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**INFLUENCE PROCESSES FOR INFORMATION TECHNOLOGY ACCEPTANCE:  
AN ELABORATION LIKELIHOOD MODEL**

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# **INFLUENCE PROCESSES FOR INFORMATION TECHNOLOGY ACCEPTANCE: AN ELABORATION LIKELIHOOD MODEL**

## **ABSTRACT**

This study examines how informational influence processes shape information technology (IT) acceptance among users, how such influence effects vary across a user population, and the persistence of these effects over time. Drawing on the elaboration-likelihood model (ELM), we compare two alternative influence processes, the central and peripheral routes, in motivating IT acceptance, operationalize these processes using argument quality and source credibility constructs, and link these constructs as independent variables to perceived usefulness and attitude, the core perceptual drivers of IT acceptance. We further examine how influence processes are moderated by users' expertise and job relevance, and the temporal stability of these processes. Nine hypotheses thus developed were empirically tested using a field survey of document management system acceptance at an eastern European governmental agency. This study contributes to the IT acceptance literature by introducing the notion of influence processes to acceptance research, by elaborating alternative modes of influence and factors constraining their effects, and by presenting ELM as a referent theory for future acceptance research. For practitioners, this study presents influence processes as a policy tool that managers can use to motivate IT acceptance in their organizations, benchmarks alternative influence strategies, and demonstrates how to customize influence strategies across a diverse user population.

**Keywords:** Information systems acceptance, elaboration likelihood model, influence, persuasion, attitude, survey research.

**ISRL Categories:** AA05, AA08, AI0108, GB02, GB03.

## **MOTIVATION FOR THE STUDY**

Individual acceptance of information technology (IT) has been a central and recurrent theme in information systems (IS) research for more than two decades. Understanding IT acceptance is important because the expected benefits of IT, such as gains in efficiency, effectiveness, or productivity, cannot be realized if individual users do not accept these systems for task performance in the first place. Prior research in this area have identified several perceptions believed to impact IT acceptance, such as perceived usefulness, perceived ease of use, and attitude, and proposed several theories to explain the causal structure of these effects,

such as innovation diffusion theory, technology acceptance model, and theory of planned behavior. Though it is generally acknowledged that information acquired from external sources helps shape users perceptions regarding IT acceptance and eventual acceptance behavior, there has been virtually no research to explain why and how external agents exert such influence on user perceptions, what alternative influence processes can be employed by these agents, and how to tailor these processes to the unique needs of specific user groups.

This study is one of the earliest to examine influence processes related to IT acceptance. Understanding these processes is important for theoretical as well as practical reasons. Theoretically, such research fills in a critical void in the IT acceptance literature by explaining the formation of user perceptions related to IT acceptance. This paper also identifies alternative mechanisms for influencing user perceptions, presents moderating factors mitigating their impacts on acceptance perceptions, and explains variations in influence patterns across user populations. For practitioners, this research may help organizational managers design appropriate influence strategies to motivate IT acceptance in their organizations and offers suggestions on how to tailor these strategies to match the unique characteristics of their organizational users or user groups for maximum effect.

The specific research questions of interest to this study are:

- RQ1. How do informational influence processes shape user acceptance of new IT?
- RQ2. Do the effects of these influence processes vary across a user population, and if so, how?
- RQ3. How persistent are the effects of these influence processes over time?

To address the above questions, we start with a thorough examination of the elaboration likelihood model (ELM) in the social psychology literature and propose nine research hypotheses specifically designed to answer to these questions. The proposed hypotheses are then tested

using empirical data collected from a field survey of document management system (DMS) acceptance among administrators and line staff at Lviv City Hall in Ukraine. Implications of our research for IS research and practice are described.

## **PRIOR RESEARCH**

Much of the prior research on IT acceptance has been informed by two dominant theoretical perspectives. The first perspective, based on Rogers' (1995) innovation diffusion theory (IDT) in the communications literature, has examined a variety of technological, communication, and social characteristics that influence one's acceptance of IT and her timing of acceptance among a user population (e.g., Brancheau and Wetherbe 1990; Moore and Benbasat 1991; Nilakanta and Scamell 1990). The second perspective, based on Fishbein and Ajzen's (1975) theory of reasoned action (TRA) and Ajzen's (1991) theory of planned behavior (TPB) in the social psychology literature, has focused on attitudinal drivers of acceptance such as individual beliefs and affect (e.g., Davis, Bagozzi, and Warshaw 1989; Lewis, Agarwal, and Sambamurthy 2003; Venkatesh and Davis 2000; Venkatesh, Morris, Davis, and Davis 2003). IT-specific variants of the latter theories include the technology acceptance model (TAM) (Davis et al. 1989) and decomposed theory of planned behavior (DTPB) (Taylor and Todd 1995).

The above studies have identified a wide variety of factors related to IT acceptance, including individual beliefs such as perceived usefulness and ease of use, communication channel factors such as mass media versus interpersonal influence, key players in a social network such as opinion leaders and change agents, and so forth (see Tornatzky and Klein [1992] for a summary of IDT-based studies and Venkatesh et al. [2003] for summary of TAM/DTPB-based studies). However, neither IDT nor TAM/DTPB was designed to address influence

processes or their role in IT acceptance, and hence, we examine such issues using the ELM perspective described in the next section.

Though neither IDT nor TAM directly addresses influence processes per se, both theories indirectly acknowledge their role in technology acceptance. TAM subsumes the notion of informational influence within “external variables” that are presumed to impact one’s IT acceptance beliefs such as perceived usefulness and perceived ease of use, and thereby, indirectly influence one’s acceptance behavior (Davis et al. 1989). Being a cognitive model of usage, TAM examines how cognitive beliefs such as perceived usefulness and perceived ease of use influence users’ IT acceptance behavior. However, it excludes the sociological process of informational influence that leads to the formation of those beliefs, as being extraneous to and beyond the scope of TAM.

The communication process in IDT can be viewed as an influence process (though Rogers [1995] did not use the term “influence”) where earlier adopters inform later adopters of a new innovation and persuade them to adopt it. IDT describes two communication channels, mass media (e.g., news media, popular press) and interpersonal channels (e.g., opinions of colleagues, family members, and referent others), which can be viewed as alternative modes of influence. These channels are presumed to shape one’s perceptions of key innovation attributes such as its relative advantage, complexity, and compatibility, much like the associations between external variables and cognitive beliefs in TAM. IDT also suggests that communication channels may have differential effects across the user population in that the more innovative early adopters are likely to be more motivated by mass media while the less innovative late adopters rely more on interpersonal channels.

Based on the above theories, we can infer that (1) informational influence plays an

important role in the formation of IT acceptance beliefs and ultimately shape users' acceptance behaviors; and (2) the same informational influence may engender differential effects across different user groups. Despite these insights, IDT still provides limited explanation of the influence process and its impacts on IT acceptance behavior for at least two reasons. First, IDT distinguishes between communication channels (e.g., mass-media versus interpersonal) but not between the informational content communicated by those channels (e.g., a more-detailed versus a less-detailed review of an IT system) or information sources within each channel (e.g., a well-respected versus a less-known author writing such review). Presumably, not all informational content or information sources are equally effective in shaping users' perceptions about new technology. For instance, we tend to be more influenced by experts' opinions than those of non-experts, or if the rationale or evidence underlying such opinions is presented rather than missing. Hence, information content and source are also likely to be important in motivating IT acceptance as the communication channel presenting such content.

Second, IDT does not explain why different user groups (early versus late adopters) respond differently to mass media or interpersonal influences. Adopters' innovativeness is viewed as an outcome variable reflecting their timing of adoption, rather than a causal driver of their behavior, and is therefore of limited help in predicting how IT acceptance patterns may vary across a population of potential users.

In summary, prior research has indirectly acknowledged that informational influence may play a potential role in helping users form salient perceptions related to IT acceptance. However to date, the nature and outcomes of these influence processes has not been systematically studied. In the next section, we present ELM as a referent theory that can help generate new insights regarding the types and effects of influence processes on IT acceptance.

## THEORY AND RESEARCH HYPOTHESES

### Elaboration Likelihood Model

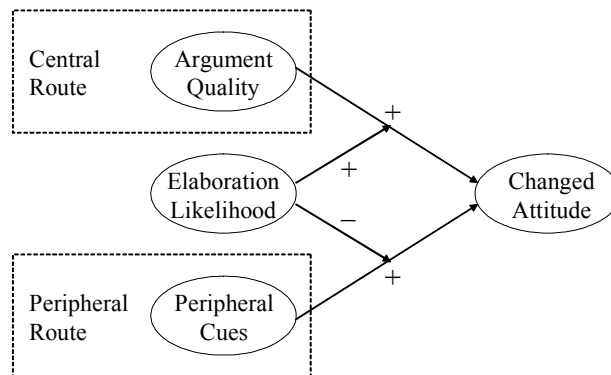
The role of influence processes in shaping human perceptions and behavior has been examined by dual-process theories in the social psychology literature.<sup>1</sup> Similar to IDT, dual-process theories suggest that information is the primary driver of attitude change and consequent behavior change. Such information may introduce people to new possibilities, cause them to reexamine their prior beliefs and attitudes, and potentially change extant behaviors. However, unlike IDT, dual-process theories suggest that social judgments are not always based on effortful processing of judgment-relevant information, but can sometimes be based on less effortful processing of alternative cues. These two alternative processes of cognition formation, more versus less effortful processing of information, form the core of all dual-process theories. Further, dual-process theories also specify conditions under which of the two alternative processes is more likely to be invoked. Interested readers are referred to Eagly and Chaiken (1993) and Chaiken and Trope (1999) for detailed discussions of the various dual processing theories in social psychology.

