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Examining the effects of cognitive style in individuals' technology use decision making ☆

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Abstract

In this study, we examine individuals' acceptance of a new technology by proposing and testing a factor model that incorporates cognitive style and specifies its plausible effects on essential acceptance determinants. The data from 428 subjects fit the model satisfactorily and support all of its suggested hypotheses. Cognitive style shows significant direct effects on perceived usefulness, perceived ease of use, and subjective norms. Both perceived usefulness and subjective norms affect actual technology usage significantly. People with innovative cognitive styles are more likely to perceive a new technology as useful and easy to use than are those with adaptive cognitive styles.

Keywords: Technology acceptance; Technology use; Cognitive style; Individual differences

1. Introduction

Investigations of technology acceptance by target users have received considerable attention from information systems (IS) researchers and practitioners. Several theoretical models and frameworks attempt to explain or predict a person's decision to accept a new technology. Of particular prevalence are the technology acceptance model (TAM) [25], the theory of planned behavior (TPB) [5], the self-efficacy theory (SET) [9], and the innovation diffusion theory [66]. A review of extant literature suggests a common focus on the effects of individual characteristics, such as innovativeness [2], intrinsic motivation [83], self-efficacy [23], anxiety [34], gender [81], and age [57]. The cumulative evidence from prior research suggests that these characteristics can affect people's attitudinal beliefs, perceptions, and assessments of a new technology.

According to cognitive appraisal theory, individual cognitive traits, the social environment, and information use can affect a person's interpretation of an ambiguous environment [68]. To examine the potential impacts of cognitive traits on people's interpretations of an environment, previous research has taken a cognitive perspective toward organizational information processing and suggested the relevance of cognitive style, a fundamental personal trait generally referring to the relatively stable mental structures or processes that a person prefers to use when perceiving or evaluating information [41,58]. Results from prior studies show that cognitive style can affect a person's decision making and behavior significantly [e.g., 29,34,53,84]. Conceivably, people vary in their cognitive style, and such differences may influence their technology acceptance decision making.

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Accordingly, it is important to investigate the relationship between cognitive style and technology acceptance decision making. Equipped with a better understanding of that relationship, technology professionals and business managers could design more effective training programs or management interventions to foster technology acceptance among targeted users.

Cognitive style has been studied in the context of organizational technology implementation (e.g., [14]), but its effects on technology acceptance by individuals have received little research attention. Several previous studies, including [32,37,85], point to the importance of cognitive style in the context of individuals' technology acceptance decision making, which deserves continued research efforts for both conceptual analysis and empirical testing. We propose a factor (variance) model to explain individuals' acceptance of a new technology. Our model incorporates the effects of cognitive style and is tested empirically using evaluative responses from 428 undergraduate students. The technology we study is Microsoft (MS) ACCESS™, a commonly available database technology capable of addressing our subjects' data management needs at work or school (e.g., school assignments, organizing data/information of interest). Our model development synthesizes relevant previous research and analysis of important acceptance determinants that are specific to the user acceptance phenomenon under investigation. From a theoretical aspect, our model is rooted in the TAM, the TPB, and SET. We conducted a large-scale survey to test the model holistically and the individual causal paths it suggests. Overall, we posit that cognitive style has important direct effects on perceived usefulness, perceived ease of use, and subjective norms, and that perceived usefulness and subjective norms jointly explain an individual's actual use of a (new) technology.

The remainder of the paper is organized as follows: in Section 2, we review relevant previous research and highlight our motivation. In Section 3, we describe our research model and discuss the specific hypotheses tested in this study, followed by details about our study design and data collection procedure in Section 4. We discuss important analysis results and their implications in Section 5. We conclude with a summary, discussions of the study's contributions and limitations, and some future research directions in Section 6.

2. Literature review and motivation

User technology acceptance has been examined from different theoretical aspects. Of particular importance is the TAM, a generic model specifically developed to explain or predict individuals' acceptance of computer-based systems in various scenarios or organizational contexts [25]. The TAM is adapted from the theory of reasoned action (TRA), an established social psychology theory capable of explaining a wide range of human behaviors [30]. The cumulative empirical results pertaining to the TAM are reasonably strong and exhibit satisfactory power to explain initial user acceptance across different technologies, organizational contexts, and user groups. According to the TAM, perceived usefulness and ease of use are critical to an individual's technology acceptance decision making. In general, perceived usefulness reflects an individual's subjective estimation of the job performance enhancement that is likely to result from the use of a new technology, whereas perceived ease of use refers to the degree to which he or she expects the use of the technology to be free of effort [27].

Although it remains popular and has accumulated reasonable empirical support, the TAM has been criticized for its parsimony. Do perceived usefulness and perceived ease of use provide sufficient utilitarian value for advancing our understanding of individuals' technology acceptance decision making or improving technology design and management practices? According to some previous studies (e.g., [56]), the TAM is easy to use and can measure general-level user acceptance across a broad range of users and technologies, but it does not provide sufficient insights into why people accept or reject a new technology or generate specific results that can lead to better system designs. This suggests the importance of investigating and empirically testing the essential determinants of perceived usefulness and perceived ease of use in a targeted user acceptance scenario.

Considerable prior research that conceptualizes decision-making processes neglects important characteristics of individual decision makers by assuming that people process information or arrive at decisions in a similar manner [cf. 50]. Consequently, the resulting analyses or models exclude those factors representing individual differences that might in effect influence the actual decision-making process and its outcomes [18,65]. In the context of user technology acceptance, the TAM is limited in the particular factors that determine perceived usefulness and perceived ease of use [78]. Similarly, important variables that can represent individual differences are not included in either the TAM or the TRA, though the TRA attempts to capture the effects of individual differences through an expectancy belief formation [2,3]. Therefore, research models should consider and test essential individual differences to offer more complete depictions of how perceptions are formed and the subsequent role they play in affecting people's technology usage behaviors.

Previous technology acceptance studies have considered the effects of important individual differences [e.g., 7,14,85]. Of particular importance is the fundamental personality characteristic of cognitive style, which can result in stable individual differences in people's preferred ways of processing and organizing information and experience. Cognitive style correlates significantly with job performance [8]. People having an adaptive cognitive style tend to be more likely to use a new information system [52,69]. However, some researchers [37,67] have questioned the relevance of cognitive style in IS research, arguing that a designer's knowledge of users' cognitive style assessments may not improve his or her ability to analyze or make decisions about important system design issues. The development of robust instruments and encouraging empirical evidence, however, suggest that investigations into the relationships between important individual traits and their behaviors will continue unabated [13].

