Inf Syst Front (2011) 13:381–395
DOI 10.1007/s10796-010-9288-3

Why adoption and use behavior of IT/IS cannot last?—two studies in China

Nan Zhang · Xunhua Guo · Guoqing Chen

Published online: 30 October 2010

Abstract It is often observed in China that the user acceptance of a new information technology starts satisfactorily well when it is strongly promoted or even enforced to be used, but declines sharply after the initial stage. Based on an extended model derived from the Technology Acceptance Model (TAM), this paper presents two studies in academic and governmental contexts respectively to analyze such phenomena from a post-adoption perspective. Results from structured equation model (SEM) analyses demonstrate the ability of the model to interpret the IT acceptance behavior of Chinese users both during and after the initial stage. It is then inferred that the initial rise of user acceptance is usually driven by mandatory instructions due to the managerial characteristics of long power distance in Chinese organizations, while the drop in the second period is caused by changes that occur in some of the recognition factors in the model, which may reflect the lack of fit between technology and work style. In the two specific cases studied in the paper, the lack of compatibility and facilitating conditions made the user acceptance decline after the initial period when the effects of training and mandatory instructions faded away.

Keywords Information technology acceptance · Post-adoption · Structural equation model · e-Learning software · e-Government systems

N. Zhang
School of Public Policy and Management, Tsinghua University, Beijing 100084, China

X. Guo (✉) · G. Chen
School of Economics and Management, Tsinghua University, Beijing 100084, China
e-mail: guoxh@sem.tsinghua.edu.cn

1 Introduction

As the economy of China keeps growing rapidly in a cultural and social environment greatly different from those of western countries, IT penetration brings both opportunities and challenges to Chinese companies, as well as governmental organizations (Kunnathur and Shi 2001). To some extent, the impact of IT application in China might be even deeper than that in any other country, as China is reforming from an isolated centrally-controlled economy to a market open to the global economy (Martinsons 2005). Having recognized the competitive importance of IT, Chinese governments and companies are becoming more and more active in information systems planning and implementation.

Generally, Chinese users, either individuals or organizations, act as followers in the global diffusion of IT innovations, which tends to imply that they are able to start with more advanced technologies available, might learn lessons from others, and are less bothered with the problems caused by "legacy" systems (Chen et al. 2007; Guo and Chen 2005; Martinsons 2005). However, observations demonstrated that, quite often, IT acceptance in China is not developing smoothly (Guo and Chen 2004; Reimers et al. 2009). Although Kim and Malhotra's study stated that users tend to follow a repeated behavior pattern when using information systems (Kim and Malhotra 2005), evidences from the practice in China revealed that, in many cases, the user acceptance of a new technology starts satisfactorily well when it is strongly promoted or even enforced to be used, but declines sharply after the initial stage is over.

As has been described in various literatures, the problem of ineffective investment and duplicate construction has long been troubling Chinese organizations in the process of

IT/IS application (Chen et al. 2007; Wang et al. 2006). One of the most important causes for this problem could be that the adoption and use of implemented information systems cannot last. For instance, in the IT Application Office of a district government in Beijing, where one of the authors worked as a part-time consultant, more than 30 e-Government application systems have been implemented and promoted among the government's subsidiaries and citizens in the district since 2001. Each time when a new system was introduced, the government placed weighty expectation on it and promoted it strongly, and the reward was always an exciting beginning of usage. About several months later, however, users would gradually give up using the system while the government's attention transfers to another one. By 2007, none of the systems implemented before 2004 had been effectively utilized. The short lifecycle of IT/IS makes the officers of the government disappointed. As such failures accumulated, they are getting more and more eager to know whether such a "declining phase" of IT/IS usage is inevitable. The similar problem also troubled companies and noncommercial organizations in the same way. We believe that the two cases that will be presented below in this paper should not be deemed as special or isolated cases.

The accumulation of IT/IS adoption literature in last two decades can provide elicitation to us for understanding this usage problem more or less. In the practice and research of IT/IS application and management, it is often questioned why some systems or software are well utilized, while others are not (Legris et al. 2003). While the power of information technology continues to improve dramatically, IT/IS practitioners and managers are still troubled by the long-existing problem that end-users are often unwilling to use available information systems that, if used, would generate significant performance gain (Davis 1989; Venkatesh and Ramesh 2006). Consequently, IT/IS adoption and use have remained a central concern in the field of information systems research, producing tremendous theoretical advances in various contexts (Dwivedi et al. 2008; Legris et al. 2003; Venkatesh et al. 2003; 2007).

Along with penetration of IT/IS in organizations, research issues around post-adoption and continued use have received more and more attention in IT/IS adoption research. By using longitudinal or multi-stage research method, a few studies tried to discuss post-adoption issues based on extended TAM models and some other behavior science theories (Bhattacherjee 2001; Bhattacherjee and Premkumar 2004; Karahanna et al. 1999; Kim and Malhotra 2005; Lippert and Forman 2005; Thong et al. 2006). However, these works typically focus on static models and measure all model constructs concurrently, rather than adequately capture or describe the dynamic interplay among environment, individuals' perception and behavior in the process of IT/IS implementation and promotion.

Although the abundant TAM-related research has led to critical reflection in the area (Benbasat and Barki 2007; Venkatesh et al. 2007), the critics also noted that it is valuable to develop and test multi-stage models as well as to observe the behavioral changes within a longer time span (Benbasat and Barki 2007). In this paper, we focus on the behavioral factors that influence the adoption of new technology and systems over longitudinal periods, so as to help understand what changes have taken place in the users' perception after the initial period of usage and made the user acceptance decline. We try to explore the annoying phenomenon of "declining phase" in two ways based on the extended TAM model: one is to test the hypotheses of different influence paths in the model at two time-points, while the other is to analyze the differences between the values of the determinant factors which play significant roles in the behavioral model. By examining the changes in the behavioral patterns of systems users, it would be possible to explain why acceptance and use of the new technology are initially good but not so as time goes by.

According to a general classification, the locus of adoption could be differentiated between "organization" and "individual" (Fichman 1992). Like most empirical studies by far, our research started with the individual locus of adoption, grounding on the standpoint that individual behavior could be deemed as a basic element of organizational behavior. In this regard, our first study examined the acceptance of an English-learning software, which was installed in a school lab but seldom utilized by students. Subsequently, we extended the research to the organizational context and investigated the usage pattern of an e-Government system.

The purpose of the studies was aimed at analyzing the users' adoption behavior toward the systems. Our target was set at discovering the behavioral mechanism that drives the acceptance level fall after a period of using the software. Based on a two-stage research model derived from the TAM (Davis 1989; Davis et al. 1989), which has by far been the most widely discussed among all the related models, and accumulated literature (Venkatesh and Davis 2000; Venkatesh and Morris 2000; Taylor and Todd 1995; Venkatesh 2000; Moore and Benbasat 1991; Lewis et al. 2003; Wixom and Todd 2005; Karahanna et al. 1999; Thompson and Higgins 1991; Agarwal and Karahanna 2000; Agarwal and Prasad 1998; Thatcher and Perrewe 2002; Thong et al 2006), we tested the factors influencing the acceptance of the system in two different time points: one was within the initial period; the other was 2 months later when the acceptance level significantly declined. Results from structured equation model (SEM) analyses illustrated that most of the factors in our proposed model

have direct or indirect significant influence on the intention to use at both the initial period and the post-adoption stage, and demonstrated the ability of the research model to interpret the IT acceptance behavior of Chinese users either during or after the initial period. Furthermore, it could be inferred that the drop of user acceptance in the second period was caused by changes that occurred in the recognition factors proposed in the model. In our specific cases of the English learning software and the e-Government system, it was the changes in the facilitating conditions recognition and compatibility recognition that mostly led to the decline of user acceptance and actual use.