The specific dual process theory of interest to this study is the elaboration likelihood model (ELM). This theory was specifically chosen because: (1) it relates directly to influence processes and their impacts on human perceptions and behavior, and (2) it also explains why a given influence process may lead to differential outcomes across individuals. ELM posits that attitude change among people may be caused by two “routes” of influence, the central route and the peripheral route, which differ in the amount of thoughtful information processing or

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<sup>1</sup> The term “influence” is often called “persuasion” in the referent literature. However, for purposes of clarity and consistency, we use “influence” throughout this paper.

“elaboration” demanded of individual subjects (Petty, Cacioppo, and Goldman 1981; Petty and Cacioppo 1986). The central route requires a person to think critically about issue-related arguments in an informational message and scrutinize the relative merits and relevance of those arguments, prior to forming an informed judgment about the target behavior. In IT acceptance contexts, such arguments may refer to the potential benefits of system acceptance, comparison of alternative systems, availability and quality of system support, and/or costs of and returns from system acceptance. The peripheral route involves less cognitive effort, where subjects rely on cues regarding the target behavior, such as number of prior users, endorsements from IT experts, and likeability of or affinity towards endorser, rather than on the quality of arguments, in attitude formation. In such situations, attitude change stems mostly from peripheral processes such as identification with the source (Kelman 1961) or reliance on decision heuristics (Chaiken 1980). The central and peripheral routes of attitude change are typically operationalized in ELM research using the *argument quality* and *peripheral cues* constructs respectively, as shown in Figure 1.



**Figure 1. Elaboration Likelihood Model**

The central and peripheral routes are distinct in at least three ways. First, the two routes process different types of information. The central route processes message-related arguments, while the peripheral route processes cues. Second, the cognitive effort involved in information

processing is much higher in the central route than in the peripheral route. The central route requires thoughtful comprehension of the arguments presented, evaluation of the quality of those arguments, and combination of multiple and sometimes conflicting arguments into an overall evaluative judgment, while the peripheral route places less information processing demands on subjects and merely requires their association with salient positive or negative cues related to the attitude object (Petty et al. 1981). Third, cognition changes induced via the central route tend to be more stable, enduring, and predictive of future behaviors since they are based on deliberate and thoughtful consideration of relevant arguments (Petty and Cacioppo 1986). In contrast, changes induced via peripheral cues tend to be less persistent, susceptible to counter-influence, and less predictive of long-term behavior.

According to ELM, information recipients can vary widely in their ability and motivation to elaborate on an argument's central merits, which in turn constrains how a given influence process impacts their attitude formation or change. This ability and motivation to elaborate is captured in ELM by the *elaboration likelihood* construct. Petty and Wegener (1999) note, "The term 'elaboration' is used to suggest that people add something of their own to the specific information provided in the communication... beyond mere verbatim encoding of the information provided" (p. 46). People in the high elaboration likelihood state are more likely to engage in careful scrutinization or thoughtful processing of an information message, and therefore, tend to be more persuaded by argument quality than by peripheral cues. In contrast, those in the low elaboration likelihood state, lacking the motivation or ability to deliberate thoughtfully, tend to be motivated by peripheral cues. Note that this distinction does not imply that people influenced via the central or peripheral routes will experience different outcomes. Surely, two individuals may accept the same IT even though they arrived at that decision via two

different influence routes. Hence, ELM suggests that: (1) a common influence process can engender very different responses across different individuals in a given population, (2) a common influence process may result in varying responses for the same individual, if her elaboration likelihood fluctuates with technology, time, or situational contexts, and (3) different influence processes (argument-based or cue-based) may generate similar responses among a diverse population. In short, elaboration likelihood moderates the effects of argument quality and peripheral cues on cognition change (see Figure 1).

ELM describes elaboration likelihood in terms of its two component dimensions: motivation and ability to elaborate, both of which should be present for extensive elaboration to occur (Petty and Cacioppo 1986). ELM researchers have typically operationalized motivation as recipients' *personal relevance* of the available information, and their ability as *prior expertise* or experience with the attitude object. If information recipients view a given message as being important and relevant to the target behavior, they are more likely to invest the necessary cognitive effort to elaborate on the information presented. In contrast, those that view the same message as having little personal relevance may not be willing to spend the time and effort in analyzing that message, but instead rely on cue-based heuristics for framing their subsequent perceptions. Likewise, experts in the target behavior are more likely to engage in a thorough consideration of argument quality instead of relying on potentially incomplete or inaccurate peripheral cues. Non-experts, in contrast, may have little choice but to depend on peripheral cues such as credibility of the information source. Personal relevance and prior expertise, the two dimensions of elaboration likelihood, are therefore presumed to moderate the effects of argument quality and peripheral cues on cognition changes.

It should be noted that elaboration likelihood is not a personality trait or a persistent

individual difference, but rather a temporal state that may fluctuate with situational contexts and time, even for the same individual. For instance, a physician may be an expert in diagnosing medical conditions but a novice in automotive repair. Hence, she may employ the central route for diagnosing and treating medical conditions among her patients, but rely on the peripheral route, such as advice from an auto technician, for diagnosing and correcting automotive malfunctioning. Likewise, domain experts, who normally tend to rely on central route processing for deciding on a target behavior, may sometimes be forced to rely on the less demanding peripheral route if they lack the time or resources to adequately process all message-related arguments. Given its state representation, elaboration likelihood can be enhanced in the workplace by manipulating the message, the source, and the influence context, such as the amount of time available to process arguments, message repetition, the number of distractions, and pre-message conditioning (e.g., telling subjects that they will be questioned on the message later). Indeed, ELM researchers like Petty, Haugtvedt, and Smith (1995) and others have manipulated this state in laboratory tests of the theory.

ELM has enjoyed a rich tradition of empirical research in the social psychology (e.g., Petty et al. 1981; Petty and Cacioppo 1986; Petty et al. 1995) and marketing (e.g., Lord, Lee, and Sauer 1995) literatures. However, to date, it has seen only limited use in information systems research. Among its early IS applications, Mak, Schmidt, and Lyytinen (1997) conducted an experiment to examine how users' participation in designing an expert system, as a proxy for elaboration likelihood motivation, influenced their acceptance of the system's recommendations. Consistent with predictions from ELM, they observed two alternative routes of influence: users with low participation were primarily influenced by the perceived credibility of expert system developers (a peripheral cue), while those with high participation were influenced by the

ambiguity of the decision setting (an argument quality). Dijkstra (1999) used ELM in an experimental setting to examine why some users tend to agree with incorrect advice generated by expert systems, and found that student subjects who expended less mental effort, scored lower on recall questions, and perceived assigned cases as being easy (low elaboration likelihood) agreed with incorrect system advice more often than those spending more time and effort in analyzing the system recommendations. Sussman and Siegel (2003) employed ELM in a non-experimental setting to study knowledge adoption via electronic mail by consultants at a public accounting firm. They found that argument quality and source credibility positively influenced consultants' perceived usefulness of information contained in those e-mails, indirectly motivating them to accept that information in their own tasks. Sussman and Siegel (2003) also reported that recipients' involvement (elaboration motivation) and expertise (elaboration ability) moderated the main effects of argument quality and source credibility on perceived information usefulness. Interestingly, while most ELM studies have used attitude as the dependent variable, Sussman and Siegel (2003) employed perceived usefulness as the dependent variable of interest, and found that ELM's postulates still apply.

Though the above studies attest to the empirical validity of ELM in different IS contexts, none were concerned with the problem of IT acceptance. For instance, Mak et al.'s (1997) work examined expert system design, Dijkstra (1999) studied decision making, and Sussman and Siegel (2003) investigated knowledge adoption. More importantly, though these studies demonstrated the existence of the dual modes of information processing, none were focused on influence processes in particular or the impact of such processes. This paper fills a gap in the IT acceptance literature by drawing our attention to the role of influence processes in acceptance, by applying ELM to understanding these influence processes, along with their outcomes and

constraints, and by introducing ELM as a referent theory for future IT acceptance research.

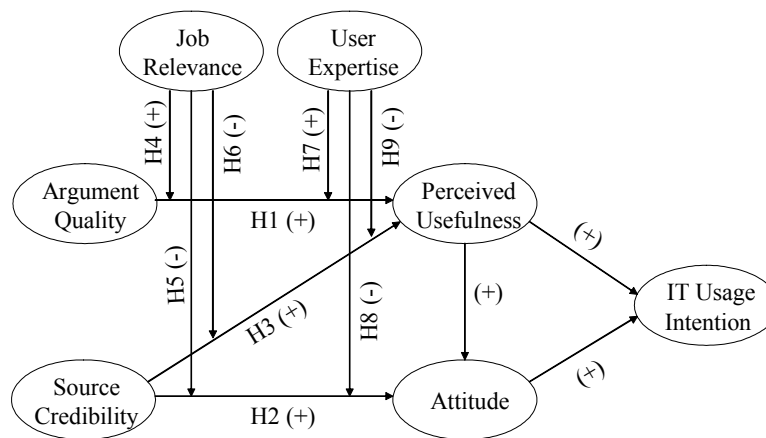
## **Research Model**

ELM is relevant to understanding IT acceptance behaviors because, per IDT, IT acceptance is fundamentally an informational influence problem whereby prior users inform potential users of a new IT and persuade them to adopt it (Rogers 1995). TAM suggests that external variables such as informational influence shape user perceptions regarding an IT system, which in turn, drive IT acceptance intentions and behaviors (Davis et al. 1989). The ELM literature provides the theoretical basis and an empirical base for systematically studying alternative influence processes, their effects, and moderating factors.