Cognitive style has been categorized according to different classification schemas, each of which emphasizes particular polar opposites of individual traits for exposition, even as it recognizes that people exhibit a continuum of traits [11]. Among these classifications, the adaption–innovation theory [44] has well-established theoretical premises and been applied broadly in social psychology and other disciplines [e.g., 17,20 21 22]. According to this theory, a person's cognitive style in a problem-solving or decision-making context can be classified as adaptive or innovative on a continuum anchored at "extremely adaptive" and "extreme innovative." In general, adaptors prefer operating within a consensually agreed upon paradigm and often are skilled at initiating changes to improve or adapt current methods of doing things. Adaptors typically are characterized by precision, reliability, efficiency, discipline, and/or conformity; they usually seek solutions to a problem in previously understood and tested ways and appear impervious to boredom, maintaining high accuracy over long spells of detailed work. In contrast, innovators like to reconstruct a problem and tend to perceive existing paradigms as part of the problem. Innovators prefer working outside an agreed upon paradigm and often effectively initiate changes that manifest obviously, if not fundamentally and drastically, different ways of doing things. Innovators are typified by their unconstrained (undisciplined) thinking, as well as their tangential approaches to task performance or problem solving that extend beyond an existing or accepted paradigm.

Innovators are catalysts in a group but can be perceived as unreliable, unsound, or impractical, partially because they often cannot maintain detailed, meticulous work for long periods of time. Previous IS research has studied adaption–innovation theory [e.g., 2,21]; Kirton [45] operationalizes it with the Kirton Adaption–Innovation Inventory (KAI), an instrument for measuring an individual's cognitive style on an adaptor–innovator continuum. The KAI consists of 32 question items, measured by five-point scales on which respondents explicitly indicate their self-assessed degree of ease or difficulty in consistently maintaining a particular adaptive or innovative behavior over time.

We investigate the effects of cognitive style on user technology acceptance decision making. Because it embraces an adaptive–innovative continuum fundamental to the decision-making aspect of cognitive style, we adopt the adaption–innovation theory in our model development and measure cognitive style using question items from the KAI. Compared with other classifications based on field-dependence versus field-independence or analytic versus intuitive traits, our choice of the adaption–innovation theory is more appropriate with respect to our intended investigation of the probable effects of cognitive style on people's technology acceptance decisions. In addition, our measurement choice (i.e., KAI) has a sound theoretical basis and has been developed and validated with methodological rigor.

3. Research model and hypotheses

Our research model extends the TAM by incorporating the adaption–innovation theory, as well as other constructs important to the targeted user acceptance phenomenon. We empirically test the model using evaluative responses by undergraduate students of a major university in the western United States. The particular technology under examination is MS ACCESS™, which we chose because it is both commonly available and relevant to this population of subjects. According to our analysis, most subjects have various data management needs that can be adequately addressed by this technology, which is generally available at work or school.

As shown in Fig. 1, our research model states that an individual's actual use of a technology can be explained jointly by perceived usefulness and subjective norms. Although voluntary technology acceptance can be measured by intention to use the technology, we target actual technology use and examine the direct effects of its key determinants rather than their mediating effects through behavioral intention for several reasons. First, from the

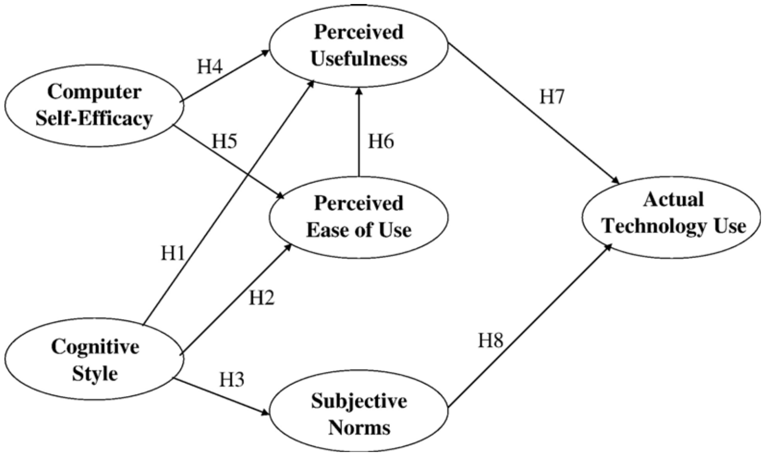

Fig. 1. Research model.

perspectives of both enhanced system design practices and effective user acceptance management, actual technology use is substantially more important or relevant than intention to use. Prior research that involves the TAM generally examines the intention to use a (new) technology rather than actual technology use, which represents an important limitation that deserves investigative attention [49]. Although considerable previous research suggests that intention can mediate the effects of attitude, perceived usefulness, perceived ease of use, and/or social norms on actual behavior, no variables have been observed to mediate the full effect of important acceptance drivers [25,72]. This dearth implies the risk of limited mediating effects, an important consideration that some prior research has used as a rationale to remove attitude from research models [79]. In addition, researchers and practitioners, for practical purposes, are motivated by their desire to better understand actual use of a new technology, above and beyond any indicated intentions to do so. After all, findings pertinent to actual usage contribute directly and valuably to improved system design practices and effective user acceptance management interventions.

Our model suggests that perceived usefulness and subjective norms positively affect actual technology use and that perceived ease of use has a positive impact on perceived usefulness. According to our model, cognitive style has important direct effects on perceived usefulness, perceived ease of use, and subjective norms. In addition, computer self-efficacy has positive effects on both perceived usefulness and perceived ease of use but not on subjective norms.

Perceived usefulness (PU) refers to the extent to which a person believes that using the technology will enhance her or his job performance and thereby reflects the performance–use contingency [25]. Considerable efforts have attempted to identify and test key determinants of perceived usefulness [2,3,78,80]. We focus on the impacts of cognitive style and posit that it has a significant direct effect on perceived usefulness. Innovation is frequently associated with risk, uncertainty, or imprecision [66]; therefore, innovators may be capable of coping with more uncertainty than adaptors [44]. In general, innovators are nonconformists who prefer alternative problem-solving approaches and are fond of exploration. In light of their boundary-breaking or exploratory orientation, innovators may be more likely to discover, recognize, or appreciate the “utility” of a new technology than are adaptors, who tend to be task-oriented and prefer existing, familiar ways of doing things. This reasoning is consistent with the notion that innovators can develop more positive evaluations of an innovation [2]. Therefore, innovators are more likely to develop positive perceptions about the usefulness of a new technology than are adaptors. Thus, we test the following hypothesis:

H1. Cognitive style has an important effect on perceived usefulness; specifically, innovators are more likely to perceive a technology as useful than are adaptors.

Perceived ease of use (PEOU) refers to the extent to which an individual believes his or her use of a new technology will be free of effort [25] and therefore reflects his or her assessment of the requirements (costs) for using the technology. Innovators have been identified as “active information seekers about new ideas” and therefore more cosmopolitan than adopters [66]. When developing perceptions about a new technology, innovative people are likely to approach the challenge from different perspectives and employ multiple channels but demand fewer interpersonal sources. Innovators think tangentially and often attempt to find new ways to use a new technology; they are more adept in dealing with unstructured problems and feel comfortable approaching them from unconventional angles [47]. Compared with adaptors, innovators are more likely to perceive their use of a new technology as easy, partially because the use of a technology resembles an unstructured problem to some degree [46]. Therefore, we test the following hypothesis:

H2. Cognitive style has an important effect on perceived ease of use; specifically, innovators are more likely to perceive a technology as easy to use than are adaptors.