In the next section, we will describe our research model. In Sections 3 and 4 respectively, we will present the processes and results of the two specific studies. Section 5 provides some comprehensive discussions and Section 6 concludes the paper.

2 Research model

2.1 Theoretical base

Since late 1980s, information technology adoption and use have remained a central concern in the field of information systems research. Related efforts have produced a number of theoretical models, such as Technology Acceptance Model (TAM) (Venkatesh and Davis 2000; Davis 1989; Davis et al. 1989), Task-Technology Fit Model (TTF) (Goodhue and Thompson 1995; Dishaw and Strong 1999), and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003), to interpret the psychological and social mechanisms that potentially determine the behavior of technology adoption. As well, influential theories in other areas, including Theory of Planned Behavior (TPB) (Mathieson 1991; Taylor and Todd 1995), Social Cognitive Theory (SCT) (Compeau et al. 1999), and Innovation Diffusion Theory (IDT) (Moore and Benbasat 1991; Rogers 1995; Plouffe et al. 2001; Katz and Shapiro 1986), were applied to and extended for the studies of technology adoption. Meanwhile, large amounts of empirical and field studies were conducted in various regions of the world to validate the theories. Results from these studies illustrated that the models generally explain a substantial proportion (about 40% on average) of the variance in usage intention and behavior (Legris et al. 2003) and it is believed that the achievements in technology adoption research could essentially help IT manufacturers and managers to better handle the development, application, and management of IT.

In the past 30 years, TAM has been prevailing in the area of IT adoption research. The model was firstly proposed by Davis in 1989 (Davis 1989; Davis et al. 1989) and later gained substantial theoretical and empirical supports (Venkatesh and Davis 2000). The core concepts and structure of TAM are illustrated in Fig. 1. Since the establishment of the model, extensions centering on this core structure have been mounting up in the literature, which provided us with rich references for constructing our research model. Recently, however, the over-intensive focus on TAM itself is being criticized as lacking innovation in theoretical nature and departure from the current important IT management problems (Benbasat and Barki 2007; Venkatesh et al. 2007). It is suggested that the future research on IT/IS adoption be closer to actual issues and settings in IT/IS implementation and management, than simply discuss theoretical models (Venkatesh et al. 2007). In other words, it would be more promising to take the conceptual models as tools for examining the implementation and management of specific applications in various contexts.

2.2 Static extended model

Taking TAM as the kernel, we introduced eight external factors into the model to explain the mechanism that determines the user recognition and acceptance. These factors were all adapted from related literature and the static extended model is illustrated in Fig. 2.

Hypotheses H1a through H1f were derived from the core concepts of TAM, namely Perceived Usefulness (U), Perceived Ease of Use (EOU), Attitude toward Using (A), Behavioral Intention to Use (BI), and Actual System Use (USE). The definitions of the two key factors, PU and PEOU, strictly follow the classical TAM literatures (Davis 1989; Davis et al. 1989):

> **Perceived usefulness (PU)** is defined as the prospective user's subjective probability that using a specific

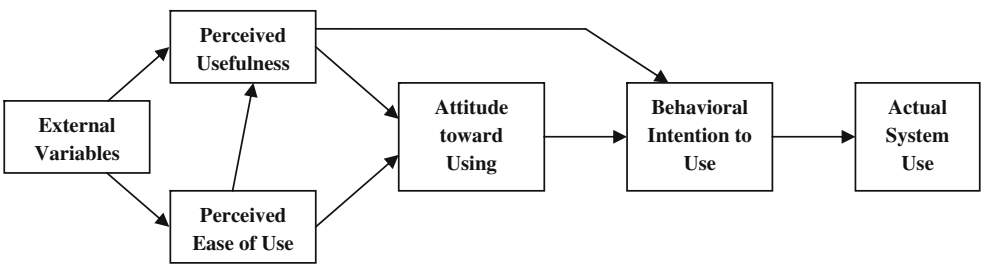
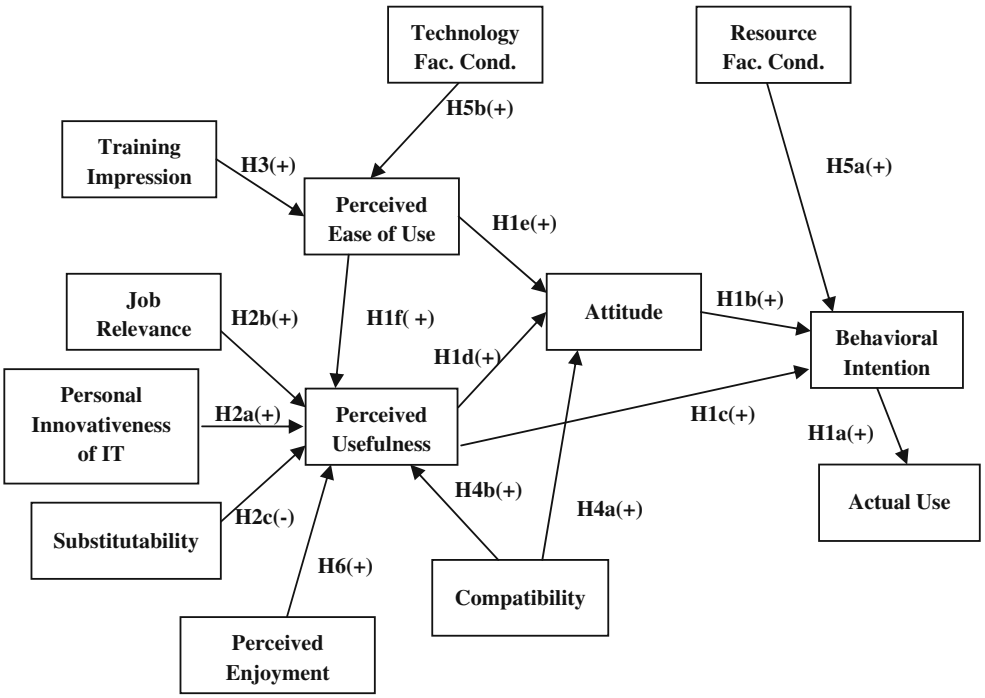


Fig. 1 Technology acceptance model (TAM) (Davis et al. 1989)



Notes: "+": positive effect "-": negative effect "ns": no effect

Fig. 2 The static extended TAM

application system will increase his or her job performance within an organizational context.

Perceived ease of use (PEOU) refers to the degree to which the prospective user expects the target system to be free of effort.

TAM postulates that actual technology usage is determined by behavior intention to use, which in turn, is viewed as being jointly determined by the person's attitude toward using the technology and perceived usefulness (Davis et al. 1989), According to Theory of Reasoned Action, as a sort of reasoned behavior, the actual use behavior is dominated by behavioral intention (Ajzen and Fishbein 1980). The series of hypotheses based on TAM are as follow:

- H1a: Behavioral intention to use will have a positive effect on actual use.
- H1b: Attitude toward using will have a positive effect on behavioral intention to use.
- H1c: Perceived usefulness will have a positive effect on behavioral intention to use.
- H1d: Perceived usefulness will have a positive effect on the attitude toward using.
- H1e: Perceived ease of use will have a positive effect on the attitude toward using.
- H1f: Perceived ease of use will have a positive effect on the perceived usefulness.