In applying ELM to the IT acceptance context, we first expand the dependent variable in ELM (i.e., attitude) to include belief, affect, and intention regarding IT acceptance (see Figure 2). This is justifiable since social psychology research views attitude as a broad construct consisting of three related components: cognition, affect, and conation (Breckler 1984). While the affect dimension is commonly referred to as attitude in IT acceptance research, the cognition dimension is related to beliefs salient to the target behavior such as expected benefits from IT acceptance, and the conation dimension refers to intentions or behavioral dispositions regarding IT acceptance. A detailed discussion on the tripartite conceptualization of attitude and its empirical validation is available from Breckler (1984).

Extant attitude theories in social psychology such as TRA (Fishbein and Ajzen 1975) and TPB (Ajzen 1991) hold that beliefs influence affect (attitude), which in turn, influences intentions regarding a target behavior. Adapting TRA to the specific context of IT acceptance, TAM specified two IT acceptance-related beliefs, perceived usefulness, defined as the extent to

which potential users expect using an IT system to benefit their task performance, and ease of use, defined as the extent to which they expect IT acceptance to be relatively free of effort (Davis et al. 1989). TAM also included a direct effect from perceived usefulness to IT acceptance intention, over and above the indirect effect via attitude, to suggest that utilitarian considerations such as perceived usefulness may sometimes override negative affect or attitude in motivating IT acceptance in the workplace.



**Figure 2. Research Model**

According to TAM, therefore, the two direct influences on users' IT acceptance intentions are their perceived usefulness from IT acceptance and attitude toward acceptance, respectively capturing utilitarian and affective motivations of IT acceptance. Perceived usefulness is positively correlated to attitude, since users tend to develop a positive affect toward a system if they expect that system to benefit their task performance. Further, attitude and perceived usefulness have positive effects on users' IT acceptance intentions, given human tendencies to maintain mutually consistent beliefs, affect, and intentions. These associations have been empirically validated across a wide range of technological and organizational contexts (e.g., Davis et al. 1989; Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh et al. 2003).

Recent IT acceptance studies have found the link between attitude and intention to be somewhat inconsistent, especially for organizational usage and during later stages of usage (Venkatesh et al. 2003). However, perceived usefulness and attitude represent alternative motivations for IT acceptance since users may be influenced by utilitarian considerations (perceived usefulness), affective considerations (attitude), or both in their IT acceptance decisions. Though attitude may have a less significant effect in workplace settings, this effect may be more significant in other contexts such as personal or home acceptance, early-stage acceptance, and so forth. In keeping with the semantic distinction between perceived usefulness and attitude and theoretical prescriptions from TAM, TRA, and TPB, we decided to retain both constructs in our study. The positive associations between perceived usefulness, attitude, and IT acceptance intentions, as suggested by the above theories are depicted in Figure 2. However, these associations are not stated as formal hypotheses since they are ancillary to our study of ELM-based influence processes and are also not new in IT acceptance research.

ELM suggests that argument quality and peripheral cues are directly related to attitude and belief change. *Argument quality* refers to the persuasive strength of arguments embedded in an informational message, while *peripheral cues* relate to meta-information about the message (e.g., message source) but not its embedded arguments. Many peripheral cues have been suggested in the ELM literature, including the number of messages, number of message sources, source likeability, and source credibility. Of these, source credibility<sup>2</sup> appears to be one of the more frequently referenced cues. *Source credibility* is defined as the extent to which an information source is perceived to be believable, competent, and trustworthy by information recipients (Petty et al. 1981; Sussman and Siegal 2003). This construct is relevant for IT acceptance because users, being unable to keep up with the rapid rate of technological change in

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<sup>2</sup> Petty et al. (1981) labeled this construct as “source expertise.”

this industry, often rely on expert advice to learn about the latest or the best technologies available. Presumably, there may be other peripheral cues potentially relevant to IT acceptance that are not examined in this paper but may be the subject of future studies.

Though most prior ELM studies have focused on attitude as the dependent variable of interest (Petty et al. 1981; Lord et al. 1995), Sussman and Siegel (2003) demonstrated that perceived usefulness is also a relevant perception in the context of knowledge acceptance. Given that perceived usefulness and attitude are important and alternative drivers of IT acceptance, informational influence in this context may be directed at informing potential users of the utility of IT acceptance (e.g., a third-party report comparing the target IT system with competing alternatives on several dimensions) or at enhancing users' affect toward IT acceptance (e.g., a celebrity endorsement), or both. Since message arguments are directed at users' rational judgment rather than their affect, argument quality is expected to influence perceived usefulness rather than attitude, by reinforcing or altering their extant beliefs about system acceptance. Likewise, peripheral cues such as source credibility are likely to influence attitude because such cues appeal to human affect rather than their rational judgment. These expectations lead us to propose:

- H1. The argument quality of informational messages has a positive effect on potential users' perceived usefulness of IT acceptance.
- H2. The source credibility of informational messages has a positive effect on potential users' attitude toward IT acceptance.

It is possible that argument quality may improve users' attitude toward IT acceptance. For instance, a well-articulated message may make one feel better about using a system. However, this effect is likely to be moderated by perceived usefulness, since high quality arguments may not change affect without first changing the users' usefulness beliefs. In other

words, users feel better because they view the system as being more useful and not because the argument presented was strong. On the other hand, source credibility may sometimes directly influence users' perceived usefulness of IT acceptance, particularly if the recommendation for using the target system comes from a well-recognized or trusted IT expert. In this instance, potential users may substitute their own effortful thinking process with the expert's recommendation and employ a less effortful peripheral-route decision process to assess the potential usefulness of IT acceptance. Hence, we hypothesize:

H3. The source credibility of informational messages has a positive effect on potential users' perceived usefulness of IT acceptance.

It is worth noting that Hypothesis H1 depicts a central-route influence process where information influence is based on argument quality, while H2 and H3 represents peripheral-route influence based on source credibility. ELM also posits that the effects of argument quality and source credibility are moderated by potential users' motivation and ability to elaborate on informational messages (Petty and Cacioppo 1986). Drawing on prior ELM research, we operationalize the motivation dimension of elaboration as *job relevance*, defined as message recipient's perceived relevance of an IT system to their work, and the ability dimension as *user expertise*, defined as message recipient's ability to use IT in general.

Potential users who view a new IT system to be highly relevant to their work performance are more motivated to engage in effortful scrutiny of all available information, thereby forming more informed and stable perceptions of usefulness based on message arguments. These users have less need for and are therefore less likely to consider peripheral cues. Conversely, users who perceive the same system as being less relevant to their work are less motivated to engage in extensive elaboration, and may instead rely on peripheral cues such as source credibility for shaping their personal attitudes and usefulness perceptions of IT

acceptance. Hence, we propose:

- H4. Job relevance has a positive moderating effect on the association between argument quality and perceived usefulness of IT acceptance.
- H5. Job relevance has a negative moderating effect on the association between source credibility and attitude toward IT acceptance.
- H6. Job relevance has a negative moderating effect on the association between source credibility and perceived usefulness of IT acceptance.

Likewise, expert or computer-savvy IT users are more inclined to carefully scrutinize new messages about an IT to identify key reasons for using it and form an informed judgment about IT acceptance. These users will rely less on peripheral cues, because they are aware of the possibility of inaccuracy, unrealism, and bias in such cues. For instance, most advertisements tend to portray overly positive, rather than balanced or realistic, perspectives of IT systems because such ads are intended to maximize IT sales. Hence, perceptions based on those cues are also likely to be biased. Further, expert users' superior IT expertise obviates their need to examine peripheral cues, since they can form more accurate perceptions by critically examining the informational content. In contrast, novice or less expert users are forced to rely on peripheral cues such as source credibility, rather than embedded message arguments, in framing their attitude and perceived usefulness perceptions. Hence, we propose:

- H7. User expertise has a positive moderating effect on the association between argument quality and perceived usefulness of IT acceptance.
- H8. User expertise has a negative moderating effect on the association between source credibility and attitude toward IT acceptance.
- H9. User expertise has a negative moderating effect on the association between source credibility and perceived usefulness of IT acceptance.

Note that hypotheses H4 through H9 do not imply that high elaboration inspires IT acceptance or that low elaboration leads to non-acceptance. ELM indeed acknowledges that high

and low elaboration processes may both lead to equivalent user perceptions and consequent intentions, irrespective of users' elaboration motivation or ability. Despite the fact that both high and low elaboration processes may lead to the same outcome, the influence paths for users in these groups are different in that the high elaboration process is influenced by argument quality, and the low elaboration process relies on source credibility and other peripheral cues. This difference in influence process is manifested in the strength of user perceptions, leading to differential long-term persistence of influence effects.

