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Abstract

*Information systems research has focused extensively on the factors that foster adoption and usage. This research has focused on overall beliefs about system usage, antecedents of system satisfaction, and other factors that facilitate system success, create positive attitudes, and encourage usage. However, little attention has been given to what **inhibits** usage. The inhibitors of usage are implicitly assumed to be the opposite of the facilitators. The position taken in this paper is that usage inhibitors deserve their own independent investigation and are proposed to exist and act uniquely apart from the extensive set of positively oriented beliefs well established in the information systems literature. A theory that proposes inhibitors as beliefs about an information system that uniquely discourage technology use both directly as well as by negatively influencing other beliefs about the system is developed and tested. To test the theory, an empirical field study involving 387 participants in a scenario-based exercise involving a variety of actual e-Business Websites was conducted. The results support that usage inhibitors are qualitatively different from established system attributes and that they act uniquely to negatively bias these beliefs. The theory and results add to our understanding of IS design and functionality and why users may choose **not** to use a system.*

Keywords: Technology rejection, use inhibitors, discontinuance

Introduction

> *Prior technology adoption research has typically seen the presence of certain factors (e.g., perceived usefulness) as leading to adoption, while a lack of those factors is seen as the cause of rejection. [Our] research broadens that perspective by presenting preliminary evidence that non-adoption (rejection) decisions are based on critical barriers (i.e., rapid change, high cost, and lack of knowledge)* (Venkatesh and Brown 2001, p. 91)

Information systems research has been frequently and appropriately concerned with why individuals adopt technology, the factors and beliefs that lead a person to use a system, and the environmental conditions that facilitate such use. This research has taken a variety of forms, famously in terms of technology acceptance (Davis 1989) but through other paradigms as well such as IS success (DeLone and McLean 1992, 2003). This important research has found that a user's perceptions of reliability, assurance, and usefulness—to list just a few variables—are important in predicting attitudes toward technology and subsequent acceptance. Although these are valuable perspectives, they almost exclusively focus on the *positive* beliefs of users regarding technology. However, we may well be overlooking additional factors that act uniquely to dissuade usage. As stated above by Venkatesh and Brown, there may exist barriers to use that act to *solely* inhibit use in their presence but do not encourage use in their absence.

This paper will introduce and defend the theoretical existence of such usage inhibitors. Having discussed the proposed nature and effects of inhibitors, I will then describe an empirical study to test the overall theory of inhibitors and do so with attention to the wide variety of positively oriented beliefs covered in past IS research. The core intent is to add to our understanding of technology use beyond that found in the current usage paradigms that have almost exclusively adhered to a positive outlook.

Why Usage Inhibitors Deserve Independent Investigation

Certainly IS research has addressed specific antecedents that strictly act to discourage usage or its analogues (e.g., website purchase intention). For example, distrust (McKnight et al. 2003), risk (Grazioli and Jarvenpaa 2000; McKnight et al. 2002; Pavlou 2003), dissatisfiers (Zhang and von Dran 2000), anxiety (Brown et al. 2004; Compeau et al. 1999; Venkatesh 2000), and resource barriers (Mathieson et al. 2001) have been investigated for their effects on usage. However, these studies were to address the pertinent and specific phenomenon of interest. What all of these particular antecedents may be indicative of is a general phenomenon of usage inhibition. What has been missing, and what is being proposed here, is a comprehensive theory of usage, inhibition. By theorizing and investigating such a phenomenon, we can increase out understanding of usage, lack of usage or even outright system rejection. Further, we may uncover additional antecedents heretofore left uncovered, or at least unexplored in a holistic manner. An investigation of inhibitors may be of interest not only because it uncovers additional antecedents to usage (or lack thereof), but also that these inhibitors may *act in different ways* in comparison to the vast array of enablers that we have studied (e.g., perceived ease of use).

Model for the Enablers and Inhibitors of Technology Usage

As noted, prior research has identified specific factors that act solely to discourage use but without a holistic theoretical evaluation of usage inhibition phenomena. I propose that inhibitors exist and act separately from the multiple array of enablers that have been studied in the past. If one is to explore and articulate those factors that influence usage *above and beyond* previously identified positive features, it is essential to provide the appropriate theoretical context for those inhibitors. Technology adoption and usage research has focused on perceptions toward a given system and various models have been developed to identify what those perceptions are and how they act to influence use. Four paradigms have been the primary basis for this investigation, namely: technology acceptance (TAM; Davis 1989); user satisfaction (DeLone and McLean 2003); diffusion of innovations (DOI, Rogers 1995); and service quality (DeLone and McLean 2003; Parasuraman et al. 1985, 1988). All of these paradigms identify key external beliefs that influence attitudes and intentions toward usage behavior and the influence of such external beliefs was a key proposition of the initial TAM literature (Davis et al. 1989; Venkatesh 2000; Wixom and Todd 2003). For example, if a user considers that a system is reliable, that perception is an external belief that may influence whether the user considers adopting the system. Again, although the beliefs posited in the above four paradigms are valuable in predicting usage, they are overwhelmingly positive in nature. As examples, consider perceptions of flexibility and assurance taken from user satisfaction and SERVQUAL respectively. These enabling external beliefs act to encourage or discourage use, dependent upon their valence. Users who perceive a system to be flexible tend to adopt that system whereas systems perceived to be constraining are not.