Among the eight external variables incorporated in the model, Personal Innovativeness of IT (PIIT), Job Relevance (JR), and Substitutability (SUB) can be categorized into "Individual Factors" (Lewis et al. 2003), which usually have impact with relative advantage on perceived usefulness (Agarwal and Prasad 1998; Karahanna et al. 2002). Accordingly, in our model, these factors are considered as the determinants of perceived usefulness. Being adapted from Innovation Diffusion Theory (Rogers 1995), ***Personal innovativeness of IT (PIIT)*** *represents the willingness of an individual to try out any new information technology* (Agarwal and Prasad 1998). This factor was often taken as one of the direct or indirect determinants to IT adoption in former literature (Agarwal and Prasad 1998; Yiu et al. 2007). ***Job relevance (JR)*** *represents the degree of consistence between system functions and the user's current job requirements.* This factor was firstly proposed in the Task-Technology Fit Model (TTF) (Goodhue and Thompson 1995). It is natural to expect that users with higher job relevance will more easily perceive the usefulness of the new technology or system. ***Substitutability (SUB)*** *stands for the individual judgment on whether the problem that the new system is aimed to address can be solved by other existing methods.* The existing methods here include not only IT/IS facilities, but also non-technological means that are being used. For example, if a person feels that traditional face-to-face conversation can be easily taken as a sound replacement for electronic

communication, it would be considered that electronic communication is highly substitutable to him (Dennis and Reinicke 2004). To some extent, this factor may be especially important in the context of China, where labor is still relatively inexpensive and many firms think it advantageous to employ people rather than IT (Zhu and Wang 2005). Summarily, we have the following hypotheses regarding these individual factors:

- H2a: Personal innovativeness of IT will have a positive effect on perceived usefulness.
- H2b: Job relevance will have a positive effect on perceived usefulness.
- H2c: Substitutability will have a negative effect on perceived usefulness.

Training Impression (TI) *refers to individuals' perceptions on the practical effect of IS related training.* Although Employee training regarding IT has long been considered as a critical issue of IT management in China (Chen et al. 2007), it was argued that IT training sometimes does not lead to positive IT usage (Gallivan and Srite 2005). In our model, we hypothesized that Training Impression will only influence perceived ease of use.

- H3: Impression of training will have a positive effect on perceived ease of use.

As one of the factors determining the diffusion speed in the Innovation Diffusion Theory (Rogers 1995), ***Compatibility (C)*** *refers to the degree to which the use of the new technology is perceived by a user to be consistent with their practice style or preference* (Chau and Hu 2002). The existing literature indicates that perceived compatibility may have impact on both attitude toward using and perceived usefulness (Taylor and Todd 1995; Chau and Hu 2002).

- H4a: Compatibility will have a positive effect on attitude toward using.
- H4b: Compatibility will have a positive effect on perceived usefulness.

The concept of facilitating conditions was firstly proposed in a research of PC usage (Thompson and Higgins 1991) and was later divided into Technology Facilitating Conditions (TFC) and Resource Facilitating Conditions (RFC) (Taylor and Todd 1995). ***Technology Facilitating Conditions (TFC)*** *represents the technical objective environmental factors that help users use the target technology more conveniently such as user guide, technology supporting service and so on.* ***Resource Facilitating Conditions (RFC)****, however, emphasizes non-technical objective environmental factors that influence users' perception of convenience of target technology use such as financial conditions.* In our model, the following hypotheses were included:

- H5a: Resource facilitating conditions will have a positive effect on near-term behavior intention to use.
- H5b: Technology facilitating conditions will have a positive effect on perceived ease of use.

The last factor in our research model is Perceived Enjoyment (PE), which was firstly introduced in a research of PC acceptance (Igbaria et al. 1997). ***Perceived Enjoyment (PE)*** *refers to the degree to which a user enjoys the process of the target technology use.* With the rising of hedonic technologies such as online games, this factor is gaining more and more attention. We have the following hypothesis in our model:

- H6: Perceived enjoyment will have a positive effect on perceived usefulness.

However, it should be noted that perceived enjoyment may only show significant impact when the technology is somehow hedonic. Therefore, we will only include this factor in the study of e-Learning software in an individual context, but not that of the e-Government system in an organizational context.

2.3 Dynamic hypotheses

Based on the static model, we continued to probe into the difference on user perception and behavior patterns between the initial period and the post period in two ways, so as to explain the "decline phase" problem of IT/IS implementation in China.

Firstly, some important factors will show different influence power and path in the different stage in IT/IS adoption. Notably, it has been demonstrated that the impact path of perceived ease of use would change over time. At the initial stage, perceived ease of use would only have significant impact directly on attitude, without significant impact on perceived usefulness. After a period of usage, the impact of perceived ease of use on perceived usefulness and attitude would become dominantly significant (Davis et al. 1989). Similar difference has also been found between experienced and inexperienced users (Taylor and Todd 1995). Therefore, we expect in our model that such an impact will not be significant at the first time point but become acceptable at the second time point.

- H1e': Compatibility will have a positive effect on attitude toward using during the initial period and have no effect on attitude toward using after the initial period.

- H1f': Perceived ease of use will have no effect on perceived usefulness during the initial period and have a positive effect on perceived usefulness after the initial period.

Although existing literature indicates that perceived compatibility may have impact on both attitude toward using and perceived usefulness (Taylor and Todd 1995; Chau and Hu 2002), Empirical tests have provided mixed results, which we feel can be related to the time points of investigations. It is possible that the impact path of the compatibility factor will change over time. Specifically, compatibility's impact on attitude would decline over time, but its impact on perceived usefulness would increase. Thus, the following hypotheses can be derived:

- H4a': Compatibility will have a positive effect on attitude toward using during the initial period and have no effect on attitude toward using after the initial period.
- H4b': Compatibility will have no effect on perceived usefulness during the initial period and have a positive effect on usefulness after the initial period.

These path changes can be deemed as reflection of the fusion process in IT/IS adoption, as the three most important determinants of attitude (perceived ease of use, compatibility and perceived usefulness) interact with each other along with users' practice of system use (See Fig. 3).

3 Empirical study I: Acceptance of an e-Learning software

Our first empirical study using the above presented model was designed to explore the recognition and adoption of an English-learning software in the undergraduate freshmen (about 150 students) of our school from September to December 2005. This computer-aided English-learning software was installed in a laboratory of the school. With simulation practice, voice recording, human-computer conversation, and other interactive functions, the software was designed to help the students improve their listening and speaking ability in English. Unfortunately, the utilization of this software has long been extremely low.

3.1 Data collection

We conducted two rounds of surveys to analyze the acceptance and usage of the software among the freshmen. Questions utilized in the questionnaire to operationalize the constructs included in the research model were largely adapted from the existing literature. All the questions were translated into Chinese and adjusted in wording in the light of the characteristics of the software for better understanding. Most of the items were measured using a five point Likert-type scale, ranging from "strongly disagree" (1) to "strongly agree" (5).

The first round (T1) of survey was conducted right after the enrolment of the fresh students. A 1-h training session was arranged, including half hour of demonstration by a lab assistant and the other half for try-out. The questionnaires were handed out during the try-out period and collected right after the training was finished. In total, 134 questionnaires were distributed and 121 valid responses were collected, with a responding rate of 90%. The students were divided into four groups for training. The results of a Mann-Whitney U test (Venkatesh et al. 2003) showed that there is no difference between the groups of trainees on any of the 13 constructs at a significance level of 0.01.

