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Xiaoqing Wang
University of Pittsburgh

Brian Butler
University of Pittsburgh

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Xiaoqing Wang and Brian S. Butler
Katz Graduate School of Business
University of Pittsburgh
Pittsburgh, PA USA
xiawang@katz.pitt.edu **bbutler@katz.pitt.edu**

Abstract

Information technology is changing rapidly. However, existing technology acceptance models do not consider the impact of changes on individual acceptance of information technology. This paper introduces the construct of technology change and integrates current technology acceptance models with social psychology theories of attitude change to propose a theory of technology acceptance under conditions of change. Beginning with a review of current technology acceptance models, this paper considers how they implicitly deal with IT change. A conceptualization of technology change focused on rate, magnitude, and distribution of change is then presented. Finally, a three-stage theoretical model of how technology change affects acceptance through individual attitudes and beliefs is presented. The core of the model focuses on the processes of forming attitudes and beliefs about technology change, changing attitudes and beliefs about the technology, and technology acceptance decision making. These processes are expected to be moderated by the visibility, relevance, and compatibility of the changes. This model, by integrating the reality of technology change with extensive research on technology acceptance, extends our understanding of the complex interplay between technology and people in dynamic, evolving information systems.

Introduction

Information technology changes rapidly. For example, Internet Explorer moved from the base release IE 1.0 to IE 6.0 with 19 releases in 6 years. Its rival, Netscape Navigator, went through 28 versions in 7 years (Wilson 2003). At the same time, the nature of software changes has also subtly changed: there are fewer new versions, but many more updates. Microsoft publishes 10 to 20 updates related to Windows per day (Microsoft Download Center 2003). New versions of Microsoft products, Netscape Navigator, and Real Player are routinely called upgrades. New functionality in the Windows operating system even allows a computer to automatically search for and download updates from the Microsoft Website as they become available. With the advent of staged software development, people face similarly high levels of technology change in organizations, with frequent modifications being made even to complex intra-organizational or interorganizational business systems. So how do individuals deal with these technology changes? How do technology changes affect individual attitudes and beliefs about systems?

Although technology change is commonplace in everyday life, it has not received much attention from IS researchers. Existing literature on technology acceptance focuses on individual adoption of given technologies (Davis 1989; Davis et al. 1989; Venkatesh and Davis 1996, 2000; Venkatesh and Morris 2000), assuming that the technology is completely new for the users and that it does not change during the usage period. A few studies have considered individual intention to continue using a technology (Agarwal and Prasad 1997; Bhattacherjee 2001; Hartwick and Barki 1994; Karahanna et al. 1999), loosening the assumption of technological novelty. But still these papers did not consider the possibility that the underlying technology could change over time.

The objective of this paper is to introduce the concept of technology change into technology acceptance research. Building on a critical review of the existing technology acceptance literature, this paper proposes a conceptual model of how individuals react to technology change through changes in their attitudes and beliefs. The paper is organized as follows: the next section provides

an overview of the existing technology acceptance literature. Then, technology change is conceptualized and a model of how technology change affects user attitudes, beliefs, and behavior is proposed. The paper concludes with a discussion of directions for future research on technology change and individual use of systems.

Overview of Technology Acceptance Literature

Most technology acceptance models draw on the theory of reasoned action (TRA) or the theory of planned behavior (TPB) (Ajzen 1991; Ajzen and Fishbein 1980). According to TRA, people act in accordance with their intentions, intentions which are influenced by attitudes toward the behavior and subjective norms. Attitudes are the individual's disposition toward a behavior; subjective norms refer to the perceived social pressure to perform or not perform a behavior (Ajzen and Fishbein 1980). TPB builds on TRA and adds a third variable, perceived behavior control (Ajzen 1991). With TPB and TRA, attitudes toward a behavior arise from individual beliefs about the consequences of that behavior and the individual's affective response to those consequences.

