MIS Quarterly

RESEARCH ARTICLE

# SHACKLED TO THE STATUS QUO: THE INHIBITING EFFECTS OF INCUMBENT SYSTEM HABIT, SWITCHING COSTS, AND INERTIA ON NEW SYSTEM ACCEPTANCE[1]

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*Given that adoption of a new system often implies fully or partly replacing an incumbent system, resistance is often manifested as failure of a user to switch from an incumbent technology to a newly introduced one. Thus, a potential source of resistance to adopting a new system lies in the use of an incumbent system. Using the status quo bias and habit literatures as theoretical lenses, the study explains how use of an incumbent system negatively impacts new system perceptions and usage intentions. We argue that habitual use of an incumbent system, rationalization due to perceived transition costs, and psychological commitment due to perceived sunk costs all encourage development of inertia. Inertia in turn fully mediates the impact of these incumbent system constructs on constructs related to acceptance of the new system via psychological commitment based on cognitive consistency and by increasing the importance of normative pressures. Specifically, we hypothesize that inertia leads to decreased perceptions of the ease of use and relative advantage of a newly introduced system and has a negative impact on intentions to use the new system, above and beyond its impact through perceptions. Finally, we hypothesize that inertia moderates the relationship between subjective norm and intention, such that normative pressures to use a new system become more important in the presence of inertia. Empirical results largely support the hypothesized relationships showing the inhibiting effect of incumbent-system habit, transition and sunk costs, and inertia on acceptance of a new system. Our study thus extends theoretical understanding of the role of incumbent system constructs such as habit and inertia in technology acceptance, and lays the foundations for further study of the interplay between perceptions and cognition with respect to the incumbent system and those with respect to a new system.*

**Keywords**: IS habit, technology acceptance, inhibitors, inertia, switching costs, status quo bias, subjective norm, sunk costs, transition costs, incumbent system

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[1]Detmar Straub was the accepting senior editor for this paper. Andrew Burton-Jones served as the associate editor.

The appendices for this paper are located in the "Online Supplements" section of the *MIS Quarterly*'s website (http://www.misq.org).

## Introduction

User resistance to adopting and using new information systems has long been a concern to researchers and practitioners alike (Gibson 2003; Hirschheim and Newman 1988; Lapointe and Rivard 2005; Marakas and Hornik 1996; Markus 1983; Martinko et al. 1996). Given that adoption of a new system often implies fully or partly replacing an incumbent system, resistance is often manifested as failure of a user to switch from an incumbent technology to a newly introduced one (Ye et al. 2006). Thus, a potential source of resistance to adopting a new system lies in the use of an incumbent system.

Prior research has focused primarily on conscious resistance and its antecedents, such as switching costs and other "mooring factors"[2] (e.g., Kim and Kankanhalli 2009; Ye et al. 2006). However, resistance can have both conscious and subconscious sources. One subconscious source of resistance is incumbent system habit (i.e., incumbent system use that has become an automatic response for obtaining specific instrumental goals). Although recent IS research (e.g., Kim et al. 2005; Limayem et al. 2007) has begun to investigate habit, it has focused primarily on the role habit plays in IS continuance and how the development of new system habits may lead to increased future use. There is very little empirical research examining how deeply ingrained habitual behavior toward an incumbent system may negatively affect perceptions of a newly introduced one, and thus potentially serve as an inhibitor to new system acceptance.

To design effective interventions aimed at counteracting both conscious and subconscious bias toward incumbent system use, it is first necessary to understand the exact mechanisms by which these factors impact new system acceptance. In this preliminary study, we focus on intentions as the ultimate dependent variable, while recognizing the need for further research incorporating actual new system usage. Findings from both the organizational change and social psychology literature indicate that a strong incumbent habit may have a negative impact on intention and its antecedents. However, the manner in which this impact occurs has not yet been theoretically explained, nor has the strength of the posited impact been tested. Similarly, while past research indicates that individuals take switching costs into account in deciding whether to adopt a new system, the exact mechanisms by which these switching costs may impact new system perceptions and usage intentions have not been thoroughly explained.

[2]A mooring factor is defined as a personality, social, or contextual constraint that can facilitate or hamper migration decisions (Zengyan et al. 2009).

One theoretical perspective that is useful in understanding how use (habitual or otherwise) of an incumbent system may impact new system perceptions and intentions is status quo bias (SQB) (Samuelson and Zeckhauser 1988). The SQB perspective provides a context-dependent set of theoretical explanations for why an individual may remain in a status quo state even in the presence of better alternatives. It suggests that individual decision makers may be biased toward maintaining the status quo through mechanisms such as rational decision making based on perceived costs of transitioning to a new course of action, and psychological commitment to an existing course of action due to incorrectly factoring in sunk costs or a desire to maintain cognitive consistency. Status quo bias is often manifested as inertia, defined here as attachment to, and persistence of, existing behavioral patterns (some of which are habituated) even if there were better alternatives and incentives to change.

This study extends an IS acceptance model—the technology acceptance model (TAM; Davis 1989) with subjective norm—to explain how use of an incumbent system negatively impacts new system perceptions and intentions. In viewing inertia as a manifestation of status quo bias, we draw upon a set of theoretical explanations from the SQB perspective to hypothesize how the incumbent system constructs of perceived transition and sunk costs bias users toward the status quo and, thus, influence inertia. We further use the habit literature to extend the SQB perspective and hypothesize that in addition to conscious antecedents, inertia is influenced by subconscious incumbent system habit. Using the theoretical explanation of psychological commitment (drive for consistency) found in the SQB perspective, we also posit that the effect of these incumbent system constructs on new system behavioral beliefs and usage intentions is mediated by inertia. Finally, we posit that inertia moderates the relationship between subjective norm and intention, such that normative pressures to use a new system become more important in the presence of inertia. We validate our model using two stages of data collection (questionnaire and free simulation experiment) regarding use of e-mail versus Google Docs for collaborating/sharing files in group projects.

Our research has both theoretical and practical implications. Through developing a better theoretical understanding of the role of habit, switching costs, and their inertial consequences, we extend the technology acceptance nomological network by explicitly acknowledging the role of the incumbent system in the decision to use a newly introduced system. We further answer the call of Benbasat and Barki (2007) to place greater emphasis on understanding the antecedents of belief perceptions in TAM research. Finally, we contribute to the SQB perspective by investigating the mechanisms by which this bias operates in impacting new system perceptions and usage intentions, and by expanding the set of theoretical explanations of SQB beyond conscious determinants to include subconscious determinants such as habit. This enables us to suggest ways that organizations can disrupt incumbent system habits, modify user perceptions, and counteract inertia, thereby improving new system acceptance.

## Theoretical Background

### *Status Quo Bias and Switching from an Incumbent to a New System*

The SQB perspective (Samuelson and Zeckhauser 1988) explains why individuals disproportionately make decisions to continue an incumbent course of action, rather than switching to a new (potentially superior) course of action. Thus, it provides a set of useful theoretical explanations for understanding the impact of incumbent system use as an inhibitor of new system acceptance.

The SQB perspective posits that individual decision makers are biased toward maintaining the status quo, that is, toward "doing nothing or maintaining one's current or previous decision" (Samuelson and Zeckhauser 1988, p. 7). This bias may be the result of *rational decision making*, whereby the individual takes into account the costs (real or perceived) of switching from the status quo to a new position, and chooses not to make the switch. For example, an individual might recognize that another system would be more efficient for performing a given task, but the costs of learning to use a different system are perceived as greater than the potential gains. Similarly, uncertainty about the benefits of alternative systems, due to the user having limited knowledge of them and perhaps no hands-on experience trying them out, may lead that individual to stick to the incumbent system as a "known quantity."

Rational decision making alone does not adequately explain status quo bias. SQB may also be the result of *cognitive misperceptions* due to loss aversion. This means that individuals tend to weigh potential losses (however small) as being greater than potential gains in making a decision as to whether to switch away from the status quo. Finally, SQB may be the result of *psychological commitment* to an existing course of action. This commitment may be due to incorrectly factoring in sunk costs, striving for cognitive consistency in decision making, attempting to maintain one's social position, attempting to avoid regret that might result from making a bad decision, or desiring to maintain a feeling of being in control (Kim and Kankanhalli 2009; Samuelson and Zeckhauser 1988). Although the SQB perspective represents a comprehensive set of theoretical explanations that account for status quo bias, not all explanations are present in a specific context. Rather, Samuelson and Zeckhauser's (1988) empirical evidence suggests that the set of theoretical mechanisms via which status quo bias operates is *context-specific*.

Status quo bias ultimately manifests itself externally as inertia. While Samuelson and Zeckhauser frequently discuss "status quo inertia," they do not explicitly define inertia or posit its antecedents. However, they appear to equate "status quo inertia" with "staying with the current course of action"—the latter of which may or may not suggest genuine bias (as in the case of a clearly inferior alternative). In fact, they state that "status quo inertia is not itself evidence of status quo bias" (p. 23). Given Samuelson and Zeckhauser's lack of definitional clarity on inertia, we draw upon the inertia literature to clearly differentiate inertia from merely continuing with the incumbent course of action, in that inertia reflects a preference to stay with the incumbent course of action even if there were better alternatives or incentives to change. Inertia thus reflects a bias toward the status quo.