Integration of Paradigms

There have been various combinations of the above paradigms with the goal of increasing the overall understanding of system satisfaction, attitudes, beliefs, and usage (e.g., Devaraj et al. 2002; Karahanna et al. 1999) Given the similarity of innovation beliefs among the four perspectives, it is not surprising that there have been various amalgamations of beliefs. However, uniting

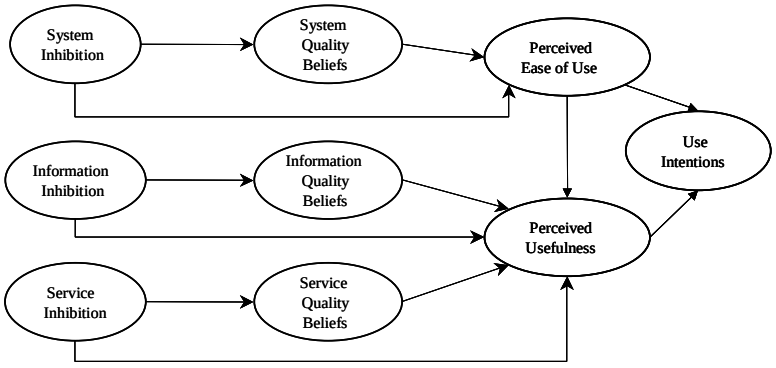

Figure 1. Research Model

these paradigms *theoretically* has not been accomplished until recently. Wixom and Todd (2003) propose and test a theory that effectively bridges the gap between the two dominant paradigms of TAM and user satisfaction. They empirically demonstrate that the *system as object beliefs* found in the user satisfaction literature (e.g., information currency, system reliability) are effective predictors of use when mediated by the *usage beliefs* (e.g., usefulness) found in TAM. The model is taxonomic in that it classifies ease and usefulness as usage beliefs separate from external beliefs that are relevant to the IS itself. Theoretically, the model explains how and why these beliefs influence one another. Beliefs about the IS as an object are external variables that ultimately influence usage through the mediation of the TAM usage beliefs. I posit that the inhibitors of technology use involve the perceptions users have about the IS *as an object*. This lies in contrast to determining inhibiting beliefs about *using the IS*.

Figure 1 provides an overview of the theoretical model to be used both in identifying inhibitors and in describing their influences on use. Inhibitors are additional and separate external beliefs about a system as an object. Inhibitors act to discourage use by acting both on the beliefs about use as well as biasing the enabling beliefs about the system as an object. The beliefs about using a system derive from the technology acceptance model (ease of use and usefulness) and the positively oriented enabling beliefs about the system as an object are derived from the user satisfaction literature. These latter beliefs are captured by the concepts of information, system, and service quality.[1] These positively oriented beliefs will be referred to as *enablers* to distinguish them from the inhibitors. The following two sections discuss the model in depth by describing the unique nature of inhibitors and their unique influences on usage.

The Unique Nature of Technology Usage Inhibitors

The examples regarding non-adoption and discontinuance cited above lend support that the beliefs that play a role solely in discouraging use are unique and qualitatively different from those that facilitate use. An unanswered question is *why* these beliefs might exist separately from the enablers. The proposition here is that inhibitors are of a unique nature based upon the principle of asymmetrical negative effects. Asymmetry applies to those perceptions whose presence undermines use intentions but in their absence offers no benefit. Such a perception is one in which there is no clear positive opposite. An analogy from psychology is the concept of trauma, an extreme cognitive ir emotional reaction to which there is arguably no positive counterpart (Baumeister et al. 2001). This asymmetry of effects is closely aligned with what Zhang and von Dran (2000) call dissatisfiers. They propose that certain Internet website "hygiene" design characteristics are necessary but not sufficient conditions for user satisfaction. For example, users take for granted that a system will accept their data entry and thus do not perceive this feature. However, when a system does not perform this basic function, the presence of this issue is quite salient.

The Unique Effects of Technology Usage Inhibitors

In addition to supporting the existence and unique nature of inhibitors, it is more important to understand the effects these beliefs have on usage. It would be tautological to simply say that inhibitors are factors that discourage use. Instead, I posit that inhibitors exist and act in a unique manner as compared to the enablers. The basis for the unique role that inhibitors play in dissuading use derives from two reasons, namely, asymmetrical negativity bias and anchoring and subsequent perceptual bias.

First, the principle of asymmetrical negative effects serves not only to support the existence of inhibitors but also their unique effects. The presence of an inhibitor acts as a clear signal to a user that a system is poor despite otherwise positive features. The asymmetrical influence of certain phenomena is well established theoretically. The perception of a negative attribute can act as a much more diagnostic cue relative to a positive attribute (Skowronski and Carlston 1987). In addition to the clarity of the signal that an inhibitor can provide is the overall power of that signal. Norm theory (Kahneman and Miller 1986) supports that negative acts are more noticed and garner more cognitive attention than the positive. Negative experiences have powerful effects on memory such that negative events are remembered better than positive ones (Baumeister et al. 2001).[2] In addition to power over memory is the power of negative perceptions on information processing. There is a distinct asymmetry in the speed and confidence of decisions made with negative information versus positive (Yzerbyt and Leyens 1991). Negative information leads to faster,

[1]The dimensions of IQ, SQ, and service quality have been variously operationalized. The most parsimonious is offered by Rai et al. (2002), who defined the attributes of SQ as ease of use and IQ as content, accuracy, and format. DeLone and McLean provide a broader set of five dimensions for each of the IQ and SQ factors and three for service quality. The dimensions to be used in this study are based upon a review of several studies (DeLone and McLean 1992, 2003; Gefen 2002; McKinney et al. 2002; Rai et al. 2002; Seddon 1997; Wixom and Todd 2003).