Subjective norms can explain how people's cognitive processing takes place within a social system. Such cognitive processing may be internal to an individual but indicates the extent to which he or she is influenced by the surrounding social system and its norms. In general, subjective norms refer to the degree to which a person believes that those who are important to him or her think he or she should perform the behavior in question [30]. Thus, subjective norms represent an important determinant of behavior [5]. Previous IS research has shown that both peers' and superiors' influences can affect a person's decision to accept a new technology [56,75]. This construct appears in both the TRA and the TPB but not in the TAM because of its questionable theoretical premises and measurement difficulties [27]. Although some studies ignore subjective norms [e.g., 1,73,74], others include this construct in their models but report inconsistent empirical evidences of its impacts on user technology acceptance decision making, significant [35,75] as well as insignificant [27,56] effects. However, multiple theoretical premises converge regarding the importance of social aspects of technology acceptance, including critical mass [81,55], social influence [31], adaptive structuration [64], hermeneutic interpretation [48], and critical social theory [60]. Collectively, these theoretical perspectives reinforce the need to consider subjective norms in user technology acceptance investigations. Understandably, people may vary in the extent to which they incorporate referent others' opinions or feedback when they make technology acceptance decisions. In our case, innovators likely are relatively insensitive to issues or opinions that might jeopardize group cohesion or create differences (conflicts) in a group because their creative nature prompts them to pursue unique or unusual paths during problem analysis and solving, which in turn may challenge established rules or shock people. The salient subjective norms in a social system (including general assessments or opinions about a new technology) therefore may have less influence on innovators than on adaptors, who tend to comply with norms. Hence, we test the following hypothesis:

H3. Cognitive style has an important effect on subjective norms; specifically, innovators are less likely to be influenced by subjective norms than are adaptors.

Computer self-efficacy also affects user technology acceptance decision making [51]. Rooted in social cognitive theory [9], computer self-efficacy suggests that a person's perception of his or her ability to perform a behavior is influenced by watching others perform the behavior, as well as by the outcomes he or she expects. In general, efficacy expectation refers to the conviction that the person can successfully execute the behavior required to produce a desired outcome [9]. Similarly, computer self-efficacy reflects a person's judgment of his or her ability to use a computer technology [23,54]. Previous research [10] advocates using measures specific to the underlying psychological function under examination (e.g., the technology artifact under study) rather than relying on vicarious experience. Accordingly, we measure individual subjects' general capability to use ACCESS™. An individual's self-efficacy with respect to a particular technology then becomes a key determinant of his or her perception about the technology, such that self-efficacy may affect a person's outcome expectations, including those closely related to perceived usefulness [23]. As a result, people with high computer self-efficacy are more likely to develop favorable perceptions of a new technology [79] and perceive their use of the technology as easier [24] compared with those with low computer self-efficacy. Accordingly, we test the following hypotheses:

H4. Computer self-efficacy has a significant positive effect on the perceived usefulness of a technology.

H5. Computer self-efficacy has a significant positive effect on the perceived ease of use of a technology.

According to the TAM, perceived ease of use has a direct positive effect on perceived usefulness. All else being equal, the easier a technology is to use, the more useful it appears [78]. This causal relationship can be reasoned from a cost–benefit analysis. When the use of a technology is less effortful, its relative benefits appear greater. That is, when perceiving the use of a technology as free of effort (i.e., zero or little costs), an individual is likely to believe that the technology provides more relative value in his or her task performance. Empirical support of this direct causal link has been reasonably strong [e.g., 25,78]. Hence, we test the following hypothesis:

H6. Perceived ease of use has a significant positive effect on the perceived usefulness of a technology.

Most prior research measures technology acceptance using behavioral intentions rather than actual technology use. Although behavioral intention may have a reasonable correlation with actual behavior [78], its use cannot replace or improve on actual technology use. Consistent with the suggestion by Ajzen and Fishbein [6], we remove behavioral intention from our model and specifically focus on actual technology use—the ultimate user acceptance measure. Accordingly, we test the respective direct effects of perceived usefulness and subjective norms on user technology acceptance instead of their mediating effects through behavioral intention. Perceived usefulness, which reflects a person's perception of the performance–use contingency and is closely linked to outcome expectations, instrumentality, and extrinsic motivation [25–28], can affect actual technology use [27,74,80]. Prior research has identified perceived usefulness as an important determinant of user acceptance, including actual technology use [25,27,56,76]. Perceived usefulness has been shown to be a highly significant predictor of an individual's use of a software application in different time periods [27]. The cumulative empirical evidence suggests that perceived usefulness has a significant effect on actual technology use [74]. Thus, we test the following hypothesis:

H7. Perceived usefulness has a significant positive effect on actual technology use.

Subjective norms can influence a person's behavior through such mechanisms as internalization and identification. In general, internalization denotes the process by which a person incorporates an important referent's belief that he or she should perform a particular behavior into his or her own belief structure [42]. In our case, when a superior or colleague suggests that a new technology is useful, a person may believe that it is useful (to some extent) and eventually use the technology. People's perceptions of a technology's usefulness also can increase or decrease in response to persuasive informational social influences. In a social or organizational setting, people often respond to social normative influences so that they can establish or maintain a favorable image within their reference group [42]. Prior research observes a high degree of interdependence between an individual and other social actors when they carry out individual duties or collective tasks in different organizational contexts. In turn, increasing one's status within a group provides a desirable basis of power or influence through such processes as social exchange, coalition formation, and resource allocation [16,62,63]. By performing a behavior consistent with the salient group norm, a person can achieve identification with membership, social support, and, ultimately, goal attainment [16,43,63]. As a result, people may become increasingly motivated to use a new technology when their use of the technology is consistent with the salient social norm. Thus, we test the following hypothesis:

H8. Subjective norms have a significant positive effect on actual technology use.

4. Study design and data collection

We designed a survey study to test our research model and the hypotheses it suggests. We targeted undergraduate students majoring in business at a comprehensive state university located in the western United States. Our subjects are diverse in background, and many work in various organizations on a full- or part-time basis, in which context they are required to use different technologies. The use of university students who are employed but have not accumulated significant work experiences may be advantageous in reducing the potential confounds that can result if the various work experiences influence their technology usage [40,77]. We study MS ACCESS™, a common database management technology used widely in business organizations. Our technology choice thus exemplifies a challenge facing contemporary information systems in various organizations; namely, employees regularly must make decisions about whether to accept or reject a technology. We expect the results from our study of MS ACCESS™ to be reasonably generalizable to similar technologies.