Principles taken from the SQB perspective have appeared in past IS research on user resistance, even if only implicitly (for a review, see Kim and Kankanhalli 2009). However, to our knowledge, only Kim and Kankanhalli (2009) have explicitly used the SQB perspective to explain the inhibiting effect of switching costs on resistance to a new system. Further, while status quo bias implies a conscious choice by the individual to maintain the incumbent course of action even if better alternatives were to become available, its antecedents may also include subconscious factors such as incumbent system habit. Yet, to date, habits have not been empirically studied in regard to their impact on IS switching behaviors or SQB. Thus, we believe it is important to develop a clear theoretical understanding of how subconscious incumbent system habit, the various conscious factors described in the SQB perspective, and inertia relate to each other in determining technology acceptance. We now turn our focus to further developing the theoretical concepts of inertia and incumbent system habit.

### *Inertia*

Individual (as opposed to organizational or group) level inertia has received scant attention in the IS literature (see Chen and Hitt 2002; Gupta et al. 2007; Kim and Kankanhalli 2009; Kim 2009; Kim et al. 2005; Lending and Straub 1997), and the term lacks conceptual clarity. In a general context, inertia denotes "remaining at rest or in uniform motion in the same straight line unless acted upon by some external force"

(Merriam-Webster Dictionary). Most discussions on individual level inertia are found in the consumer behavior literature, where inertia is alternately considered an antecedent, component, or sustainer of brand loyalty, and somewhat vaguely defined as tendency to continue purchasing a brand that one has purchased in the past, as opposed to seeking out variety (Bawa 1990; Greenfield 2005; McMullan 2005).

While consumer brand choice has obvious parallels to user choice of a particular IS to complete a specific task, Rumelt's (1995, p. 2) description of organizational inertia is perhaps more instructive for understanding inertial IS use within organizations:

> Inertia is the strong persistence of existing form and function. If the form is efficient, inertia is costless and arguably beneficial. However, if…form or practices are inefficient, inertia is a problem. Indeed, the most direct evidence of inertia is the persistence of inefficient forms and practices.

We thus formally define individual level inertia as *attachment to, and persistence of, existing behavioral patterns (i.e., the status quo), even if there are better alternatives or incentives to change*. In other words, inertia represents a rigid continuance of the status quo. We further define inertia in an IS context as *user attachment to, and persistence in, using an incumbent system (i.e., the status quo), even if there are better alternatives or incentives to change*. We should note (following Samuelson and Zeckhauser) that the presence or knowledge of an alternative system, or incentives to use that other system, is not a necessary condition for the existence of inertia. Rather, inertia reflects unwillingness to abandon the status quo irrespective of present alternatives or alternatives that may potentially become available in the future. However, inertia is perhaps most easily recognized when present alternatives are ignored or incentives fail.

We conceptualize inertia as having behavioral, cognitive, and affective components (see Barnes et al. 2004; Ergün et al. 1999; Oliver 1999; Oreg 2003; Piderit 2000). Thus, our conceptualization of inertia differs from that of Gupta et al. (2007) in that they viewed inertia as having only a behavioral component, representing continuance of a behavior solely due to subconscious habits. Here, *behavior-based inertia* implies that use of a system continues simply because it is what the individual user has always done, and therefore without giving it much, if any, thought. This may or may not indicate the presence of a genuine subconscious habit. *Cognitive-based inertia* implies that an individual consciously continues to use a system even though they are aware that it might not necessarily be the best, most efficient, or most effective way of doing things (Rumelt 1995). Kim (2009, p. 528) referenced "mental inertia" as individuals "tend[ing] to keep making similar decisions despite the presence of new information." However, it is important to keep in mind that individuals may recognize that an incumbent system is not the best, most efficient, or most effective option for completing a given task, without having a specific alternative system in mind. Finally, *affective-based inertia* occurs when an individual continues using a system because it would be stressful to change, because they enjoy or feel comfortable doing so, or because they have otherwise developed a strong emotional attachment to the current way of doing things (Barnes et al. 2004; Rumelt 1995).

It is worth noting that inertia is not equivalent to behavioral intention to continue using the incumbent system in that the latter may, but does not necessarily, reflect an inert user. In other words, one may express intentions to continue using the incumbent system not because this is what they have always done or in spite of being aware that better alternatives exist (i.e., due to inertia), but rather because they believe that the incumbent system has advantages over the new system. In this case, intentions to continue using the system would be high but inertia would be low. In the same vein, low inertia does not necessarily imply that the user will adopt the new system. There may be a variety of other reasons (e.g., the system is not useful or easy to use, salient others do not support use of the system, low self-efficacy) that may prevent a user from adopting. In this case, although inertia would be low, the user would nonetheless have no intentions to adopt the new system.

The literature identifies a number of antecedents to inertia. These antecedents are highly dependent on the specific context under investigation. For example, in consumer behavior, inertia has been linked to satisfaction and a consumer's "need to routinize behavior so as to minimize the 'cost of thinking'" (Bawa 1990, p.263). Several sources of inertia have been identified at the organizational level of analysis that have parallels at the individual level. These include *distorted perception* and *dulled motivation* (due to the direct costs of change or an insufficiently felt need to change; similar to perceived transition costs of changing to a new IS in the SQB perspective), *failed creative response* (from viewing the current situation as natural and inevitable, and possessing inadequate strategic vision; similar to individual differences such as low personal innovativeness with IT), and *action disconnects* from embedded routines (represented at the individual level as habits) (Rumelt 1995). Norms (e.g., positive reinforcement) and an individual's sensitivity to external pressure (i.e., psychological commitment in the SQB perspective) can also contribute to inertia (Greenfield 2005; Plutzer 2002). Finally, studies of inertia in strategic decision making indicate that individual differences such as education and training, as well as "precedents, traditions, rituals, and formalized procedures" can all lead to inertia (Fredrickson and Iaquinto 1989, p. 518). Thus, in summarizing what various literature streams have said about inertia, it becomes clear that routines (particularly those that develop into habits), switching costs, and various individual differences are all important sources of inertia. We now turn to a more in-depth discussion of IS usage habits and their impact on technology acceptance.

## Habit

We define habit as "learned sequences of acts that have become automatic responses to specific cues, and are functional in obtaining certain goals or end-states" (Verplanken and Aarts 1999, p. 104).[3] As a form of goal-directed automaticity, habit cannot simply be associated with frequency of past behavior (as is commonly done), but rather should be conceptualized as a multidimensional, formatively measured psychological construct consisting of the four dimensions of *intentionality*, *awareness*, *controllability*, and *mental efficiency* (Bargh 1989, 1994; Polites 2009; Verplanken and Orbell 2003). Habits are intentional in that they are functional or goal-oriented in nature. Nevertheless, habitual behavior occurs outside of awareness, in that the individual may be unaware of the situational trigger leading them to perform the behavior, or unaware of how the trigger is interpreted at the moment it occurs. Further, habits are difficult to control, in that one may find it difficult to resist the urge to perform, especially if the habit is part of a larger automatized work routine. Finally, habits are mentally efficient, meaning that they free the individual's attentional resources to do other things at the same time (Bargh 1994; Verplanken and Orbell 2003). This savings of memory space and processing time is particularly useful when one must perform a complex yet programmable sequence of actions on a frequent, ongoing basis (Schank and Abelson 1977).

Habit is often confused with inertia in the literature. For example, Bawa (1990) called inertia in brand purchasing "habituation," and Fredrickson and Iaquinto (1989) equated inertia, momentum, and habit. However, while habit may lead to inertia, the two constructs are clearly distinct. Habit is a learned response *automatically* triggered by stimulus cues in the environment. Inertia is a *conscious* choice to stay with the status quo even in the presence of better alternatives or incentives to change. Whereas habits are by definition subconscious, inertia may have both conscious and subconscious origins. Thus, an inert user may or may not be a habitual user of the incumbent system and, although use of an incumbent system may be automatically triggered by habit, the user may well be willing to consider switching to the new system.

## Habit and IS Usage

A review of technology acceptance research reveals only a handful of studies that have focused specifically on habit (e.g., Gefen 2003; Kim and Malhotra 2005; Kim et al. 2005; Limayem and Hirt 2003; Limayem et al. 2007; Wu and Kuo 2008). While these studies have improved our understanding of how IS habits may develop and lead to sustained usage, extant studies have all viewed habit as a positive influence on *continued* use of an existing system, although they have alluded to the idea that habitual use of an incumbent system could potentially interfere with the adoption of a new one (Gefen 2003; Limayem et al. 2001).