[2]In fact, Baumeister et al. report that negative traits may be recalled *twice* as well as positive ones.

more confident decisions as compared to equally positive information. In terms of beliefs that a person may have about an IS, an inhibitor will lead to clear and salient negative perceptions about the consequences of use and thus intentions to use.

In addition to the direct effect inhibitors have on usage beliefs and intentions, inhibitors will also act to bias perceptions of *other beliefs* about the IS as an object. In other words, *regardless of the objective attributes that a system may have*, the presence of an inhibitor will lead to negative perceptions of those attributes. Such a bias occurs with the halo effect. A halo effect is the potentially invalid judgment of specific attributes based upon a person's overall evaluation of a target (Dick et al. 1990). An example would be a student who evaluates a professor as a poor teacher because he is disgruntled about a low grade on an assignment, even when that professor has otherwise excellent teacher ratings. However, the halo effect is a top-down model, in other words, a global attitude influences the evaluation of a specific dimension regardless of the dimension's objective true performance. What I propose is a perceptual-specific sequential processing model for the effects of inhibitors, in other words, a single perception can bias another perception. The presence of an inhibitor and its asymmetric nature make it salient, diagnostic, and readily accessible cues that factor into the anchoring of other perceptions. Such an effect is similar in impression formation (Asch 1946; Everard and Galletta 2004; Yzerbyt and Leyens 1991). Specific to IS, Everard and Galletta supported the theory of negative impression formation toward a website. They conducted a study that controlled the presence or absence of flaws and found that the perception of flaws led to diminished perceptions of website quality. Arguably such negative quality perceptions emanate from a user's perceptions of quality being anchored and subsequently biased by the perception of the flaw. What Everard and Galletta showed was that even in the absence of an actual flaw, if a user *perceived* a flaw, they had a lower overall impression of the quality of the website. Such anchoring of perceptions is known to be a key influence in initial systems use contexts swaying beliefs about use (Venkatesh 2000). I posit that in combination with the clear and salient negative signals that inhibitors provide, inhibitors will also anchor and subsequently bias perceptions of other beliefs about the information, system, and service quality attributes of the IS.

In summary, I propose that an inhibitor plays two roles in discouraging usage. For one, they act directly on beliefs about the consequences of use. That is, if a user perceives an inhibitor, they will judge the system to be difficult to use and not useful. The second role of inhibitors is that they will bias the positively oriented and symmetrically acting beliefs of the system as an object: system, information, and service quality.

Consequent Effects of System as Object Beliefs

User satisfaction quality beliefs have *different* downstream effect on the beliefs about use (Wixom and Todd 2003). System quality beliefs, beliefs that revolve around the interaction and infrastructure aspects of an IS, have a primary influence on perceived ease of use. Information quality beliefs, on the other hand, deal with the utilitarian and goal-oriented features of the system and thus influence perceived usefulness. These relationships are reflected in the model in Figure 1 for both the enabling quality beliefs as well as the inhibitor direct effects. The question remains in what way service quality, and by extension service inhibitors, affect beliefs about use.[3] I posit that service quality and service inhibitors are also goal-oriented perceptions that a user has of a system and thus influence usefulness. Further, since service is a performance-related attribute, its influence would be toward usefulness, a performance expectancy of the system (Venkatesh et al. 2003).

Method

The e-Business environment was used as the context for studying the inhibitors of technology usage. E-Business is a vast and critically important IS phenomenon that has significantly altered the practice of management information systems (DeLone and McLean 2003; Straub et al. 2002; Straub and Watson 2001). To test the theoretical model relating inhibitors to beliefs about the system, beliefs about use, and ultimately use, I conducted a two-phase study. The first phase involve identifying and defining inhibitors, a necessary first step given this is an unexplored phenomenon. The second and more substantive phase was a field study involving e-Business consumers.

[3]Wixom and Todd did not address the consequent effects of service quality beliefs but state that future research should investigate this facet.

Table 1. Inhibitors to be Tested

Inhibitor	Definition
System	
Intrusiveness	System performs tasks that were not requested or expected creating a task interruption.
Effort Redundancy	System requires unnecessary repetition of already performed steps (e.g., entering in name and address twice, losing already stored information)
Process Uncertainty	User is left unsure whether the system processed a request by the user.
Design volatility*	Frequent changes to the layout and design of the system requiring users to reacquaint and reeducate themselves
Information	
Information overload	Too much information is provided beyond the user's
Irrelevant requests for information	Requests for information that is irrelevant or in service situations, information requested of a personal nature not needed for a system transaction.
Deceptiveness	System fails to meet promises and such failure is perceived as purposeful by the user
Service	
Excessive Responsiveness	Responds to the user beyond desired levels (e.g., excessive assistance with simple tasks).

*The design volatility inhibitor was dropped from this study. It was presumed that such a belief could only take place with repeated use of a system. The nature of the field study's design for testing the theoretical model precluded such an examination.

