Behaviour & Information Technology
Vol. 28, No. 4, July–August 2009, 389–401

Taylor & Francis
Taylor & Francis Group

The intention–behaviour gap in technology usage: the moderating role of attitude strength

A. Bhattacherjee[a] and C. Sanford[b]*

[a]*Information Systems and Decision Sciences, University of South Florida, Tampa, FL, USA;* [b]*Department of MIS, College of Commerce, National Chengchi University, Taipei, Taiwan*

(*Final version received April 2008*)

Extant theories of information technology (IT) usage present users' behavioural intention as the primary predictor of their IT usage behaviour. However, empirical evidence reveals only a low-to-medium effect size for this association. We call this inconsistency the 'intention–behaviour gap', and argue that a clearer understanding of this gap requires a deeper theoretical examination of the conditions under which intentions may or may not influence behaviour. Drawing on recent attitude theoretic research in social psychology, we distinguish between two types of attitudes – strong *versus* weak – and suggest that the intention–behaviour association may hold for users with strong attitudes but is likely to be weaker for those with weak attitudes. Using the elaboration-likelihood model, we propose two dimensions of attitude strength relevant to the IT usage context – personal relevance and related expertise – and theorise them to moderate the intention–behaviour association in a positive manner. Results from a longitudinal field survey of document management system usage among governmental employees at L'viv City Hall, Ukraine support our theoretical hypotheses. Theoretical and practical implications of our findings are discussed.

Keywords: IT diffusion and adoption; user acceptance of IT; questionnaire surveys

1. Introduction

Intention-based models, such as the technology acceptance model (TAM) (Davis *et al*. 1989), the motivational model (Davis *et al*. 1992), and the unified theory of acceptance and usage of technology (UTAUT) (Venkatesh *et al*. 2003), have been at the heart of information technology (IT) acceptance and usage research for nearly two decades (see Venkatesh *et al*. 2003 for an extensive review). Researchers are interested in intention because of its predictive value (i.e. its ability to predict future behaviours), and have devoted extensive efforts in identifying the beliefs and affect that can shape intention. However, there is mounting empirical evidence that intention may not always influence behaviours as expected or may do so in an inconsistent manner. For instance, studying graduate business students' use of a word processing program, Davis *et al*. (1989) observed that intention explained only 40% of the variance in future usage. Similar studies conducted in student (e.g. Taylor and Todd 1995) and organisational settings (e.g. Venkatesh *et al*. 2003) have reported usage intention and perceived behavioural control to jointly explain about 34–36% of the variance in actual IT usage behaviour, suggesting a low-to-medium effect size of intention on usage behaviour. Why don't some people use IT when they express the intent to use it? We call this anomaly the 'intention–behaviour gap'. Understanding this gap and its causes is the central objective of this study.

The intention–behaviour gap can be defined as the degree of inconsistency between users' intention regarding a specific behaviour and their actual behaviour. This gap is not unique to IT usage research. A meta-analysis by Sheppard *et al*. (1988) found that correlations between human intentions and behaviours, in general, average about 0.58. This correlation may be high for some behaviours such as voting, where pre-election attitude[1] is observed to have a correlation of 0.92 with eventual voters' actual voting behaviour (Kelley and Mirer 1974), moderate for other behaviours such as organ donation, where people's attitude toward organ donation has a 0.58 correlation with their actual signing of a legal document authorising posthumous organ donation (Goodmonson and Glaudin 1971), or low for still other behaviours such as cheating, as evidenced from a 0.02 correlation between students' attitude toward cheating and overt cheating behaviour (Corey 1937). The intention–behaviour correlation for IT usage tends to fall in the low-to-medium range, which is indicative of a moderate to large intention–behaviour gap.

Understanding the intention–behaviour gap, its causes and effects is important for theoretical and practical reasons. Theoretically, understanding this gap can help us reconcile differential findings in the

*Corresponding author. Email: sanford.cc@gmail.com

ISSN 0144-929X print/ISSN 1362-3001 online

DOI: 10.1080/01449290802121230
http://www.informaworld.com

empirical literature regarding the strength of this association and re-evaluate our use of intention as a reasonable proxy for actual IT usage behaviours. Further, this understanding can also advance our extant knowledge base of IT usage by helping delineate the boundary conditions beyond which current intention-based theories are less helpful in predicting IT usage. From a practical standpoint, this gap may help explain why organisational intervention plans designed to promote IT use (e.g. IT training programs) are not equally successful in motivating IT usage across user populations. Further, understanding the underlying factors causing this gap may help managers design intervention plans to help bridge this gap or at least mitigate its potential effects.

What is the cause of this intention–behaviour gap? One potential explanation of the gap may lie in the 'social desirability' effect, where subjects (professional or student IT users) report favourable intentions because they do not wish to portray themselves at odds with the organisational manager championing the new system or the professor conducting that study. However, their intentions may not be followed up with actual behaviour, if they are truly opposed to or ambivalent toward IT usage. Although we test for this possibility in our empirical study, a more potent theoretical explanation of the intention–behaviour gap may be derived from recent developments in the 'attitude strength' concept in the social psychology literature (Krosnick *et al*. 1993, Krosnick and Petty 1995, Pomerantz *et al*. 1995, Holland *et al*. 2002). This line of research suggests that people with 'strong' attitudes demonstrate a stronger association between attitudes and behaviour, whereas those with 'weak' attitudes often have a weaker association. Some of the most significant events in history, such as the American civil rights movement and the fall of the Soviet Union, and even some of the most heinous ones, such as the bombing of abortion clinics by pro-life activists, were caused by people with strong attitudes. In contrast, the perpetuation of racial apartheid in South Africa before 1991, the tolerance of gender inequality in the workplace, and low voter turnout in many elections can be blamed on the weak attitudes of large populations of people. People with strong attitudes tend to actively participate in rallies, demonstrations and meetings to support their cause, whereas those with weak attitudes generally stay on the sidelines even if they are equally supportive of the cause. Because intention represents the conative dimension of attitude (Breckler 1984), this reasoning can be extended to explain the intention–behaviour gap. Just as people exhibit differential strengths in their voting, pro-choice or anti-war attitudes, rarely will they have equivalent strengths in their attitudes towards IT usage. Users with strong attitudes towards IT usage will accept a new IT enthusiastically, experiment with its use and invest time and effort in learning how to use it, whereas those with weak attitudes may initially accept the system but lack the commitment to using it over the long term and abandon usage if it appears to be too demanding, resulting in minimal or deficient use.

Despite a wealth of prior studies on user attitudes related to IT usage, to the best of our knowledge there has been no prior investigation of attitude strength in the literature. However, ignoring attitude strength (i.e. treating subjects with diverse attitude strengths as equivalent) may mask or confound the effect of, or lack thereof, user attitudes or intentions on their actual usage behaviours. This study proposes a theoretical model that captures variances in attitude strength across a user population and provides a better prediction of IT usage behaviours than that accounted for by extant intention-based theories. Further, because attitude strength 'has been more of a vague metaphor than a formally defined social scientific construct' (Krosnick and Petty 1995, p. 2), this study also provides a dimensionalisation and operationalisation of attitude strength tailored to the specific context of IT usage.