The technology acceptance model (TAM) has been a major stream in technology acceptance research (Agarwal 2000). TAM treats the two belief variables—perceived ease of use and perceived usefulness—as the most salient in determining individual acceptance intention and behavior (Davis 1989). These beliefs are positively related to acceptance behavior both directly and indirectly through the mediating effect of intention to accept the technology. Both perceived ease of use and perceived usefulness have received strong empirical support in explaining variation in acceptance intention and behavior (Davis 1989; Davis et al. 1989; Venkatesh and Davis 1996, 2000; Venkatesh and Morris 2000).

TAM has been used to explain the acceptance behavior of a range of technologies including text-editors (Davis 1993), spreadsheets (Agarwal and Prasad 1999), e-mail (Szajna 1996), configuration software (Gefen and Keil 1998), and debugging tools (Bajaj and Nidumolu 1998). However, it has also been criticized for its simplicity and lack of emphasis on attitudes (Legris et al. 2003; Taylor and Todd 1995). In response, researchers have extended TAM in a variety of ways, considering additional beliefs, individual differences, social influences, and continuous use situations.

Specific beliefs and external variables are examined. Beliefs refer to an individual's cognitive evaluation of the consequences of a particular acceptance behavior (Agarwal 2000). There has been considerable research studying the role of different beliefs in determining acceptance (Agarwal and Prasad 1997; Karahanna et al. 1999; Moore and Benbasat 1991; Rogers 1995). Diffusion of innovation theory (DIT) provides a basic theoretical set of beliefs for studying acceptance, including relative advantage, complexity, compatibility, trialability, and observability (Rogers 1995). Based on DIT, Moore and Benbasat (1991, 1996) developed and tested an instrument to measure perceived characteristics of an innovation. For use of personal workstations, they found that compatibility, perceived usefulness, and ease of use were significant predictors, while result demonstrability, visibility, image, and trialability were not. Agarwal and Prasad (1997) examined current usage and continued usage intentions for the Web. They found that while current level of usage is affected by visibility, compatibility, and trialability, continued usage intentions were only influenced by perceived usefulness and result demonstrability. Researchers have also considered external constructs such as prior use (Dasgupta et al. 2002; Jackson et al. 1997), experience (Thompson et al. 1994), computer self-efficacy (Venkatesh and Davis 1996), individual differences (Agarwal and Prasad 1999), culture (Straub and Keil 1997), and gender (Gefen and Straub 1997; Venkatesh and Morris 2000).

Many studies have considered subjective norms, arguing that social influence is important in shaping individual acceptance behavior (Jackson et al. 1997; Karahanna et al. 1999; Kraut et al. 1998; Lucas and Spitler 1999; Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh and Morris 2000). Social influence refers to the influence of attitudes and beliefs of others through social interaction and communication (Agarwal 2000). The effect of social influence on acceptance is often moderated by other external variables. For example, in a longitudinal field study of information systems development projects, it was found that social influences were more salient to users in mandated-use situations, while attitudes were stronger predictors to acceptance in voluntary usage situations (Hartwick and Barki 1994). In another study, subjective norms were found to exert strong influence on women's technology use decisions but not men's, although the effect of subjective norms diminished over time (Venketesh and Morris 2000).

Some work has begun to distinguish between initial adoption and continuous use decisions and to identify different determinants of acceptance in these two situations. Hartwick and Barki (1994) published one of the earliest attempt to model the relationship between user participation and system usage as a continuous loop. They found that subjective norms' direct influence on acceptance intention was stronger during initial adoption, while their indirect influence through attitudes was stronger during

continuous use. Also, the relationship between acceptance intention and behavior was stronger in continuous use situations than during initial adoption. Karahanna et al. (1999) found similar results in their study of Windows. They found that while preadoption attitude was based on perceptions of usefulness, ease-of-use, result demonstrability, visibility, and trialability, post-adoption attitude was based only on instrumental beliefs of usefulness and perceptions of image enhancement. Bhattacherjee (2001) used expectation-confirmation theory to study the process of IS continuance among online banking users, finding that users' continuance intention was determined by satisfaction with IS use and perceived usefulness of continued use. Users formed expectations about the online service, and their experience of the service performance determined their confirmation level, which in turn influenced perceived usefulness and satisfaction with IS use.