Phase 1: Discovering and Identifying Usage Inhibitors

With the e-Business context in mind, a panel of 36 online consumers provided both positive and negative experiences that were subsequently analyzed using the critical incident technique (Flanagan 1954). The results were further analyzed using a hierarchical cluster analysis to generate a set of 17 broad inhibitor categories. This analysis was followed by a semantic comparison between the inhibitors with the taxonomy of enabling beliefs described above. For example, *cumbersome to use* was found to be an inhibitor of usage but is the antithesis of TAM's *ease of use*. In a similar manner, *system failure* corresponded with *reliability* found in both the user satisfaction and service quality models. This taxonomic analysis resulted in a set of inhibitors that were qualitatively different from well-established enabling beliefs. The final list of inhibitors are identified and defined in Table 1.

Phase 2: Theoretical Model Testing

Field Study Sample

A sample of 387 e-Business consumers drawn from a nationwide panel from a marketing research firm was used. The average age of the participants was 35 and 51 percent were female. A little over one-third of the participants (36 percent) completed college or some graduate schoolwork, 16 percent completed graduate school, and the remainder (48 percent) reported completing high school or some college. A small percentage of participants (14 percent) reported never having used a travel website before participating in the study with the majority of the participants making use of such sites at least once per year. Overall, the characteristics of this sample are similar to the population of Internet users in general (Lenhart et al. 2003).

An invitation to participate in the study was broadcast via electronic mail to members of the marketing research firm's panel. Individuals were provided a $10 incentive for their assistance in the study. The server logs recorded 1,176 unique visits to the site with a total response of 401 participants for an effective response rate of 34 percent. Responses were audited with respect to the time spent by participants on both the travel itinerary investigation and completion of the subsequent survey. In cases where the time spent on either the scenario or field survey was minimal, the response was not included in the analysis. Obvious data runs were also excluded.

Field Study Procedure

The study was conducted entirely online. Participants were asked to follow a fictitious scenario requiring them to investigate an airline and hotel itinerary for an upcoming friend's visit. To investigate this itinerary, participants were randomly assigned to use one of 36 travel websites. They were asked to create an optimum itinerary within the constraints of the scenario. Participants could win up to $50 dependent upon the quality of the itinerary they created. This served to build involvement in the task of creating the itinerary and to ensure that participants actively engaged with the website prior to evaluating it. At the completion of the itinerary investigation, participants were asked to provide details of the itinerary they created and then respond to a field survey regarding their perceptions and evaluation of the assigned travel site.

Although numerous specific e-Business contexts were considered, a travel-related e-Business exercise was considered to be an effective and useful context. In addition to being one of the most common and fastest growing activities performed online, shopping for travel allows for close and thorough interaction with a website and its functions (itinerary specification, search, etc.) without requiring a purchase. Even for a specific trip, travel options are highly differentiated, further increasing involvement and interaction with the website. Finally, there are an extensive number of travel sites available, permitting a wide variance in system design and functionality.[4] The 36 sites in the pool were selected to assure capability to produce both airline and hotel reservation information within the United States. Popular sites (e.g., Expedia.com) were screened out of the list.

Field Study Measurement

The dependent constructs of ease of use, usefulness, and use intentions were adapted from standard measures used in previous empirical studies (Davis 1989; Devaraj et al. 2002; Gefen et al. 2003; Venkatesh 2000; Venkatesh et al. 2003) and measured using seven-point Likert agreement scales. Measures for the system as object beliefs regarding system, information and service quality were based upon a review of several studies (DeLone and McLean 2003; Gefen 2002; McKinney et al. 2002; Rai et al. 2002; Wixom and Todd 2003). The inhibitor belief measures were adapted from the items used in the cluster analysis.[5] In addition to responding to the specific instrument items, participants were also asked for general, open-ended comments so as to elaborate on their responses. Unobtrusive measures of time spent on the travel scenario and field survey activities were also gathered.[6]

Field Study Design

Several significant features of this field design are noteworthy. For one, the nature of the task and product was constant for all participants and thus they were eliminated as potential confounds. Also, because participants were randomly assigned to websites, the potential confounds related to individual differences was reduced. Second, by examining participants' online activities from the server logs, I could ensure that respondents spent sufficient time at the website, and that they evaluated the website immediately after use. This eliminated errors in evaluation which might emanate from time lags between website use and actual evaluations. Third, I screened the websites to eliminate those that were popular and highly utilized (e.g., Expedia.com, Travelocity.com). Avoiding popular sites was useful for several reasons. It helped to avoid brand perception confounds. It reduced the likelihood of positively biased reports of intent to use. Most importantly, it precluded possible prior use of the website by the participant. It was desired to have participants use a particular site for the very first time because the study is focused on initial adoption rather than continued usage. Finally, the variety of 36 real websites served as a natural form of variation in the constructs of interest. Although the analysis is strictly based upon perceptions, objective differences between sites can be evaluated. Also, the use of actual sites, as opposed to simulated or otherwise artificially manipulated interfaces, allowed for rich operationalizations of enablers and inhibitors. Rather than try to artificially mimic only several inhibitors within a narrow scope, a broad array of website features could be examined with this design and the results are more generalizable.

[4]A search via Yahoo Travel in September 2003 revealed 197 distinct operating travel websites.

[5]The deceptiveness measure was adapted from Grazioli and Jarvenpaa (2000).

[6]The complete instrument is available upon request.

Results of the Field Study

On average, participants spent 68.5 minutes completing the itinerary exercise and the survey with approximately equal amounts of time spent on each activity (88 percent of the participants took part in the study through a broadband connection). The goal of having users interact with a site for the very first time was met with 96 percent of the participants reporting no prior experience with their assigned travel site.