Research examining the impact of habit on beliefs and intentions is sparse. There are two different views on the impact of habit on the antecedents of behavior. The first view is that deliberate cognitive processing (via behavioral beliefs and intentions) and automatic processing (via habit) are alternate determinants of behavior. Thus, habitual users engage in a behavior automatically, and do not make ongoing evaluations of that behavior unless some circumstance triggers the need for conscious thought (Petty and Cacioppo 1981; Ronis et al. 1989). The second view, based on self-perception theory (Bem 1972), is that habitual users look at their behaviors for guidance in forming attitudes, in essence saying "I am always practicing Behavior X, therefore I must like it" (Eagly and Chaiken 1993; Kim and Malhotra 2005). Neither viewpoint, however, provides insight into the role of incumbent habits in predicting attitudes toward *new* behaviors.

The role of habit in inhibiting change has not been studied in an IS context, with one exception. Murray and Haubl (2007) examined how "skill-based habits of use," developed through repeated use of a particular system (e.g., learning how to navigate a specific website for information), could lead to cognitive switching costs that "lock-in" individuals to preferring that system over alternatives in the future. While the Murray and Haubl study did not examine how habitual *choice* of the system to perform a given task leads to inertia and influences perceptions and intentions related to new system use, it provides valuable insights on the inhibiting role of habitual *use* of an incumbent system in technology acceptance.

[3] Although Limayem et al. (2007) make a distinction between *habit* and *habitual behavior/habitual use*, in this paper we use the terms interchangeably.

In the following section, we present a series of hypotheses, grounded in the SQB perspective, regarding the manner in which both incumbent system habit and perceived switching costs, through inertia, impact behavioral beliefs and intentions related to use of a newly introduced system.

## Research Model

Our conceptual model is shown in Figure 1. We begin with a core model of recognized technology acceptance constructs (Box B in Figure 1) that represents an individual's salient behavioral and normative beliefs and intentions toward using the *new* system. This model is based on TAM (which includes perceived usefulness (PU), perceived ease of use (PEOU), and usage intention), with the addition of subjective norm (SN). Thus, the model incorporates both behavioral and normative beliefs as important determinants of behavioral intentions. Since the new system is proposed as a replacement for an incumbent system, we use relative advantage (RA) instead of PU (Rogers 1995). The relationships between PEOU, RA, SN, and Intention have been theoretically justified and empirically supported in many prior studies (see reviews in Lee et al. 2003; Venkatesh et al. 2003) and given that they are not the focus of our research, we do not offer formal hypotheses.

We add to this core model a set of constructs associated with use of the *incumbent* system (Box A in Figure 1) that serve as a source of resistance toward acceptance of the new system. With one exception (the effect of incumbent system habit on inertia), we use the SQB literature to identify the incumbent system constructs and how they contribute to status quo bias, as well as to inform the relationships between the incumbent system constructs and new system technology acceptance constructs.

The focal incumbent system construct is inertia, which is a manifestation of status quo bias. Through the SQB perspective, we identify two conscious sources of inertia (perceived sunk costs and transition costs) that have recently been investigated with regard to user resistance to new systems (Kim and Kankanhalli 2009). Although the SQB perspective is silent on subconscious determinants of inertia and only implicitly discusses habit, the literature on habit and inertia both strongly suggest a relationship between the two. As such, we posit incumbent system habit as a subconscious source of inertia. Further, using the concept of psychological commitment (cognitive consistency) from the SQB perspective as well as research on the impact of self-regulatory processes on normative beliefs, we posit that inertia fully mediates the impact of incumbent system habit and perceived switching costs on new system beliefs and intentions by lowering behavioral beliefs about the new system and by moderating the relationship between SN and intentions.

Since our focus is on inertia's mediating role between the incumbent system constructs in Box A and the new system constructs in Box B, we do not hypothesize relationships between the antecedents of inertia or the impact of other factors (specifically, individual differences) on either inertia or traditional technology acceptance constructs. However, in recognizing the potential importance of the latter, we control for several of these factors (Box C in Figure 1). Personal innovativeness with IT (PIIT), prior experience with the new system, and self-efficacy are arguably among the most common individual differences shown in extant research to consistently affect technology acceptance (see Agarwal and Prasad 1998; Taylor and Todd 1995; Venkatesh et al. 2003). Propensity to resist change and PIIT are both associated with inertia as well, in that they touch on one's propensity to continue using an incumbent IS given alternatives.

### *Inertia as Persistence of Habit*

Embedded routines have been identified as a common source of inertia in organizations (Rumelt 1995). Since organizational routines can be composed of many interlocking individual-level habit sequences (Becker 2004), this implies that habitual use of an existing IS can be a major source of inertia when a new system is introduced. In fact, some researchers have defined inertia as "habit persistence" (see Roy et al. 1996; Rumelt 1995).

Since habitual IS users engage in behaviors automatically, they will not reevaluate those behaviors absent a context change triggering a strongly felt need to do so, but will instead simply continue with their existing behavioral patterns (Petty and Cacioppo 1981; Ronis et al. 1989). In fact, habits are often viewed as beneficial since they prevent the individual from having to make decisions, thus reducing the costs of "individual choice and responsibility, including gathering and processing information and weighing outlay against input" (Wood and Quinn 2004, p. 55). Habits enable the individual to automatically defer to the status quo, and save costs associated with having to reanalyze past decisions to follow a particular course of action (Samuelson and Zeckhauser 1988). This implies that habits will be associated with behavior-based inertia.

Further, the difficulty of controlling habits and the mental efficiency with which they can be performed may cause an individual to ignore alternatives, giving lip service to the idea that better alternatives may exist, but clinging to habitual

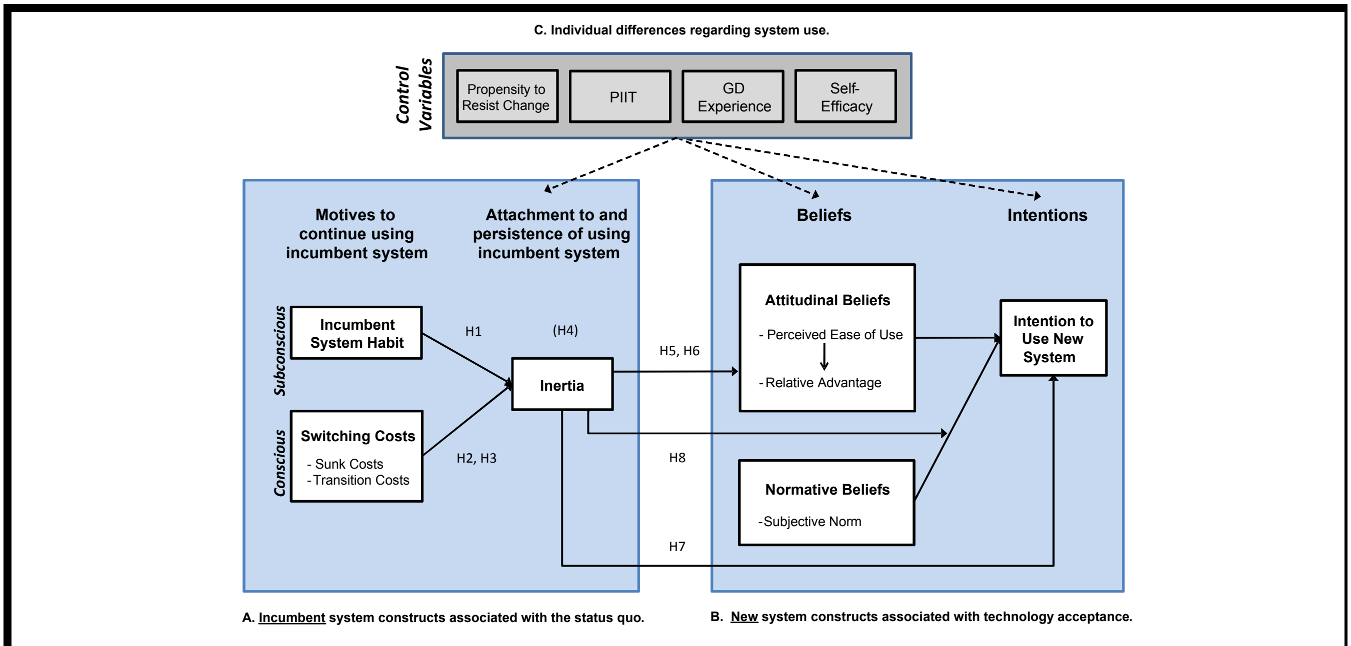


**Figure 1. Conceptual Model**

behaviors that have already been deemed satisfactory and have become efficient and comfortable to perform (Lending and Straub 1997; Murray and Haubl 2007). Wood and Quinn (2004, p. 8) indicate that once individuals are satisfied with an ongoing behavior, they will continue performing it due to an "avoidance-based self-regulatory process" where they seek to avoid an undesired state representing "what would happen if they quit doing the behavior." Such an undesired state might include increased stress from change. In fact, past research has shown that individuals feel less overwhelmed and stressed when practicing habitual behaviors, since their practice requires few cognitive resources. Simply considering alternative behaviors can increase stress, leading an individual to become more committed to their current behavioral patterns (Wood and Quinn 2004). This implies that habits will be associated with both cognitive-based and affective-based inertia. Thus, we posit

H1. *Incumbent system habit will positively impact inertia.*

### *Intertia and Perceived Costs of Switching from the Status Quo*

In addition to having subconscious sources, inertia can be the result of a conscious bias toward the status quo. One explanation given for status quo bias is *rational decision making* based on an assessment of transition costs. Common transition costs include the time and effort required to adapt to a new situation. These costs make a switch from the status quo much less likely to occur (Samuelson and Zeckhauser 1988). Prior research has shown that individuals will justify continuing their use of an incumbent system due to concerns about the time required to learn a new one (see Lending and Straub 1997). Thus, we expect that when the time and effort required to learn another system are perceived as being high, individuals will be more likely to stick with the status quo, resulting in greater levels of inertia.