While continuous use models of technology acceptance extend technology acceptance models by considering changes in the user, the assumption of a stable, unchanging technology remains. The existing literature does not consider technology change or how change affects user attitudes and behavior. Although how individuals evaluate a given technology and make acceptance decisions has been studied extensively, no study has included change in its models. Research on individual technology acceptance has been primarily concerned with technology that is completely new to the individual. The characteristics of the technology are assumed to be exogenous and constant. Technology change is implicitly characterized as discrete, radical, and sporadic. This in turn significantly constrains the ability of these models to explain the interaction between individuals and technology in complex, dynamic environments. To address this limitation we will first consider a conceptualization of technology change and then propose a model linking technology change and technology acceptance.

The Nature of Technology Change

Technology change includes a range of modifications to an existing system, each involving the alteration, removal, or addition of features regarding the functionality or interface of the system. In these terms, technology acceptance models can, at best, be seen as considering only one type of change. An implicit assumption underlying this body of research is that a radical technology change occurs with the introduction of a completely new technology, with users initially choosing either to accept or reject it. While continuous use studies extend this by considering the decision to continue using an existing system, recent criticism suggests that a richer understanding of technology and technological change is needed (Orlikowski and Iacono 2001). The discussion below extends the meaning of technology change to include incremental and invisible changes in addition to the most radical shifts. We propose that technology change can be characterized in terms of three aspects: the rate of change, the magnitude of change, and the distribution of change.

Rate of Change

Different technologies change at different rates. In addition, the rate of change can vary over time for particular technologies. For example, Microsoft periodically introduces new versions of the Windows operating system. It announced its first Windows operating system, Windows 1.0, in 1985. Over the next 10 years it developed and improved the Windows series, announcing its second major milestone, Windows 95 in 1995. However, between 1998 and 2001 there was a new release of Windows operating system every year (Microsoft 2002).

As technology change occurs, the rate of change is an important variable affecting individual decision to continue using the modified technology. As frequency of change increases, individuals may be more resistant because of the greater need to learn new skills, or they may become more accepting because they have become accustomed to change. Hence, rate of change is also related to another important variable that is missing in the IS literature, attitudes toward technology change. Technology acceptance models tend not to consider the rate of change or how it affects individual attitudes toward change or the technology itself, potentially leading to inconsistent findings in empirical studies and incomplete understanding of individuals' use of IT.

Magnitude of Change

Magnitude refers to the size or extent of change in general. Technology changes can differ in their magnitude with some being radical innovations and others more incremental and mundane. Not only does Microsoft release new versions of the Windows operating system, it also publishes numerous incremental updates for its products each year. For example, Microsoft has released

255 updates and service packs for Windows XP on its Website in the 2 years since its launch. There were 54 updates and service packs just for Windows XP from January to March 2003, which is on average 18 per month. Customized organizational systems create the same situation. While organizations occasionally adopt revolutionary new technology, more frequently they incrementally fix problems, add functionality, and adapt existing systems and applications (DeSanctis and Poole 1994; Orlikowski 1996, 2000; Robey and Sahay 1996; Tyre and Orlikowski 1993).

The mechanisms by which individuals respond to incremental changes and radical changes are different. When individuals make use decisions in the face of incremental technology changes, they are already familiar with the technology from prior experience. Hence, their evaluation of the changes either reinforces or contradicts previous evaluations of the technology. That is to say, individuals draw on experience, beliefs, and attitudes when evaluating incremental technology changes. In addition, because users already have experience, beliefs, and attitudes about the technology, responding to incremental changes involves attitude change. Attitudes toward the changes and previous attitudes toward the technology together influence the attitude change process, a process that is conceptually distinct from attitude formation. Users may dislike a change, but if this negative evaluation does not outweigh the previous positive attitudes toward the technology, users will keep using the technology despite the unsatisfactory change.

This interplay of attitude formation about changes and attitude change about a technology is implicit in studies of technology change that highlight the challenges of behavioral change (Valley 2001). Working from the observation that while technical changes may occur at accelerating rates, attitude, behavioral changes, and knowledge changes do not (Whiting and McGee 2000), these studies suggest that incremental technology change can be a powerful tool because it is more compatible with individual and organizational attitude and behavioral change processes (Orlikowski 1993).