The second round (T2) was conducted 8 weeks later, which was at the middle of the semester. From their experience, the IT office of the school decided that 8 weeks are sufficient for students to get familier the learning system. During those 8 weeks, the students were allowed to go to the lab and use the English learning system freely, but there was not any specific assignment about the system for them. Questionnaires were handed out to the 121 students who participated in the first round and 93 valid responses were collected, with a responding rate of 77%. Similarly,

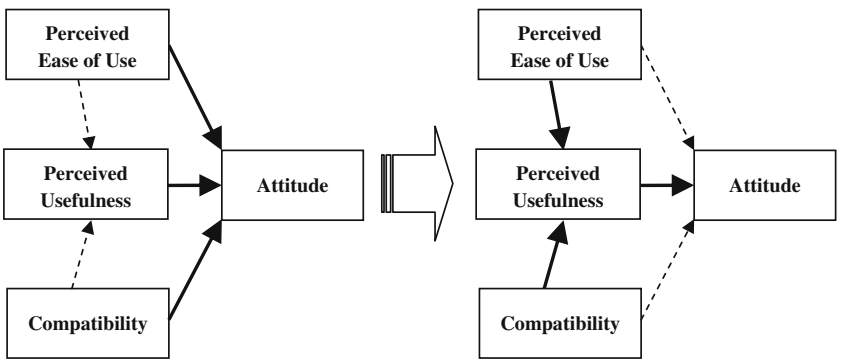


Fig. 3 The dynamic hypotheses

results of another Mann-Whitney U test on the responses from T1 showed that there is no difference between responding and none-responding students at T2 on any of the 13 constructs at a significance level of 0.01. Therefore, it could be concluded that there is no intolerable systematical bias.

All respondents to this study are Chinese first-year undergraduate students, with high-school graduation English level. Some other information about the profiles of respondents is shown in Table 1.

3.2 Reliability and validity

The internal consistency reliability (ICR) was assessed by Composite Reliability of which values higher than 0.7 generally indicate acceptable reliability (Wixom and Todd 2005). In our study, the Composite Reliability values of the two rounds of surveys are displayed in Tables 2 and 3. With none of the values for all 13 constructs less than 0.7, the reliability of the scales could be accepted.

Convergent validity was evaluated by the average variance extracted (AVE). According to related studies, AVE values higher than 0.5 are acceptable (Yi and Hwang 2003; Wixom and Todd 2005; Bhattacherjee and Premkumar 2004). For a satisfactory degree of discriminant validity, the square root of AVE of a construct should be higher than the variance shared between this construct and the other ones in the model (Igbaria et al. 1997; Wixom and Todd 2005; Bhattacherjee and Premkumar 2004; Agarwal and Karahanna 2000). In our research, as shown in Tables 2 and 3, although some of the variables' inter-correlations were relatively high, convergent and discriminant validities of the model both attained a satisfying level, with all the AVE square root values above 0.7.

4 Results

The research model was tested using partial least squares (PLS), a structural equation modeling (SEM) technique suitable for highly complex predictive models. Whereas covariance-based SEM techniques such as LISREL and EQS use a maximum likelihood function to obtain the estimated values in the models, the component-based PLS uses a least-squares estimation procedure. By this means, PLS avoids many of the restrictive assumptions underlying covariance-based SEM techniques, such as multivariate normality and large sample size (Yi and Hwang 2003; Zhu and Kraemer 2005; Venkatesh et al. 2003; Plouffe et al. 2001; Venkatesh 2000; Lewis et al. 2003; Agarwal and Karahanna 2000; Wixom and Todd 2005; Agarwal et al. 2000; Venkatesh and Morris 2000; Bhattacherjee and Premkumar 2004).

We used the PLS Graph software (version 3.0) for the analysis, utilizing the bootstrap re-sampling method (200 re-samples) to determine the significance of the paths within the structural model (Chin 1998). Figure 4 shows the results of the test of the hypothesized structural model, where the results without brackets are of the first round (T1) and those with brackets are of the second round (T2).

With most hypotheses in the model significantly supported by the statistical results, it is reasonable to accept that the extended longitudinal technology acceptance model proposed could help us to better understand IT adoption and use over time.

The most unexpected result regards personal innovativeness, which displays no effect at T1 but a negative effect on perceived usefulness at T2. Similar results can be found in a study of GSS (Karahanna et al. 2002). It is possible that innovative individuals are likely to be aware of cutting-edge technology. Since the e-Learning software used in the current study was not very state-of-the-art, it is possible that these individuals were disappointed in the features and capabilities afforded by the tool. In other words, those who had a high assessment on their own innovativeness might have more opportunities to use various software and tend to think lowly of the target technology. Another possible reason for this result is that the questions about user innovativeness in the questionnaire we used in the survey

Table 1 Demography information of study I

Measure	Items	First round		Second round	
		Frequency	Percent	Frequency	Percent
Gender	Female	75	62.0	59	63.4
	Male	46	38.0	34	36.6
IT experience (score)	Very Weak	12	9.9	8	9.7
	Weak	57	47.1	43	46.2
	Average	17	14.0	15	16.1
	Strong	18	14.9	14	15.1
	Very Strong	3	2.5	2	2.2
	Non-response	14	11.6	11	10.7

Table 2 Reliability and validity of T1 survey in the e-Learning software study

	U	EOU	A	BI	C	E	TFC	RFC	PIIT	TI	JR	SUB
ICR	0.90	0.89	0.95	0.90	0.82	0.81	0.88	0.86	0.87	0.91	0.82	0.88
Mean	4.02	4.04	4.14	3.83	3.55	3.68	3.54	3.02	3.12	3.95	3.95	2.62
S.Dev	0.60	0.64	0.65	0.70	0.63	0.61	0.83	0.92	0.91	0.67	0.80	0.75
U	0.83											
EOU	0.04	0.82										
A	0.51	0.30	0.95									
BI	0.54	0.17	0.61	0.91								
C	0.35	0.16	0.42	0.46	0.78							
E	0.51	0.22	0.51	0.49	0.45	0.77						
TFC	0.12	0.24	0.27	0.30	0.39	0.22	0.89					
RFC	0.16	0.07	0.07	0.08	0.21	0.10	0.22	0.87				
PIIT	0.06	−0.08	0.05	0.08	0.15	0.33	0.15	0.19	0.92			
TI	0.07	0.65	0.31	0.20	0.18	0.30	0.22	0.03	0.01	0.82		
JR	0.36	−0.10	0.33	0.22	0.19	0.18	0.05	−0.09	0.06	−0.09	0.83	
SUB	−0.32	0.07	−0.23	−0.31	−0.04	−0.14	0.01	0.04	−0.01	0.16	−0.04	0.89

was an self-evaluation report, which could lead to information distortion because it is hard for people to judge their personalities objectively

Although neither of the hypotheses of facilitating conditions H3a and H3b was supported at T1, it cannot be simply concluded that facilitating conditions does not play a role in IT acceptance and use during the initial period. The reason for this result may lie in that the respondents had not yet formed stable and clear perception on the facilitating conditions of the target system at T1. Unsurprisingly, along with further use, the effects of facilitating conditions on the acceptance intention and adoption behavior showed up and the impacts became significant at T2.