Supporting the Asymmetrical effects of inhibitors

To test for the asymmetrical nature and effect of inhibitors, I analyzed the bivariate correlations between each inhibitor and usage intention using subsamples split on the inhibitor mean. The correlations were then compared. Given that an inhibitor has been proposed as a perception that has an influence if present but no influence if absent, it would be expected that there would be little influence from a below-average inhibitor but there would be a significant and negative effect from an above average inhibitor.[7] The results of the bivariate correlation analysis generally support the asymmetric nature of inhibitors. As shown in Table 2, the below-mean inhibitors had little effect on intention. Five of the seven correlations for below-mean inhibitors were not significantly different from zero. In other words, for those individuals who did not perceive an inhibitor, usage was not impacted. In contrast, six of the seven above mean inhibitor correlations were significant and negative, indicating that perception of an inhibitor led to being dissuaded from use.

Testing for Common Method Bias

I conducted two tests to guard against the possibility that single-method bias might artificially inflate the relationships among constructs: a Harman (1967) one-factor extraction test and a test for a main effect for website identity. No single factor explained most of the variance, thus supporting the absence of common method bias. Further, the second test for a main effect for website identity was supported—there was a significant multivariate effect for website identity as supported by Wilks' lambda (0.038, $p < 0.05$) and Pillai's trace (2.944, $p < 0.05$). These results support that those who used a given website tended to have similar beliefs as other users of that same website.

Table 2. Examination of the Asymmetric Effects of Inhibitors

Inhibitor	Overall Bivariate Correlation with Intention	Subsample Correlation with Intention (Inhibitor < mean)	n	Subsample Correlation with Intention (Inhibitor > mean)	n
Intrusiveness	**-0.35**	*-0.10*	177	**-0.23**	210
Process Uncertainty	**-0.34**	*-0.12*	223	**-0.29**	164
Effort Redundancy	**-0.29**	**-0.18**	216	*-0.10*	171
Irrelevant requests for information	**-0.24**	*-0.01*	266	**-0.28**	121
Information overload	**-0.18**	*-0.04*	229	**-0.25**	158
Deceptiveness	**-0.48**	**-0.29**	284	**-0.32**	103
Excessive responsiveness	**-0.24**	*-0.01*	266	**-0.28**	121

Boldface indicates $p < 0.05$, italics indicates non-significance

[7]A key assumption made in this analysis is the choice of where to split the sample. It would be plausible to split the sample on a scale midpoint (i.e., 4). However, the point of this analysis is to note the effects of inhibitors relative to an underlying normative perception. Such norms are best represented by an overall mean perception of a given inhibitor (Sirdeshmukh et al. 2002).

Theoretical Model Testing

The properties of the theoretical model were assessed using LISREL 8.30 (Jöreskog and Sörbom 1999) following a two-step measurement and structural approach (Anderson and Gerbing 1988; Gefen et al. 2000). Asymmetric effects were not considered in the structural model in the interests of parsimony. The online data collection method assured that there were no missing data values to contend with in the analysis.[8]

Assessment of Measurement Model

To support the discriminant and convergent validity as well as the internal consistency of the items, I analyzed a measurement model involving all of the items reflecting their associated constructs that, in turn, were allowed to freely correlate with one another. The majority of items met the recommended 0.70 (standardized) threshold for loading on their respective factor (Nunnally and Bernstein 1994). The reverse-coded items for deceptiveness, format, and effort redundancy had low loadings and were dropped as a result.

I assessed the internal consistency of the constructs using Cronbach's alpha, composite reliability and the average variance extracted (AVE). All constructs were well in excess of the recommended 0.70 (Nunnally and Bernstein 1994) and 0.70 and 0.50 (Fornell and Larcker 1981) respective thresholds recommended for these statistics.

Table 3 shows the inter-construct correlation matrix with the square root of AVE for each construct in the diagonal. To support the discriminant validity between constructs, I compared the square root of AVE with the correlations between constructs (Fornell and Larcker 1981). The square root of AVE for a construct should be greater than the correlations with any other construct, thus supporting that the variance shared between a construct and its measures exceeds the variance shared by that construct with other constructs. The majority of constructs met this criterion with the exception of two general areas within the inter-construct correlation matrix. Interestingly, these two areas involved the well-established TAM measures of ease of use, usefulness, and intention and the also well-established service quality measures of assurance and empathy. With respect to the TAM measures, I applied the additional discriminant validity test for chi-square differences suggested by Venkatraman (1989). This test compares two structural models consisting of two constructs. One model allows the inter-construct correlation (phi) to be freely estimated while the other model constrains the correlation to 1.00 and tests for a significant difference in relative fit. All tests supported that the inter-construct correlations were significantly different from 1.00 and thus distinct.