In light of the abovementioned motivations, the specific research questions of interest to this study are as follows: (1) how large is the intention–behaviour gap in the context of IT usage, (2) how does attitude strength influence IT usage, if at all, and (3) how can we measure attitude strength in the IT usage context? We attempted to answer these questions using the deductive approach of scientific inquiry, by drawing upon attitude strength research in social psychology and the elaboration likelihood model (ELM) (Petty and Cacioppo 1986) to identify key dimensions of attitude strength and theoretically link these dimensions to user behaviour. The hypothesised associations were then empirically tested using a field survey of document management system (DMS) usage among governmental employees at an Eastern European municipal agency. Results of the analysis demonstrated that: (1) the intention–behaviour gap is moderate to large for IT usage, (2) attitude strength indeed moderates the effect of user intentions on their IT usage behaviour and (3) attitude strength in the IT usage context can be captured using personal relevance and related knowledge dimensions.

The rest of the article proceeds as follows. The next section presents prior research and theoretical background linking attitude strength to the intention–behaviour association. Research hypotheses developed from this theoretical analysis are empirically tested in the third section using data collected from a field survey of DMS usage among administrative and staff personnel at L'viv City Hall in Ukraine. The final

section discusses the study's limitations, its findings and implications for future IS research and practice.

2. Theory and research model

2.1. Attitude strength

What is attitude strength and how is it different from the attitude construct frequently mentioned in the IT usage literature? Attitude is defined in the social psychology literature as a relatively enduring evaluation of a given object or behaviour held by individuals (Eagly and Chaiken 1993). This evaluation may include people's beliefs about the object (cognition), feelings towards the object (affect) and intentions regarding that object (conation), which tend to be positively correlated (Breckler 1984). Note that this tripartite conceptualisation of attitude, consisting of beliefs, feelings and intention components, is conceptually a little different from the way attitude is viewed in much of the prior IT usage research, as solely an affect that is distinct from but related to beliefs (e.g. perceived usefulness) and intentions. Irrespective of how attitudes are conceptualised, both the social psychology (e.g. Krosnick and Petty 1995) and IT usage (e.g. Davis *et al*. 1989) literatures assert that beliefs and affect influence one's intentions, which in turn, influences subsequent user behaviour. In other words, intention reflects the outcome or the final evaluation of users' attitudinal processes that are related to IT usage, which in turn should be positively related to their actual usage behaviour.

The three components of attitude (beliefs, affect and intention) are typically conceptualised and measured along a bipolar continuum ranging from 'negative/unfavourable/bad' to 'positive/favourable/good' or using Likert-scaled items anchored between 'strongly disagree' and 'strongly agree'. In other words, attitudes can be measured in terms of their valence (positive or negative) and extremity (1, 2 or 3 on seven-point scales). However, attitudes with equivalent valence and extremity may still differ in their underlying strength, as reflected in subjects' subsequent behaviour. For instance, two individuals responding identically to an attitude question (e.g. both answering +3 on a scale ranging from –3 to +3) may have equally high positive attitudes, yet one (the person with a strong +3 attitude) may behave more enthusiastically and proactively than the other (the person with a weak +3 attitude). Further, the former person is more likely to maintain their attitude over the long term than the latter person.

However, despite its intuitive appeal, 'attitude strength has generally not been defined with any precision and it does not appear to have any agreed-upon meaning for attitude researchers' (Raden 1985, p. 312). Although attitude is an evaluation, attitude strength does not appear to be a singular construct but rather a short-hand representation of an attitude's long-term stability and consequential nature (Krosnick *et al*. 1993). The attitude strength concept has been described in terms of a diverse set of dimensions focused on the attitude's stability and consequences, including intensity, certainty, importance, knowledge, accessibility, consistency, involvement, relevance, experience and others, as summarised in Table 1.

Following three empirical studies, Krosnick *et al*. (1993) found no consistent correlational structure among 10 different dimensions of attitude strength, suggesting that they cannot and should not be integrated into a unidimensional latent construct. They further noted that not all of these dimensions may be relevant for all attitude objects, and that our current understanding of these dimensions is based on studies of public attitudes toward controversial social and government policies, such as abortion, capital punishment and defence spending, which may differ for other contexts. Because IT usage represents an entirely different class of behaviours, a re-examination of the attitude strength dimensions is certainly warranted in our study.

The diverse and conflicting conceptualisations of attitude strength described earlier are also indicative of the shortcomings of prior psychology research in this area. The first problem is the lack of an underlying theory to guide the selection of attitude strength dimensions or understanding their specific effects on human behaviour. Lacking a guiding theory, these dimensions appear to have been chosen in an *ad hoc* and unsystematic manner, leading to confusion and proliferation of dimensions. Second, given that different dimensions of this construct has been suggested and tested across different behavioural contexts, it appears that attitude strength is a situated construct without an *ex ante* set of pre-defined dimensions that can be applied universally across all behavioural contexts, but whose dimensions are specific to the context under investigation. To strengthen the concept of attitude strength and examine its impact on IT usage behaviour in a meaningful manner, it is therefore important to: (1) ground this construct within a strong theory of human behaviour and (2) bound it within the specific context of IT usage. In the next sub-section, we employ the ELM as the theoretical basis for our choice of attitude strength dimensions as well as for explaining how these dimensions influence IT usage.

2.2. Elaboration likelihood model

The ELM is a dual-process theory rooted in the social psychology literature, that suggests that social

Table 1. Dimensions of attitude strength.

Dimension	Definition	Illustrative study
Intensity	Strength of emotional reaction provoked by the attitude object	Cantril (1946)
Certainty	Degree to which an individual is confident that their attitude towards an object is correct	Krosnick and Schuman (1988)
Importance	Extent to which an individual cares about and is personally invested in an attitude	Tourangeau *et al.* (1991)
Interest	Extent to which an individual is motivated to gather information about an attitude object	Kendall (1954)
Involvement	Degree to which one is personally involved and vested in the attitude object	Borgida and Howard-Pitney (1983)
Personal relevance	Degree to which one believes that an attitude object is salient to one's personal needs	Cialdini *et al.* (1976)
Knowledge	Amount of information about an object that accompanies one's attitude towards it in memory	Kanwar *et al.* (1990)
Accessibility	Strength of the object-evaluation link in memory, measured by the time taken by the subject to report their attitude	Fazio (1986)
Direct experience	Degree to which one has participated in behavioural activities related to an object	Regan and Fazio (1977)
Affective-cognitive consistency	Match between one's feelings about an object and one's beliefs about its attributes	Rosenberg (1956)
Need for commitment	Intrinsic motivation to engage in effortful cognitive endeavours	Haughtvedt and Petty (1992)
Latitudes of rejection	Size of the region between one's pro and con attitude perception that one finds objectionable	Sherif *et al.* (1965)
Latitude of noncommitment	Size of the region between one's pro and con attitude perception that one finds neither objectionable nor acceptable	Sherif *et al.* (1965)