About 40% of the students were using the software frequently after the training at T1. Eight weeks later at T2, however, almost nobody was still using it. We found that at T2, the mean values of core TAM perceptions except for intention to use remained high. The most significant changes occurred in compatibility, technology facilitating conditions, and resource facilitating conditions. The mean value of compatibility dropped from 3.55 at T1 to 3.07 at T2, while that of technology facilitating conditions dropped from 3.54 to 3.34 and that of resource facilitating

Table 3 Reliability and validity of T2 survey in the e-Learning software study

	Use	U	EOU	A	BI	C	PE	TFC	RFC	PIIT	TI	JR	SUB
ICR	0.90	0.89	0.89	0.92	0.95	0.86	0.85	0.83	0.88	0.94	0.86	0.81	0.74
Mean	1.82	3.80	3.94	3.96	3.16	3.07	3.57	3.34	2.72	3.06	3.94	4.04	2.91
S.Dev	0.82	0.58	0.56	0.62	0.76	0.67	0.66	0.75	0.92	0.94	0.66	0.71	0.70
Use	0.90												
U	0.32	0.82											
EOU	0.20	0.40	0.82										
A	0.23	0.66	0.49	0.92									
BI	0.40	0.52	0.35	0.62	0.95								
C	0.41	0.40	0.31	0.38	0.50	0.82							
E	0.34	0.48	0.31	0.50	0.49	0.50	0.81						
TFC	0.16	0.05	0.33	0.02	0.21	0.22	0.27	0.84					
RFC	0.28	0.05	0.10	0.24	0.46	0.35	0.28	0.19	0.89				
PIIT	0.03	−0.13	0.08	0.05	0.14	0.15	0.21	0.12	0.33	0.94			
TI	−0.05	0.12	0.39	0.12	0.14	0.27	0.19	0.11	−0.04	0	0.83		
JR	0	0.25	0.07	0.19	0.19	0.08	0.15	−0.18	0.27	0.15	−0.07	0.83	
SUB	−0.10	−0.12	0.07	0.07	0.02	−0.04	−0.12	0.02	0.14	0.10	0.27	0	0.77

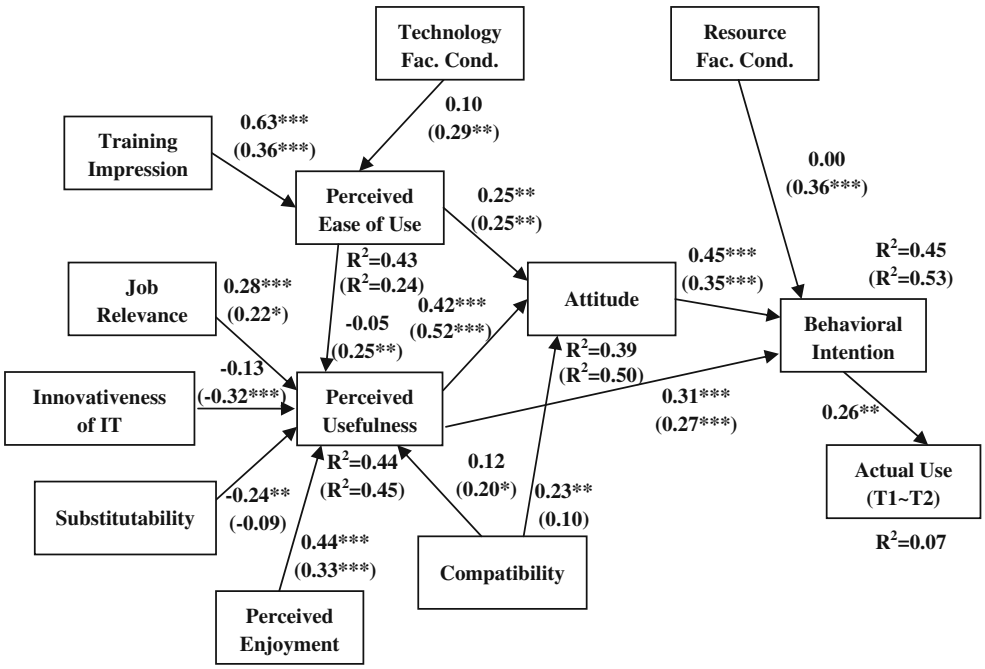


Fig. 4 Testing results of structural equation model in the e-Learning software study

Notes: *p<0.05, **p<0.01, ***p<0.001.

conditions dropped from 3.02 to 2.72. The implication of this observation is that the students gave up using the software because they felt that it was not compatible with their practice style and that technology and resource facilitating conditions were not good enough. Consequently, possible solutions to the low utilization of the software may need to focus on adjusting its compatibility and improving the facilitating conditions.

5 Empirical study II: Acceptance of an e-Government system

To further investigate the phenomenon of the "declining phase", we conducted another empirical study in an organizational context. While the adoptive decision of students with regard to a piece of personal software is mainly a pure individual choice in the academic environment, adoption of large systems in social organizations is usually more complicated and more influenced by environmental and institutional conditions. As a typical representative of social organizations, government agencies were chosen as an ideal context for extending our adoption research to the organizational environment. Meanwhile, as has been discussed, the problem of "declining usage" is even more severe in governmental organizations, compared with business companies. In order to analyze the problem more profoundly, we conducted a further empirical study with regard to an e-government system implemented in the local government of Chaoyang District, Beijing, China.

The target system in this study was an e-Government system implemented by the government of Chaoyang District, Beijing China. Chaoyang District is a large district in Beijing accounting for a big portion of the capital's economy. It is also where the Central Business District (CBD) of the city and the main venue of 2008 Olympic Games are located. There are more than 40 subsidiaries in Chaoyang, which are responsible for providing routinized public service to citizens. The e-Government system we studied was designed as an integrated workflow management system to support and routinize the daily procedures of the government's subsidiaries (Zhang et al. 2009). The system was developed in early 2006 and put online in late February. In May 2006, the IT application office of the District government arranged a distance video training for employees in 20 subsidiaries that were intended to use the system. Our survey was conducted after the training.

5.1 Data collection

The instrument utilized in this study was almost the same as the first study discussed above, except that the perceived enjoyment and substitutability factors were not included. The perceived enjoyment factor was removed because this factor is considered as only suitable for hedonic systems. Substitutability was also excluded because there was no alternative for the system to the government employees in practice Most of the items were measured using a five point Likert-type scale, ranging from "strongly disagree" (1) to "strongly agree" (5). Actual use of the system was

measured by the real usage data (the number of service cases processed with the system) during 4 weeks after the training, which had been automatically logged by the system. Before releasing the questionnaire, we conducted a pilot survey among the employees of the IT management office.

After the training, we uploaded our questionnaire to the intranet of the government and encouraged the users of the systems to participate. Two weeks later, we collected in total 97 valid responses for analysis, which accounts for about 50% of the number of users that attended the training. Although we did not conducted the second round survey in this study because of some difficulties, following the approach in previous post-adoption researches (Karahanna et al. 1999; Taylor and Todd 1995), we tested the model and compared the factor values by dividing the responses into two groups, where one consists of old users who already had approximately 3 months of system use experience before the training, and the other consists of new users who just started to know about the system in the training. The information about the profiles of respondents is shown in Table 4.

5.2 Reliability and validity

The assessment of reliability and validity followed the same methods as in the e-Learning software study. Table 5 illustrates the analysis results, showing that the reliability and validity of this study are all on a satisfying level.

6 Results

In this study, the research model was also tested by partial least squares (PLS) using PLS Graph (version 3.0) software with the same parameters as in the e-Learning software study. As we only have one time point of survey in this study, following a technique utilized in related studies (Taylor and Todd 1995; Karahanna et al. 1999), we divided the samples into two groups to investigate the hypotheses in the model that would change in different time period. One group consisted of the respondents that had not used the target system before the training (N=35), while the other consisted of those who had used it (N=62).