According to ELM's "temporal persistence hypothesis", user perceptions based on thoughtful elaboration tend to be temporally more stable, more persistent, and less susceptible to counter-persuasion than those based on less elaboration (Petty and Cacioppo 1986). This implies that if one's perceived usefulness and attitude toward IT usage are formed via the peripheral-route process, then such perceptions tend to "decay" significantly with time as the effects of the influence process wears off. In contrast, if the initial perceptions are based on central-route process, as is typical for users in the high elaboration state, then such perceptions tend to remain persistent over time. Though users' initial elaboration state can be used as a proxy for central versus peripheral route processes, such elaboration may change over time. For instance, users who initially decide to accept a system based on detailed consideration of the pros and cons of system acceptance may not want to engage in such a similar thoughtful process later on in deciding whether or not to continue using the system but instead rely on peripheral cues. However, since we lacked data to adequately validate whether or not subjects' elaboration process changed during the three-month duration of this study we do not specify formal hypotheses representing this effect but provide an exploratory empirical test of these associations.

In summary, Hypotheses H1 through H3 capture the main effects of argument quality and

source credibility on user perceptions, representing two alternative routes of influence in ELM. Hypotheses H4 through H9 represent the moderating effects of users' elaboration motivation (job relevance) and elaboration ability (user expertise) on ELM's two primary routes of influence. Empirical testing of these hypotheses is described in the next section.

## **RESEARCH METHOD**

### **Study Setting**

The hypothesized ELM-based influence model of IT acceptance was tested empirically using a survey study of a document management system (DMS) acceptance by administrators and staff personnel at L'viv City Hall in Ukraine. The DMS was a custom application built using Lotus Notes, with the goal of improving the city's ability to record, track, and manage construction permits, business license applications, zoning clarifications, and other citizen or business requests. The DMS was funded in part by a United States Agency for International Development (USAID) grant as part of a broader e-government initiative to promote governmental efficiency and transparency in developing countries.

The state of DMS acceptance at L'viv at the time of this study was as follows. The City of L'viv received an average of about 8,300 service requests, claims, and complaints per month, most of which were hand-delivered or mailed in by concerned citizens to the appropriate division at the City Hall. Though city divisions were encouraged to record all correspondence in the DMS, this was not a strict mandate and was frequently ignored. About 20% of the incoming documents were forwarded to the city correspondence office for entry into the DMS system, while the remaining 80% was retained in paper format for manual processing, even though only 8-10% of the latter was processed within 30 days as required by city covenants and 30-40% of

the manual documents were simply “lost in the system.” Service requests entered in the DMS were registered and 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 respective division for processing. Divisional staff electronically attached any investigational reports, their own comments, and 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 final disposition of each case, the official response was drafted by the assigned staff member and sent back to the city correspondence office, where it was printed and mailed to the filing citizen.

Most city administrators and staff members did not know much about the existence of the DMS, its purpose, or how it could benefit their work. Though the City Mayor wanted all city employees to use the DMS for document processing, there was no explicit mandate, no incentives, and no training to facilitate its acceptance. The salary structure for governmental employees were set by the central Ukrainian government in Kyiv, and local governments had limited latitude to award bonuses or incentives for motivating desired employee behaviors, such as IT acceptance. City Hall employees lacked a customer service culture, dating back to the pre-1991 Soviet era, when citizens were too intimidated to file service requests and government officials had little proclivity to respond to those requests. Further, many city employees did not have computer backgrounds and were simply intimidated by the new technology. Additionally, electronic documents were not officially recognized by Ukrainian courts or other governmental agencies such as finance or tax accounting, and hence, many city employees preferred to work with paper documents instead. Given the above scenario, it was not surprising that DMS acceptance was practically non-existent among L’viv city employees.

To improve service delivery to citizens, increase the productivity of city employees, and instill a culture of technology-enabled customer service, the City Mayor initiated a series of training sessions to introduce the city's administrative and staff personnel to the DMS and influence them to use it. One of this study's authors was commissioned to provide this training, with the goal of improving user beliefs and attitude toward the system and ultimately facilitating their DMS acceptance. Eighty seven City Hall employees, including 30 administrators (senior executives or division heads) and 57 divisional staff members; from a total of 130 such personnel participated in the training program in four groups. Secretaries, aids, interns, and field personnel were excluded from training, since they had no decision-making responsibility on citizen requests and did not directly interact with the DMS. Each group received three 8-hour days of training. The first two days were designed to bring participants up to speed on using the Windows operating system, word processing, spreadsheets, electronic mail, and web browsing. This was necessary given the lack of basic computer literacy among many city employees. The third day focused exclusively on Lotus Notes, its messaging, calendaring, and collaboration features, document generation, cataloging, and tracking, and using electronic control cards to migrate documents between city divisions. Training included both lectures and hand-on practice sessions. At the end of the three-day training program, subjects were asked to complete a paper-based survey, intended to elicit their perceptions of each of the seven constructs listed on Figure 2. A second round of data collection followed three months later, when subjects' perceived usefulness and attitude regarding DMS usage was recaptured using the same instruments as in the first survey, and matched with responses from the first round using participants' self-reported home or cell telephone numbers. Note that data from the second round was intended for an exploratory test of ELM's "temporal persistence hypotheses" and not for testing any of the

study's formally stated hypotheses.

The final 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, since a majority of the targeted population responded to our survey request, probably due to the overt support and involvement of the City Mayor. Additional comparison of means tests found that the respondent group was not significantly different in age, years of formal education, or years of work experience from the average profile of L'viv city employees, negating any concerns of non-response bias.

### **Operationalization of Constructs**

The seven constructs of interest to this study were perceived usefulness, attitude, acceptance intention, argument quality, source credibility, user expertise, and job relevance. All constructs were measured using multiple-item perceptual scales, using pre-validated instruments from prior research wherever possible, and reworded to relate specifically to the context of DMS acceptance. Individual scale items are listed in the appendix.

Perceived usefulness was measured using four Likert scaled items developed and validated by Davis et al. (1989) that tapped into subjects' perceptions of productivity, performance, and effectiveness gains from DMS acceptance, and overall usefulness. Attitude was measured using Taylor and Todd's (1995) four-item semantic differential scale anchored between "bad...good", "foolish...wise", "unpleasant...pleasant", and "like...dislike" adjective pairs. Intention to use IT was measured using an adapted version of Taylor and Todd's (1995) three-item Likert-scale that examined subjects' intent to use DMS within the next month, in the near future, and for more of their job responsibilities.

Source credibility was assessed using a modified version of Sussman and Siegal's (2003) four-item Likert scale. Three items from the original scale that tapped into subjects' perception of the source's knowledgeability, expertise, and trustworthiness were retained, while the reliability item was changed to credibility. The latter change was necessary since reliability perceptions are typically based on prior interaction history with the message source, which was justified for Sussman and Siegal's sample of consultants with a prior history of information sharing, but was less applicable in our case since the target users were not familiar with the trainer prior to this study.

Argument quality was measured using a Likert scale patterned after Sussman and Siegal's (2003) scale. The original scale examined completeness, consistency, and accuracy as dimensions of argument quality. While experienced consultants in the original study may be able to reasonably judge the above dimensions of an informational message, our sample of mostly inexperienced DMS users were not expected to do so. Hence, we replaced the above dimensions with the extent to which subjects believed that information provided during the DMS training was informative, helpful, valuable, and persuasive.

User expertise was assessed 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," similar to the scale employed by Sussman and Siegal (2003). These domains were specifically selected because DMS acceptance involves creating online documents, storing them on computers, and sharing them via e-mail. User expertise was cross-validated with a single-item fill-in measure of number of years of prior computer experience, which was positively correlated with each of the above three items.

Finally, job relevance was measured using two Likert-scaled items proposed and

validated by Venkatesh and Davis (2000), which examined the importance and relevance (appropriateness) of DMS in performing the subjects' job. Empirical validation of the above scales is described in the next section.

## **DATA ANALYSIS AND RESULTS**

Data analysis proceeded in two stages. In the first stage, all measurement scales were tested for reliability and construct validity using confirmatory factor analysis (CFA). CFA is more appropriate than alternative statistical techniques such as exploratory factor analysis when there is strong a priori theory and the research employs mostly pre-validated measurement scales (Bagozzi and Phillips 1982), as were the case in this study. For purposes of CFA, all measured items were modeled as reflective indicators of their corresponding latent constructs, all constructs were allowed to covary freely in the measurement model, and each factor loading and inter-construct correlation was scrutinized individually. In the second stage, the associations between latent constructs in the CFA model were modified to match the theoretical causal structure specified in our hypotheses, and individual path effects and variance explained were examined. This two-stage approach to data analysis was preferred over an alternative one-stage approach, where measurement and structural models are examined simultaneously, because the former approach provides a more complete and robust test of measurement validity by examining potential associations between constructs that may not otherwise be theoretically specified in the one-stage structural model.