judgements are not always based on effortful processing of all pertinent information that is related to the attitude object, but are sometimes based on a less effortful process of association or inferencing based on cues such as the quantity of or the source of information (Petty and Cacioppo 1986). For instance, people's attitudes toward new IT usage may be based on their detailed examination of several review reports about using that IT, or based on the person (e.g. an expert or a trusted source) who recommended its use. The former process, which requires careful scrutinisation of the quality and validity of arguments presented in review reports, is called the 'central-route' to attitude formation, whereas the second process, which requires a mere association with the information source, is called the 'peripheral route'. The act of effortful processing of arguments via the central route is termed 'elaboration' in the ELM. In addition, the theory also specifies the conditions under which one is likely to invoke the central or peripheral routes in forming their attitudes.

The ELM is relevant to our study of attitude strength because strong attitudes are often the result of the high-elaboration central route, whereas weak attitudes are generally associated with the low-elaboration peripheral route (Krosnick and Petty 1995). Note that the peripheral route does not imply that the resulting attitudes (beliefs, affect or intentions) will be of lesser magnitude or extremity. In fact, some people may exhibit extreme attitudes to issues related to religion or race, even though such attitudes were formed primarily based on the opinions of others (i.e. the peripheral route). The ELM suggests that the extent to which potential users thoughtfully elaborate their IT usage decision determines their attitude strength toward IT usage, irrespective of the magnitude or extremity of that attitude.

A necessary prerequisite of the elaboration process is that elaborating individuals must possess the motivation and ability to scrutinise the available information. Again, this requirement does not imply that motivation and ability are needed to form attitudes toward the target object. Lacking such motivation or ability, one can still form an attitude regarding the target object via the low-elaboration peripheral route. However, elaboration motivation and ability serve to distinguish between high and low elaboration users within a target population, and hence between those with strong and weak attitudes.

In a test of the elaboration hypothesis, Haughtvedt and Petty (1992) provided subjects with an advertisement describing an answering machine that resulted in equally favourable attitudes towards the product for people varying in their need for cognition (an individual difference variable reflecting the degree to

which one enjoys effortful thinking). Two days later, subjects with a high need for cognition had attitudes similar to those following the initial ad, but attitudes of the low need for cognition subjects had decayed (i.e. they lost their initial favourability toward the product). Because the need for cognition was a proxy for elaboration in this study, it follows that high elaboration people are likely to have stronger (persistent) attitudes compared with low elaboration people.

Elaboration motivation is commonly conceptualised in the ELM literature as subjects' personal relevance of the attitude object, and elaboration ability of their expertise regarding the attitude object (Petty and Cacioppo 1986). If potential users perceive a new IT as being relevant to their personal or work life, they are more motivated to use IT. For instance, users with complex personal financial portfolios have a natural proclivity toward financial management software such as Quicken that can help reduce their effort in tracking personal finances, relative to those who have no such need. Though necessary, motivation may alone be insufficient to cause people to elaborate their IT usage decisions. This is so because IT usage is generally a complex technical task that requires specialised skills and knowledge on the part of the user (Attewell 1992). For a new IT, because users are unlikely to have such expertise prior to using the target IT, their related expertise in similar and related IT may be a reasonable proxy for their expertise with the target IT. In our financial management example, users who have previously used spreadsheets or other financial management tools are more likely to transfer that expertise to using Quicken than those who have never used similar tools. Users with greater related expertise are therefore more likely to make a careful deliberation regarding their use of a new IT. It is noteworthy in this context that the personal relevance construct is similar to the importance and interest dimensions of attitude strength in Table 1, whereas related expertise is similar to the notion of direct experience and knowledge dimensions (Fazio and Zanna 1981, Krosnick *et al.* 1993). On the basis of the ELM, personal relevance and related expertise are the only two theoretically justified dimensions that appear to fit the description of attitude strength while also being salient to the IT usage context.

The ELM postulates that elaboration motivation and ability moderate the effect of user attitudes on their subsequent behaviours in a positive manner. Because elaboration motivation and ability are respectively captured via the personal relevance and related expertise constructs in the IT usage context and that user attitudes toward new IT usage culminate in their intentions regarding IT usage, we can expect personal relevance and related expertise to positively moderate the association between user intention regarding IT usage and actual IT usage behaviour. Additionally, based on prior IT usage models such as TAM (e.g. Davis *et al.* 1989), we know that user intention is positively related to IT usage, though as suggested earlier, this correlation appears to be low to moderate in IT usage contexts. In fact, the less predictive is intention of usage behaviour (i.e. the greater is the intention–behaviour gap), the greater is the expected strength of the moderating effects of the two attitude strength constructs: personal relevance and IT expertise. These expectations lead to the following three hypotheses:

H1: Users' intention regarding new IT usage is positively related to their IT usage behaviour.
H2: Users' personal relevance of new IT usage positively moderates the association between their intention and IT usage behaviour.
H3: Users' related expertise in similar IT positively moderates the association between their intention and IT usage behaviour.

These three hypotheses are pictorially illustrated in our research model in Figure 1. Although hypothesis H1 in this model is adapted from previous IT usage research, this model departs from prior research in its identification of the two attitude strength dimensions specific to the IT usage context and postulates their moderating effects on IT usage (Hypotheses H2 and H3). Further, because current users of an IT may continue using that system in a habitual manner irrespective of and without an effortful elaboration process, in order to control for the potential confounding effect of such habitual use, prior IT usage is included in our research model as a control variable.

3. Research methods

3.1. Empirical setting

Our hypothesised research model was empirically tested using a longitudinal field survey of

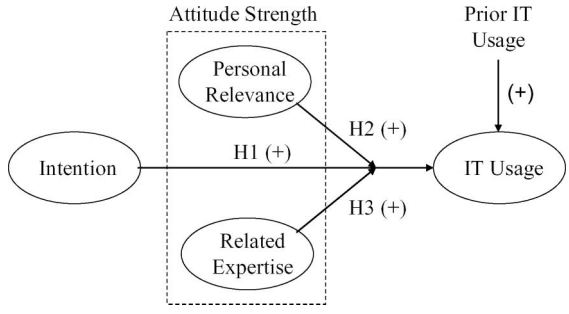


Figure 1. Research model.

administrative and staff personnel at L'viv City Hall in Ukraine regarding their usage of a DMS. This DMS was a custom application built using Lotus Notes with the goal of improving the city's ability to record, track and process construction permits, business licences, zoning clarifications and other requests filed by local citizens and businesses. The data was collected as part of a broader study on influence strategies, which is described in Bhattacherjee and Sanford (2006).