Table 4 Demography information of study II

Measure	Items	Frequency	Percent
Gender	Female	62	63.9
	Male	35	36.1
System use	OLD	62	63.9
	NEW	35	36.1
Age	23–29	35	36.1
Mean=35.0	30–39	31	31.9
St. dev=8.6	40–49	25	25.8
	50–55	6	6.2
IT experience (year)	1–5	10	10.3
Mean=9.9	6–10	49	50.5
St. dev=4.1	11–15	29	29.9
	15–21	9	9.3

Figure 5 shows the results of the test of the hypothesized structural model, where the results without brackets are of the first group (G1) and those with brackets are of the other group (G2).

Most of the hypotheses in the research model were supported again in this study, with the following exceptions: (1) personal innovativeness of IT failed to show significant influence on perceived usefulness for both groups; (2) resource facilitating conditions failed to show significant influence on behavioral intention to use for both groups; (3) compatibility failed to show significant influence on perceived usefulness for G1; (4) perceived ease of use failed to show significant influence on attitude toward using for G2; and (5) behavioral intention to use show significant influence on actual use for G1.

The result that innovativeness does not have significant impact is similar as in the e-Learning software study, except that this time the hypothesis is rejected with both two groups of samples. Interestingly, the mean value of personal innovativeness of IT is 3.95, which is higher than any of the other factors. Furthermore, this mean value is even higher at 3.98 in the aged respondents (above 40 years old), who would generally considered less innovative. This contradiction may deserve further investigation in the future.

It is worth noting that for the new users (G1), intention to use does not have significant impact on actual use. This reflects the fact that the users were enforced to use the system during the period. The government promoted the system with administrative order at the beginning and the users had to use the system at that moment. Only after the initial period when the use of the system became voluntary, would the impact of intention on actual use show up.

We also noted that, again, the mean values of compatibility and technology facilitating conditions are low (3.34 and 3.49 respectively) in this study. From the chart of the usage frequencies of the system from February to August (shown in Fig. 6), we found that the frequency of usage steeply rose after the training in May, but started to drop 2 months later. It can be inferred that it was the lack of compatibility and technology facilitating condition that make the employees resist using the system, and that training could be of little help for solving this problem.

Table 5 Reliability and validity of the survey in the e-Government system study

	Use	U	EOU	A	BI	C	TFC	RFC	PIIT	TI	JR
ICR	1	0.92	0.89	0.93	0.93	0.93	0.85	0.89	0.93	0.93	0.84
Mean	3.20	3.76	3.59	3.49	3.94	3.34	3.49	3.57	3.95	3.59	3.91
S.Dev	1.18	0.76	0.70	0.84	0.64	0.80	0.75	0.78	0.72	0.77	0.73
Use	1.00										
U	−0.06	0.86									
EOU	0.14	0.51	0.82								
A	0.11	0.67	0.54	0.94							
BI	0.18	0.48	0.42	0.64	0.94						
C	0.12	0.61	0.57	0.68	0.48	0.90					
TFC	0.13	0.34	0.59	0.42	0.35	0.51	0.86				
RFC	−0.04	0.29	0.36	0.27	0.12	0.28	0.24	0.89			
PIIT	−0.03	0.18	0.36	0.26	0.19	0.33	0.27	0.10	0.93		
TI	0.18	0.41	0.69	0.54	0.36	0.57	0.55	0.46	0.31	0.91	
JR	0.01	0.57	0.51	0.61	0.43	0.62	0.57	0.21	0.33	0.57	0.85

Through interviews with the target users, this impression was further confirmed. In Guanzhuang, a sub-district of Chaoyang, nobody was using the system anymore since August, although there had also been a peak of usage in June and July. The interviewees told us that the system was "not suitable for daily work", "unable to support some of the tasks", and "depressing work efficiencies." These feedbacks were consistent with the low mean value of compatibility.

Meanwhile, the interviewees acknowledged that it was the enforcement of authorities that drove them to use the system. In Taiyanggong, another sub-district where the usage was much better, an interviewee stated, "as long as the boss requires, no matter favorable or not, we will use it." Considering the analyses above, it would be natural to predict that the effect of such enforcing promotion will not sustain.

These evidences strongly support our hypothesized explanation for the "declining phase" of IT user acceptance in China. In other words, the cultural characteristics of high power distance and low individualism pushed the end-users to accept and use the new systems at the beginning stage when it is heavily promoted by the top management, while the actual lack of fitness between technology and culture (or work styles), reflected by the low level of compatibility recognition, prevented the adoption from long-term permeation.

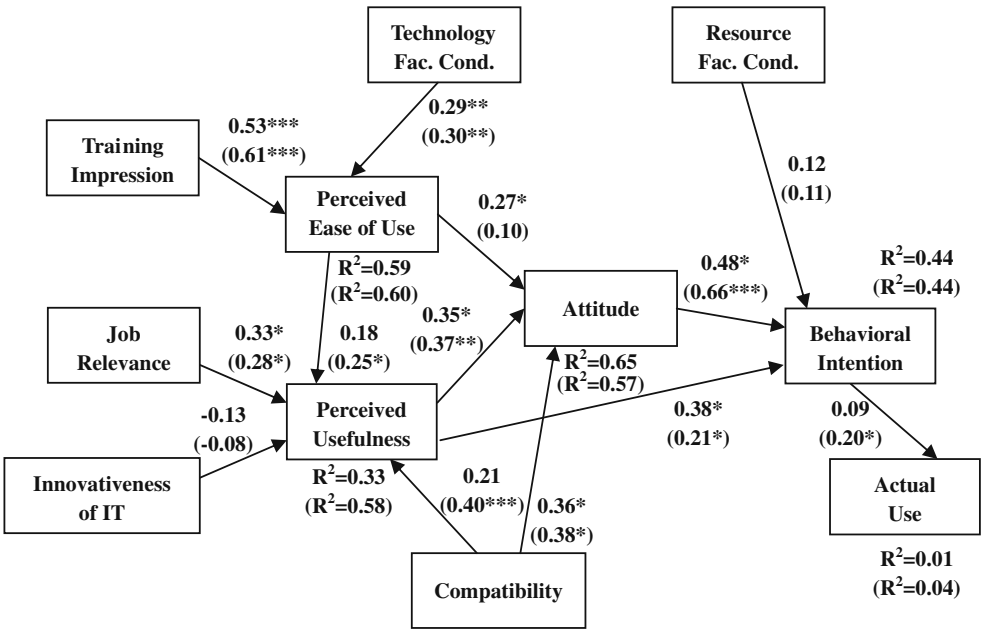


Fig. 5 Testing results of structural equation model in the e-government system study

Notes: *p<0.05, **p<0.01, ***p<0.001.

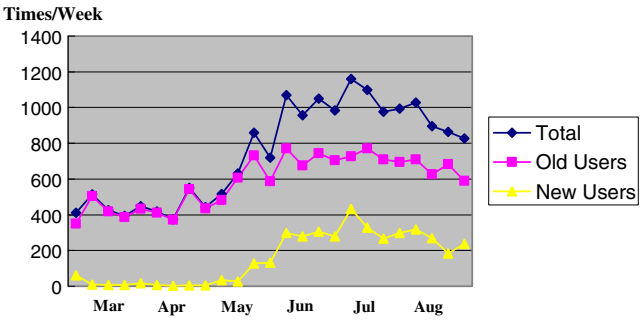


Fig. 6 Usage frequencies of the e-Government system

7 Discussion

A summary of the empirical test results for both of the two studies is shown in Table 6. It can be concluded from the results that the model on average explains about 46% of the variance in all five endogenetic variables, which is higher than the average level of prior studies regarding intention of use (Legris et al. 2003).