We developed our question items by adapting measurements from relevant prior research. Specifically, we adopted the items to measure cognitive style from the three subscales of the KAI [45]. When responding to each item, subjects were asked to reflect on and present, consistently and for a sufficient amount of time, a specific self-image. We adopted a five-point Likert scale for each item, ranging from "very easy" to "very difficult," to indicate the degree of ease or difficulty with which the respondent thought he or she could present the image demanded or portrayed by the measurement item. A low composite score, summed across all measurement items, suggests a cognitive style that leans toward the adaptive anchor of the continuum [45]. In contrast, a high composite score reveals a cognitive style relatively closer to the innovative anchor. Based on the results of a pilot

Table 1
Important characteristics of subjects participating in the study

Demographic characteristics	Descriptive statistics
Average age (in years)	22
Gender	Male: 294 (68.7%)
	Female: 127 (29.7%)
Affiliated school	Business: 282 (65.89%)
	Other: 118 (27.57%)
	Undecided: 28 (6.55%)
Year in university	Freshman: 129 (29.9%)
	Sophomore: 141 (32.9%)
	Junior: 115 (26.9%)
	Senior: 37 (8.6%)
Self-reported computer skills	5.28 (on a 7-point scale)
Average Internet usage (per week)	≤7 h: 243 (57%)
	7–20 h: 115 (27%)
	>20 h: 60 (14%)
Prior experience using computers	≤7 years: 98 (23%)
	7–12 years: 226 (52.8%)
	>12 years: 104 (24.2%)

study, we adopted 8 question items in the subsequent study; thus the composite scores range between 8 (i.e., extremely adaptive) and 40 (i.e., extremely innovative).

We also adopted the items for the other constructs in our research model from relevant measurement scales from prior research, with wording changes appropriate for the targeted technology acceptance context. Specifically, we obtained the question items to measure perceived usefulness and perceived ease of use from scales by Davis et al. [27] and Igbaria [38]. The items to assess perceived ease of use and subjective norms came from validated measurements by Davis [25]. We also adopted the items developed by Compeau and Higgins [23] to measure computer self-efficacy. We measured each item using a five-point Likert scale, anchored by 1 = "strongly disagree" and 5 = "strongly agree." We list the specific measurement items used in our study in the Appendix.

We targeted business-major students enrolled in an Introduction to Management Information Systems class required by the school. This course is designed to provide students with general computer training and familiarity with software applications commonly required by upper-division business classes, as well as various job positions in business organizations. In particular, Microsoft Office applications (i.e., Word, PowerPoint, Excel, and ACCESS) are stipulated as part of the course curriculum. At the time of the study, this course was offered in a total of 11 sections; all the instructors assisted our subject recruiting. ACCESS was the last software application taught and was scheduled in the last five weeks of the semester; i.e., after Word, PowerPoint, and Excel. We conducted the survey after the five-week ACCESS module with students who volunteered to participate.

Our subjects received class participation credit for their completing the questionnaire. Before each data collection, we read aloud and distributed copies of a scripted document to inform the students explicitly about the study's objective and our data analysis plan. In particular, we addressed any issues or concerns regarding privacy and assured that our analysis of the data would occur at an aggregate level, not in any personally identifiable manner.

Of the 550 students enrolled in the course, 428 agreed to take part in the study voluntarily and completed the questionnaire, representing an effective response rate of 78%. Analysis of our subjects shows an approximate seven-to-three gender distribution in favor of males; their ages ranged from 17 to 48 years, with an average of 22 years. Based on their self-assessments, our subjects, as a group, had reasonably high computer skills. Most respondents had declared as business majors (about 65%), and the remainder indicated their intention to do so in the near future; i.e., "other" or "undecided." Table 1 summarizes some important demographic characteristics of our subjects.

5. Analysis results and discussion

Following the suggestion by Straub [72], we reexamined the validity of our instrument in terms of reliability and convergent and discriminant validity. We assessed its reliability by examining the Cronbach's alphas of the respective constructs. As shown in Table 2, the alpha value of each investigated construct exceeds

Table 2
Summary of descriptive statistics, correlation coefficients, and reliability

	Means	STD	PEOU	PU	SN	Cognitive style	CSE	AU	Cronbach's alpha
PEOU	3.53	1.10	1.00						0.87
PU	4.15	1.41	0.65	1.00					0.92
SN	3.27	1.30	0.37	0.60	1.00				0.85
Cog. Style	3.72	0.63	0.18	0.27	0.15	1.00			0.82
CSE	4.28	0.98	0.60	0.41	0.58	0.20	1.00		0.78
AU	2.81	4.76	0.13	0.30	0.24	0.13	0.15	1.00	0.74

Table 3
Examination of convergent and discriminant validity using factor analysis

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
ATU-1	0.26	0.11	0.05	−0.25	**0.95**	0.06
ATU-2	0.18	0.12	0.04	−0.19	**0.72**	0.08
PEOU-1	0.51	0.06	0.13	−0.36	0.15	**0.81**
PEOU-2	0.57	0.16	0.29	−0.22	0.18	**0.82**
PEOU-3	0.52	0.20	0.18	−0.27	0.13	**0.86**
PEOU-4	0.45	0.10	0.22	−0.31	0.12	**0.70**
PU-1	**0.78**	0.25	0.24	−0.58	0.30	0.57
PU-2	**0.74**	0.29	0.22	−0.58	0.37	0.46
PU-3	**0.84**	0.20	0.36	−0.38	0.28	0.47
PU-4	**0.85**	0.19	0.22	−0.50	0.33	0.52
PU-5	**0.80**	0.14	0.35	−0.51	0.33	0.46
SN-1	0.50	0.08	0.14	**0.67**	0.24	0.30
SN-2	0.38	0.14	0.20	**0.76**	0.23	0.22
SN-3	0.36	0.04	0.27	**0.82**	0.26	0.25
SN-4	0.38	0.15	0.29	**0.82**	0.27	0.19
CSE-1	0.31	0.02	**0.46**	−0.33	0.10	0.27
CSE-2	0.15	0.12	**0.80**	−0.14	0.02	0.00
CSE-3	0.15	0.16	**0.84**	−0.21	0.05	0.06
CSE-4	0.33	0.15	**0.41**	−0.28	0.08	0.34
CSE-5	0.38	0.09	**0.57**	−0.18	0.13	0.29
CSE-6	0.26	0.09	**0.40**	−0.008	0.07	0.27
CT-1	0.11	**0.72**	0.15	−0.05	0.06	0.00
CT-2	0.20	**0.73**	0.14	−0.15	0.11	0.19
CT-3	0.12	**0.73**	0.10	−0.08	0.13	0.08
CT-4	0.11	**0.55**	0.03	−0.14	0.13	0.27
CT-5	0.11	**0.53**	0.01	−0.08	0.10	0.26
CT-6	−0.04	**0.42**	0.11	−0.14	0.13	−0.11
CT-7	0.12	**0.65**	0.07	−0.03	0.14	0.11
CT-8	0.18	**0.60**	0.18	−0.14	0.13	0.00
Eigenvalue	8.69	3.35	2.19	2.08	1.46	1.04
Variance explained (in %)	29.96	11.55	7.55	7.19	5.03	3.60

Bold data highlight the loadings of items that measure the same construct (which can better contrast the loadings of these items for other constructs).

the commonly suggested threshold of 0.7 [33,61] and thus suggests the satisfactory reliability of our instrument.