The system was designed to work as follows. Concerned citizens and businesses hand-delivered the service requests, claims and complaints to the city divisions or mailed them in to the city corresponding office. These incoming requests were entered and registered with the DMS by city personnel, catalogued with an electronic control card, assigned to an appropriate administrator such as a division head, administrator or secretariat, and sent to a staff member in the appropriate division for processing. Divisional staff electronically attached the investigational reports, their own comments and/or draft responses to the control card, and sent it to the administrator for approval. If needed, administrators send relevant documents to the Mayor's office or the city executive committee for further approval. Upon approval, the official response for each case was drafted by the assigned staff member and sent to the city correspondence office, where it was printed and mailed to the filing citizen.

Of approximately 8300 service requests received by the city per month, only about 20% of the requests (i.e. those mailed in to the city correspondence office) were entered into the DMS at the time of the study. The remaining 80%, received by divisional offices, were manually processed on paper, even though internal audits suggested that over 90% of such manual documents were not processed within 30 days, as required by city covenants, and that 30–40% of such documents were 'lost in the system'. Though system implementation was completed at the time of this study, very few city employees knew about the system, its purpose or how to use it. There was no explicit mandate, no incentives and no training to facilitate usage. Many city employees had never used computers before and were simply intimidated by the system. Further, electronic documents were not officially recognised by Ukrainian courts and other governmental agencies, providing a disincentive for electronic processing. Hence, DMS usage was practically non-existent among city employees at the time of this study.

To motivate employee use of the DMS and improve citizen service, the city Mayor commissioned one of this study's authors to train its divisional employees (both administrative and staff personnel) in using the DMS. From a total of 130 such personnel, 87 employees, including 30 administrators and 57 staff members, participated in the training programme in four groups. Participants received three 8-h days of lectures and hands-on training. The first 2 days were devoted to using the Windows operating system, word processing, spreadsheets, electronic mail and web browsing, to bring city employees up to speed with the latest computer technologies. The third day focused on Lotus Notes, its messaging, calendaring and collaboration features, document generation, cataloguing and tracking features, and how to use electronic control cards to move documents between city divisions. At the end of this training, subjects were administered a paper-based survey questionnaire that elicited their perceptions of personal relevance, related expertise and intention regarding DMS use. Three months later, subjects reported their extent of DMS usage using a second questionnaire. The two questionnaires were matched using a four-digit number self-selected by subjects, which was typically the last four digits of their home or cell phone number.

3.2. *Variable operationalisation*

The four constructs of interest to this study were behavioural intention, personal relevance, related expertise and IT usage (prior and current). Each construct was measured using multiple-item scales, adapted and extended from prior research and reworded to relate specifically to the current context of DMS usage.

Intention to use IT was measured using an adapted version of Taylor and Todd's (1995) three-item 'behavioural intention' scale, which examined subjects' intent to use DMS within the next month, in the near future, and for more of their job responsibilities. The IT usage and prior IT usage constructs were measured 3 months apart using a three-item scale adapted from the Thompson *et al.* (1991) 'IT utilisation' scale. These items asked subjects to indicate the number of times they currently use the system per week, the total number of specific DMS applications they currently use and the percentage of received customer requests that they currently process with the system. Though the usage items were self-reported, they required subjects to enter actual usage data instead of subjective perceptions. More accurate system-generated measures of IT usage were not available because L'viv City Hall had no policy or practice of tracking system usage data at the time of the study.

The related expertise scale was patterned after Sussman and Siegal's (2003) scale, using three items that asked subjects to self-rate their prior knowledge of electronic mail, word processing and computers on seven-point scales anchored between 'novice' and

'expert'. These domains were specifically chosen because DMS usage required creating online documents, storing them on computers and sharing them via email. These perceptual items were cross-validated with a single-item fill-in measure of number of years of prior computer experience, which was positively correlated to each of the three related expertise items. Lastly, job relevance was measured using two Likert-scaled items proposed and validated by Venkatesh and Davis (2000), which captured subjects' perceptions of the importance and relevance (appropriateness) of DMS use in their job. Empirical validation of these scales is described next.

4. Data analysis and results

Data analysis proceeded in three stages. First, we assessed the quality of our data sample and evaluated it for common biases and errors. The second stage involved assessment of the psychometric properties (construct validity and reliability) of our measurement scales. The third stage involved structural testing of our hypothesised model. The procedures and results of each stage are described later.

4.1. Assessment of data quality

Though several steps were incorporated in our research design to avoid common measurement errors, we performed additional *post hoc* analyses to ensure that our data sample was of acceptable quality. First, our final data sample consisted of 81 usable responses, from 28 administrators and 53 staff personnel, for an overall response rate of 62.3%. Non-response bias was not an issue, because a majority of the targeted population responded to our survey request, probably due to the overt support of the city Mayor. Additional comparison of means tests found that the respondent group did not differ significantly in age, years of formal education or years of work experience from the overall population of city employees, alleviating any remaining concerns of non-response bias.

Second, to avoid common method bias, the dependent and independent variables were measured using two separate survey questionnaires spaced 3 months apart. Such a longitudinal design was especially important because we wanted to control for prior IT usage for those users who may have had some experience with this system prior to this study. However, we also conducted Harmon's single factor test (Podaskoff and Organ 1986) to test for any residual common method bias that could still exist in our data sample. In this test, if a substantial amount of common method variance is present in the data sample, either a single factor will emerge from the factor analysis or one general factor will account for most covariance in the dependent and independent variables. An exploratory factor analysis (EFA) of all of our scale items revealed five factors explaining 92.84% of the variance in our study's constructs, with the first factor explaining 45.26% and the last factor explaining 6.49% of the total variance (see Table 2). This analysis suggested that our data sample was likely not contaminated by common method bias.

Third, social desirability bias was also a non-issue, because both of our surveys were paper-based and completely anonymous, linked by a four-digit code self-selected by subjects. Neither the researcher nor the city administration had the ability to link specific responses to subjects or *vice versa*, and subjects were repeatedly assured of that anonymity. Further, any social desirability bias was expected to influence the intention measures. An examination of the raw data found that each of our three intention items ranged from 1 to 7 (across the entire spread of the seven-point Likert scales), with means of 4.30, 4.31 and 4.06, respectively (about the midpoint of these scales). This fairly symmetric distribution of intention measures suggested the lack of social desirability bias in our data sample.

4.2. Measurement validation

Construct validity of the measurement scales was assessed in two ways: (1) a preliminary examination of EFA results conducted as part of the Harmon's test

Table 2. Exploratory factor analysis.