Distribution of Change

Another characteristic of technology change is its pace or the distribution over time of the changes. The same amount of change can happen sporadically, occurring intensively at one time but not another, as is assumed in most implementation and technology acceptance literature, or they can be ongoing and continuous, evenly distributed over time. For instance, Microsoft provides many updates to its Windows operating system. Users may visit the Windows Website and download all necessary updates once every three months, or choose to make those changes whenever they become available. In other cases, studies of post-implementation change have found that technology remains flexible and dynamic with variations and adaptations emerging continuously (Orlikowski 1996, 2000; Robey and Sahay 1996).

Considering the pacing of change highlights that individual acceptance of technology may not be a one-time decision process. If change happens continuously, acceptance is no longer a rare and discrete event, but a frequent and ongoing process. Whenever one perceives changes in existing technology, there is a potential choice which involves forming an attitude toward the change, modifying beliefs and attitudes about the technology, and making a decision about acceptance or rejection. In this context, evaluation and acceptance becomes an ongoing decision process linked to the pacing of technology change.

As users are exposed to different levels of change and they need to evaluate small changes and make regular decisions, the way they develop beliefs and attitudes may shift. Users who, when encountering rare change, make usage decisions based on careful cognitive thinking, are more likely to be affected by social influences when faced with the need to make the same types of decisions on an ongoing basis (Chaiken et al. 1996). This stands in contrast to acceptance studies, which found that as times goes by and users gain experience with a stable technology, their decision to continue using the technology is less affected by subjective norms (Venkatesh and Morris 2000).

As noted above, a richer concept of technology change considers a continuum between the most radical and the most incremental type of change. The position of technology changes in the continuum depends on the characteristics of these changes, namely their rate, magnitude, and distribution. While previous work on technology acceptance is valuable for its insight into important determinants of acceptance behavior, it is ultimately limited in scope within a richer model of change: the phenomenon studied by previous literature can be seen as a special case of acceptance, i.e., a one-time acceptance choice in the face of a radical, rare shift to a new, stable technology. This suggests the need for an expanded model of technology acceptance.

Technology Acceptance Under Conditions of Change (TAUCC)

While existing technology acceptance models provide a foundation, there is a need for an extended model: a model of technology acceptance under conditions of change. In this section, we draw upon technology acceptance and attitude change research to propose a three stage model of technology acceptance under conditions of change (TAUCC). TAUCC involves three stages: formation of attitudes and beliefs about change, change of attitudes and beliefs about the technology, and acceptance or rejection of the altered technology.