### **Scale Validation**

Confirmatory factor analysis (CFA), used for assessing measurement scale validity, was

performed using the partial least squares (PLS) approach. PLS-Graph Version 3.0 software (Chin and Frye 1994) was used for this purpose. The variance-based PLS approach was preferred over covariance-based structural equation modeling approaches such as LISREL for two reasons: (1) LISREL requires a sample size of at least 5-10 times the number of scale items, while PLS does not impose sample size restrictions, (2) LISREL requires the underlying data to have a multivariate normal distribution, while PLS is distribution-free (Chin, Marcolin, and Newsted 2003). Given that our sample size of 81 was smaller than 175-350 required for LISREL analysis of our hypothesized model and the inherent difficulties with establishing multivariate normality in small samples, PLS was chosen for data analysis. Raw data was used as input to the PLS program, and path significances were estimated using the bootstrapping resampling technique with 100 sub-samples.

Scale validation proceeded in two phases: convergent validity and discriminant validity analyses. Convergent validity of scale items was assessed using three criteria suggested by Fornell and Larcker (1981): (1) all item factor loadings ( $\lambda$ ) should be significant and exceed 0.70, (2) composite reliabilities ( $\rho_c$ ) for each construct should exceed 0.80, and (3) average variance extracted (AVE) for each construct should exceed 0.50, or in other words, square root of AVE should exceed 0.71. As seen from Table 1, standardized CFA loadings for all scale items in the CFA model were significant at  $p < 0.001$  and exceeded the minimum loading criterion of 0.70, with the minimum loading being 0.81 for source credibility item SC4. From Table 2, we can see that composite reliabilities of all factors also exceeded the required minimum of 0.80, with the lowest value being 0.91 for the source credibility construct. Further, browsing the principal diagonal elements in Table 2, we can see that the smallest square root for AVE among all seven constructs in our CFA model was 0.85 for source credibility, which was greater than

the desired minimum of 0.71. Hence, all three conditions for convergent validity were met.

**Table 1. Confirmatory Factor Analysis Results**

Scale Item <sup>a</sup>	Item Mean	Item S.D.	Item Loading <sup>b</sup>	Standard Error
IN1	4.30	1.48	0.93	0.014
IN2	4.31	1.35	0.94	0.015
IN3	4.06	1.34	0.88	0.033
PU1	4.85	1.71	0.97	0.008
PU2	4.73	1.73	0.94	0.021
PU3	4.86	1.66	0.96	0.010
PU4	4.81	1.78	0.94	0.015
AT1	4.37	1.50	0.94	0.011
AT2	4.32	1.44	0.93	0.023
AT3	4.40	1.39	0.90	0.039
AT4	4.31	1.53	0.94	0.011
AQ1	4.96	1.70	0.93	0.016
AQ2	4.90	1.65	0.89	0.032
AQ3	4.77	1.61	0.90	0.031
AQ4	5.09	1.64	0.89	0.019
SC1	4.48	1.30	0.89	0.030
SC2	4.43	1.37	0.83	0.069
SC3	4.42	1.41	0.87	0.033
SC4	4.40	1.19	0.81	0.058
UE2	4.40	1.54	0.94	0.014
UE2	4.16	1.61	0.91	0.022
UE3	4.20	1.58	0.92	0.022
JR1	4.41	1.55	0.94	0.015
JR2	4.38	1.60	0.93	0.015

<sup>a</sup> Item legend: IN: Intention; PU: Perceived usefulness; AT: Attitude; AQ: Argument quality; SC: Source credibility; UE: User expertise; JR: Job relevance.  
<sup>b</sup> All item loadings were significant at  $p < 0.001$  with  $t\text{-statistic} > 20$ .

**Table 2. Scale Properties**

Construct <sup>a</sup>	Mean	S.D.	$\rho_c$	Inter-Construct Correlations <sup>b</sup>						
				IN1	PU1	AT1	AQ1	SC1	UE1	JR1
IN	4.22	1.39	0.94	<i>0.91</i>						
PU	4.81	1.72	0.97	0.73	<i>0.95</i>					
AT	4.35	1.47	0.96	0.68	0.47	<i>0.92</i>				
AQ	4.93	1.65	0.94	0.47	0.60	0.32	<i>0.90</i>			
SC	4.43	1.32	0.91	0.58	0.47	0.67	0.32	<i>0.85</i>		
UE	4.25	1.58	0.94	0.35	0.40	0.30	-0.22	0.34	<i>0.92</i>	
JR	4.40	1.58	0.93	0.40	0.39	0.43	0.33	0.09	0.17	<i>0.93</i>

<sup>a</sup> Construct legend: IN: Intention; PU: Perceived usefulness; AT: Attitude; AQ: Argument quality; SC: Source credibility; UE: User expertise; JR: Job relevance.  
<sup>b</sup> Diagonal elements (in italics) represent square root of AVE for that construct.

Discriminant validity between constructs was assessed using Fornell and Larcker's

(1981) recommendation that the square root of AVE for each construct should exceed the correlations between that and all other constructs.<sup>3</sup> From the data presented in Table 2, we can see that the highest correlation between any pair of constructs in the CFA model was 0.73 between perceived usefulness and attitude. This figure was lower than the lowest square root of AVE among all constructs, which was 0.85 for source credibility. Hence, the discriminant validity criterion was also met for our data sample.

### **Hypotheses Testing**

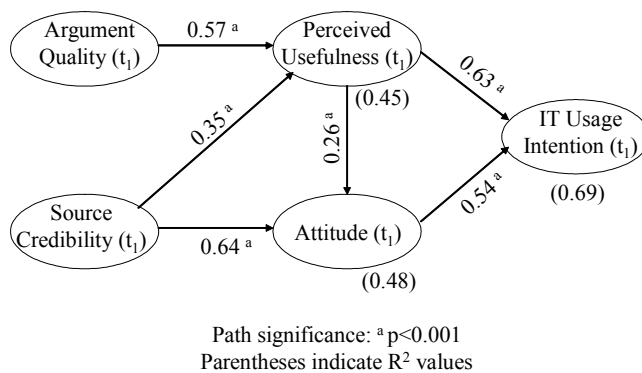
The next step in our data analysis was to examine the significances and strengths of each of our hypothesized effects. This analysis was done using two PLS models. The first model examined the main effects specified in hypotheses H1 through H3, while the second model examined the moderating effects stated in H4 through H9. Results of the analysis for each phase, including standardized path coefficients, path significances, and variance explained ( $R^2$  value) for each dependent variable, are presented in Figures 3 and 4 respectively.

The main effects model (Figure 3) examined the effect of argument quality on perceived usefulness (H1) and that of source credibility on attitude (H2) and on perceived usefulness (H3), as well as three associations between perceived usefulness, attitude, and IT acceptance intention suggested by TAM. All six paths in this model were significant at  $p < 0.01$ . Consistent with ELM, argument quality had a strong and significant effect ( $\beta = 0.57$ ;  $p < 0.001$ ) on perceived usefulness, thereby supporting H1. Source credibility also had significant effects on attitude ( $\beta = 0.64$ ;  $p < 0.001$ ) and on perceived usefulness ( $\beta = 0.35$ ;  $p < 0.001$ ), demonstrating support for H2 and H3 respectively. Additionally, users' intention to use DMS was influenced significantly by

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<sup>3</sup> This is supposedly a stronger test of discriminant validity than pair-wise comparison of  $\chi^2$  values of unconstrained and constrained CFA models often reported in the literature (Fornell and Larcker 1981).

both perceived usefulness ( $\beta=0.63$ ;  $p<0.001$ ) and attitude ( $\beta=0.54$ ;  $p<0.001$ ), as expected from TAM, and perceived usefulness had a significant effect on attitude ( $\beta=0.26$ ;  $p<0.001$ ). Argument quality and source credibility jointly explained 45% of the variance in perceived usefulness, with argument quality contributing a larger proportion to that explanation. Source credibility and perceived usefulness jointly explained 48% of attitude, with source credibility having the dominant effect.

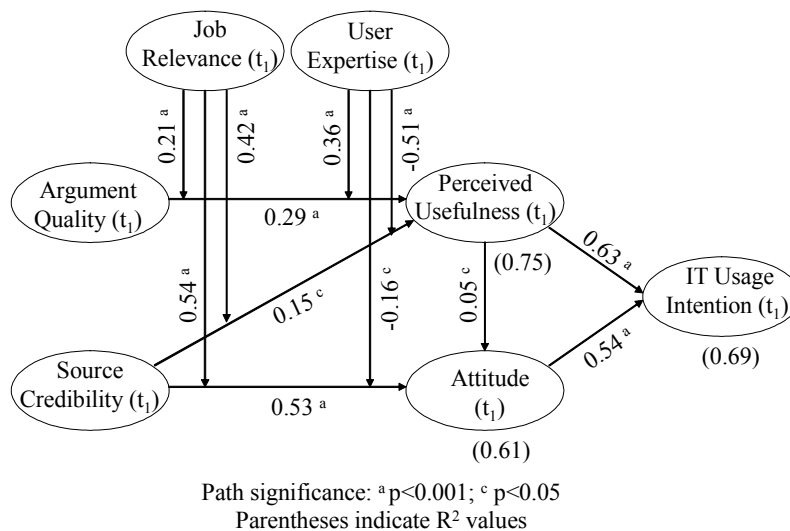


**Figure 3. PLS Analysis of Main Effects**

Collectively, the above results demonstrate that both central-route and peripheral-route processes are effective ways of influencing one's perceived usefulness and attitude toward IT acceptance, and that the central-route and peripheral-route influences are captured effectively using the argument quality and source credibility constructs respectively. Further, the effect of source credibility on perceived usefulness suggests that user perceptions may not necessarily be based entirely on a pure central-route or peripheral-route influence process, but may sometimes be formed jointly by both processes.