Scale items	Factor loadings*				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
PUSE1	−0.16	0.04	0.94	0.05	0.10
PUSE2	0.10	−0.04	0.97	−0.03	−0.12
PUSE3	0.04	0.05	0.93	0.01	−0.00
EXP1	0.14	0.93	−0.03	−0.07	−0.01
EXP2	−0.03	0.82	0.01	0.21	−0.13
EXP3	0.01	0.93	0.09	−0.06	0.06
REL1	*0.45*	−0.14	0.16	−0.09	0.63
REL2	0.06	−0.02	−0.06	0.11	0.91
INT1	0.14	−0.04	0.04	0.87	−0.06
INT2	0.23	−0.05	0.04	0.85	−0.08
INT3	−0.15	0.13	0.02	0.87	0.21
USE1	0.81	0.03	0.06	0.16	0.06
USE2	0.84	0.11	−0.02	0.09	0.08
USE3	0.79	0.20	−0.01	0.08	0.12
Eigenvalue	6.34	2.50	2.09	1.17	0.95
% of variance	45.26	17.82	14.92	8.35	6.49

PUSE, prior IT usage; EXP, related expertise; REL, personal relevance; INT, intention; USE, IT usage.
*Principal component analysis with oblimin rotation.

reported earlier and (2) confirmatory factor analysis (CFA) of the hypothesised scales. The initial EFA results (principal components analysis with oblimin rotation) found four significant factors with an eigenvalue greater than 1.0, and a fifth factor with a 0.95 eigenvalue very close to that figure. Each factor corresponded cleanly to items that belong to a common scale (see Table 2). All same factor loadings exceeded the norm of 0.60 to assure convergent validity of scale items, and all but one cross-factor loadings were less than the 0.30 value required for discriminant validity. The errant item (REL1) did not have a high loading on any other factor and was thus retained in the study, particularly because this scale (personal relevance) had only two items.

CFA analysis was performed via the partial least squares (PLS) approach, conducted using the PLS-Graph Version 3.0 software (Chin and Frye 1994). The variance-based PLS approach was preferred over covariance-based structural equation modelling approaches such as LISREL because PLS does not impose sample size restrictions and is distribution-free[2] (Chin *et al*. 2003). For CFA analysis, all measured items were specified as reflective indicators of their corresponding latent constructs, and each construct was allowed to covary freely with all other constructs. Raw data was used as input to the PLS program, and path significances were estimated using the bootstrapping re-sampling technique with 200 sub-samples. Results of this analysis are provided in Tables 3 and 4.

Convergent validity of scale items was assessed using three criteria suggested by Fornell and Larcker (1981): (1) all item factor loadings (λ) should be significant and exceed 0.70, (2) composite reliabilities (ρ_c) for each construct should exceed 0.80 and (3) average variance extracted (AVE) for each construct should exceed 0.50. As seen from Table 3, all CFA loadings were significant at $p < 0.05$ and exceeded 0.70, with a minimum loading of 0.89 for intention item INT3. Table 4 shows that composite reliabilities of all factors also exceeded the required minimum of 0.80, with the lowest value being 0.93 for the personal relevance construct. Further, the smallest AVE value among all five constructs in the CFA model was 0.84 for intention and related experience, which was greater than the desired minimum of 0.50. Hence, all three conditions for convergent validity were met.

Discriminant validity was assessed using Fornell and Larcker's (1981) criterion that the square root of AVE for each construct should exceed the correlations between that and all other constructs.[3] From the data in Table 4, we can see that the highest correlation between any pair of constructs in the CFA model was 0.67 (between personal relevance and IT usage). This figure was lower than the lowest square root of AVE among all constructs, which was 0.92 for intention. Hence, the discriminant validity criterion was also met for our data sample.

Table 3. Confirmatory factor analysis results.

Scale item[a]	Item mean	Item S.D	Item loading	*T*-statistic
PUSE1	0.49	0.91	0.93[a]	38.24
PUSE2	0.47	0.82	0.96[a]	116.03
PUSE3	0.44	0.79	0.96[a]	170.83
EXP1	4.40	1.54	0.93[b]	2.57
EXP2	4.16	1.61	0.91[b]	2.53
EXP3	4.20	1.58	0.92[b]	2.55
REL1	4.41	1.55	0.94[c]	2.12
REL2	4.38	1.60	0.93[c]	2.10
INT1	4.30	1.48	0.92[a]	26.61
INT2	4.31	1.35	0.94[a]	47.90
INT3	4.06	1.34	0.89[a]	21.57
USE1	4.12	1.65	0.95[a]	86.54
USE2	4.09	1.81	0.96[a]	116.62
USE3	3.96	1.73	0.96[a]	124.93

PUSE, prior IT usage; EXP, related expertise; REL, personal relevance; INT, intention; USE, IT usage.
Significance of factor loadings: [a]$p < 0.001$, [b]$p < 0.01$, [c]$p < 0.05$.

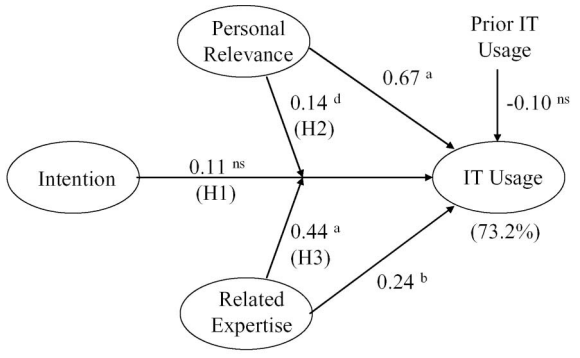
Table 4. Scale properties.

	Inter-construct correlations*						
Construct	ρ_c	AVE	PUSE	EXP	REL	INT	USE
PUSE	0.96	0.90	0.95				
EXP	0.94	0.84	0.29	0.92			
REL	0.93	0.86	0.19	−0.03	0.93		
INT	0.94	0.84	0.30	0.42	0.39	0.92	
USE	0.97	0.91	0.27	0.44	0.67	0.63	0.96

PUSE, prior IT usage; EXP, related expertise; REL, personal relevance; INT, intention; USE, IT usage.
*Diagonal elements (in italics) represent square root of AVE for that construct.

4.3. *Hypotheses testing*

The next step in our data analysis was to examine our proposed research model (Figure 1) as a whole and also the individual paths hypothesised in this model. This analysis was also conducted using PLS. Along with the associations specified in our research model (Figure 1), we added two new paths from personal relevance and related expertise to IT usage in our structural model (see Figure 2) to statistically isolate our hypothesised moderating effects from corresponding main effects of the moderating constructs. Even though these new paths were not hypothesised effects, they were needed for regression purposes, because without them, path coefficients of the moderating effects would be non-interpretable and inaccurate.



Path significance: [a] p<0.001, [b] p<0.01, [c] p<0.05, [d] p<0.10, [ns] p>0.10

Figure 2. PLS analysis of research model.