With most hypotheses in the model significantly supported by the statistical results, it is reasonable to accept that the extended technology acceptance model proposed in this paper could help us to better understand longitudinal IT adoption and use more accurately. Furthermore, the hypotheses from the original TAM model, namely H1a~H1f, have all been tested and reached the very identical results with most prior studies regarding TAM (Venkatesh and Davis 2000; Davis 1989; Davis et al. 1989; Venkatesh et al. 2003; Venkatesh and Morris 2000), which implies that the core hypotheses of TAM could be consistent in the context of China. Therefore, a large number of valuable research results based on TAM regarding IT/IS implementation and training methodology would also hopefully be helpful to Chinese companies and other organizations.

In both cases studied above, the direct effects of Perceived Ease of Use and Perceived Compatibility on attitude decrease along with time, while their impacts on Perceived Usefulness increase gradually. Although some of the hypotheses were not fully validated due to the difficulty in choosing time points accurately, these changes in the cognitive model regarding impact paths are clear in our research, which are consistent with some earlier studies (Davis 1989; Szajna 1996). Meanwhile, our studies reveal that the impact paths of Perceived Compatibility also display a similar change, which to some extent explains the mixed results in literature regarding Perceived Compatibility, which was mentioned above. In other words, the results indicate that there might be a process of cognition "fusion" along with the development of technology acceptance. Specifically, some cognition structures that are independent at the beginning may display higher and higher co-relations as the time goes by and the adoption process evolves, such as the cognitions of Perceived Ease of Use and Perceived Compatibility that gradually converge to Perceived Usefulness. Neglecting such dynamic changes may lead to distortion in understanding the real structures of technology acceptance behaviors. Moreover, these findings regarding the cognition fusion also provide explanations for the fact that end-users tend to complain of system quality and design defects when a system fails to be effectively used.

Table 6 Summary of test results

Hypotheses	e-Learning software		e-Government systems	
	T1 (N=121)	T2 (N=93)	G1 (N=35)	G2 (N=62)
H1a	Support	N/A	No support	Support
H1b	Support	Support	Support	Support
H1c	Support	Support	Support	Support
H1d	Support	Support	Support	Support
H1e	Support	Support	Support	Not Support
H1f	Support	Support	Support	Support
H2a	No support	No support	No support	No support
H2b	Support	Support	Support	Support
H2c	Support	No support	N/A	N/A
H3	Support	Support	Support	Support
H4a	Support	Support	Support	No support
H4b	Support	Support	Support	Support
H5a	No support	Support	Support	Support
H5b	No support	Support	No support	No support
H6	Support	Support	N/A	N/A

In the cases studied, the decline of usage could both be attributed to the problems hidden in compatibility and facilitating conditions. Regarding the e-Learning software, the technology was not compatible with the students' practice style of learning English. Meanwhile, the online help system of the software and the helpdesk of the laboratory were not well established. Regarding the e-Government system, the application was designed as a supervising utility for the district government itself and consequently was not adaptable for the subsidiaries' daily work. On the surface, it was such factors that make the user acceptance decline after the initial period. Intrinsically, however, the low level of compatibility is in fact a strong indicator for the lack of fitness between technology and culture.

When facilitating conditions are provided, Perceived Usefulness, Perceived Ease of Use and Perceived Compatibility are the three critical factors affecting user's attitude and intention towards using. The results from both of our studies reveal that even when the user acceptance dropped sharply, the users' evaluation on Perceived Usefulness and Perceived Ease of Use remain relatively high, while there recognition on Perceived Compatibility decreased significantly. Therefore, it is reasonable to attribute the decline of user acceptance to the problems in compatibility.

Comparing to the western country, cultural backgrounds can be found for such compatibility problems in China's IT/IS application and management, especially in non-profit organizations such as governments and schools. Information systems implemented in such organizations are usually initiated as top-down decisions. Because of the highly centralized decision making mechanism in many Chinese organizations (Chen et al. 2007), systems planned and designed in these often put more emphasis on functions supporting supervision, control, and efficiency, while the requirements for compatibility with culture and end-user work styles are neglected. It has long been generally agreed that change management in the scope of the whole organization is critical to the success of IT/IS application (Legris et al. 2003). However, in many Chinese organizations, especially governments and schools, IT/IS departments are still treated as technical supporting forces and have severely insufficient power to coordinate system planning, analysis, and design. Among the subsidiaries of the Chaoyang District government we explored in the second study, 87% of the top administration teams considered that the main responsibility of IT/IS departments as "maintaining current systems and providing technical support". Moreover, a considerable number of the subsidiary governments have only "network administrators", but no IT/IS managers. Such defects in organizational structures make it hard to fit technologies and systems with culture and work styles.

Although observations are that user acceptance often starts fairly well in the initial period, the above analyses reveal that failures are bred before the system implementation if the compatibility issue is not addressed carefully. To the extent of our knowledge, the phenomenon that IT/IS user acceptance declines after the initial period might be unique to Chinese organizations which are clearly labeled with Eastern culture characteristics, especially high power distance, low individualism, and high Confucian dynamism (Hofstede 2001).

8 Conclusion

Based on an extended model derived from the Technology Acceptance Model (TAM), this paper has presents two longitudinal studies in individual and organizational contexts respectively to analyze the phenomenon that IT/IS user acceptance declines after the initial period from a cultural perspective in China. Results from structured equation model (SEM) analyses have demonstrated the ability of the model to interpret the IT acceptance behavior of Chinese users either during or after the initial stage. It is inferred that the initial rise of user acceptance is usually driven by mandatory instructions due to the Eastern cultural characteristics of Chinese organizations, while the drop in the second period is caused by changes that occur in some of the recognition factors in the model, reflecting the lack of fit between technology and culture.

These findings may at least convey managerial implication for Chinese IT managers in two respects. First, we have demonstrated that it is a feasible way to analyze the phenomenon of the "declining phase" by using our extended technology acceptance model to examine the user cognition factors at different time points or among different user groups. This model can be applied in other situations to find out the reasons that drive the user acceptance down after the initial period. Second, the two cases we studied have revealed that, in China, at least some of the failures in systems application were rooted in the planning and design of the software or systems themselves because the compatibility issue, which reflects the level of fitness between technology and organizational culture, had not been considered thoroughly. It would be helpful, if not necessary, for IT managers to evaluate the users' perception before and after the implementation of new systems, so as to understand whether the systems bring positive impressions to the users' recognition regarding compatibility, technology facilitating conditions, and so on. It was reported that "regarding switching online as the end of a system application project" is the second critical failure factor in IT application in China.[1] Because Chinese users often act as followers in the IT diffusion process due to

[1] http://www.industry.ccid.com.

historical reason, their expectation on new technologies may be over heated at the beginning. Moreover, because of the traditional centralized decision making mechanism in China, applications are often promoted with mandatory instructions. All these may lead to an encouraging initial phase, which is exactly where the "declining phase" breeds.

On-going research is aimed at conducting more studies under various organizational situations, with regard to various technology and systems, especially emerging technologies and applications such as web 2.0 and SaaS, so as to further test and develop the research model for longitudinal technology acceptance analysis, as well as to further investigate the driving factors of the "declining phase" phenomenon of IT application in China.

Acknowledgements The work was partly supported by the National Natural Science Foundation of China (70972029/70890081/70621061/70831003), China Postdoctoral Science Foundation (20080440030/201003094), the Research Center for Contemporary Management, and the E-Government Lab of Tsinghua University. The authors would like to thank Professor Wayne Wei Huang from Ohio University, for his valuable comments on the draft of this paper.

References

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: cognitive absorption and beliefs about information technology usage. *MIS Quarterly, 24*, 665–694.