We reexamined the convergent and discriminant validity of our measurement items by performing a confirmatory factor analysis (principal axis factoring) with an oblimin rotation and Kaiser normalization, primarily because of the plausible correlations between the investigated constructs. As summarized in Table 3, our analysis results show that the measurement items load highly on their respective constructs and therefore exhibit satisfactory convergent validity. At the same time, these items load significantly lower on other constructs, thus suggesting satisfactory discriminant validity. The eigenvalue of each extracted factor exceeds 1.0, a common threshold value [71]. Analysis of the correlation coefficients between the investigated constructs also suggests the adequate convergent and discriminant validity of our instrument.

We tested the proposed model and its causal paths using structural equation modeling. Specifically, we used LISREL to test the overall model and our hypotheses. We first assessed the extent to which our data fit the overall model; both the Tucker–Lewis index (also known as the nonnormed fit index, or NNFI) and the comparative fit index (CFI) are 0.94, which exceeds the commonly recommended threshold of 0.90 [15]. We evaluated additional common model fit indexes: the ratio between chi-squares and degrees of freedom, normed fit index (NFI), and root mean square error of approximation (RMSEA). As summarized in Table 4, our data reveal an RMSEA less than the commonly suggested threshold of 0.08 [19]. Moreover, the parsimony-adjusted NFI [39] is 0.91 and thus satisfactory in light of the commonly suggested value of 0.60 [59]. According to these essential model fit indexes and their associated recommended threshold values, our data show a satisfactory fit to the overall model.

We tested each stated hypothesis by examining the direction (positive versus negative) and magnitude of the corresponding causal path, as well as its statistical significance. As summarized in Table 5, our data support all of our hypotheses; all suggested paths are statistically significant in the direction we postulated. Cognitive style appears to have significant effects on perceived usefulness, perceived ease of use, and subjective norms, with $p<0.01$. Computer self-efficacy is also an important factor that affects both perceived usefulness and perceived ease of use, with $p<0.05$. Perceived ease of use has a positive, significant impact on perceived usefulness ($p<0.0001$). Both perceived usefulness and subjective norms exhibit a significant influence on actual technology use, $p<0.0001$ and $p<0.05$ respectively.

Our analysis provides encouraging evidence that cognitive style is an important determinant of user technology acceptance. According to our findings, cognitive style has significant effects on a person's perceptions of a technology's usefulness and ease of

Table 4
Results of overall model fit assessments

Fit index	Recommended value	Observed value
Chi-square/degree of freedom	≤ 3.0	2.4
CFI	≥ 0.9	0.94
NNFI	≥ 0.9	0.94
NFI	≥ 0.6	0.91
RMSEA	≤ 0.08	0.07

Table 5
Summary of hypothesis testing results

Path	Path coefficient	Hypothesis testing results
H1: Cognitive style → PU	0.30	Supported at the 0.01 level
H2: Cognitive style → PEU	0.42	Supported at the 0.01 level
H3: Cognitive style → SN	0.31	Supported at the 0.01 level
H4: CSE → PU	0.22	Supported at the 0.05 level
H5: CSE → PEU	0.35	Supported at the 0.05 level
H6: PEU → PU	0.63	Supported at the 0.0001 level
H7: PU → Usage	0.74	Supported at the 0.0001 level
H8: SN → Usage	0.45	Supported at the 0.05 level

use, as well as the salient subjective norms that pertain to his or her use of the technology. Our results also suggest considerable differences in how cognitive style affects these user acceptance drivers. Specifically, we observe that innovators are more likely to accept a new technology than adaptors; their perceptions of the usefulness and ease of use of a new technology also are more favorable than those of adaptors. Furthermore, our data suggest that innovators place less weight on subjective norms than do adaptors. This finding may be partially explained by the relatively greater value innovators place on a technology's utility and ease of use; they therefore may become less sensitive to the assessments by their supervisors or peers. Overall, our analysis results show the significant causal effects of cognitive style on important technology acceptance determinants, which should be considered when extending a salient, parsimonious theoretical model to explain similar technology acceptance phenomena.

According to our analysis, computer self-efficacy has significant effects on both perceived usefulness and perceived ease of use, consistent with prior research results (e.g., [23]) that suggest self-efficacy can influence performance expectations. Our study generates empirical support for a significant relationship between a person's computer self-efficacy and his or her perception of how easy it is to use a technology. This finding is congruent with results from several prior studies; e.g., [36,79]. Several implications may be extracted from our findings. For example, the observed effects of computer self-efficacy may suggest a technology competence hierarchy, according to which a person's knowledge, training, or skills in using computer technology in general may affect his or her perceptions and assessments of other (probably more advanced) technologies. In turn, this finding highlights the importance of general technology training to establish a baseline "readiness" for sophisticated technology. The discussed "upward competence" might also shed light on the desirability of designing a sophisticated system of which operations are compatible to those of general or similar technologies.

Our results also show that perceived ease of use has a significant positive effect on perceived usefulness, which in turn influences actual technology use significantly, in support of the suggestions of the TAM [82]. In addition, subjective norms also show a significant positive effect on actual technology use, suggesting that people are increasingly motivated to use a new technology when their use of the technology is consistent with the salient social norms (Fig. 2). Fig. 2 summarizes our model testing results.

6. Summary

In response to the importance of cognitive style, we examine its effects on user acceptance decision making. We propose a factor model to explain targeted user acceptance and conduct a survey study to test the model holistically, as well as its suggested causal paths. According to our analysis, cognitive style has significant direct effects on perceived usefulness, perceived ease of use, and subjective norms. People with an innovative cognitive style are more likely to perceive a technology as useful and easy to use but are less influenced by important referents' assessments or opinions than are those with an adaptive cognitive style. Perceived usefulness appears to have a significant effect on actual technology use; so do subjective norms but perhaps to a lesser extent. According to our findings, cognitive style exhibits some important effects on essential user acceptance determinants and therefore should be considered when extending salient (parsimonious) theoretical models or frameworks.

Our study contributes to user acceptance research, in that it extends salient parsimonious models by incorporating cognitive style and empirically testing its effects on user technology decision making. Prior research emphatically has analyzed user acceptance through the lens of cognitive processing, whereby perceived usefulness, perceived ease of use, and resultant intentions are affected by an individual's cognitive processing and ability. In this vein, the results from our study advance user technology acceptance research by conceptualizing the relationships between cognitive style and important acceptance drivers (such as perceived usefulness, perceived ease of use, and subjective norms) and empirically scrutinizing their effects on actual technology use.

We also contribute to technology implementation research by examining the influences of key individual differences in technology acceptance contexts. The effects observed at the individual level can be integrated into analyses of technology adoption decision making at an organization level and thereby provide richer insights into technology implementation management.