The first step in our model testing was to compare the explanatory power of our hypothesised model with that of a baseline model, which excluded personal relevance and related expertise, along with all of their direct and moderating effects. This baseline model explained 33.4% of the variance in IT usage, with intention having a standardised path coefficient of 0.57 on the dependent variable. This R^2 value is similar to that reported in previous IT usage studies (e.g. Davis *et al.* 1989, Venkatesh *et al.* 2003). However, the research model explained 73.2% of the usage variance (see Figure 2), representing an 120% increase in explanatory power over the baseline model. A nested model F-test[4] found this increase in R^2 value from the baseline model to the research model to be significant at $p < 0.001$ after adjusting for degrees of freedom, suggesting that our hypothesised model indeed provided a superior explanation of users' actual IT usage behaviours.

It is noteworthy that though intention explained 33.4% of the IT usage variance in the baseline model, similar to many previous studies (e.g. Davis *et al.* 1989), this explanation dropped to about 1% in the research model, when controlled for the moderating effects of personal relevance and related expertise. This suggests that the intention–behaviour association, even when it seems substantive and significant on first sight, may be less so if attitude strength effects are not taken into consideration.

We next proceeded to examining individual path significances and standardised path coefficients for each hypothesised path in our research model. Though the effect of intention on IT usage was significant in the baseline model ($\beta = 0.57$; $t = 7.22$; $p < 0.001$), this effect became non-significant in our research model ($\beta = 0.11$; $t = 0.60$; $p > 0.05$), once the moderating effects of personal relevance and related expertise were added to the model (see Figure 2), thereby failing to support hypothesis H1. The moderating effect of personal relevance on the intention–usage association (Hypothesis H2) was weakly positive and non-significant at $p < 0.05$ ($\beta = 0.14$; $t = 1.22$; $p > 0.05$), but marginally significant at $p < 0.10$. The direct effect of personal relevance on IT usage was, however, strongly significant ($\beta = 0.67$; $t = 4.27$; $p < 0.001$). In contrast, related expertise had a strong positive moderating effect on the intention–usage association (Hypothesis H3) ($\beta = 0.44$; $t = 3.77$; $p < 0.001$) and its direct effect on IT usage was also significant ($\beta = 0.24$; $t = 2.64$; $p < 0.01$). Hence, one of the two moderating effects of attitude strength dimensions was strongly validated, whereas the other was marginally validated. Our inability to provide strong validation for hypothesis H2 can be partially attributed to our small sample size of 87, which hurt the statistical power of our analysis, i.e. our ability to detect marginally significant effects. Note that in the interest of clarity and disclosure, we show the direct effects of personal relevance and related expertise in Figure 2, even though these were non-hypothesised effects and should not be interpreted without their corresponding moderating effects. Implications of these findings are discussed in the next section.

5. Discussions and conclusions

5.1. *Key findings*

This research started with the goal of addressing three research questions: (1) how large is the intention–behaviour gap in the context of IT usage, (2) how does attitude strength influence IT usage, if at all, and (3) how can we measure attitude strength in the IT usage context? On the basis of an empirical analysis of longitudinal survey data of DMS usage by governmental employees at L'viv City Hall, our findings confirm that there is indeed a significant gap between users' intention to use IT and their actual usage behaviour. We also find that the intention–behaviour association in IT usage context can be somewhat misleading if relevant moderating constructs are not taken into account. For instance, this association explained 33.4% of the usage variance in our baseline model without correcting for the moderating effects of attitude strength, which dropped to 1% when attitude strength effects were taken into account.

Following a detailed examination of the attitude strength literature and theoretical analysis using the ELM (Petty and Cacioppo 1986), we hypothesised that attitude strength could be adequately represented in the IT usage context using the personal relevance and related expertise dimensions, and that each of these dimensions would independently moderate the

intention–behaviour association in a positive direction. Both of the above expectations were validated in our empirical analysis. In fact, both moderating effects were positive and stronger ($\beta = 0.14$ for personal relevance and 0.44 for related expertise) than the intention–behaviour association ($\beta = 0.11$). In other words, we demonstrated that the intention–behaviour association (inverse of the intention–behaviour gap) is larger for users with stronger attitudes and smaller for those with weaker attitudes.

Several other findings from our study are intriguing. Personal relevance ($\beta = 0.67$) and related expertise ($\beta = 0.24$) had significant and positive direct effects on IT usage, in addition to their positive moderating effects, suggesting that these attitude strength constructs may potentially serve as independent predictors of IT usage behaviours. The size of these main effects relative to that of the intention constructs is evidence of their potential importance in the IT usage context. Though it was not certainly our intent to explore additional predictors of IT usage, we may have inadvertently uncovered two such predictors in personal relevance and related expertise. Of course, additional theoretical and empirical analysis is required to confirm the reasonableness and validity of these constructs as predictors of IT usage and the nomological paths via which they may influence usage.

We observed that the moderating effect of related expertise was stronger and more significant than its direct effect on IT usage. The reverse was the case for personal relevance, where the direct effect was stronger than the moderating effect. It therefore appears that the effect of personal relevance on IT usage behaviour may be more direct than moderating in nature, whereas that of related expertise is more moderating than direct. One potential explanation for this pattern of effects is that personal relevance enhances the utility and instrumentality of IT usage among its potential users, or in other words, personal relevance may be one component of and strongly correlated with users' perceived usefulness or expected benefits from system usage. Hence, the large direct effect of personal relevance may be reinforcing the role of perceived usefulness as a dominant predictor of IT usage, as known from TAM, UTAUT, and other theories of IT usage (Davis *et al.* 1989). However, in view of the uncertain theoretical support for the direct effect of personal relevance, we urge readers to interpret the above finding with caution.

Recall that personal relevance represents elaboration motivation in the ELM, whereas related expertise captures elaboration ability. Though current theories such as TAM have examined at depth the role of motivations (e.g. perceived usefulness) in driving IT usage behaviour, there appears to be little consideration of abilities such as related expertise. Our study demonstrates that related expertise influences usage behaviour in a moderating manner more than in a direct manner. From a practical standpoint, this appears reasonable because users with high intentions to use an IT may be unable to translate those intentions into actual usage behaviours if they are incapable of using the IT. Our study highlights the crucial role that ability can play in shaping actual usage behaviours, by moderating the effects of intention. Including the moderating effect of user abilities can therefore be a plausible and reasonable way of extending prior IT usage theories in order to derive a more complete and accurate explanation of user behaviours.

5.2. *Limitations of the study*

Our study's findings should be interpreted in light of its empirical limitations. The first limitation is related to our measurement of the IT usage construct. We used subjects' self-reported frequency and extent of usage over the last one week (to minimise recall bias) when measuring our dependent variable. Though this measure is more informative and likely more accurate than Likert-scaled measures of perceived usage, it is certainly not as accurate, unbiased or objective as usage data collected from system logs. Objective usage data was not available because the City of L'viv had no policy or procedure of tracking or recording such data at the time of our study. Further, such self-reported measures of IT usage have been employed elsewhere in IT usage research (e.g. Thompson *et al.* 1991), and hence may be considered acceptable.