The moderating effects model (Figure 4) tested the extent to which job relevance and user expertise, representing elaboration motivation and ability respectively, moderated the main effects hypothesized in H1-H3. The interaction terms were modeled in PLS as products of each items belonging to the underlying scales, as recommended by Chin et al. (2003), and added to

the main effects model in Figure 3. The main effects of the moderating constructs on IT acceptance perceptions were also included in this model in order to statistically separate the hypothesized moderating effects from all statistically possible main effects (these main effects are not reported here because of their lack of theoretical significance). As shown in Figure 4, including the above moderating effects increased variance explained ( $R^2$  value) in perceived usefulness from 45% in the main effects model to 75% in the moderating effects model, and that in attitude from 48% to 61%. F-tests comparing the  $R^2$  values for each dependent variable between the nested main and moderating effects models<sup>4</sup> found the increase in explanatory power to be statistically significant at  $p < 0.001$  for both perceived usefulness and attitude. This confirmed our expectation that the hypothesized moderating effects indeed provide superior explanation of IT acceptance perceptions over and above the corresponding main effects.



**Figure 4. PLS Analysis of Moderating Effects**

Examining individual paths in the moderating effects model, we found that the job relevance had a significant positive moderating effect on the association between argument quality and perceived usefulness ( $\beta = 0.21$ ;  $p < 0.001$ ), as expected from H4. Job relevance also

<sup>4</sup> Computed as:  $F = (R^2_{\text{interaction}} - R^2_{\text{main}}) / [(1 - R^2_{\text{interaction}}) / df]$

positively moderated the effects of source credibility on attitude ( $\beta=0.54$ ;  $p<0.001$ ) and perceived usefulness ( $\beta=0.42$ ;  $p<0.001$ ), when these associations were expected to be *negative* from H5 and H6 respectively. Potential reasons for these unexpected effects are explored below. User expertise positively moderated the effect of argument quality on perceived usefulness ( $\beta=0.36$ ;  $p<0.001$ ), in accordance with H7, and negatively moderated the effects of source credibility and attitude ( $\beta=-0.16$ ;  $p<0.05$ ) and perceived usefulness ( $\beta=-0.51$ ;  $p<0.001$ ), consistent with H8 and H9 respectively.

The positive moderating effects of job relevance on the main effects of source credibility on attitude and perceived usefulness were perplexing, since H5 and H6 hypothesized these effects to be negative. While these discrepancies may be attributed to measurement errors, they may also be indicative of a deeper theoretical problem. To further investigate these counter-intuitive results, we revisited the ELM literature and found similar unusual findings in other studies that used source credibility as a peripheral cue (e.g., Eagly and Chaiken 1993). In a recent overview of ELM, Petty and Wegener (1999) attempted to reconcile these conflicting findings by suggesting that a given variable can serve as either a cue or an argument, depending on the amount of thoughtful elaboration pursued by different subjects. This multiplicity of influence patterns or “multiple roles postulate” was described as:

“[A]s people approach the high end of the elaboration continuum, they are more likely to scrutinize *all* available information in the immediate influence context in an attempt to evaluate the true merits of the argument *and position* advocated” (Petty and Wegener 1999, p. 46).

Thus, users pursuing the high elaboration route may consider factors that are not only related to the arguments embedded in a message, but also peripheral cues related to the message source (e.g., is this source legitimate?) as an issue-relevant argument. Such thorough consideration of source credibility by high elaboration users as part of a broader decision process

is distinct from the blind acceptance of a source's credentials by low elaboration users (Chaiken and Maheswaran 1994). If most users in our sample did follow the high elaboration route and viewed source credibility as an issue-relevant argument rather than as a peripheral cue, then the positive moderating effects of job relevance on the main effects of source credibility are indeed justified.

To empirically examine the plausibility of the above explanation, we conducted a follow-up analysis where we computed the overall elaboration level of each subject in our sample, based on a non-weighted average of their job relevance and user expertise scores. We then divided the entire sample into two groups based on whether their overall elaboration was above or below the sample median. If people in the high elaboration state indeed viewed source credibility differently from those in the low elaboration state, as Petty and Wegener (1999) suggested, then we should expect significant *positive* moderating effects of job relevance on the main effects of source credibility on perceived usefulness and attitude for the high elaboration group, but *negative* moderating effects for the low elaboration group. Separate PLS analysis for each group confirmed these expectations, demonstrating path coefficients of 0.41 ( $p < 0.001$ ) and 0.63 ( $p < 0.001$ ) for the high elaboration group, and  $-0.17$  ( $p < 0.05$ ) and  $-0.05$  ( $p > 0.05$ ) for the low elaboration group, providing partial support for the above explanation. These findings also demonstrate the complex and idiosyncratic nature of the source credibility construct that researchers should take into consideration while designing future ELM-based studies. In retrospect, it seems that "source likeability" or "source affinity" might have been a more appropriate peripheral cue than source credibility in our study.

Finally, as a preliminary test of ELM's "temporal persistence hypotheses," we examined the stability of the ELM outcomes, perceived usefulness and attitude, between the time  $t_1$

immediately following the DMS training and time  $t_2$  three months later. For this purpose, we computed the change in perceived usefulness and attitude scores from  $t_1$  to  $t_2$  as dependent variables, and linked these difference scores to job relevance and argument quality as independent variables in our PLS analysis. Since high job relevance or high user expertise (i.e., high elaboration motivation and ability respectively) was likely to cause minimum temporal change in perceived usefulness or attitude, we expected all four effects from the two independent variables to the two dependent variables to be negative. PLS analysis confirmed these expectations for the effects of user expertise on perceived usefulness change ( $\beta=-0.14$ ,  $p<0.05$ ) and attitude change ( $\beta=-0.13$ ,  $p<0.05$ ). Job relevance had a significant negative effect on attitude change ( $\beta=-0.25$ ,  $p<0.001$ ), but a non-significant positive effect on perceived usefulness ( $\beta=0.16$ ,  $p>0.05$ ). It is possible that the non-significant effect may be due to the non-significant change in perceived usefulness mean from 4.81 at time  $t_1$  to 4.83 at time  $t_2$ , while the attitude mean recorded a significant change from 4.35 to 4.11 during that time ( $p<0.01$ ). However, we caution readers against drawing any conclusive inferences from this exploratory analysis, given that we did not control for subjects' processing modes (central versus peripheral routes) during the three-month course of this study. If subjects' influence modes changed from central to peripheral or vice versa, then that could invalidate our temporal persistence findings. Future research on ELM's temporal effects should be sensitive to such potential changes in subjects' elaboration patterns, and employ controlled laboratory experiments appropriately designed to control for subjects modes of elaboration.

## CONCLUSIONS

### Discussion of Key Findings

This study started with the goal of addressing three research questions: (1) how do informational influence processes shape one's IT acceptance, (2) do the effects of these influence processes vary across users and situational contexts and if so how, and (3) how persistent are these effects over time? To answer these questions, we started with ELM, a dual-process theory of persuasion from social psychology, to identify the central and peripheral routes as two alternative ways of influencing IT users, postulate elaboration motivation and ability as moderating factors mitigating the two influence routes, and suggesting that the central-route influence is more temporally stable than peripheral-route influence. We proposed nine hypotheses related to the first two research questions, of which seven were validated using a field survey of document management system (DMS) acceptance among governmental employees in Ukraine. The remaining two hypotheses, both moderating effects, were reconciled using post hoc sub-group analysis and found to be consistent with theoretical expectations. The third research question was examined via an exploratory test based on limited data, and hence, we caution against drawing conclusive interpretations from this analysis.

Our empirical findings demonstrate that the central and peripheral routes are both viable ways of influencing users to accept a new IT. In the central route, users engage in thoughtful processing of issue-relevant arguments embedded in an informational message, while in the peripheral route, they merely attend to the peripheral cues about the message such as the credibility of the message source. These influence mechanisms shape users' IT acceptance intention by modifying key perceptions salient to acceptance such as perceived usefulness and attitude. Our results confirm that both influence routes are moderated by users' motivation and ability to elaborate or process issue-relevant arguments. Users with higher elaboration motivation and ability tend to be more influenced by the central route, while those with lower

motivation and ability and influenced by the peripheral route. We also report that the central route results in more stable attitude and usefulness perceptions than the peripheral route, and are hence, likely to have a longer-term impact on user acceptance decisions than the latter.

Based on prescriptions from the ELM literature, the central and peripheral routes were operationalized in this study using the argument quality and source credibility constructs respectively, while elaboration motivation and ability was captured using job relevance and user expertise constructs respectively. Though user expertise positively moderated the central route influence process involving argument quality and negatively moderated the peripheral route process involving source credibility, as theoretically expected, job relevance had positive moderating influences on both central and peripheral route processes. Additional follow-up analysis directed at resolving this anomaly revealed that while source credibility was a salient peripheral cue for low elaboration users, it was also viewed as an issue-relevant argument by high elaboration users. Combining high and low elaboration users in one group and testing their collective moderating influence on the impacts of source credibility therefore generated idiosyncratic results, masking the differential nature of the effects for the two user groups. Future ELM researchers should be sensitive to such idiosyncratic impacts of source credibility, and may consider replacing this construct with a pure peripheral cue such as source likeability or affinity. Future researchers are also encouraged to examine other plausible peripheral cues, such as size of prior IT user base, and other elaborators beyond job relevance and user expertise, such as extent of distraction or time pressure in argument processing.