Table 3. Correlations of Latent Constructs

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22a/b
1 Intention	**0.80**																					
2 Ease of Use	0.75	**0.77**																				
3 Usefulness	0.86	0.81	**0.77**																			
4 Information overload	-0.20	-0.44	-0.22	**0.85**																		
5 Irrelevant requests	-0.29	-0.33	-0.31	0.34	**0.88**																	
6 Deceptiveness	-0.53	-0.58	-0.54	0.31	0.31	**0.87**																
7 Format	0.59	0.66	0.63	-0.40	-0.34	-0.53	**0.93**															
8 Currency	0.44	0.44	0.41	-0.15	-0.33	-0.45	0.50	**0.92**														
9 Relevance	0.60	0.60	0.70	-0.10	-0.27	-0.49	0.46	0.45	**0.95**													
10 Accuracy	0.55	0.58	0.53	-0.17	-0.23	-0.64	0.46	0.67	0.59	**0.95**												
11 Completeness	0.62	0.61	0.70	-0.15	-0.32	-0.56	0.60	0.52	0.69	0.66	**0.91**											
12 Intrusiveness	-0.42	-0.51	-0.46	0.28	0.33	0.49	-0.51	-0.27	-0.37	-0.29	-0.33	**0.79**										
13 Process uncertainty	-0.39	-0.47	-0.42	0.28	0.43	0.44	-0.42	-0.31	-0.41	-0.40	-0.39	0.44	**0.90**									
14 Effort redundancy	-0.33	-0.40	-0.32	0.15	0.26	0.28	-0.28	-0.26	-0.22	-0.31	-0.29	0.47	0.35	**0.82**								
15 Reliability	0.54	0.63	0.56	-0.21	-0.26	-0.55	0.44	0.43	0.49	0.53	0.56	-0.54	-0.44	-0.42	**0.96**							
16 Accessibility	0.65	0.78	0.69	-0.32	-0.34	-0.60	0.64	0.50	0.59	0.56	0.74	-0.44	-0.46	-0.28	0.60	**0.96**						
17 Navigation	0.65	0.86	0.67	-0.48	-0.34	-0.52	0.70	0.44	0.52	0.52	0.58	-0.56	-0.44	-0.47	0.62	0.74	**0.82**					
18 Timeliness	0.48	0.57	0.54	-0.30	-0.22	-0.40	0.44	0.32	0.47	0.36	0.48	-0.41	-0.33	-0.26	0.59	0.52	0.62	**0.85**				
19 Flexibility	0.68	0.66	0.73	-0.15	-0.26	-0.49	0.58	0.52	0.64	0.60	0.72	-0.42	-0.41	-0.42	0.60	0.71	0.69	0.54	**0.92**			
20 Excessive responsiveness	-0.23	-0.40	-0.25	0.67	0.43	0.44	-0.39	-0.27	-0.24	-0.28	-0.21	0.41	0.40	0.12	-0.36	-0.36	-0.41	-0.38	-0.27	**0.77**		
21 Empathy	0.66	0.61	0.67	-0.18	-0.31	-0.55	0.54	0.56	0.63	0.62	0.69	-0.37	-0.36	-0.35	0.53	0.61	0.58	0.47	0.74	-0.19	**0.80**	
22a Assurance	0.79	0.76	0.79	-0.20	-0.40	-0.63	0.62	0.63	0.77	0.74	0.80	-0.46	-0.54	-0.36	0.69	0.73	0.69	0.54	0.79	-0.30	0.95	**0.79**
22b Assurance (revised)	0.71	0.67	0.75	-0.21	-0.37	-0.60	0.59	0.56	0.70	0.70	0.74	-0.44	-0.46	-0.37	0.63	0.67	0.65	0.54	0.78	-0.27	n/a	**0.79**

The square root of Average variance extracted (AVE) is shown in the diagonal. This value should be greater than the inter-construct correlations to support discriminant validity.

[8]A covariance matrix is omitted due to space constraints but is available from the author upon request.

Table 4. Measurement Model Fit Statistics

Statistic	Value	Recommended Value
Normed χ^2 (χ^2/df; χ^2=3231.42, df=1742)	1.86	$\leq$ 3.0
Comparative fit index [CFI]	0.94	$\geq$ 0.90
Normed fit index [NFI]	0.88	$\geq$ 0.90
Standardized root mean square residual (Standardized RMR)	0.044	$\leq$ 0.050
Root-mean-square error of approximation (RMSEA)	0.045	< 0.050
Goodness of fit index [GFI]	0.80	$\geq$ 0.90
Adjusted goodness of fit index [AGFI]	0.76	$\geq$ 0.80

The second noted area of concern for discriminant validity was between the service quality constructs of empathy and assurance. These two constructs were correlated at 0.95, indicating that they are likely one and the same. This result is consistent with other studies that found factor collapse and/or instability among service quality dimensions (Gefen 2002; Kettinger and Lee 1994; Pitt et al. 1995). As a result, I combined assurance and empathy into a single assurance construct. Table 3 reflects this revised conceptualization.

The measurement model was then assessed for overall fit characteristics (see Table 4). The normed chi-square was well below the recommended 2.00 (Carmines and McIver 1981). The other results were largely in line with recommended levels for GFI, CFI, and NFI (0.90 or greater) and for AGFI (0.80 or above), as well as for RMR (0.050 or below) and RMSEA (at or below 0.050) (Gefen et al. 2003; Gefen et al. 2000). Although the GFI and AGFI were slightly below suggested thresholds, lower thresholds for these statistics are plausible for highly complex models (Netemeyer et al. 2001).

Second Order Analysis of Information and System Quality

Before testing the structural properties of the theoretical model, the 10 constructs associated with information and system quality (Table 5) were used to model two second order *superordinate* constructs (Edwards 2001).[9] There are both conceptual and structural modeling reasons to do so. Conceptually, the IS literature has often modeled information and system quality at this second order level, sometimes with single item measures of the quality dimensions (e.g., Doll et al. 1995; Rai et al. 2002). From a structural standpoint, failing to account for a second order construct could create issues with multicollinearity. As antecedents, highly correlated constructs impacting the same consequent construct will result in unstable structural paths, just as occurs in multiple regression. According to Chin (1998), the use of a second order construct model is appropriate if there are more than four constructs per second order factor and those factors each have a standardized factor loading on the second order construct greater than 0.70. As shown in Table 5, the second order constructs of system and information quality meet the aforementioned criteria with the majority of loadings exceeding 0.70.

