the early stage of the system use, ease of use and SN is more important, especially for women. Therefore, trainers can develop specific tactics such as focusing on *how* to use the system and encouraging communication among female users Realizing that once users are no longer newcomers to the system, and thus focusing on usefulness, the training program should accordingly focus on usefulness, exploring the functional potentials of the system of interest. This strategy can also be applied for users with different levels of prior experience. Other potential factors include voluntariness, the nature of the tasks and the professions, and technological factors as suggested earlier in the paper. By taking these factors into account, practitioners can take corresponding measures to predict or promote user technology acceptance more effectively and efficiently.

There are some limitations in this study. One is the limited number of articles reviewed. Even though they are considered representative, only 54 articles are included in this study. The results, therefore, could be biased to some extent. On the bright side, our results show great consistency with several other meta-analysis results (Lee et al., 2003; Legris et al., 2003; Ma and Liu, 2004). The second limitation is that the relationships between moderating factors are not under consideration and therefore the proposed model may need further refinement. For example, Chau and Hu (2002) argued that the subjects used in their research, physicians, had more "power of expertise", and more autonomy over their work, and therefore were less likely to be influenced by "administrative and managerial decisions", which were usually mandatory. Their arguments suggest a relationship between two moderators, voluntariness and profession autonomy. The research on interactions among factors and relationships within the integrated model can add more practical values to the model by finding more explicit factors that are easy to use. These limitations will be addressed in future research.

It is noteworthy that we realize a balance between a comprehensive and a barebones model. The inclusion of moderating factors is assumed to enhance explanatory power while lowering the model's elegance. In this study, we emphasize enhancing explanatory power, while leaving parsimony to future research, since low explanatory power seems more salient to date (Lee et al., 2003).

Appendix A. The articles used in the meta analysis

Article ID	Title	Journal	Page
Davis et al. (1989)	User acceptance of computer technology: a comparison of two theoretical models	Management Science (35:8)	982–1003
Davis (1989)	Perceived usefulness, perceived ease of use, and user acceptance of information technology	MIS Quarterly (13:3)	319–340
Thompson et al. (1991)	Personal computing toward a conceptual model of utilization	MIS Quarterly (15:1)	125–143
Mathieson (1991)	User intentions: comparing the technology acceptance model with the theory of planned behavior	Information Systems Research (2)	173–191
Adams et al. (1992)	Perceived usefulness, ease of use and usage of information technology: a replication	MIS Quarterly (16:2)	227–250
Davis et al. (1992)	Extrinsic and intrinsic motivation to use computers in the workplace	Journal of Applied Social Psychology (22)	1111–1132
Davis (1993)	User acceptance of information technology: system characteristics, user perceptions and behavioral impacts	International Journal of Man-Machine Studies (38)	475–487
Hendrickson et al. (1993)	On the test–retest reliability of perceived usefulness and perceived ease of use scales	MIS Quarterly (17:2)	227–230
Segars and Grover (1993)	Re-examining perceived ease of use and usefulness: a confirmatory factor analysis	MIS Quarterly (18:4)	517–525
Barki and Hartwick (1994)	Measuring user participation, user involvement and user attitude	MIS Quarterly (18:1)	59–82
Subramanian (1994)	A replication of perceived usefulness and perceived ease of use measurement	Decision Sciences (25: (5/6))	863–874
Szajna (1994)	Software evaluation and choice: predictive validation of the technology acceptance instrument	MIS Quarterly (18:3)	319–324
Chin and Gopal (1995)	Adoption intention in GSS relative importance of beliefs	Data Base (26:2/3)	42–63
Chin and Todd (1995)	On the use, usefulness and ease of use of structural equation modeling in MIS research: a note of caution	MIS Quarterly (19:2)	269–280
Taylor and Todd (1995b)	Understanding information technology usage: a test of competing models	Information Systems Research (6:2)	144–172
Taylor and Todd (1995a)	Assessing IT usage: the role of prior experience	MIS Quarterly (19:4)	561–570
Chau (1996a)	Empirical assessment of a modified technology acceptance model	Journal of Management Information Systems (13:2)	185–204
Chau (1996b)	An empirical investigation on factors affecting the acceptance of CASE by systems developers	Information & Management (20)	269–280
Davis and Venkatesh (1996)	A critical assessment of potential measurement biases in the technology acceptance model: three experiments	International Journal of Human–Computer Studies (45:1)	19–45
Hendrickson and Collins (1996)	An assessment of structure and causation of IS usage	Data Base (27:2)	61–67
Igbaria et al. (1996)	A motivational model of microcomputer usage	Journal of Management Information Systems (13:1)	127–143
Szajna (1996)	Empirical evaluation of the revised technology acceptance model	Management Science (42:1)	85–92