In applying the ELM to understanding IT acceptance, we also made some additional theoretical extensions. We noted that the central and peripheral routes to influence are not mutually exclusive in IT acceptance contexts, but that potential IT users may sometimes employ

both processes simultaneously in forming perceptions related to IT acceptance. For instance, we noted that one's usefulness perceptions can be shaped by both argument quality and source credibility, resulting in a mixed-mode model. Further, we split the attitude construct in ELM into perceived usefulness and attitude, respectively representing the cognitive and affective component of user attitudes. Extensions such as these may be necessary if a theory is taken from one context and applied in an entirely different context. Such theoretical adaptations are additional ways of extending the core theory while simultaneously enhancing its explanatory ability across a range of research problems.

How does our elaboration likelihood model of informational influence inform core IT acceptance theories such as IDT and TAM? While TAM acknowledges that "external variables" may influence user perceptions related to IT acceptance, it provides no explanation of which external variable influence which user perception and how. The ELM casts new insights into this unaddressed area by suggesting informational messages from external sources as the primary "external variables" of interest and by indicating that the extent to which these messages influence user perceptions is moderated by users' personal characteristics such as their motivation and ability to elaborate issue-relevant arguments.

Likewise, IDT suggests that information communicated by mass media and interpersonal communication channels shape users' awareness of and motivation to accept a new IT, but cannot clarify what aspects of the communicated information influence users' acceptance decisions. The ELM posits argument quality and peripheral cues embedded in the communicated information as the key drivers of users' acceptance decisions. Further, IDT also indicates that these communication patterns have varying effects on different types of users (e.g., early versus later adopters), but does not elaborate why. The ELM addresses this gap by

focusing on users' elaboration motivation and ability as moderating the impact of external informational message on user acceptance.

### **Limitations of the Study**

Like most empirical research, this study is not without limitations. First, this study did not actively manipulate central and peripheral routes to influence. There was a common treatment in our research design in that subjects did receive three days of formal, hands-on training on IT usage, but it was left to the subjects' to decide whether they would follow the central or peripheral route. For practical constraints imposed by the field setting where data was collected, it was not possible for us to administer separate central-route and peripheral-route treatments to different subject groups, as would have been ideal for testing the hypothesized ELM effects. Though this lack of experimental controls may have hurt the internal validity of our findings, we believe that our field-based data collection helped improve our external validity or generalizability compared to experimental studies in laboratory settings. We encourage future researchers to employ tightly controlled experimental designs in laboratory settings to test the internal validity of our findings. Such designs should attempt to maintain the equivalence of central and peripheral route treatments by say, equating the number of message arguments and peripheral cues provided to treatment groups. Moreover, any test of attitude persistence should be conducted under conditions where initial attitude extremity is equivalent across central and peripheral route subject groups. This would help assure that any difference in attitude persistence is caused by differences in influence route rather than by initial differences in attitude extremity, and additionally, minimize the potentially confounding effect of initial attitude differences on differential attitude decay over time (Petty et al. 1995).

Second, similar to many prior studies on IT acceptance, we used acceptance intention as a proxy for acceptance behavior. As prior research indicates, intention and behavior may have a correlation as low as 0.5 (see Sheppard, Hartwick, and Warshaw's [1988] meta-analysis of this effect size) and that additional factors may confound the effect of intention on behavior. However, objective data on acceptance behavior was not available in our study since the City of L'viv had no mechanism or policy of storing such data on a centralized server. While we would have certainly preferred to include acceptance behavior data if available, we do not believe that measuring acceptance behavior would have substantively changed any of our reported findings since the focus of this study was on understanding informational influence effects on user perceptions and not on acceptance behavior per se.

Third, we examined one peripheral cue in this study, namely source credibility. Our choice of this cue was motivated by its prevalent use in the ELM literature (e.g., Petty et al. 1981; Sussman and Siegal 2003). However, as we realized following our empirical analysis, source credibility may be viewed differently by IT users depending on their extent of elaboration, resulting in idiosyncratic effects on the dual process model. Alternative peripheral cues potentially more pertinent to IT acceptance include number of users that have previously accepted the target IT, number of times an informational message is reiterated, and source likeability, which are left open for future research.

### **Contributions for Practice**

This study has several contributions for IS practice, especially within the context of managing IT implementation within organizations. IT managers often invest millions of dollars on new IT with the goal of generating long-term organizational benefits such as improving

worker productivity or decision quality. However, such investments are wasted if managers cannot influence organizational users to accept the implemented systems for their everyday work. IT managers can benefit from knowing what influence processes can be used to motivate individual acceptance of IT within their organizations, under what circumstances are these processes likely to succeed or fail.

Drawing from ELM, this research presents two alternative modes of influence, namely the central and peripheral routes, which managers can employ to encourage organizational members' acceptance of IT. The former technique involves educating users about the potential benefits of IT acceptance by providing them high-quality arguments about how the new IT can substantially improve their work, while the latter technique involves providing peripheral cues such as endorsements from reputable or preferred sources about the benefits and potential impacts of IT acceptance.

Second, IT managers should understand that a "one size fits all" approach to influence may not lead to the desired acceptance outcomes in organizations, given wide variation in organizational members' motivation and ability to elaborate issue-relevant arguments. Our study found that organizational users who see high job relevance in IT usage and have relatively high IT expertise tend to follow the central route to influence and are influenced more by argument quality, while those with low perceptions of job relevance and expertise are more likely to depend on peripheral cues for deciding whether or not to accept a given IT. In fact, targeting a user group with the wrong type of influence process can backfire and engender IT resistance within the target user group. Further, influence processes that worked in one organization may not work equally in other organizations, due to intrinsic differences in their workers' elaboration states. Accordingly, IT managers should endeavor to assess users' elaboration motivation and

ability before deciding which influence strategy to pursue in their organizations and how to customize influence strategies to specific user groups.

Finally, which of the two influence processes is better for changing user perceptions over the short- and long-term? Our findings suggest that both the central and peripheral routes of influence are viable ways of shaping user perceptions over the short-term. However, based on our limited examination of ELM's temporal persistence hypotheses, we suggest the central route may be superior over the long-term because the perceptions created by this route are more stable over time and lead to persistent effects on long-term IT acceptance. Wherever possible, IT managers should therefore strive to employ the central route to influence, in order to extract the most benefits from scarce IT implementation resources. Since elaboration likelihood is a temporary state rather than a personality trait, managers can enhance users' elaboration level via strategies such as manipulating the message, the source, or the influence context, providing more time to users for processing arguments, reducing the number of distractions, and pre-message conditioning (such as by telling subjects that they will be questioned on the message later), all of which are likely to enhance users' motivation to pursue the central-route influence process. Further, managers can directly influence job relevance by customizing the system to user or workgroup needs and user expertise via IT training programs.

### **Contributions for Research**

To the best of our knowledge, this is the first study to theoretically specify or empirically test the role of influence processes in IT acceptance. Prior IT acceptance studies started with individual perceptions such as usefulness and ease of use while attempting to understand acceptance, but did not specifically examine how those perceptions can be influenced in the first

place. In that sense, our research addresses a void in extant IT acceptance research by highlighting influence processes that can shape the formation of individual perceptions and eventual IT acceptance. As Markus and Robey (1988) observed, IT implementation is more than just technology deployment; it requires careful orchestration of the social process of organizational change for overcoming users' resistance toward a new system and persuading them to use it. Overcoming user resistance requires deep-seated belief and attitude change on the part of target users, and hence, it is important to study the influence processes by which such attitude change can be accomplished. By advancing the case for studying influence processes in IT acceptance research, this study may help stimulate future research on proactive modification of acceptance patterns within organizations.

Though IDT-based studies have noted informational influence to drive technology acceptance among a user population, exactly what type of influence can achieve the desired change effectively over the short and long-term and under what circumstances is still largely unknown to IS scholars. User influence is a challenging task, as evident from Dennis' (1996) findings that even if users have access to critical information needed to perform certain tasks, via latest technologies such as group support systems, they may not necessarily utilize such information appropriately to make optimal decisions. Hence, it is incumbent upon us as researchers to identify alternative ways of influencing users, examine the relative efficacy and long-term stability of these processes, and describe conditions under which they are less effective, as was done in this study.