Another explanation for status quo bias is *psychological commitment*, which can be a consequence of misperceived sunk costs. Sunk costs represent an individual's reluctance to "cut their losses," and a tendency to justify previous commitments to a course of action (good or bad) by making subsequent commitments. The more one has invested in an existing course of action, the more likely one will be to continue down that path in the future (Samuelson and Zeckhauser 1988). Sunk costs in an IS setting include the time and effort already invested in learning to use the incumbent system, as well as "skills related to the previous way of working (which will be lost as a result of switching)" (Kim and Kankanhalli 2009, p. 569). This implies that the more time and effort an individual has already invested in learning the incumbent system, the more likely they will be to exhibit inertia, based on perceptions of high sunk costs. Thus, we posit

H2. *Perceived transition costs will positively impact inertia.*

H3. *Perceived sunk costs will positively impact inertia.*

### The Influence of Incumbent-System Constructs on New System Acceptance: The Mediating Role of Inertia

We propose that inertia is the mechanism by which incumbent system habit impacts behavioral beliefs and intentions toward using a new system. This has been implied in prior research discussing the consequences of engrained habits (e.g., Barnes et al. 2004; Gupta et al. 2007; Lending and Straub 1997; Verplanken and Wood 2006), but to our knowledge never explicitly hypothesized or formally tested. Similarly, we propose that inertia is the mechanism by which perceived costs of switching from an incumbent system impact technology acceptance. In other words, we expect habit, perceived sunk costs, and perceived transition costs to have an impact on RA, PEOU, and BI only to the extent to which they bias the user toward the status quo (i.e., cause a state of inertia). In the absence of inertia, it is possible that a habitual user of an incumbent system may readily recognize the advantages of switching to the new system and form genuine intentions to do so. Similarly, an individual may perceive high switching costs, but unless these produce inertia, they may readily recognize the relative benefits of a newly introduced system and form intentions to switch to it. Thus, we posit

H4. *Inertia will fully mediate the relationships between the incumbent system constructs of habit, transition costs, and sunk costs and the new system technology acceptance constructs.*

### The Impact of Inertia on Intentions

In principle, inertia could have three different types of effects on intentions: direct, mediated, or moderated. Positing inertia as having a direct effect on intentions would indicate that inertia influences intentions independent of PEOU, RA, and SN (i.e., that inertia simply contributes to the variance in intentions beyond what is already explained by PEOU, RA, and SN). Since this perspective overlooks all other possible effects, we believe that it does not tell the whole story. Thus, while we acknowledge that inertia can also have a direct effect on intentions, we believe that it has additional indirect effects via RA, PEOU, and SN. Therefore, in the sections that follow, we discuss the remaining two perspectives: (1) the impact of inertia on intentions as mediated by PEOU, RA, and SN, and (2) inertia as a moderator of the PEOU-Intention, RA-Intention, and SN-Intention relationships. It is important to note that since inertia has not, to our knowledge, been explicitly incorporated into prior behavioral models, our hypotheses are of necessity exploratory in nature. Although theoretical arguments can be made for both the mediating and moderating perspectives, the hypotheses posited are based on assessment of the relative weight of theoretical and empirical evidence available for each perspective.

#### Behavioral Beliefs

***Mediation Perspective***. According to the mediation perspective, inertia would be expected to negatively bias a user's behavioral beliefs about a newly introduced system, which would then result in lower intentions to use the new system. The SQB perspective supports this view by drawing from several theory bases, including self perception theory (Bem 1972) and theories of cognitive dissonance and consistency (see Petty and Cacioppo 1981).

As inertia sets in, the volume and diversity of information processing tends to decrease. Self perception theory states that individuals will rely on their past behavior, as opposed to current deliberations, to guide their perceptions and intentions. This means that the inertial individual may draw from past decisions (to use the incumbent system) to guide present and future choices, by saying to oneself, "if it was good enough for me then, it is (must be) good enough for me now" (Samuelson and Zeckhauser 1988, p. 39). Thus, the individual avoids having to make an accurate assessment about the relative advantages of the incumbent versus new systems, and rationalizes continuance in the status quo.

In rationalizing continuance with the status quo, individuals strive to maintain cognitive consistency by reducing cognitive dissonance. This means that if an individual doesn't want to give up their current way of doing things, they must somehow justify viewing that alternative negatively to avoid suffering cognitive dissonance (Festinger 1957). Thus, we would expect an inert user of an incumbent system to bias their perceptions of a new system downward to eliminate cognitive dissonance and continue in the status quo.

Finally, the SQB perspective posits that, in the absence of rational reasons for maintaining the status quo, bias may be the result of *cognitive misperceptions of loss aversion*, whereby the losses of changing from the current situation appear larger than the gains (Kim and Kankanhalli 2009). This may result in lowered perceptions of the relative advantage of using the new system. *Rational decisions based on uncertainty* regarding whether the new system will truly perform better than the incumbent one may also lead to a biased assessment of relative advantage (Samuelson and Zeckhauser 1988).

***Moderation Perspective***. The moderation perspective states that the relationship between behavioral beliefs and new system usage intentions depends on one's level of inertia. As we have discussed, inert individuals may perceive the benefits of switching to the new system and may recognize that the incumbent system may not present the most efficient or effective way of performing a task. Nonetheless, they persist in using the incumbent system either because this is what they have always done in the past (behavior-based inertia) or because it may be too stressful or emotionally taxing to change (affective-based inertia). As such, one might expect inertia to negatively moderate the relationship between behavioral beliefs regarding new system usage and intentions to use it, such that the relationship will be weaker, or suppressed, in the presence of inertia.

***Conclusion***. While both the mediation and moderation perspectives have merit in explaining the relationship between inertia, behavioral beliefs, and new system usage intentions, we believe that existing theory, grounded especially in the SQB perspective, more strongly supports the mediation view. Specifically, we posit that an inertial user's lack of motivation for change will manifest itself in lowered perceptions of new system benefits (rather than in weakening the effect of new system perceptions on intention as would be suggested by the moderation perspective).

While we propose behavioral beliefs to mediate the impact of inertia on intentions, we also expect inertia to have a direct impact on intentions above and beyond that which is mediated by beliefs. Once inertia has set in, an individual is not likely to voice intentions to use the new system, irrespective of their perceptions of its usefulness and ease of use. In an organizational environment, this phenomenon has been labeled as *action disconnects*, *behavioral lock-in*, and *captivity*, which may lead to resistance to change even when the individual acknowledges the presence of superior alternatives, or resistance due to disinterest in changing one's ways (Barnes et al. 2004; Ergün et al. 1999; Rumelt 1995). In a study of faculty response to a new technology for conducting literature searches, Lending and Straub (1997, p. 470) found that

> even when the respondent was aware that an alternative technology existed, which might offer a better fit than the method currently used…the respondent typically continued in habitual use of a possibly sub-optimal technology….These participants knew that the method they were using was often not the best and also knew that other and better methods existed.

Thus, the Lending and Straub study provides evidence that users may engage in persistent use, even when they perceive that better systems are available. In other words, inertia will result in lowered usage intentions, independent of one's beliefs regarding the ease of use or usefulness of the new system. Therefore, we posit

H5. *Inertia will negatively impact perceptions of the ease of use of the new system.*

H6. *Inertia will negatively impact perceptions of the relative advantage of the new system.*

H7. *Inertia will negatively impact intentions to use the new system.*

## Subjective Norm

***Mediation Perspective***. According to the mediation perspective, inertia would be expected to negatively bias a user's normative beliefs about use of a newly introduced system, which would, in turn, lead to lower intentions to use the new system. Specifically, similar to the effect on behavioral beliefs, the reduced level of information processing that is associated with high levels of inertia might lead an inert individual to have inaccurate perceptions of the normative pressures by their coworkers, supervisors, and upper management with respect to using the new IS. To avoid cognitive dissonance arising from their decision to persist in using the incumbent system, these inert individuals would attribute lower normative pressures to use the system to salient others in their social environment.