Second, one may question whether personal relevance and related expertise adequately represent attitude strength across different IT usage contexts. We identified these two dimensions following a thorough investigation of different attitude strength dimensions posited in the social psychology literature and a theoretical examination (based on the ELM) of the causal process by which attitude strength influences behaviours. It is, however, possible that there may be other attitude strength dimensions pertinent to IT usage; identifying and testing those dimensions are potential opportunities for future research.

Third, there may be presumably other factors, such as facilitating conditions that influence IT usage (Venkatesh *et al.* 2003) and were not explicitly controlled for in this study. However, many of those factors are implicitly controlled in our research design and within prior IT usage as the control variable. For instance, facilitating conditions typically refer to user access to the target IT, which did not change at L'viv City Hall across the 3-month duration of this study,

even though many users were not aware of the DMS or knew how to use it. Hence, our inclusion of prior IT usage indirectly controlled for the potential effects of facilitating conditions and did not pose a serious threat to the internal validity of our results.

5.3. Implications for research

This study is likely the first to (1) examine the intention–behaviour gap within the context of IT usage, (2) introduce the notion of attitude strength as a means of bridging this gap and (3) describe the nomological paths via which attitude strength dimensions influence usage behaviours. Given the low-to-medium effect of intention on IT usage behaviour, there is clearly a need to go beyond extant theories of usage and explore potential reasons contributing to such low effect. In the end, intentions are of little value (and IT usage research is futile) if they do not translate into usage behaviours.

Our study theorised personal relevance and related expertise as two dimensions of attitude strength salient to IT usage, linked them to usage behaviour, and empirically validated the hypothesised associations. Although we do not claim that these are the only two relevant dimensions of attitude strength, this is a reasonable starting point in our attempt to understand and hopefully bridge this intention–behaviour gap. We urge future researchers to examine the generalisability of our findings to other IT usage contexts, as well as explore in greater depth the dimensional structure of attitude strength as applicable to IT usage.

Our findings also have some additional implications for mainstream IT usage research. Given the inherent difficulties of collecting actual IT usage data, many empirical studies tend to use intention as a proxy of actual usage behaviour. Our findings demonstrate that this approach may be acceptable for users with strong attitudes, but is clearly inappropriate for those with weak attitudes. In other words, studies that employ intention as a proxy of usage should also measure attitude strength and demonstrate that their subject sample is characterised by strong attitudes, in order to justify their omission of usage measures. Alternatively, IT usage researchers should endeavour to collect at least self-reported measures of usage as done in this study.

From a research design perspective, our two dimensions of attitude strength, namely personal relevance and related expertise, gave us some insight regarding our choice of empirical settings for conducting IT usage research. In other words, we should choose settings where our target subjects are likely to have relatively high levels of personal relevance and related expertise in order to meaningfully interpret their intention and usage behaviours. For instance, undergraduate students' use of web browsers may be a reasonable empirical study; however, their use of decision support systems (e.g. Jarvenpaa *et al.* 1985) may not be appropriate if these subjects do not have the related expertise to evaluate such systems adequately or if they do not see such systems as being relevant to their work or personal lives.

Finally, our study serves to delineate the theoretical boundaries beyond which contemporary intention-based models of IT usage, such as TAM and UTAUT, are less useful in predicting IT usage. Intention is a good measure of IT usage behaviour in such models only if the user population is expected to have a strong attitude regarding the target behaviour. Conversely, if users' attitudes towards using a given IT is weak, intention-based explanations of IT usage behaviours may be inaccurate and non-interpretable. Under the latter circumstances, alternative theories of IT usage, tailored to weak attitude settings, may be needed.

5.4. Implications for practice

The findings of this study also have interesting implications for IT practitioners. First, change management efforts in organisations designed to enhance workers' intentions regarding IT usage (e.g. user education and training) may be futile if workers possess weak attitudes toward such usage. Hence, organisational managers should not only understand the attitude strength concept, but also attempt to measure it accurately to diagnose any potentially idiosyncratic outcomes of their change initiatives. We provided validated measures of personal relevance and related expertise that can help practitioners to that end.

Second, understanding attitude strength is not only important for its diagnostic value, but also for tailoring change management initiatives to the specific needs of user groups. Strong attitudes are undoubtedly required to enact organisational or social change, and to translate user intentions into effective usage behaviours. However, strategies geared toward users with strong attitudes may have minimal or no effect on those with weak attitudes, if the latter group does not understand the personal relevance of using the new IT or lack the related expertise to use it effectively. Under such circumstances, it is advisable to separate users with strong and weak attitudes and pursue separate intervention plans for each group.

In particular, change management programmes for users with weak attitudes should first attempt to build users' attitude strength than attitudes toward the target technology. This is so because user attitudes, which culminate in intentions, are of little value in motivating user behaviour if users did not have strong attitudes to

begin with. Efforts to build attitude strength should focus on educating users on the relevance of new IT for their personal or work activities, and also on building their expertise in supporting tools and technologies such as databases, emails and workflow systems. Building such expertise is undoubtedly a long-term process and should be planned and budgeted for accordingly.

Finally, the change in IT usage means in our subject sample from the start to the end of our study (0.47 for prior IT usage; 4.06 for IT usage 3 months later) should give hope to managers that changes in IT usage behaviour among organisational users are indeed possible. But organisational managers should be keenly aware of roadblocks, such as weak attitudes, that may lie in the way and make conscientious efforts to overcome these barriers, if they are to achieve implementation success.

In conclusion, this study introduced the concept of attitude strength to the IT usage literature as a potential means of explaining why intention–behaviour association is strong among some users but not among others. The goal of IT managers in organisations should be to build strong attitudes towards IT use, and this cannot be accomplished until managers understand what strong attitudes are and how they are formed. Further, this study clarifies the boundary conditions of current intention-based models of IT usage, and suggests some ways in which these models can be expanded. We hope that this study will motivate future researchers to examine this interesting but unexplored area of IT usage research.

Notes

1. Attitude is viewed in the social psychology literature as a generic construct consisting of three correlated dimensions: beliefs, affect, and intention (see Breckler 1984).
2. LISREL requires a minimum sample size of 5–10 times the number of scale items and requires the underlying data to have a multivariate normal distribution, which were not met in our relatively small sample size.
3. This is supposedly a stronger test of discriminant validity than pair-wise comparison of χ^2 values of unconstrained and constrained CFA models often reported in the literature (Fornell and Larcker 1981).
4. Computed as: $F = (R^2_{\text{full model}} - R^2\text{baseline model})/[(1 - R^2_{\text{full model}})/df_{\text{difference}}]$.

References

Attewell, P., 1992. Technology diffusion and organizational learning: the case of business computing. *Organization Science*, 3, 1–19.