Table 5. Information and System Quality Second Order Construct Loadings

System Quality 1st Order Construct	System Quality Factor Loading	Information Quality 1st Order Construct	Information Quality Factor Loading
Reliability	0.72	Format	0.71
Accessibility	0.86	Currency	0.66
Navigation	0.83	Relevance	0.75
Timeliness	0.65	Accuracy	0.75
Flexibility	0.84	Completeness	0.87
The loadings above are the correlation of the first order constructs to the respective quality *second order* factor. These should not be confused with instrument item loadings.			

[9]Since service quality is represented by a single construct of assurance, there is no need to model a second order construct.

Assessment of Structural Model

Figure 2 displays the detailed structural model to be tested. The structural model fit statistics are presented in Table 6 and the results of the structural model are presented in Table 7.[10] The squared multiple correlations in the endogenous latent constructs were intention 75 percent; ease of use 65 percent; usefulness 64 percent; service quality (assurance) 10 percent; system quality 34 percent and information quality 29 percent.

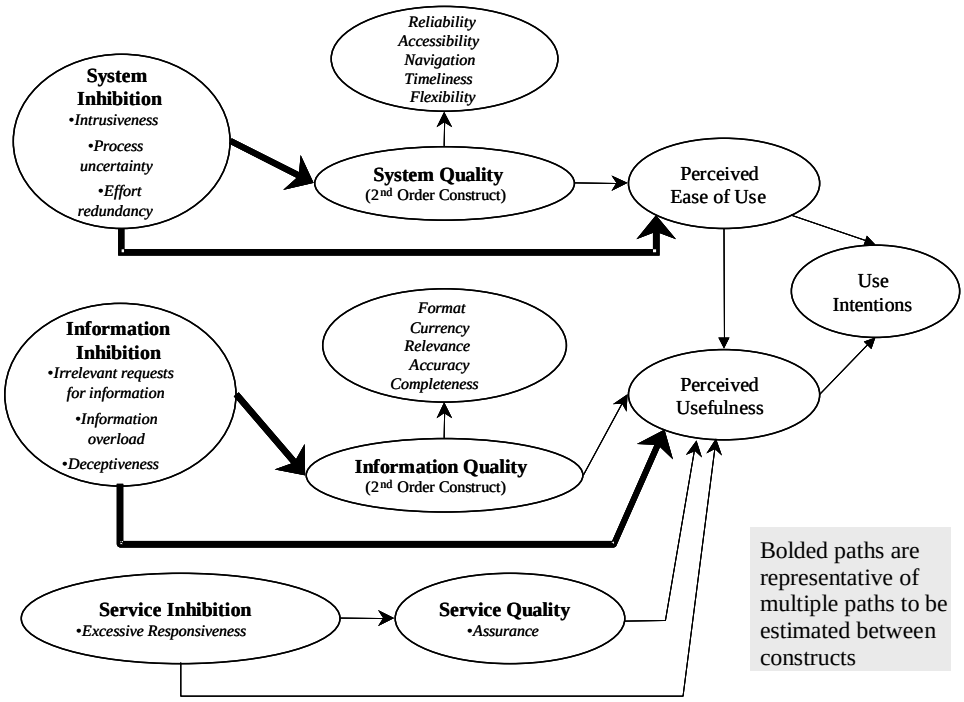

Figure 2. Structural Model to be Tested

Table 6. Structural Model Fit Statistics

Statistic	Value	Recommended Value
Normed χ^2 (χ^2/df; χ^2=4932.29, df=1872)	2.63	$\leq$ 3.0
Comparative fit index [CFI]	0.88	$\geq$ 0.90
Normed fit index [NFI]	0.81	$\geq$ 0.90
Standardized root mean square residual (Standardized RMR)	0.200	$\leq$ 0.050
Root-mean-square error of approximation (RMSEA)	0.062	< 0.050
Goodness of fit index [GFI]	0.73	$\geq$ 0.90
Adjusted goodness of fit index [AGFI]	0.70	$\geq$ 0.80

[10]The relatively lesser fit of the structural model in comparison to the measurement model is largely due to how the second order system and information quality constructs were modeled. I used a direct item to construct modeling approach. For example, system quality was directly reflected by the 16 items that composed the original 5 system belief constructs. A more appropriate (and better fitting) approach would involve the creation of a second-order endogenous construct reflected by the first order constructs that are themselves reflected by manifest items. LISREL presents a challenge in modeling endogenous second order constructs (Edwards 2001, p. 161).