***Moderation Perspective***. The moderation perspective implies that the relationship between normative beliefs and intentions to use a new system depends on one's level of inertia. One way in which inertia might moderate the relationship between subjective norm and intention is by making the relationship *weaker* in the presence of high inertia. In other words, although an inert individual would still perceive that their coworkers and supervisors consider it important for them to use a new system, they will be less likely to respond to that pressure by actually expressing intentions to use it. Inert individuals are comfortable with the status quo, and seek to avoid the stress of changing. Thus, they may discount the views of others in making a decision on whether to switch to a new IS. Inertia could also moderate the relationship between subjective norm and intention by making the relationship *stronger* in the presence of high inertia. As we discussed earlier, inert users lack motivation to fully consider alternatives, and to carefully analyze and critically evaluate a new IS themselves. As such, they might be expected to rely more heavily on pressure from salient others in their social environment to shape their intention toward using the new system and break them out of their inert state.

In fact, from a SQB perspective, Samuelson and Zeckhauser (1988, p. 38) argue that "individuals often find that the path of least resistance is to conform to the institutional status quo—be it company policy, standard operating procedure, or the social norm—whether or not this constitutes an optimal decision in the circumstances." In this case, the social norm that the individuals would be conforming to would be switching to the new system.

***Conclusion***. The SQB perspective appears to support both a mediating and a moderating effect of inertia. We could not find any extant empirical studies explicitly testing the relationship of inertia to subjective norm. However, there is some potential empirical evidence for the positive moderation perspective. Specifically, Bagozzi et al. (1992) investigated the individual difference variable of *state versus action orientation* in relation to coupon usage. Having a state (as opposed to action) orientation indicates that an individual has low (as opposed to high) self-regulatory capacity. Individuals with a state orientation approach their decision making in a static (passive) manner which often prevents change, and in fact has been associated with inertia. Bagozzi et al. found empirical evidence that state orientation and subjective norm positively interact, indicating that normative considerations are more important for state-oriented individuals, or, put differently, the intentions of such individuals are based more on subjective norms than on attitudes. If we view inert individuals as residing in a state orientation, we would likewise expect normative pressures to play a more instrumental role in predicting intentions to use the system in the presence of high inertia. Therefore, based on the theoretical support from the SQB perspective and the empirical evidence from marketing, we posit

> H8. *Inertia will moderate the relationship between subjective norm and intentions to use the new system such that the relationship is stronger in the presence of high inertia.*

## Individual Difference Control Variables

While our study does not focus on the impact that various individual difference constructs may have on Boxes A and B (Figure 1), we nevertheless include several of these as control variables in our model, given they may have an impact on both inertia and beliefs related to new system use. These control variables include two individual differences (individual propensity to resist change and PIIT) that might reasonably be expected to impact one's persistence in using an incumbent system. The other two individual differences (self-efficacy and prior experience with the new IS) are widely recognized as important factors in extant technology acceptance research, and thus there is good reason for including them as controls in the model as well. We briefly discuss each control variable here; however, we do not introduce formal hypotheses for them.

Oreg (2003) conceptualized individual *propensity to resist change* as consisting of four dimensions, based on sources of resistance believed to have their foundation in an individual's personality. These dimensions include the behavioral dimension of *routine seeking*, the affective dimensions of *emotional reaction to imposed change* and *short-term thinking*, and the cognitive dimension of *cognitive rigidity*.

The dimension of *routine seeking* reflects an individual's tendency to incorporate routines into their life, and a preference for familiar situations with limited stimulation and novelty. Routines are not habits per se (see Limayem et al. 2007), although a routine that is repeated frequently over time in a stable context may develop into a habit. The dimension of *emotional reaction to imposed change* reflects "the amount of stress and uneasiness the individual experiences when confronted with change" (Oreg 2003, p. 693), and implies a lack of psychological resilience. It is based on the view that some individuals do not like to have control over their life situation taken away from them by imposed, rather than self-initiated, change, and are less able to deal with the stress associated with that change. *Short-term thinkers*, on the other hand, tend to focus on the "immediate inconvenience or adverse effects" of a change (Oreg 2003, p. 682). They do not like to have to do more work in the short term due to changes, and will allow the short-term inconvenience to distract them from considering options with a long term benefit. Finally, individuals with high levels of *cognitive rigidity* do not change their minds easily; they find it more difficult to do so and thus do it less often. In addition, they may be close-minded and less willing and able to adjust to new situations (Oreg 2003, p. 681). Individuals with each of these characteristics would be more likely to develop inertia, even in the absence of a habit. They might also be expected to have lower perceptions of the RA and ease of use of a new system, and to voice lower intentions to use it.

*Personal innovativeness in the specific domain of IT* (PIIT), defined as "the willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998, p. 206), on the other hand, has been shown to be an important predictor in technology acceptance models. While individuals with a high level of PIIT may still develop IS usage habits, we would also expect them to be less likely to develop inertia. We thus include PIIT as a control impacting inertia, PEOU, RA, and new system usage intentions.

Prior IS research based on the theory of planned behavior has found *self-efficacy* to have an impact on PEOU (see Venkatesh et al. 2003) and also on intentions to use a new system as an internal factor in facilitating conditions and part of perceived behavioral control (Taylor and Todd 1995). Thus we include it as a control variable in our model. Finally, although individuals in our study had not yet adopted the new system, it is possible that some had prior experience using it. Therefore, consistent with prior research, we include *prior experience with the new system* as a control impacting inertia, PEOU, RA, and intentions.

## Methodology

### Study Context and Sample

An important part of the research design was selecting a task for which more than one information system existed to complete that task. Further, both the incumbent and new systems should be available for use (i.e., situations in which use of the new system is not mandated, or in which the incumbent system cannot/will not be discontinued). One example of a task for which multiple systems exist to support its completion is collaboration/file sharing on project teams. Given the frequency of collaboration and file exchange on many projects, use of a particular system to complete this task should exhibit a high likelihood of leading to habit development over time. Further, there are many different tools that can be used for collaboration/file sharing. Many teams meet in person, others use e-mail almost exclusively, and still others use integrated tools designed to improve the efficiency of a number of different project tasks.

We thus surveyed 603 students from eight different MIS courses at a university in the southeast United States, in spring 2008. Respondents were asked about their use of collaboration/file sharing tools in group projects, and received extra credit for completing the questionnaire. An alternate assignment was provided to those not wishing to participate in the study. The two systems used for the study, incumbent and new respectively, were e-mail and Google Docs for collaborating and exchanging files in group projects. Google Docs was an appropriate e-mail alternative to investigate since several instructors had expressed a desire to get their students to discontinue use of e-mail in favor of Google Docs. Further, Google Docs is readily available to students in that it only requires signing up for a Google account (a simple, free process) to use.

### Operationalization of Research Variables

We used the habit scale developed by Polites (2009), which measures habit formatively as a multidimensional psychological construct. This conceptualization differs from that of most existing self-report habit scales (e.g., Cheung and Limayem 2005; Kim et al. 2005; Limayem and Hirt 2003; Limayem et al. 2007; Verplanken and Orbell 2003) that view habit as unidimensional and reflective. It also differs from prior measures that use frequency of past usage as a proxy for habit (e.g., Kim and Malhotra 2005), since not all frequent system use is truly habitual.

As a form of automaticity, the presence and strength of a habit can be evaluated based on the dimensions of awareness, control, mental efficiency, and intentionality with respect to performing a particular behavior (Bargh 1989, 1994). By definition, habit is goal-directed and therefore intentional in nature. Intentionality is further implied for work-related IS habits, since a given system is used to complete one or more work-related task. Intentionality is thus captured by wording each item in terms of the use of a specific system to perform a specific task, as opposed to being captured via separate items (Verplanken and Orbell 2003). A strong habit is further manifested by a combination of high lack of awareness, low controllability, and high mental efficiency. While some experts have questioned whether a subconscious behavior such as habit can truly be captured through self-report measures (see Wilson and Dunn 2004), we agree with Verplanken and Orbell that "if *measured appropriately*, it is possible to have people reflect on their behavior in terms of the degree to which it is habitual" (2003, p. 1316, emphasis added).

Existing inertia scales were deemed inadequate. Thus, prior to the current study, we developed a nine-item scale for inertia that taps each of its three dimensions, and subjected both the habit and inertia scales to a series of validity tests. First we generated a pool of items based on the literature, and subjected them to two rounds of card sorting (following the approach of Moore and Benbasat 1991), which also incorporated items for related constructs such as perceived habit, perceived automaticity, history of behavioral repetition, and self-identity (the latter two based on Verplanken and Orbell). Items were refined as necessary to achieve acceptable interrater reliability as measured by both hit ratio (final overall value of 88.5 percent) and Cohen's Kappa (final average value of .82) (Moore and Benbasat 1991). Items were further refined and tested for convergent and discriminant validity and unidimensionality, via (1) a pilot study (N = 337) utilizing exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), and (2) a cross-validation study (N = 205) utilizing CFA (see Churchill 1979; Netemeyer et al. 2003). The technologies (Microsoft Outlook, Facebook) and tasks (sending e-mails, keeping up with news on friends) differed across the card sorting and following rounds so that we could assess validity of the scales in a variety of situations.[4]

Scales for the remaining constructs were adapted from the literature (sources for each scale are listed in Table A5 in Appendix A). Due to concerns about questionnaire length, we limited the number of items for most scales to three, selecting items that best represented each construct in the context of our study. Items for all constructs except propensity to resist change and PIIT were worded in regard to the focal technology and task to match the focus of the study.