Bhattacherjee, A. and Sanford, C., 2006. Influence strategies for information technology usage: an elaboration-likelihood model. *MIS Quarterly*, 30, 805–825.

Borgida, E. and Howard-Pitney, B., 1983. Personal involvement and the robustness of perceptual salience effects. *Journal of Personality and Social Psychology*, 45, 560–570.

Breckler, S.J., 1984. Empirical validation of affect, behaviour, and cognition as distinct components of attitude. *Journal of Personality and Social Psychology*, 47, 1191–1205.

Cantril, H., 1946. The intensity of an attitude. *Journal of Abnormal and Social Psychology*, 41, 1–12.

Corey, S.M., 1937. Professed attitudes and actual behaviour. *Journal of Educational Psychology*, 28, 271–280.

Chin, W.W. and Frye, T.A., 1994. *PLS-graph user's manual*. Alberta, Canada: University of Calgary, Faculty of Management.

Chin, W.W., Marcolin, B., and Newsted, B.P., 2003. A partial least squares latent variable modeling approach for measuring interaction effects: results from a monte carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research*, 14, 189–217.

Cialdini, R.B., *et al*., 1976. Elastic shifts of opinion: determinants of direction and durability. *Journal of Personality and Social Psychology*, 34, 663–672.

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

Davis, FD., Bagozzi, R.P., and Warshaw, P.R., 1992. Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22, 1111–1132.

Eagly, A.H. and Chaiken, S., 1993. *The psychology of attitudes*. Forth Worth: Harcourt Brace Jovanovich.

Fazio, R.H., 1986. How do attitudes guide behaviour. *In*: A.R. Pratkanis, S.J. Breckler, and E.T. Higgins, eds. *The handbook of motivation and cognition: foundations of social behavior*. New York: Guilford Press.

Fazio, R.H. and Zanna, M.P., 1981. Direct experience and attitude-behaviour consistency. *Advances in Experimental Social Psychology*, 14, 161–202.

Fornell, C. and Larcker, D.F., 1981. Evaluating structural equations with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39–50.

Goodmonson, C. and Glaudin, V., 1971. The relationship of commitment-free behavior and commitment behavior: a study of attitude toward organ transplantation. *Journal of Social Issues*, 27, 171–183.

Haughtvedt, C.P. and Petty, R.E., 1992. Personality and persuasion: need for cognition moderates the persistence and resistance of attitude changes. *Journal of Personality and Social Psychology*, 63, 308–319.

Holland, R.W., Verplanken, B., and Van Knippenberg, A., 2002. On the nature of attitude behavior relations: the strong guide, the weak follow. *European Journal of Social Psychology*, 32, 869–876.

Jarvenpaa, S.L., Dickson, G.W., and Desanctis, G., 1985. Methodological issues in experimental is research: experiences and recommendations. *MIS Quarterly*, 9, 141–156.

Kanwar, R., Grund, L., and Olson, J.C., 1990. When do measures of knowledge measure what we think they are measuring? *Journal of Consumer Research*, 17, 603–608.

Kelley, S. and Mirer, T.W., 1974. The simple act of voting. *American Political Science Review*, 68, 572–591.

Kendall, P., 1954. *Conflict and mood: factors affecting the stability of response*. Glencoe, IL: Free Press.

Krosnick, J.A., *et al*., 1993. Attitude strength: one construct of many related constructs? *Journal of Personality and Social Psychology*, 65, 1132–1151.

Krosnick, J.A. and Petty, R.E., 1995. Attitude strength: an overview. *In*: R.E. Petty and J.A. Krosnick, eds. *Attitude strength: antecedents and consequences*. Mahwah, NJ: Lawrence Erlbaum Associates, 1–24.

Krosnick, J.A. and Schuman, H., 1988. Attitude intensity, importance, certainty, and susceptibility to response effects. *Journal of Personality and Social Psychology*, 54, 940–952.

Petty, R.E. and Cacioppo, J.T., 1986. *Communication and persuasion: central and peripheral routes to attitude change*. New York: Springer-Verlag.

Podaskoff, P.M. and Organ, D.W., 1986. Self-reports in organizational research: problems and prospects. *Journal of Management*, 12, 531–544.

Pomerantz, E.M., Chaiken, S., and Tordesillas, R.S., 1995. Attitude strength and resistance processes. *Journal of Personality and Social Psychology*, 27, 332–344.

Raden, D., 1985. Strength-related attitude dimensions. *Social Psychological Quarterly*, 48, 312–330.

Regan, D.T. and Fazio, R.H., 1977. On the consistency between attitudes and behavior: look to the method of attitude formation. *Journal of Experimental Social Psychology*, 13, 28–45.

Rosenberg, M., 1956. Cognitive structure and attitudinal affect. *Journal of Abnormal and Social Psychology*, 53, 367–372.

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

Sherif, C.W., Sherif, M., and Nebergall, R.E., 1965. *Attitude and attitude change*. Philadelphia: Saunders Pub.

Sussman, S.W. and Siegel, W.S., 2003. Informational influence in organizations: an integrated approach to knowledge adoption. *Information Systems Research*, 14, 47–65.

Taylor, S. and Todd, P.A., 1995. Understanding information technology usage: a test of competing models. *Information Systems Research*, 6, 144–176.

Thompson, R.L., Higgins, C.A., and Howell, J.M., 1991. Personal computing: toward a conceptual model of utilization. *MIS Quarterly*, 15, 125–143.

Tourangeau, R., Rasinski, K.A., and D'Andrade, R., 1991. Attitude structure and belief accessibility. *Journal of Experimental Social Psychology*, 27, 48–75.

Venkatesh, V. and Davis, F.D., 2000. A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, 46, 186–205.

Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D., 2003. User acceptance of information technology: toward a unifying view. *MIS Quarterly*, 27, 425–478.

Appendix 1. Measurement items

Intention:

INT1. I intend to use DMS on my job within the next one month.
INT2. I intend to use DMS on my job in the near future.
INT3. I intend to use DMS for more of my job responsibilities.

Personal Relevance:

REL1. Using DMS is important for my job.
REL2. Using DMS is relevant (appropriate) for my job.

Related Expertise:

How knowledgeable are you on using the following technologies:
EXP1. Electronic mail (novice ... expert).
EXP2. Word processing (novice ... expert).
EXP3. Computers (novice ... expert).

IT Usage (measured 3 months later):

USE1. Number of times you currently use the DMS per week: 0 | 1–3 | 4–6 | 7–9 | 10–12 | Other : ____
USE2. Number of DMS applications that you currently use: 0 | 1 | 2 | 3 | 4 | 5 | Other (specify): ____
USE3. Percentage of customer requests that you currently process using the DMS:
0% | 1–10% | 11–20% | 21–30% | 31–40% | Other: _____

Prior IT Usage:

Measured using a scale identical to IT usage, but 3 months earlier.