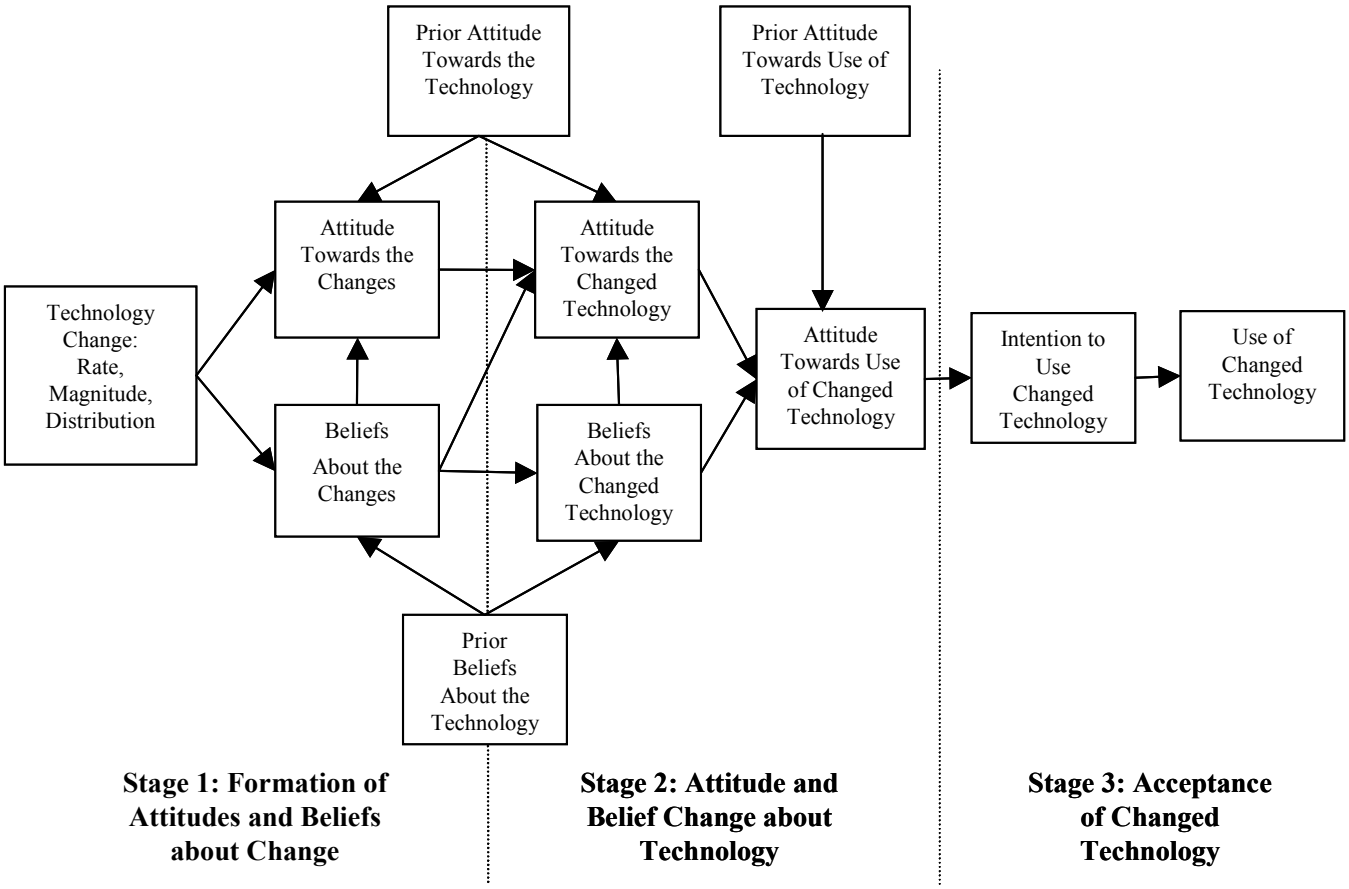

Figure 1. Model of Technology Acceptance Under Conditions of Change

Stage 1: Formation of Attitudes and Beliefs about Technology Change

Stage 1 of TAUCC involves the formation of individual beliefs and attitudes about technology change based on the characteristics of the change and prior beliefs and attitudes toward the technology. This formation process involves awareness, perception, and evaluation of changes. Individual users need to be aware of changes before evaluating them. If no change is perceived and there is no external stimulus for users to reevaluate a technology, usage behavior is not likely to change. If users are aware of changes, they form perceptions about the changes based on prior experience, observations, and information from others, and then form *beliefs about observed changes* accordingly. For example, users may see changes as familiar or unfamiliar, relevant or irrelevant. They may also believe changes as having different characteristics, for example rapid or slow, small or big, continuous or not. The rate, magnitude and distribution of change will be taken into account when beliefs and attitude about the changes are formed. Because individual users perceive changes before evaluating them, perception or meaning of changes is crucial in this attitude formation process (Herron 2002; Moore and Benbasat 1991; Scott and Bruce 1994). Finally, users evaluate these cognitive beliefs and form *affective attitudes toward the change*. For instance they may feel that the changes are good or bad, likable or not. This

beliefs and attitude formation process depends on not only the nature of change but also users' prior beliefs and attitudes about the technology.

The formation of a user's beliefs and attitudes about technology changes depends on his or her unique interpretation of the information received. How will individuals see the changes? When will individuals find changes worthy of careful consideration? Given this, how should technology changes be announced, explained, or framed so that users will respond favorably? While the proposed model provides an initial link between technology change and technology acceptance, both practitioners and researchers would benefit from future work improving the understanding of how individuals become aware of, perceive, and evaluate technology changes.