### Procedure

Data were collected at two points in time. Part one consisted of a questionnaire asking respondents about the tool they were currently using for collaboration and file sharing in group projects. Constructs measured included incumbent system habit (i.e., habit toward usage of their current collaboration tool), individual differences (propensity to resist change and PIIT), perceptions related to the current system (e.g., PEOU, perceived usefulness, subjective norm, usage intention), and demographic data (gender, age, class standing, and major).

Part two was administered two weeks later, and took the form of a free simulation experiment (Fromkin and Streufert 1976). In free simulation experiments,

> subjects are placed in a real-world situation and then asked to make decisions and choices as part of the experiment. Since there are no preprogrammed treatments, the experiment allows the values of the IVs (independent variables) to range over the natural range of the subject's experience. In effect, the experimental tasks induce subject responses, which are then measured via the research instrument (Gefen et al. 2000, p. 12).

We used student e-mail addresses to match responses across the two parts of the study. Of the original 603 respondents, 556 completed part two of the study. Respondents were asked to read a brief introduction to Google Docs (see Appendix B), and then visit the Google Docs website and review additional information about the use of Google Docs for collaboration and file sharing in team projects. They were free to sign up to try out Google Docs if they wished, although this was not a requirement of the experiment. They were then given a brief (four-question) quiz designed to ensure that they had actually read the requested information. Constructs on the questionnaire included inertia and perceptions of Google Docs (e.g., PEOU, relative advantage, transition costs, sunk costs, subjective norm, self-efficacy, Google Docs usage intention). We also asked additional questions designed to provide more detailed information on exactly how their current collaboration/file sharing method was used to support group projects (e.g., average project group size, average time to complete a project deliverable, average number of files exchanged over the course of a project). Finally, we captured data on respondents' prior experience (if any) using Google Docs.

Only the responses from students indicating in both parts one and two that e-mail was their primary form of collaborating and sharing files with teammates were ultimately used to reduce random variability due to the nature of different incumbent systems.[5] We also eliminated responses from individuals who indicated that they had more Google Docs experience than actually possible based on the date that Google Docs was introduced on the market. This resulted in a final sample size of 334. There were no missing values in the sample. Demographic information on the respondents is shown in Table 1.

## Data Analysis and Results

### Testing the Measurement Model

We used SmartPLS for assessing both the measurement model and structural model, since our model was fairly complex. habit, inertia, and propensity to resist change[6] were each con-

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[4]Further details on the scale development process are available upon request by contacting the first author.

[5]The results are that 336 students reported they used e-mail, 129 used face-to-face meetings, 47 used Google Docs, 19 used a group email address, 17 used Facebook, and 8 used other online collaboration tools.

[6]While Oreg (2003) conceptualized propensity to resist change as second-order reflective, we believe that, based on Jarvis et al.'s (2003) criteria, it is more appropriately conceptualized as second-order aggregate construct. As Petter et al. (2007) have pointed out, mis-specifying a formatively measured construct may increase the chance of Type II errors.

**Table 1. Sample Characteristics**

| Variable | Category | Frequency |
|---|---|---|
| Gender | Male | 171 (51.2%) |
| | Female | 163 (48.8%) |
| Age | < 20 years | 146 (43.7%) |
| | 20–24 years | 182 (54.5%) |
| | 25–29 years | 3 ( 0.9%) |
| | 30+ years | 3 (0.9%) |
| Class Standing | Freshman | 96 (28.7%) |
| | Sophomore | 141 (42.2%) |
| | Junior | 61 (18.3%) |
| | Senior | 36 (10.8%) |
| Average Completion Time Per Project Deliverable (Note: a single project may have more than one deliverable associated with it) | 1 to 2 days | 189 (56.6%) |
| | 3 to 7 days | 116 (34.7%) |
| | > one week, but < one month | 28 ( 8.4%) |
| | > one month, but < a semester | 0 (0.0%) |
| | All semester (3 to 4 months) | 1 (0.3%) |

| Variable | Range | Mean | Std. Dev. |
|---|---|---|---|
| Avg. Group Size (number of persons) | (2, 6) | 4.60 | 0.657 |
| Avg. Number of Files Exchanged Per Deliverable | (1, 30) | 3.72 | 2.406 |
| Google Docs Experience (mos.) | (0, 15) | 0.69 | 2.084 |

ceptualized as second-order formative, first-order reflective, multidimensional constructs. Drawing from the criteria of Jarvis et al. (2003), it is clear that the dimensions of each construct will not necessarily covary, are not interchangeable, do not necessarily have the same predictors, and together cause the construct. Thus, we first assessed the psychometric properties of all the reflectively measured scales using guidelines suggested by Fornell and Larcker (1981) and Werts et al. (1974). Results indicated a multidimensional structure for habit, inertia, and propensity to resist change, as expected. Reverse coded items for routine seeking and cognitive rigidity (see Table A5 in Appendix A) were dropped due to low loadings on their respective factors.

Composite reliability scores for the final reflectively measured scales ranged from .80 to .96, exceeding the .707 recommended guideline (see Table A1 in Appendix A). Discriminant validity was assessed by (1) items loading on their constructs at .707 or above and not cross-loading, and (2) the square root of the average variance extracted (AVE) for each construct exceeding the construct's correlations with other constructs (Chin 1998). Furthermore, for convergent validity, the AVE has to exceed .50 (Fornell and Larcker 1981). As can be seen from Tables A1 and A2 (Appendix A), our scales meet these guidelines.

Self-reported data may include common method bias that carries the potential to inflate the correlations between variables in a study, particularly when all the data are collected from a single survey at one point in time with similar Likert scales (Spector 2006). We used several techniques to assess the potential impact of common method bias on our results, and found no major cause for concern (see Appendix C for details).

### *Testing the Structural Model*

SmartPLS was used to assess the structural model. Since habit, inertia, and propensity to resist change are all conceptualized as second-order aggregate constructs, we generated factor scores for each of their first-order dimensions, which were then used as formative measures of the second-order aggregate constructs (see Bock et al. 2005; Chin et al. 2003; Choudhury and Karahanna 2008). To do so, we first ran the full research model in PLS with the dimensions for each construct disaggregated. The resulting construct scores for each dimension were then used as measures of the aggregate habit, inertia, and propensity to resist change constructs.

One of the concerns with formatively measured constructs is multicollinearity across the formative indicators of each construct. We thus tested all constructs in the model for multicollinearity. Variance inflation factor (VIF) values for the formative dimensions of inertia and propensity to resist change, as well as the formative indicators of SN, ranged from 1.3 to 2.0. This is well below the threshold of 3.3 suggested by Diamantopoulos and Siguaw (2006) and Petter et al. (2007), indicating no serious concerns with multicollinearity in the data.

VIF values for the three habit dimensions ranged from 1.2 to 1.7. Despite these values being within the accepted range, the weight for the habit dimension of controllability approached 1.0 in the PLS structural model (weights: awareness = -0.18, controllability = 0.96, efficiency of choice = 0.27). Further investigation using other multicollinearity diagnostic techniques (e.g., testing for a conditioning index > 30 for a given dimension coupled with a variance proportion < .50 for at least two variables; see Belsely et al. 1980; Tabachnick and Fidell 2007) ruled out multicollinearity.

An examination of partial correlations between each habit dimension and the habit construct itself indicates that the awareness dimension might be a suppressor variable (correlation between awareness and habit = .491; partial correlation between awareness and habit after controlling for control = -.204; correlation between control and awareness = .55). Since all three dimensions are important theory-derived facets of habit, it is not appropriate from a content validity perspective to remove any of them from the model. Thus, we summed the factor scores for each of the three habit dimensions to create a single item composite index for habit (see Cenfetelli and Bassellier 2009; Petter et al. 2007). The model with habit as a single item measure yielded similar results to the model with habit as a second-order aggregate construct (see Table D1 in Appendix D).