The final theoretical contribution of this study is its detailed exposition of the ELM and an illustration of its application to the problem of IT acceptance. Although a limited number of prior ELM-based studies had applied the theory within other contexts such as system design,

decision making, or knowledge acceptance (e.g., Mak et al. 1997; Dijkstra 1999; Sussman and Siegel 2003), this study is the first to apply this theory to the IT acceptance domain. Two major advantages of this theory, compared to prior theories of IT acceptance such as TAM and IDT, are (1) its focus on the processes by which user perceptions are formed, and (2) its contextualized nature, which can explain not only how influence effects vary across individuals but also how such variation may occur within individuals as elaboration motivation and ability changes with time.<sup>5</sup> Indeed, ELM is a process theory that has the potential of opening the black box of the influence process as it unfolds over time, in contrast to most prior theories that were primarily factors-based. However, ELM also complements prior IT acceptance theories by emphasizing that IT system acceptance must be preceded and framed by acceptance of information about the system. Such information acceptance may occur in multiple ways, such as the central and peripheral routes, which have differential implications for eventual system acceptance. We also provide an exploratory test of ELM's temporal persistence hypothesis, based on our limited data, which may be the subject of future IT usage studies. Hopefully, our detailed description of this theory will motivate its further consideration by not only IT acceptance researchers, but also those pursuing other domains of IS research.

In conclusion, this study proposes an ELM-based theoretical model of influence processes relevant to IT acceptance and validates most of its hypothesized associations via a longitudinal field survey of DMS acceptance within a governmental agency. We hope that this study will provide the foundation for building a comprehensive knowledge base of influence processes and inspire future researchers to investigate this ignored yet potentially fruitful area of IT acceptance research.

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<sup>5</sup> We thank an anonymous reviewer for making this observation.

## REFERENCES

- Ajzen, I. "The Theory of Planned Behavior," *Organizational Behavior and Human Decision Processes* (50), 1991, pp. 179-211.
- Bhattacharjee, A. "Understanding Information Systems Continuance: An Expectation-Confirmation Model," *MIS Quarterly* (25:3), September 2001, pp. 351-370.
- Bhattacharjee, A., and Premkumar, G. "Understanding Changes in Belief and Attitude Toward Information Technology Usage: A Theoretical Model and Longitudinal Test," *MIS Quarterly* (28:2), June 2004, pp. 229-254.
- Brancheau, J.C., and Wetherbe, J.C., "The Adoption of Spreadsheet Software: Testing Innovation Diffusion Theory in the Context of End-User Computing," *Information Systems Research* (1:2), 1990, pp. 115-143.
- Breckler, S. J. "Empirical validation of Affect, Behavior, and Cognition as Distinct Components of Attitude," *Journal of Personality and Social Psychology* (47:6), 1984, pp. 1191-1205.
- Chaiken, S. "Heuristic versus Systematic Processing in the Use of Source versus Message Cues in Persuasion," *Journal of Personality and Social Psychology* (39), 1980, pp. 752-766.
- Chaiken, S., and Maheswaran, D., "Heuristic Processing Can Bias Systematic Processing: Effects of Source Credibility, Argument Ambiguity, and Task Importance on Attitude Judgment," *Journal of Personality and Social Psychology* (66:3), 1994, 460-473.
- Chaiken, S., and Trope, Y. *Dual-Process Theories in Social Psychology*, The Guilford Press, New York, 1999.
- Chin, W. W., and Frye, T. A. *PLS-Graph User's Manual*, University of Calgary, Faculty of Management, Alberta, Canada, 1994.
- Chin, W. W., Marcolin, B., and Newsted, P. "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* (14:2), 2003, pp. 189-217.
- Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science* (35:8), 1989, pp. 982-1003.
- Dennis, A.R., "Information Exchange and Use in Group Decision Making: You Can Lead a Group to Information, But You Can't Make It Think," *MIS Quarterly* (20:4), December 1996, pp. 433-457.
- Dijkstra, J. J. "User Agreement with Incorrect Expert System Advice," *Behavior & Information Technology* (18:6), 1999, pp. 399-411.

- Eagly, A. H., and Chaiken, S. *The Psychology of Attitudes*, Harcourt Brace Jovanovich, Fort Worth, TX, 1993.
- Fishbein, M. and Ajzen, I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Addison-Wesley, Reading, MA, 1975.
- Fornell, C., and Larcker, D. F. "Evaluating Structural Equations with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18), February 1981, pp. 39-50.
- Hagtvedt, C. P., and Petty, R. E. "Personality and Persuasion: Need for Cognition Moderates the Persistence and Resistance of Attitude Changes," *Journal of Personality and Social Psychology* (63), 1992, pp. 308-319.
- Kelman, H. C. "Processes of Opinion Change," *Public Information Quarterly* (25), pp. 57-78.
- Lewis, W., Agarwal, R., and Sambamurthy, V. "Sources of Influence on Beliefs About Information Technology Use: An Empirical Study of Knowledge Workers," *MIS Quarterly* (27:4), December 2003, pp. 657-678.
- Lord, K. R., Lee, M. S., and Sauer, P. L. "The Combined Influence Hypothesis: Central and Peripheral Antecedents of Attitude toward the Ad," *Journal of Advertising* (24:1), Spring 1995, pp. 73-85.
- Mak, B., Schmitt, B. H., and Lyytinen, K. "User Participation in Knowledge Update of Expert Systems," *Information & Management* (32:2), February 1997, pp. 55-63.
- Markus, M. L., and Robey, D. "Information Technology and Organizational Change: Causal Structure in Theory and Research," *Management Science* (34:5), 1988, pp. 583-598.
- Moore, G. C. and Benbasat, I. "Development of an Instrument to Measure the Perceptions of Adoption an Information Technology Innovation," *Information Systems Research* (2:3), 1991, pp. 192-222.
- Nilakanta, S., and Scamell, R. W. "The Effect of Information Sources and Communication Channels on the Diffusion of Innovation in a Database Development Environment," *Management Science* (36:1), January 1990, pp. 24-40.
- Oliver, R. L. "A Cognitive Model for the Antecedents and Consequences of Satisfaction," *Journal of Marketing Research* (17), 1980, pp. 460-469.
- Petty, R. E. and Cacioppo, J. T., *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*, Springer-Verlag, New York, 1986.
- Petty, R. E., Cacioppo, J. T., and Goldman, R. "Personal Involvement as a Determinant of Argument-Based Persuasion," *Journal of Personality and Social Psychology* (41:5), 1981,

pp. 847-855.

Petty, R. E., Haughtvedt, C. P., and Smith, S. M. "Elaboration as a Determinant of Attitude Strength: Creating Attitudes that Are Persistent, Resistant, and Predictive of Behavior," in (eds.) R. E. Petty and J. A. Krosnick, *Attitude Strength: Antecedents and Consequences*, Lawrence Erlbaum Associates, Mahwah, NJ, 1995, pp. 93-130.

Petty, R. E., and Wegener, D. T. "The Elaboration Likelihood model: Current Status and Controversies," In *Dual-Process Theories in Social Psychology*, (ed.) S. Chaiken and Y. Trope, Guilford Press, New York, 1999.

Rogers, E. M. *Diffusion of Innovations*, Free Press, New York, 1995.

Sheppard, B. H., Hartwick, J., and Warshaw, P. R. "The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research," *Journal of Consumer Research* (15), December 1988, pp. 325-343.

Sussman, S. W., and Siegel, W. S. "Informational Influence in Organizations; An Integrated Approach to Knowledge Adoption," *Information Systems Research* (14:1), March 2003, pp. 47-65.

Taylor, S., and Todd, P. A. "Understanding Information Technology Usage: A Test of Competing Models," *Information Systems Research* (6:2), 1995, pp. 144-176.

Venkatesh, V., and Davis, F. D. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Management Science* (46:2), February 2000, pp. 186-205.

Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. "User Acceptance of Information Technology: Toward A Unifying View," *MIS Quarterly* (27:3), September 2003, pp. 425-478.

## APPENDIX: MEASUREMENT ITEMS

### *Perceived Usefulness:*

- US1. Using DMS in my job will increase my productivity (e.g., make my work faster).
- US2. Using DMS in my job will improve my performance (e.g., make my work better).
- US3. Using DMS in my job will make me more effective (e.g., help me make better decisions).
- US4. I find DMS to be useful in my job.

### *Attitude:*

- AT1. Using DMS in my job is a (bad ... good) idea.
- AT2. Using DMS in my job is a (foolish ... wise) idea.
- AT4. Using DMS in my job will be (unpleasant ... pleasant).
- AT3. Overall, I (dislike ... like) the idea of using DMS in my job.

### *Intention:*

- IN1. I intend to use DMS on my job within the next one month.
- IN2. I intend to use DMS on my job in the near future.
- IN3. I intend to use DMS for more of my job responsibilities.

### *Argument Quality:*

- AR1. The information provided during the DMS training session was informative.
- AR2. The information provided during the DMS training session was helpful.
- AR3. The information provided during the DMS training session was valuable.
- AR4. The information provided during the DMS training session was persuasive.

### *Source Credibility:*

- SC1. The person providing the DMS training was knowledgeable on this topic.
- SC2. The person providing the DMS training was trustworthy.
- SC3. The person providing the DMS training was credible.
- SC4. The person providing the DMS training appeared to be an expert on this topic.

### *User Expertise:*

How knowledgeable are you on using the following technologies:

- UE1. Electronic mail (novice ... expert).
- UE2. Word processing (novice ... expert).
- UE3. Computers (novice ... expert).

### *Job Relevance:*

- JR1. Using DMS is important for my job.
- JR2. Using DMS is relevant (appropriate) for my job.

Note: Items for all constructs except attitude and user expertise were measured using seven-point Likert scales anchored between “strongly disagree” and “strongly agree.” Scales for the attitude and user expertise items are shown above.