Stage 2: Changing Attitudes and Beliefs About a Technology

When meaning changes, attitudes change accordingly (Bosveld et al. 1997; Wood 2000). Psychology research suggests that individuals can have multiple attitudes toward the same object and that the most temporarily valued or accessible attitudes dominate (Wood 2000). As a result, attitudes toward an object may change frequently, depending on the importance of the various attitudes at the time of a decision. Here lies a distinction between TAUCC and previous acceptance models. Because different types of change are considered, TAUCC considers both attitude change and attitude formation. If changes are frequent and incremental based on existing systems, users already have experience with the system and have already formed attitudes and beliefs toward the system. These initial attitudes and beliefs can be long-lasting and influential. Therefore, when changes are perceived and beliefs and attitude about the changes are formed, evaluation of this new attitude and existing attitudes about the technology stimulates processes of attitude change rather than simple formation of attitudes.

First, *beliefs and attitudes about the technology* are subject to change, depending on whether beliefs and attitudes toward the changes are consistent with existing beliefs and attitudes toward the technology. For instance, if an Internet Explorer user has been happy with the browser but does not like the functionality added in the latest version, whether he or she will like the latest version depends on the strength of the negative feelings toward the new functionality. On the other hand, if the user likes the new functions, his or her positive attitude toward Internet Explorer will be strengthened. Second, *attitude toward technology use* may also change, depending on beliefs and attitudes about the changed technology as well as prior attitude toward using the technology. This stage of attitude change involves users' reevaluation of the changed technology as well as reconsideration of using the changed technology.

It is worth noting that specific belief variables are not included in the proposed model in order to increase its generalizability. Future empirical research may test a variety of belief variables concerning consequence of changes, for example perceived voluntariness of changes, perceived frequency of changes, and potential of changes to enhance self-image, based on the specific context and technology to be used. The set of belief variables in acceptance literature can be tested in the technology change model to see if the same set of variables still hold with changing technology. Further empirical research examining a range of belief variables is necessary to identify a parsimonious set of beliefs factors that is salient in each stage of TAUCC model.

Stage 3: Acceptance of the Changed Technology

When new attitudes toward the changed technology and technology use emerged, such attitudes, together with social norms, determine a user's decision to accept or reject the changed technology. This is the same process as in prior acceptance models and in TPB. Therefore, this stage is where the TAUCC and existing technology acceptance models merge. Attitudes toward using the changed technology combined with subjective norms explain the user's intention to continue or stop using the changed technology; this intention predicts the user's actual usage behavior. According to continuous use models mentioned earlier, however, the relationship between intention and use behavior may be stronger when a user already has experience with the technology (Hartwick and Barki 1994). Therefore, the intention to accept a changed technology may predict actual behavior better than the intention to accept a new technology.

In summary, the proposed three-stage model focuses on individual acceptance of technology under conditions of change (Figure 1). Stage 1 involves formation of beliefs and attitudes about technology change through awareness, perception, and evaluation of the changes. Stage 2 involves changing of beliefs and attitudes about the technology as well as changing attitudes toward technology use. Stage 3 involves acceptance or rejection of changed technology, which is affected by users' attitudes toward technology use and perceived social norms related to use.

Visibility, Compatibility, and Relevance: Moderators of TAUCC

Technology acceptance under conditions of change involves formation and changing of attitudes and beliefs. There is a rich body of literature in social psychology that studies attitude change (Cialdini and Trost 1998; Johnson and Eagly 1989; Wilson et al. 2000; Wood 1999, 2000). Specifically, research on dual-mode processing theories argues that individuals' attitudes change through two different processes: careful assessment or simple agreement (Wood 2000). Three factors are identified as affecting the processes of attitude change: awareness of change, motivation, and an individual's ability to process relevant information (Chaiken et al 1996; Petty and Wegener 1998; Wilson et al. 2000). As discussed previously, when users are not aware of changes, evaluation of changes and attitude changes are not likely to occur. Hence the more aware users are, the more likely they will assess changes carefully. Furthermore, when individuals are not highly motivated because the changes are not personally involving, or when they have low ability to understand information about the changes, they tend to use the simple strategy of agreeing with a majority position. When individuals are both motivated and capable of understanding the changes, attitude judgments are based on a more thoughtful assessment of relevant information (Wood 2000).