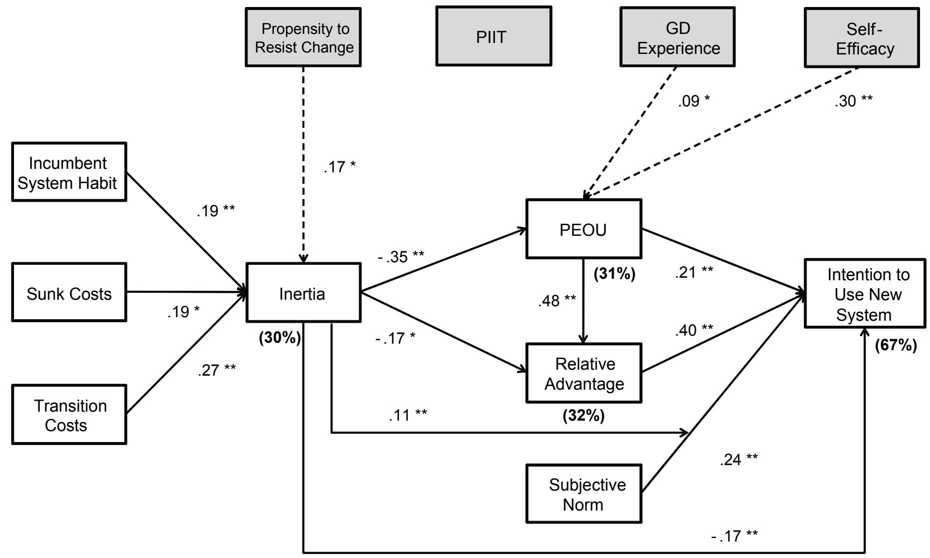
Table A3 (Appendix A) presents the weights for the PLS structural model using the summed habit score, whereas Table A4 (Appendix A) presents the inter-construct correlations for the PLS structural model. As indicated in Table A3, two of the four propensity to resist change dimensions had nonsignificant weights, as did the behavior-based inertia dimension. There is some discussion as to whether formative indicators with nonsignificant weights should be eliminated from a scale. However, if the content validity of a scale is affected by removing an indicator (and it should be if the indicators are formative dimensions of the construct), then eliminating items from the pool should be theoretically justified rather than merely based on empirical results (Bollen and Lennox 1991; Diamantopoulos and Siguaw 2006; Diamantopoulos and Winklhofer 2001; Diamantopoulos et al. 2008; Petter et al. 2007). Since each of the nonsignificant dimensions is an integral part of what defines its respective construct, and all dimensions have significant bivariate correlations with their respective constructs (Cenfetelli and Bassillier 2009), we retained all dimensions as an integral part of their respective scales despite their nonsignificant weight. Rerunning the model with the nonsignificant dimensions removed yielded similar results as the model with all dimensions included.

Figure 2 shows the results of the structural model. All hypothesized relationships and three paths from the control variables are significant at $p < .01$.[7] Table 2 shows the effect size for inertia on relative advantage, PEOU, and intention calculated using Cohen's $f^2$ formula. Table A6 in Appendix A shows *total effects* for all constructs. Although the effect size of inertia on intention is small (.09), its total effect is moderately large (-.38) and on par with that of relative advantage (.40) and PEOU (.40). Similarly, though its effect size on relative advantage is small (.03) and on PEOU is medium (.14), its total effect on these two constructs is moderately large (-.34 and -.35 respectively).

To determine whether inertia fully mediates the relationships between habit, sunk costs, and transition costs and the three TAM constructs (PEOU, relative advantage, and intention), as hypothesized in our research model, we formally tested the mediating effect of Inertia following the approach recommended by Sobel (1982). The results (Table A7 in Appendix A) indicate mediation by Inertia of all nine relationships (critical value = ± 1.96). However, while nonsignificant path coefficients for seven of the nine direct paths (e.g., habit–PEOU) in the Sobel test indicate that inertia does in fact fully mediate the impact of habit and sunk costs on the three TAM constructs, as well as the impact of transition costs on intention, significant path coefficients for the direct paths from transition costs to PEOU and RA in the Sobel test indicate that inertia only partially mediates the effect of transition costs on these behavioral beliefs.

We also formally tested the mediating effect of PEOU and RA on the relationship between inertia and intention. A significant path coefficient for the direct inertia–intention path, combined with significant test statistics for both proposed mediators in the Sobel test (see Table A7 in Appendix A) provides support for the view that PEOU and RA only partially mediate the relationship between iertia and new system usage intentions, as hypothesized.

[7] To rule out the possibility of nonlinear (quadratic) effects confounding the moderation effect between inertia and SN, we tested a model with the addition of a quadratic term for SN (Carte and Russell 2003). As expected (due to the relatively low level of correlation between inertia and SN), this term was nonsignificant, alleviating concerns of spurious moderation effects.




NOTE: Dotted lines represent control variable significant effects (nonsignificant effects of control variables are not shown).
Terms in parentheses represent the percentage of explained variance.
*p < .01, **p < .001

**Figure 2. PLS Results**

**Table 2. Effect Sizes for Inertia**

| Dependent Variable | R-Squared with Inertia | R-Squared without Inertia | Effect Size |
|---|---|---|---|
| Intention | 0.67 | 0.64 | 0.09 |
| Relative Advantage | 0.32 | 0.30 | 0.03 |
| Perceived Ease of Use | 0.31 | 0.21 | 0.14 |

## Discussion and Conclusions

### *Summary and Findings*

Hypotheses 1 through 3 were supported. High perceptions of sunk costs and transition costs, in conjunction with incumbent system habit, lead to increased inertia. While not formally hypothesized, we found that individual propensity to resist change also has a significant impact on inertia, with its total effect only slightly below that of the hypothesized antecedents of inertia. Hypothesis 4 was partially supported, indicating that inertia fully mediates between incumbent system habit and sunk costs and the TAM antecedents of adopting a new system, as well as between transition costs and new system usage intentions. However, inertia only partially mediates between transition costs and new system perceptions of RA and PEOU. Thus, inertia is an important mechanism via which incumbent system habits and perceptions of switching costs impact technology acceptance.

The findings regarding transition costs can perhaps be explained by the SQB perspective. Perceived transition costs represent rational decision making on the part of the individual (Samuelson and Zeckhauser 1988). This rationalization of the costs of switching from the incumbent system can, even in the absence of a known alternative, lead to inertia. However, once an alternative becomes known, the individual must still partake in further examination of costs versus benefits of the new system. For example, the individual might determine that because of the costs in time and effort to learn the new system, it will not be easy to use in the short term. Further, the new system has less perceived advantages over the incumbent one (in regard to short-term effectiveness, productivity, and performance) if time and effort will have to be expended to become skillful in using it. As such, it would logically follow that in the presence of known alternatives, transition costs could have direct effects on perceived usefulness and perceive ease of use, in addition to the indirect effect through inertia.

Findings support Hypotheses 5 and 6, indicating that inertia negatively impacts perceptions of both the ease of use and relative advantage of a newly introduced system. The effect size of inertia on PEOU was considerably larger than its effect on RA. However, its total effects on RA and PEOU were approximately equal and moderately large, implying that incumbent system inertia is an important predictor of both new system perceptions. Our theorizing in Hypotheses 5 and 6 adopted a mediation perspective and our results support this perspective—that is, the impact of inertia on new system usage intentions is partially mediated by behavioral beliefs. However, we also conducted a *post hoc* analysis to test the alternative view that inertia might act as a moderator in the PEOU–intentions and RA–intentions relationships, by suppressing the impact of these two behavioral beliefs on new system usage intentions. Results of this analysis (Table D1 in Appendix D) failed to uncover significant moderating effects, indicating that, at least in this context, inertia does *not* moderate the relationship between behavioral beliefs and new system usage intentions.

Hypothesis 7 was also supported, indicating that inertia has a direct negative impact on intentions to use the new system, above and beyond its impact through behavioral beliefs. While the effect size is small, the *total* effect of inertia on intentions is equal to that of PEOU and RA, indicating that it is still an important variable to consider in predicting technology acceptance. Finally, Hypothesis 8 was supported, indicating that inertia moderates the relationship between subjective norm and intentions to use a new system. The positive interaction term indicates that when an individual's inertia is high, social pressures to use a new system play a more important role in determining whether they will voice intentions to use the system (see the surface response graph in Figure 3, which shows a steeper slope for the SN–intention relationship under high levels of inertia). In other words, when inertia is present, subjective norm is an important lever to use to get people to change.

To further explore the interaction effect between SN and inertia, we calculated partial derivatives (see Appendix E). Results of this analysis show that:

(1) At high levels of inertia, SN appears to exert its strongest effect on intention. This influence becomes nonsignificant at low levels of inertia. In this case, intention seems to be explained by RA, PEOU, and inertia only (see Table E1).

(2) When SN is high, the effect of inertia on new system intention is not significant, suggesting no direct effect of inertia on intention under this scenario (see Table E2).

(3) It is when SN is low that inertia inhibits new system intention the most (see Table E2).

Collectively, these results reinforce our interpretation that SN provides strong leverage in achieving change in the presence of strong inertia.