Another contribution of our study is extending the TAM by explicating a person's usage behavior toward a commonly available technology, as well as how people vary in their adoptions of the technology. The TAM explains information system usage according to both extrinsic and intrinsic motivations, which originally was performed by operationalizing two key individual beliefs: perceived usefulness and perceived enjoyment. Furthermore, the TAM theorizes that the effects of perceived ease of use and other external variables on technology use can be fully or sufficiently mediated by these two essential beliefs. We extend the TAM by examining conceptual findings from relevant prior research, incorporating the concept of cognitive style, and empirically testing the proposed model with target technology users.

Furthermore, from a theoretical aspect, our results offer empirical support of other models that delineate the antecedents of and responses to individuals' interpretations of technology acceptance. Our model development responds to the call to examine cognitive appraisal theory through empirical evaluations of cognitive style, which appears to affect how people interpret and appraise a new technology [68]. Our analysis sheds light on the linkage between cognitive style and the overall technology acceptance process and thereby provides empirical evidence about individuals' interpretations of their information processing and its subsequent effects on their technology acceptance decision making.

Also from a theoretical perspective, our study underscores the importance of cognitive style in user technology acceptance or usage investigations. Because the concept we employ straddles the gap between individual ability and personality, our results generate some insights into additional, and possibly conceptually distinct, means to explain individual differences in the context of technology acceptance. Toward that end, our findings demonstrate the promise of adopting the established distinction between an innovative and an adaptive cognitive style. A "crescendo of interest" [4, p.3] in innovation has emerged to address management problems in the business world; our study extends that interest.

Our findings also have several managerial implications. For instance, organizations should target employees with innovative cognitive styles to be initial adopters and then depute them as (peer) change agents to facilitate and promote technology dissemination. Our results also carry important implications for designing technology training programs. In principle, training programs should be structured to meet the particular needs of different groups of employees; but in light of the cognitive style differences among individuals, training programs also should emphasize a new technology's ease of use and usefulness to adaptors to motivate their use of the technology. That is, when implementing new technology, technology trainers and business managers should consider cognitive styles carefully prior to analyzing and explicitly conveying how the new technology can assist individual employees' task performance.

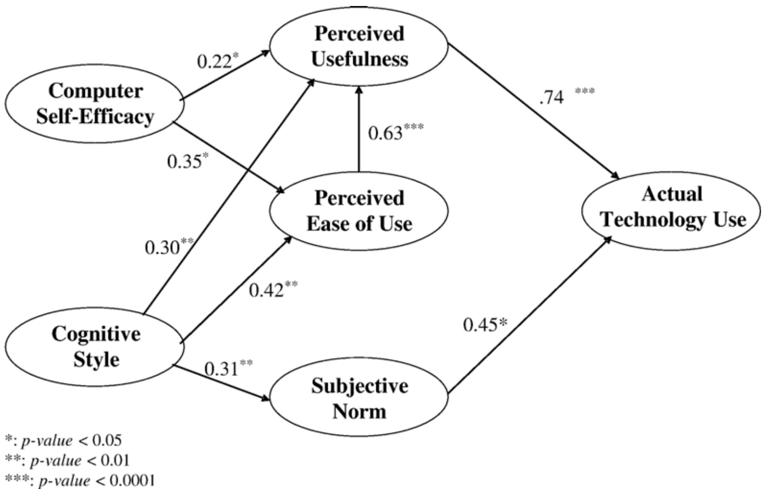

Fig. 2. Model testing results.

Our study echoes the need to understand people's decision-making processes in accepting or rejecting a technology [57]. In an organization, a newly implemented technology may affect individual employees or work groups differently, which necessitates the use of different management interventions. Our study highlights the burgeoning need to conduct thorough user analyses to understand the process and requirements of different targeted users. Managers with an innovative cognitive style may tend to perceive a technology as more controllable, which might lead them to perceive less risk and more opportunities in a technology acceptance assessment situation. Following this reasoning, these managers are likely to be proactive or even aggressive in making technology acquisition decisions. Conversely, managers with an adaptive style are more likely to be cautious and sensitive to the costs, risks, and interruptions to business continuity when they evaluate a new technology. Because managers often have a substantial influence on technology investment and adoption decisions, organizations must be sensitive to the effects of managers' cognitive styles when they assess a new technology and reach an adoption decision.

Like any other studies, our investigation is not bereft of limitations. One limitation pertains to our measurement of cognitive style. We consciously chose the adaption–innovation theory, which is appropriate for the decision-making nature of our investigation focus. However, other prevailing conceptualizations of cognitive style include logical versus illogical decision makers [12] and the two-halves brain theory [70]. We cannot rule out the possibility that these conceptual analyses would portray technology acceptance decision making differently and perhaps more accurately. Continued investigations therefore are needed to further our understanding of the underlying mechanisms of the causal relationships between cognitive style and technology acceptance (and use). Our use of a student sample represents another limitation and may constrain the external validity of our findings. To generalize our results, subsequent studies should target business users in various organizational settings and involve different technologies.

Appendix A. Listing of the Measurement Items Used in the Study

Construct	Measurement item
Cognitive style (CT)	CT-1: I have original ideas. CT-2: I like to proliferate ideas. CT-3: I am stimulating. CT-4: I like to cope with several new ideas at the same time. CT-5: I will always think of something when stuck.

Appendix A (*continued*)

Construct	Measurement item
Cognitive style (CT)	CT-6: I would sooner create than improve. CT-7: I have fresh perspectives on old problems. CT-8: I often risk doing things differently.
Computer self-efficacy (CSE)	CSE-1: I can use *MS ACCESS* if I have never used any software application like it before. CSE-2: I can use *MS ACCESS* if I have seen someone else using it before trying it myself. CSE-3: I can *MS ACCESS* if I can contact someone for help if I got stuck. CSE-4: I can use *MS ACCESS* if someone else helps me get started. CSE-5: I can use *MS ACCESS* if someone shows me how to do it first. CSE-6: I can use *MS ACCESS* if I have used similar database management software for similar tasks.
Subjective norm (SN)	SN-1: People who influence my behavior think that I should use *MS ACCESS.* SN-2: People who are important to me would think that I should use *MS ACCESS.* SN-3: People whose opinion I value would prefer me to use *MS ACCESS* rather than other data management software (such as MS Excel). SN-4: I think that those people who are important to me would want me to use *MS ACCESS* rather than other data management software applications (such as MS Excel).
Perceived usefulness (PU)	PU-1: Using *MS ACCESS* enables me to accomplish my tasks more quickly. PU-2: Using *MS ACCESS* improves my class or work performance. PU-3: Using *MS ACCESS* increases my productivity. PU-4: Using *MS ACCESS* makes it easier for me to organize and store important data. PU-5: Overall, I find *MS ACCESS* useful in my work.
Perceived ease of use (PEOU)	PEOU-1: Learning to use *MS ACCESS* is easy for me. PEOU-2: I find it not difficult to get *MS ACCESS* to do what I want it to do. PEOU-3: I find *MS ACCESS* to be flexible to interact with. PEOU-4: It is easy for me to become skillful at using *MS ACCESS*.
Actual technology use (ATU)	ATU-1: In the last 2 weeks, I on average used *MS ACCESS* ____ hours a week. ATU-2: In the last 2 weeks, I on average used *MS ACCESS* for ______ percent of my data management needs (tasks).