Therefore, social psychology research of these general phenomena suggests that there are many variations and processes by which attitude change can occur—variations that are linked in the literature with three factors: awareness, motivation, and ability to cognitively process the changes. These moderating factors from the attitude formation and change literature form another link with existing studies of technology acceptance through their correspondence with three widely studied constructs of visibility, relevance, and compatibility (Agarwal and Prasad 1997; Karahanna et al. 1999; Moore and Benbasat 1991; Rogers 1995). Visibility of technology changes underlies individual awareness of change. Relevance of changes to individual users affects their motivation to think through the implication of change. Compatibility of changes relates to users' capability to understand and process information regarding the altered technology. Together these three factors moderate the connection between characteristics of technology change and user acceptance.

Visibility refers to the degree to which change is apparent to individuals (adapted from Karahanna et al. 1999). The more visible and more accessible technology changes are, the more likely individual users are to be aware of them and, therefore, more likely to carefully evaluate them. Previous empirical research on technology acceptance examined the effect of visibility on usage intention and behavior, finding that visibility influences initial adoption but not continued usage (Agarwal and Prasad 1997; Karahanna et al. 1999). However, the reduced impact of visibility may be due to the way it was treated in the previous models. While visibility may not have a direct influence on usage intention or behavior, according to dual-mode processing theories it may moderate the process of attitude formation and change (Wilson et al 2000).

Relevance refers to the degree to which individual users perceive technology change to be personally involving and likely to have implications for themselves or their work. Users may perceive technology changes to be in their own interest, or to be beneficial only to others. If users see the changes to be relevant, they will be more motivated to learn about them and their consequences. Two existing belief variables, image and relative advantage, fit into this definition. Image captures the perception that using an innovation will contribute to enhancing the social status of an individual (Agarwal 2000). Relative advantage refers to the extent to which an individual views the innovation as offering an advantage over previous ways of performing the same task (Agarwal 2000). Higher perception of image or relative advantage and hence higher motivation encourages users to carefully evaluate information in making acceptance decisions, potentially changing the processes linking technology change and acceptance (Wood 2000).

Compatibility is the degree to which technology change is perceived as consistent with the existing values, past experiences, and a user's needs (adapted from Rogers 1995). Compatibility makes technology changes more meaningful to individual users and makes it easier for them to interpret changes. The more compatible changes are with existing beliefs and attitudes, the greater the ability of individual users to recognize and process information (Langer 1989). The less compatible changes are, the lower are users' ability to process new information, and the more likely they are to rely on social influence or preconceived interpretations (Langer 1989). Empirical work on technology acceptance has examined the effect of compatibility on usage and shown inconsistent results (Agarwal and Prasad 1997; Chen et al. 2002; Karahanna et al. 1999; Moore and Benbasat 1996). Again, a possible explanation is that current studies treated compatibility as directly affecting usage intention and behavior, but neglected its role as a process moderator.

Together, the paired concepts of visibility/awareness, relevance/motivation, and compatibility/capability to process new information provide a valuable bridge between basic research on attitude formation and change and studies of technology acceptance. On one hand, this strengthens the model of technology acceptance under conditions of change by recognizing sources of variation that have been under-conceptualized in previous work. At the same time, these moderators have the potential to

significantly increase the usefulness of the proposed model to practitioners because they provide leverage points by which managers and developers, through effective and strategic communication, can influence the processes linking technology change and acceptance.

Directions for Future Research

This paper provides a theory of technology acceptance under conditions of change. However, while it provides an initial framework with new constructs, relationships, and processes, further work is clearly needed to develop the model, test various aspects of the theory, and explore the implications for IS researchers and practitioners. Within this broad research program, specific promising directions include managing perceptions of technology change, the role of social influence in TAUCC, and broadening the concept of acceptance for complex technological environments.