Venkatesh and Davis (1996)	A model of the antecedents of perceived ease of use: development and test	Decision Sciences (27:3)	451–481
Gefen and Straub (1997)	Gender differences in the perception and use of e-mail: an extension to the technology acceptance model	MIS Quarterly (21:4)	389–400
Igbaria et al. (1997)	Personal computing acceptance factors in small firms: a structural equation model	MIS Quarterly (21:3)	279–301
Jackson et al. (1997)	Toward an understanding of the behavioral intention to use an information system	Decision Science (28:2)	357–389
Straub et al. (1997)	Testing the technology acceptance model across cultures: a three country study	Information & Management (33:1)	1–11
Doll et al. (1998)	Using Davis's perceived usefulness and ease-of-use instruments for decision making: a confirmatory and multigroup invariance analysis	Decision Science (29:4)	839–869
Gefen and Keil (1998)	The impact of developer responsiveness on perceptions of usefulness and ease of use: an extension of the technology acceptance model	Data Base (29:2)	35–49
Agarwal and Prasad (1999a)	Are individual differences germane to the acceptance of new information technologies?	Decision Sciences 30(2)	361–391
Dishaw and Strong (1999)	Extending the technology acceptance model with task–technology fit constructs	Information & Management (36:1)	9–21
Hu et al. (1999)	Examining the technology acceptance model using physician acceptance of telemedicine technology	Journal of Management Information Systems (16:2)	91–112
Karahanna and Straub (1999)	The psychological origins of perceived usefulness and ease-of-use	Information & Management (35)	237–250
Karahanna et al. (1999)	Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs	MIS Quarterly (23:2)	183–213
Lucas and Spitler (1999)	Technology use and performance: a field study of broker workstations	Decision Sciences (30:2)	291–311
Teo et al. (1999)	Intrinsic and extrinsic motivation in internet usage	OMEGA International Journal of Management Science (27:1)	25–37
Agarwal and Karahanna (2000)	Time flies when you're having fun cognitive absorption and beliefs about information technology usage	MIS Quarterly (24:4)	665–694
Gefen and Straub (2000)	The relative importance of perceived ease of use in IS adoption: a study of E-commerce adoption	Journal of the Association for Information Systems (1)	1–28
Lederer et al. (2000)	The technology acceptance model and World Wide Web	Decision Support Systems (29)	269–282
Venkatesh (2000)	Determinants of perceived ease of use: integrating control, intrinsic motivation and emotion into the technology acceptance model	Information Systems Research (11:4)	342–361
Venkatesh and Davis (2000)	A theoretical extension of the technology acceptance model: four longitudinal field studies	Management Science (46:2)	186–204
Venkatesh and Morris (2000)	Why don't men ever stop to ask for directions? gender, social influence and their role in technology acceptance and usage behavior	MIS Quarterly (24:1)	115–139
Bhattacherjee (2001)	Understanding information systems continuance: an expectation-confirmation model	MIS Quarterly (25:3)	351–370
Chau and Hu (2001)	Information technology acceptance by individual professionals: a model comparison approach	Decision Sciences (32:4)	699–719

Hong et al. (2001)	Determinants of user acceptance of digital libraries: an empirical examination of individual differences and system characteristics	Journal of Management Information Systems (18:3)	97–124
Moon and Kim (2001)	Extending the TAM for a World-Wide-Web context	Information & Management (38:4)	217–230
Mathieson et al. (2001)	Extending the technology acceptance model: the influence of perceived user resources	Data Base (32:3)	86–112
Venkatesh and Brown (2001)	A longitudinal investigation of personal computers in homes: adoption determinants and emerging challenges	MIS Quarterly (25:1)	71–102
Chau and Hu (2002)	Investigating professionals' decisions to accept telemedicine technology: an empirical test of competing theories	Information & Management (39)	297–311
Chen et al. (2002)	enticing online consumers: an extended technology acceptance perspective	Information & Management (39)	705–719
Gefen et al. (2003)	Trust and TAM in online shopping: an integrated model	MIS Quarterly (27:1)	51–90
Heijden (2003)	Factors influencing the usage of Websites: the case of a generic portal in the Netherlands	Information & Management (40)	541–549
Venkatesh et al. (2003)	User acceptance of information technology: toward a unified view	MIS Quarterly (27:3)	425–478
Heijden (2004)	User acceptance of hedonic information systems	MIS Quarterly (28:4)	695–704

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