References

[1] D.A. Adams, R.R. Nelson, P.A. Todd, Perceived usefulness, ease of use and usage of information technology: a replication, MIS Quarterly 16 (2) (1992) 227–250.

[2] R. Agarwal, J. Prasad, A conceptual and operational definition of personal innovativeness in the domain of information

technology, Information Systems Research 9 (2) (1998) 204–215.
[3] R. Agarwal, J. Prasad, Are individual differences germane to the acceptance of new information technologies, Decision Sciences 30 (2) (1999) 361–391.
[4] W.H. Agor, The Logic of Intuitive Decision Making: a Research-based Approach for Top Management, Quorum Books, New York, 1986.
[5] I. Ajzen, The theory of planned behavior, Organizational Behavior and Human Decision Processes 50 (1991) 179–211.
[6] I. Ajzen, M. Fishbein, Understanding Attitudes and Predicting Social Behavior, Prentice-Hall, Englewood Cliffs, NJ, 1980.
[7] M. Alavi, E.A. Joachimsthaler, Revisiting DSS implementation research: a meta-analysis of the literature and suggestions for researchers, MIS Quarterly 16 (1) (1992) 95–116.
[8] C.W. Allinson, J. Hayes, The cognitive style index: a measure of intuition-analysis for organizational research, Journal of Management Studies 33 (1) (1996) 119–128.
[9] A. Bandura, Self-efficacy: toward a unifying theory of behavioral change, Psychological Review 84 (2) (1977) 191–215.
[10] A. Bandura, Self-efficacy mechanism in human agency, American Psychologies 37 (1982) 122–147.
[11] R.D. Banker, R.J. Kauffman, The evolution of research on information systems: a fiftieth-year survey of the literature in management science, Management Science 50 (3) (2004) 281–298.
[12] C.J. Barnard, The Functions of the Executive, Harvard University Press, Cambridge, MA, 1938.
[13] R.M. Baron, D.A. Kenny, The moderator–mediator variable in social psychological research: conceptual, strategic, and statistical considerations, Journal of Personality and Social Psychology 51 (6) (1986) 1173–1182.
[14] I. Benbasat, R.N. Taylor, The impact of cognitive styles on information systems design, MIS Quarterly 2 (2) (1978) 43–54.
[15] P.M. Bentler, D.G. Bonett, Significance tests and goodness of fit in the analysis of covariance structures, Psychological Bulletin 88 (1980) 588–606.
[16] P.M. Blau, Exchange and Power in Social Life, John Wiley and Sons, New York, 1964.
[17] M. Bobic, E. Davis, R. Cunningham, The Kirton adaption–innovation inventory—validity issues, practical questions, Review of Public Personnel Administration (Spring 1999) 18–31.
[18] L.J. Bourgeois III, K.M. Eisenhardt, Strategic decision process in high velocity environments: four cases in the microcomputer industry, Management Science 34 (7) (1988) 816–835.
[19] M.W. Browne, R. Cudeck, Alternative ways of assessing model fit, Sociological Methods and Research 21 (2) (1992) 230–258.
[20] E.H. Buttner, N. Gryskiewicz, Entrepreneurs' problem-solving styles: an empirical study using the Kirton adaption/innovation theory, Journal of Small Business Management 31 (1) (1993) 22–31.
[21] M.A. Chilton, B.C. Hardgrave, D. Armstrong, Person–job cognitive style fit for software developers: the effect on strain and performance, Journal of Management Information Systems 22 (2) (2005) 193–226.
[22] R.G. Clapp, S.M. deCiantis, Adaption–innovation in large organizations: does cognitive style characterize actual behavior of employees at work? An exploratory study, Psychological Reports 65 (1989) 503–513.
[23] D.R. Compeau, C.A. Higgins, Computer self-efficacy: development of a measure and initial test, MIS Quarterly 19 (2) (1995) 189–211.
[24] D. Compeau, C.A. Higgins, S. Huff, Social cognitive theory and individual reactions to computing technology: a longitudinal study, MIS Quarterly 23 (2) (1999) 145–158.
[25] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, MIS Quarterly 13 (3) (1989) 319–339.
[26] F.D. Davis, User acceptance of information technology: system characteristics, user perceptions and behavioral impacts, International Journal of Man–Machine Studies 38 (3) (1993) 475–487.
[27] F.D. Davis, R.P. Bagozzi, P.R. Warshaw, User acceptance of computer technology: a comparison of two theoretical models, Management Science 35 (1989) 982–1002.
[28] F.D. Davis, R.P. Bagozzi, P.R. Warshaw, Extrinsic and intrinsic motivation to use computers in the workplace, Journal of Applied Social Psychology 22 (14) (1992) 1111–1132.
[29] G.W. Dickson, G. DeSanctis, D.J. McBride, Understanding the effectiveness of computer graphics for decision support: a cumulative experimental approach, Communications of the ACM 29 (1986) 40–47.
[30] M. Fishbein, I. Ajzen, Belief, Attitude, Intention and Behavior: an Introduction to Theory and Research, Addison-Wesley, Reading, MA, 1975.
[31] J. Fulk, C.W. Steinfield, J. Schmitz, J.G. Power, A social information processing model of media use in organizations, Communications Research 14 (1987) 529–552.
[32] G.I. Green, C.T. Hughes, Effects of decision support systems training and cognitive style on decision process attributes, Journal of Management Information Systems 3 (2) (1986) 83–94.
[33] J.F. Hair, R.E. Anderson, R.L. Tatham, W.C. Black, Multivariate Data Analysis, Prentice Hall, Upper Saddle River, NJ, 1998.
[34] A.W. Harrison, R.K. Rainer Jr., The influence of individual differences on skill in end-user computing, Journal of Management Information Systems 9 (1) (1992) 93–111.
[35] J. Hartwick, H. Barki, Explaining the role of user participation in information system use, Management Science 40 (1994) 440–465.
[36] D. Havelka, Predicting software self-efficacy among business students: a preliminary assessment, Journal of Information Systems Education 14 (2) (2003) 145–152.
[37] G.P. Huber, Cognitive style as a basis for MIS and DSS design: much ado about nothing? Management Science 29 (5) (1983) 567–579.
[38] M. Igbaria, End-user computing effectiveness: a structural equation model, Omega 18 (6) (1990) 637–652.
[39] L.R. James, S.A. Mulaik, J.M. Brett, Causal Analysis: Assumptions, Models, and Data, Sage Publications, Beverly Hills, CA, 1982.
[40] K. Joshi, K. Kuhn, Gender differences in IS career choice: examine the role of attitudes and social norms in selecting IS profession, Proceedings of the 2001 ACM SIGCPR Conference on Computer Personnel Research, San Diego, CA, 2001, pp. 121–124.
[41] Carl G. Jung, Psychological Types, or the Psychology of Individuation, Harcourt Brace, New York, 1946.
[42] H.C. Kelman, Compliance, identification, and internalization: three processes of attitude change, Journal of Conflict Resolution 2 (1958) 51–60.
[43] C.A. Kiesler, S.B. Kiesler, Conformity, Addison-Wesley, Reading, MA, 1969.