Perception of Change: Perception of changes is the key to individual acceptance, not only because it is the basis for forming beliefs and attitudes, but also because, through the moderation of visibility, relevance, and compatibility, it affects the processes that underlie individual's response to a change. Therefore, managing technology acceptance under conditions of change must focus on managing individuals' perception of changes. Additional research is needed to identify what and how features change and management strategies for communicating changes affect the theorized processes. For example, how do different ways of announcing changes affect user perception? How and when do change initiators name changes differently, distort or hide information about changes, and label something as changes? Is the label of *change* enough to create visibility/awareness of a change? Are *updates*, *bug fixes*, or simply *changes* perceived differently by users? Do change initiators use different strategies for different group of users? How does user participation before a change affect perception of the change? Answers to these questions will help researchers better understand how user perceptions of changes form, how attitudes about technologies change, and how these processes can be managed.

Social Influence: Continuous use studies of technology have begun to suggest that, after initial adoption, the role of social influence may be minimized. However, in the proposed model of technology acceptance under conditions of change, the potential role of social influence is greatly expanded, and therefore requires further theoretical and empirical attention. For example, which type of influence is stronger in each stage of technology change evaluation, and under what conditions? Researchers may also examine the effects of different management strategies and techniques on promoting communication, generating norms, and affecting user attitudes and beliefs through social mechanisms. For instance, when and how should change initiators encourage the creation of norms within user groups? When and how do change initiators welcome responses from users, and what type of response is preferred? Are discussions within or between user groups to be encouraged? Managing change is a complex activity, and answers to these questions would provide valuable leverage for practitioners interested in encouraging positive attitudes toward changes, new technologies, and continued use.

Broadening the Concept of Acceptance: In the proposed model, acceptance of technology is still conceptualized as a binary decision event. However, under conditions of regular change, there can be different conceptualizations of acceptance behavior. User behavior may include acceptance of change and continued use of changed technology, rejection of change and continued use of old technology, and rejection of change and discontinued use of old technology. Considering user reaction and behavior together raises the possibility of satisfactory acceptance, unsatisfactory acceptance with silent suffering, unsatisfactory acceptance with complaint, and simple rejection (Hirschman 1970; Rusbult and Zembrodt 1983). More work is needed to identify and develop the dependent constructs relevant to the study of technology acceptance under conditions of change. Also, future research should study the relationship between levels of acceptance and external outcomes such as task performance. This type of work would provide insight into how change initiators should use various technology change management strategies to achieve desired business outcomes.

Future research on individual acceptance of technology under conditions of change has important implications for IS researchers and practitioners. Theoretical consideration of ongoing system changes strengthens conceptual links between the developed IS research areas of technology acceptance and systems development and implementations. Studies examining how technology changes affect user's acceptance behavior via their attitudes and beliefs provide a basis for deciding what and how to manage systems implementation projects. Also, focusing on attitudes toward changes and changing attitudes bring together IS and psychology literature in explaining user's acceptance.

Practitioners also may benefit from research in technology change. Software vendors of evolving technologies and system developers in organizations are both continuously updating their products, adding new features and new capabilities. While they

are constantly changing their products hoping to make them more powerful and hence attract more users, some existing users may become annoyed simply by the rate of change or by some tiny difference in the way they have to use the updated products. User's acceptance or rejection of updated software applications is likely to result from a complex interaction of their past beliefs and attitudes toward the technology, their beliefs and attitudes about the change, and the nature of the change itself. Understanding these interactions better will enable developers to avoid structuring changes in ways that may negatively affect users' attitudes and enable managers to better deploy communication and management strategies to increase the likelihood of favorable user responses to change.

Conclusion

Users are facing much higher levels of change, but the ability of the existing IS literature to explain how they accept or reject technology change is limited. This paper proposes a model of how technology change affects users' usage behavior through their influence on user attitudes and beliefs. Technology change is conceptualized in terms of rate, magnitude, and distribution. From these characteristics, technology change is linked to technology acceptance through processes of attitude formation and change, processes that can themselves be moderated by a change's visibility, relevance, and compatibility. The goal of this work is to highlight the importance of technology change, provide a foundation built on IS acceptance research, and provide a theoretical starting point for future research on individual acceptance under conditions of change. Through this foundation, the scope of technology acceptance models can be extended to better enable IS researchers and practitioners to understand the interplay of individual, social, and technical factors in the development, management, and use of dynamic information systems.

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