Table 7. Structural Model Results

System Inhibitors	Beta	Service Inhibitors	Beta
Intrusiveness➔System Quality	-0.35***	Excess Responsiveness➔Service Quality	-0.32***
Intrusiveness➔Ease of Use	n.s.	Excess Responsiveness➔Usefulness	n.s.
Process Uncertainty➔System Quality	-0.13**	**Quality Beliefs**	**Beta**
Process Uncertainty➔Ease of Use	n.s.	System Quality➔Ease of Use	0.81***
		Information Quality➔Usefulness	0.30***
Effort Redundancy➔System Quality	-0.16***	Service Quality➔Usefulness	0.35***
Effort Redundancy➔Ease of Use	n.s.		
		Usage Beliefs	**Beta**
Information Inhibitors	**Beta**	Ease of Use➔Usefulness	0.50***
Irrelevant requests ➔Information Quality	-0.23***	Ease of Use➔Intention	n.s.
Irrelevant requests ➔Usefulness	n.s.	Usefulness➔Intention	0.79***
Information overload➔Information Quality	n.s.		
Information overload➔Usefulness	n.s.		
Deceptiveness➔Information Quality	-0.43***		
Deceptiveness➔Usefulness	n.s.		

*p < .05, **p < .01, ***p < .001, n.s. = not significant

Discussion

Inhibitors were shown to have an asymmetric effect on usage with higher levels of an inhibitor associated with negative usage intentions and lower levels generally uncorrelated with intention. A confirmatory factor analysis supported that inhibitor beliefs were qualitatively different from other, well-established beliefs about a system or beliefs about using that system. Placing these inhibitors within a theoretical network demonstrated that inhibitors have a significant negative impact on positively oriented beliefs about information, system, and service quality. The effects of inhibitors on usage beliefs were mediated by the enabling beliefs with no direct effects on usage beliefs found.

Interestingly, there were no direct effects of inhibitors on the usage beliefs. All paths leading from inhibitors directly to ease of use or usefulness, as applicable, were not significant. To further test this mediation effect, I conducted a series of mediation tests (not reported here) as suggested by Baron and Kenny (1986). Full or partial mediation was supported in all cases with the inhibitors having significant negative effects on ease of use or usefulness in the absence of enablers in the regression.

The effects of quality beliefs on usage beliefs were consistent with theory and the Wixom and Todd model. System quality positively influenced ease of use. Information and service quality both positively affected usefulness. Finally, the model's results regarding the TAM constructs were consistent with several prior studies (e.g., Gefen et al. 2003; Venkatesh 2000).

Implications of Results

The test for asymmetrical effects lent support to the concept that inhibitors instigate their effects against system use through their presence but not through their absence. Second, the inhibitors were found to be both qualitatively and quantitatively distinct from any other enabling beliefs established in the literature. Arguably, this was a challenging test in itself given each of the 7 inhibitors had to demonstrate factor separation from a full set of 12 quality beliefs. The asymmetric nature of inhibitors and that they are conceptually distinct from other beliefs supports that there exist factors that interfere with usage but, if removed or reversed, do not facilitate adoption or use. Third, although no direct effects on usage were noted, the results support that inhibitors have a significant negative influence on the system as object beliefs whether system, information, or service related quality. This effect

supports the theoretical inference that an inhibitor is a clear and salient cue which serves to anchor and subsequently bias other perceptions, specifically, other system as object quality beliefs.

The results of this study also make broader contributions to theory. First, this study adds to the Wixom and Todd integration model by showing that service quality also has a significant and positive influence on usage beliefs, specifically usefulness and thus subsequent use. Such service quality aspects can be a part of the overall perceptions of the system itself and not just tangential factors such as an IT services group (e.g., Pitt et al. 1995). A second contribution to theory is the support that certain perceptions have asymmetrical effects and their relevance to the exploration of causal antecedents. Usage was explored in this study, but other consequences of interest should consider negative as well as positive influences to fully explore antecedent phenomena. In other words, taking a purely positive antecedent approach may leave important facets undiscovered.

Managerial Implications

This research has several potential practical benefits. First, as with the focus on system as object beliefs, the identification of inhibitors ensures additional leverage points for technology providers to be aware of and ones that they can address (Taylor and Todd 1995; Wixom and Todd 2003). Systems are designed to succeed and be used. No company designs a system with purposeful barriers to use in mind. Yet clearly something does happen to interfere with the usage process. The results of this study support that technology designers would be well advised to guard against providing too much information, forcing users to repeat steps, or other inhibiting aspects just as much as making sure the system is reliable and responds quickly. As the theory and results support, all the positive work can be for naught in the presence of a poorly designed technology feature. A single negative feature may outweigh all of the other positive features that a technology has to offer. In fact, it may be a better (and cheaper) investment to avoid the design and functionality pitfalls described by the inhibitors than it is to try to meet each and every positive attribute.

Future Research

The inhibitors included in this study were not intended to be exhaustive. Future research can uncover additional inhibitors for both specific and general contexts and within both initial and continued usage contexts. More in-depth analysis of individual inhibitors would also be fruitful in opening up interesting domains. For example, technology intrusiveness has received some attention and been found to be a factor in people forgetting their tasks (Cutrell et al. 2001). Information overload has gotten surprisingly little attention (Nadkarni and Gupta 2004; Speier et al. 1999). Plumbing the depths of these and other inhibitors can further understanding of IS adoption/rejection.

Conclusion

This paper introduced the concept of technology usage inhibitors. Inhibitors are the beliefs that act to solely discourage use if present but do not encourage use if absent. These inhibitors were shown to be fundamentally different from previously established positively oriented beliefs within the various paradigms of user satisfaction, technology acceptance, diffusion of innovations, and SERVQUAL. Further, these beliefs were shown to negatively influence other beliefs a user has about the system. The key message is that we must take more than a positive perspective to usage antecedents if we are to fully encompass all of the factors that encourage use or possibly foster outright rejection of information systems.

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