[44] M.J. Kirton, Adaptors and innovators: a description and a measure, Journal of Applied Psychology 61 (1976) 622–629.
[45] M.J. Kirton, Manual for Kirton Adaption–Innovation Inventory, National Foundation for Educational Research, London, 1977.
[46] M.J. Kirton, Adaptors and innovators: the way people approach problems, Planned Innovation 3 (1980) 51–54.
[47] M.J. Kirton, Adaptors and innovators: why new initiatives get blocked, Long Range Planning 17 (1984) 137–143;Hellriegel and Slocum, Eds., Companion to Organizational Behavior, West Publishing. M.D. Richards (Ed.), Readings in Management, South-Western Publishing Co., 1986
[48] A. Lee, Electronic mail as a medium for rich communication: an empirical investigation using hermeneutic interpretation, MIS Quarterly 18 (2) (1994) 143–157.
[49] Y. Lee, K.A. Kozar, K.R.T. Larsen, The technology acceptance model: past, present, and future, Communications of the AIS 12 (2003) 752–780.
[50] N.H. Leonard, R.W. Scholl, K.B. Kowalski, Information processing style and decision making, Journal of Organizational Behavior 20 (3) (1999) 407–420.
[51] W. Lewis, R. Agarwal, V. Sambamurthy, Sources of influence on beliefs about information technology use: an empirical study of knowledge workers, MIS Quarterly 27 (4) (2003) 657–678.
[52] H.C. Lucas, Why Information Systems Fail, Columbia University Press, New York, 1975.
[53] A. Majchrzak, J. Cotton, A longitudinal study of adjustment to technological change: from mass to computer-automated batch production, Journal of Occupational Psychology 61 (1988) 43–66.
[54] G.M. Marakas, M.Y. Yi, R.D. Johnson, The multilevel and multifaceted character of computer self-efficacy: toward clarification on the construct and an integrative framework for research, Information Systems Research 9 (2) (1998) 126–163.
[55] M.L. Markus, Toward a 'Critical Mass' theory of interactive media, in: J. Fulk, W. Steinfield (Eds.), Organizations and Communication Technology, Newbury Park, CA, Sage, 1990, pp. 491–511.
[56] K. Mathieson, Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior, Information Systems Research 2 (1991) 173–191.
[57] M.G. Morris, V. Venkatesh, Age differences in technology adoption decisions: implications for a changing workforce, Personnel Psychology 53 (2) (2000) 375–403.
[58] I.B. Myers, M.H. McCaulley, A Guide to the Development and Use of the Myers–Briggs Type Indicator, Consulting Psychologists Press, Palo Alto, CA, 1985.
[59] R.G. Netemeyer, M.W. Johnston, S. Burton, Analysis of role conflict and ambiguity in structured equations framework, Journal of Applied Psychology 75 (1990) 148–157.
[60] O.J. Ngwenyama, A.S. Lee, Communication richness in electronic mail: critical social theory and the contextuality of meaning, MIS Quarterly 21 (2) (1997) 145–168.
[61] J.C. Nunnally, I.H. Bernstein, Psychometric Theory, 3d ed. McGraw-Hill, New York, 1994.
[62] J. Pfeffer, Power in Organizations, Pitman, Marshfield, MA, 1981.
[63] J. Pfeffer, Organizations and Organization Theory, Ballinger Publishing Co., Cambridge, MA, 1982.
[64] M.S. Poole, G. DeSanctis, Understanding the use of group decisions support systems: the theory of adaptive structuration, in: J. Fulk, C. Steinfield (Eds.), Organizations and Communication Technology, Newbury Park, CA, Sage, 1990, pp. 173–191.
[65] N. Rajagopalan, A.M.A. Rasheed, D.K. Datta, Strategic decision processes: critical review and future directions, Journal of Management 19 (2) (1993) 349–384.
[66] E.M. Rogers, Diffusion of Innovations, 4th ed.The Free Press, New York, 1995.
[67] D.M. Schweiger, Measuring managers' minds: a critical reply to Robey and Taggart, Academy of Management Review 8 (1983) 143–151.
[68] Ellen A. Skinner, Perceived Control, Motivation, and Coping, Thousand Oaks, CA, Sage, 1995.
[69] S.R. Snitkin, W.R. King, Determinants of the effectiveness of personal decision support systems, Information and Management 10 (2) (1986) 83–89.
[70] R.W. Sperry, Lateral specialization in cerebral function in the surgically separated hemispheres, in: R.A. Schoonover (Ed.), The Psychophysiology of Thinking, Academic Press, New York, 1973, pp. 209–299.
[71] J. Stevens, Applied Multivariate Statistics for the Social Sciences, Lawrence Erlbaum Associates, Hillsdale, NJ, 1986.
[72] D. Straub, M. Limayem, E. Karahanna-Evaristo, Measuring system usage: implications for IS theory testing, Management Science 41 (8) (1995) 1328–1342.
[73] B. Szajna, Software evaluation and choice: predictive validation of the technology acceptance instrument, MIS Quarterly 18 (1994) 319–324.
[74] B. Szajna, Empirical evaluation of the revised technology acceptance model, Management Science 42 (1996) 85–92.
[75] S. Taylor, P.A. Todd, Assessing IT usage: the role of prior experience, MIS Quarterly 19 (4) (1995) 561–570.
[76] S. Taylor, P.A. Todd, Understanding information technology usage: a test of competing models, Information Systems Research 6 (1995) 144–176.
[77] P.S. Tolbert, P. Moen, Men's and women's definitions of 'good' jobs: similarities and differences by age and across time, Work and Occupations 25 (1998) 168–194.
[78] V. Venkatesh, Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model, Information Systems Research 11 (4) (2000) 342–365.
[79] V. Venkatesh, F.D. Davis, A model of the antecedents of perceived ease of use: development and test, Decision Sciences 27 (3) (1996) 451–481.
[80] V. Venkatesh, F.D. Davis, A theoretical extension of the technology acceptance model: four longitudinal studies, Management Science 46 (2) (2000) 186–204.
[81] V. Venkatesh, M.G. Morris, 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) (2000) 115–139.
[82] V. Venkatesh, M.G. Morris, G.B. Davis, F.D. Davis, User acceptance of information technology: toward a unified view, MIS Quarterly 27 (3) (2003) 425–478.
[83] J. Webster, J.J. Martocchio, Microcomputer playfulness: development of a measure with workplace implications, MIS Quarterly 16 (2) (1992) 201–266.
[84] G.M. Zinkhan, E.A. Joachimsthaler, T.C. Kinnear, Individual differences and marketing decision support system usage and satisfaction, Journal of Marketing Research 24 (2) (1987) 208–214.

[85] R.W. Zmud, Individual differences and MIS success: a review of the empirical literature, Management Science 25 (10) (1979) 966–979.

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