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

Agarwal, R., Sambamurthy, V., & Stair, R. M. (2000). The evolving relationship between general and specific computer self-efficacy—an empirical assessment. *Information Systems Research, 11*, 418–430.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs: Prentice-Hall.

Benbasat, I., & Barki, H. (2007). Quo Vadis, TAM? *Journal of AIS, 8*, 211–218.

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

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: a theoretical model and longitudinal test. *MIS Quarterly, 28*, 229–254.

Chau, P. Y. K., & Hu, P. J. (2002). Examining a model of information technology acceptance by individual professionals: an exploratory study. *Journal of Management Information Systems, 18*, 191–229.

Chen, G., Wu, R., & Guo, X. (2007). Key issues in information systems management in China. *Journal of Enterprise Information Management, 20*, 198–208.

Chin, W. W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly, 22*, vii–xvi.

Compeau, D., Higgins, C. A., & Huff, S. L. (1999). Social cognitive theory and individual reactions to computing technology: a longitudinal study. *MIS Quarterly, 23*, 145–158.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*, 319–340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*, 982–1003.

Dennis, A. R., & Reinicke, B. A. (2004). BETA versus VHS and the acceptance of electronic brainstorming technology. *MIS Quarterly, 28*, 1–20.

Dishaw, M. T., & Strong, D. M. (1999). Extending the technology acceptance model with task-technology fit constructs. *Information & Management, 36*, 9–21.

Dwivedi, Y. K., Williams, M. D., & Venkatesh, V. (2008). A profile of adoption of information and communication technologies (ICT) research in the household context. *Information Systems Frontier, 10*, 385–390.

Fichman, R. G. (1992). *Information technology diffusion: A review of empirical research*. *The Thirteenth International Conference on Information Systems.* Dallas, Texas, United States.

Gallivan, M., & Srite, M. (2005). Information technology and culture: identifying fragmentary and holistic perspectives of culture. *Information & Organization, 15*, 295–338.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly, 19*, 213–226.

Guo, X., & Chen, G. (2004). Patterns of the internet adoption in different Chinese companies. In C.-P. WEI (Ed.), *Proceedings of the eight Asia-Pacific conference on information systems*. Shanghai: Fudan University.

Guo, X., & Chen, G. (2005). Internet diffusion in Chinese companies. *Communications of the ACM, 48*, 54–58.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations* (2nd ed.). Thousand Oaks: Sage.

Igbaria, M., Zinatelli, N., Cragg, P., & Cavaye, A. L. M. (1997). Personal computing acceptance factors in small firms: a structural equation model. *MIS Quarterly, 21*, 279–305.

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

Karahanna, E., Ahuja, M., Srite, M., & Galvin, J. (2002). Individual differences and relative advantage: the case of GSS. *Decision Support Systems, 32*, 327–341.

Katz, M. L., & Shapiro, C. (1986). Technology adoption in the presence of network externalities. *Journal of Political Economy, 94*, 822–841.

Kim, S. S., & Malhotra, N. K. (2005). A longitudinal model of continued IS use: an integrative view of four mechanisms underlying postadoption phenomena. *Management Science, 51*, 741–755.

Kunnathur, A. S., & Shi, Z. (2001). An investigation of the strategic information systems planning success in Chinese publicly traded firms. *International Journal of Information Management, 21*, 423–439.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management, 40*, 191–204.

Lewis, W., Agarwal, R., & Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: an empirical study of knowledge workers. *MIS Quarterly, 27*, 657–678.

Lippert, S. K., & Forman, H. (2005). Utilization of information technology: examining cognitive and experiential factors of post-adoption behavior. *IEEE Transactions on Engineering Management, 52*, 363–381.

Martinsons, M. G. (2005). Transforming China. *Communications of the ACM, 48*, 44–48.

Mathieson, K. (1991). Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research, 2*, 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*, 192–222.

Plouffe, C. R., Hulland, J. S., & Vandenbosch, M. (2001). Richness versus parsimony in modeling technology adoption decisions—understanding merchant adoption of a smart card-based payment system. *Information Systems Research, 12*, 208–222.

Reimers, K., Guo, X., & Chen, G. (2009). Do IT-managers learn how to control spending on new information technology? A study of IT-budget growth in Chinese companies. *Database for Advances in Information Systems, 1*, 20–37.

Rogers, E. M. (1995). *Diffusion of inovations*. New York: The Free.

Szajna, B. (1996). Empirical evaluation of the revised technology acceptance model. *Management Science, 42*, 85–92.

Taylor, S., & Todd, P. A. (1995). Assessing IT usage: the role of prior experience. *MIS Quarterly, 19*, 561–570.

Thatcher, J. B., & Perrewe, P. L. (2002). An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy. *MIS Quarterly, 26*, 381–396.

Thompson, R. L., & Higgins, C. A. (1991). Personal computing: toward a conceptual model of utilization. *MIS Quarterly, 15*, 125–143.

Thong, J. Y., 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*, 799–810.

Venkatesh, A. (2000). Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*, 342–365.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science, 46*, 186–204.

Venkatesh, V., & Morris, M. G. (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*, 115–239.

Venkatesh, V., & Ramesh, V. (2006). Web and wireless site usability: understanding differences and modeling use. *MIS Quarterly, 30*, 181–205.

Venkatesh, A., Morris, M. G., & Davis, G. B. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly, 27*, 425–478.

Venkatesh, V., Davis, F. D., & Morris, M. G. (2007). Dead or alive? The development, trajectory and future of technology adoption research. *Journal of AIS, 8*, 267–286.

Wang, C., Zhang, X., & Yu, S. (2006). *China e-government development report* (3rd ed.). Beijing: Social Sciences Academic Press.

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research, 16*, 85–102.

Yi, M. Y., & Hwang, Y. J. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human-Computer Studies, 59*, 431–449.

Yiu, C. S., Grant, K., & Edgar, D. (2007). Factors affecting the adoption of internet banking in Hong Kong—implications for the banking sector. *International Journal of Information Management, 27*, 336–351.

Zhang, N., Guo, X., Chen, G., & Chau, P. Y. K. (2009). Impact of perceived fit on e-government user evaluation: a study with a Chinese cultural context. *Journal of Global Information Management, 17*, 49–69.

Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry. *Information Systems Journal, 16*, 61–84.

Zhu, J. J. H., & Wang, E. (2005). Diffusion, use, and effect of the internet in China. *Communications of the ACM, 48*, 49–53.

Nan Zhang received his Ph.D. from the School of Economics and Management, Tsinghua University, and is currently a postdoctoral researcher in the School of Public Policy and Management, Tsinghua University. His research interests include e-government & mobile government, ICT adoption & diffusion, cultural issues of information management. His work has been published in journals like *Journal of Global Information Management*, *Systems Engineering—Theory & Practice*, *Tsinghua Science & Technology*, and conference proceedings like PACIS, ICMB and AMIGE.

Xunhua Guo received his Ph.D. from Tsinghua University and is now an assistant professor of information systems at the School of Economics and Management, Tsinghua University. He has published in journals including *Communications of the ACM*, *Journal of Global Information Management*, *Information Sciences*, and *Journal of Enterprise Information Management*. His research interests include IT/IS adoption, e-government, and organizational change. Xunhua Guo is the corresponding author and can be contacted at: guoxh@sem.tsinghua.edu.cn.

Guoqing Chen received his Ph.D. from Catholic University of Leuven and is currently a professor of information systems at the School of Economics and Management, Tsinghua University. Dr. Chen has published in journals such as *Decision Support Systems*, *IEEE Transactions*, *Information Systems*, and *Information Sciences*. He also published several HBS cases on China. His research interests include management information systems, IT management and business intelligence.