We also conducted a *post hoc* analysis to test the alternative perspective that SN may partially mediate the effect of inertia on intention. Results of this analysis (see Table A7 in Appendix A and Table D1 in Appendix D) did uncover significant mediating effects, indicating that high inertia negatively biases individuals' perceptions of normative pressures, which in turn leads to lower intentions to use the new system. Thus, the cognitive consistency explanation from the SQB perspective applies to the effect of inertia on both behavioral and normative beliefs. Further, the effect of inertia on the normative component of new system acceptance is more complex than that on the attitudinal component, displaying both mediating and moderating effects.

## Limitations

Our study is limited in that we used student subjects. Nonetheless, we believe the use of student subjects was appropriate, since it was not a contrived setting. Students were asked to answer questions regarding their actual use of e-mail to carry out a real and necessary task (collaborating and exchanging files with project teammates). Employees in many organizations also use e-mail as their primary collaboration and file exchange tool when working on projects. Further, students were asked about their perceptions of an alternative tool (Google Docs) that is readily available, often recommended by professors teaching classes involving group projects, and can also be used for collaboration and file sharing in "real world" organizational settings.

The context of the study is a concern, since the choice of which system to use for collaborating on group projects is a group decision, and group members have to use that system in an interdependent fashion. However, we surveyed individuals regarding their own perceptions and intentions. The inclusion of the SN construct might help alleviate some of this concern, since students were asked to respond regarding the extent to which they believed that their friends, teammates, and instructors thought they should use Google Docs. We also ran a model substituting intention to *use* the new system with intention to *try* the new system (see Ahuja and Thatcher 2005), indicating that actual use of Google Docs on future group projects might not be entirely under the individual's control, and results were comparable (inertia → intentions to try = -0.14; $R^2$ for intentions to try = 0.61).

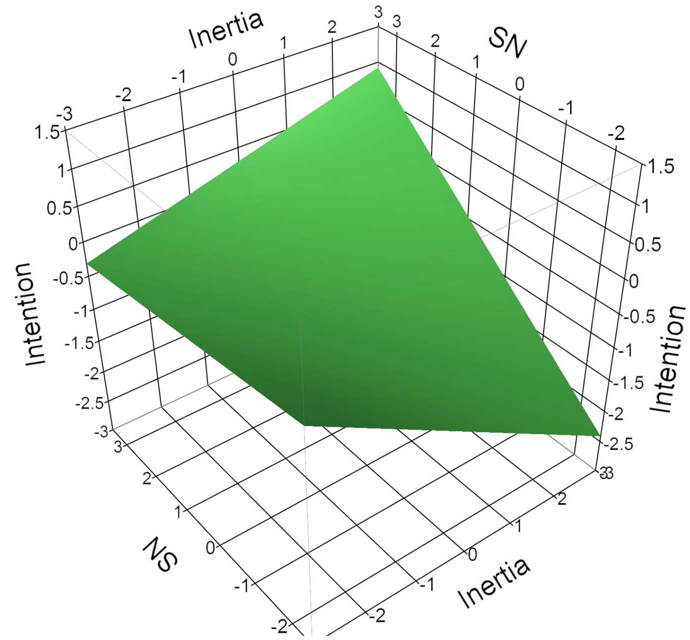



**Figure 3. Inertia–Subjective Norm Interaction**

Since measures for transition costs, sunk costs, inertia, SN, and new system perceptions and intentions were captured at the same point in time, we cannot test the time-ordering of these constructs and causal inferences are based on the underlying theory. Future studies should measure these constructs at various stages in the implementation process to strengthen inferences of causality.

Further, many scales used in the study are new, and need to be further validated in future studies using different systems and tasks. In particular, there were no extant scales for measuring inertia, thus an inertia scale was developed and validated. This scale aligns with our definition incorporating the three dimensions of inertia. Future studies on inertia should engage in further construct development and validation of the scale. In addition, the need to keep the survey as short as possible required that we use scales with fewer items than desired for measuring sunk costs and transition costs. Nonetheless, we believe that the items used capture the essence of each construct for the purposes of this study. Future studies should include a wider range of items capturing additional aspects of each construct especially for perceived transition costs.

Finally, several of the aggregate construct dimensions had nonsignificant weights. Although the nonsignificant weights indicate low relative importance for these dimensions, the bivariate correlations between dimension and construct indicate high absolute significance (see Cenfetelli and Bassillier 2009). Further, from a theoretical standpoint, each of the nonsignificant dimensions is an integral part of what defines its respective construct. Therefore, and given the newness of these scales, it is difficult to determine why certain dimensions were nonsignificant. However, Samuelson and Zeckhauser (1988) suggest that factors related to status quo bias vary based on the context. Thus, a plausible interpretation of the weights for habit, inertia, and individual propensity to resist change is that the significant weights represent those dimensions that are most salient in this particular context. There are two other explanations. First, although the VIF among dimensions of each construct ranged between 1.3 and 2, some of these dimensions are highly correlated, which may account for some dimensions being nonsignificant. Another possibility is interpretational confounding or weak external consistency (Kim et al. 2010). However, rerunning the model with all aggregate constructs modeled as superordinate yielded similar results, giving us increased confidence in our findings and that theoretical statements about our conclusions can be made with respect to the each construct.

### *Theoretical Implications*

We draw from the theoretical perspectives of SQB and habit to theoretically acknowledge that adoption decisions do not occur in a vacuum but rather to replace the status quo. Based on these theoretical perspectives, we identify relevant constructs associated with use of an incumbent system and we situate them in a nomological network of technology acceptance. By hypothesizing their effects on new system behavioral beliefs, normative beliefs, and intentions, we extend our knowledge of technology acceptance by demonstrating how incumbent system constructs can act as inhibitors to the acceptance of a new system. We have identified a preliminary set of incumbent system constructs and their nomological network. Future research should aim at identifying additional incumbent system constructs and theorizing the interplay between incumbent system and new system cognition and behaviors. The SQB perspective provides a set of theoretical explanations that can be further leveraged to identify such additional constructs and relationships.

Further, future research can examine contingencies that influence the relationships between the incumbent and new system constructs. For example, our study did not investigate the level of similarity between the incumbent and new system, or differences in complexity between the two systems, and how these might impact relationships in the model. While differences in the features possessed by each system should not matter in our theory, since what is most important is that both systems can be used to perform the same task (i.e., to achieve the same goal), differences in system complexity or level of similarity may potentially impact perceptions of switching costs and, in turn, increase (or decrease) inertia.

Further, we did not investigate the potential for more complex relationships between incumbent system constructs in our research model, nor did we investigate potential interplay between individual difference variables and these constructs. Thus, our findings suggest several avenues for future research to further tease out the impact of both incumbent system constructs and individual differences on technology acceptance as mediated by inertia. For example, do habits, individual differences, and perceptions of switching costs interact with each other, or with other factors, to predict inertia? In what situations (and for what types of systems and tasks) are usage habits more likely to lead to strong inertia? Are any of the relationships in our model bidirectional in nature? Do the focal relationships in the model change as users gain hands-on experience with the new system?

Inertia itself has not been clearly defined or measured in prior research. Thus, we contribute to both IS research and the SQB theoretical perspective by explicitly conceptualizing and measuring individual-level inertia, distinguishing between inertia and merely continuing with the status quo, and situating inertia within a larger nomological network of constructs impacting technology acceptance. We further demonstrate that inertia has both conscious and subconscious sources, which can bias a user toward maintaining the status quo rather than adopting a newly introduced system. This extends the SQB perspective that has thus far only explicitly considered conscious determinants of status quo bias. Further, our findings regarding the impact of inertia on PEOU in particular help improve understanding of what factors in addition to characteristics of the IT artifact itself lead individuals to view a system as easy to use and advantageous, thus answering the call of Benbasat and Barki (2007) to place more emphasis on investigating key antecedents of TAM variables so that appropriate organizational interventions can be planned.

Perhaps most critically, our study has examined intention as the ultimate dependent variable. This is likely one reason why the total effect of incumbent system habit was relatively small (-.07) and fully mediated by inertia. We expect that habit will have a much stronger direct impact when looking at the intention–new system usage relationship. Thus, it is critical that future studies examine the impact of incumbent system habit on actual new system usage, via the intention–behavior link (Ortiz de Guinea and Markus 2009). Despite the lack of theorizing in prior literature of the role of habit in inhibiting new behaviors, there is a widespread awareness that individuals' intentions can be overruled by habits when the latter are strongly ingrained in one's psyche (Fishbein and Ajzen 1975; Gefen 2003; Ouellette and Wood 1998). Over time, repeated action slips (Norman 1981)—that is, "slipping up" and automatically using the incumbent system out of habit after having previously voiced intentions to use the new system—could even lead to *inaction inertia*. This represents the idea that repeatedly

> foregoing an attractive action opportunity (initial inaction) decreases the likelihood that subsequent action will be taken.…Having passed up one opportunity to gain, the person becomes more likely to pass up another opportunity to gain but gain less (Tykocinski and Pittman, 1998, p. 607).

Thus, inertia can result even after individuals have made a decision to switch to the new system, if strong habits with respect to the incumbent system are not disrupted.

## Practical Implications

Studying the role of inertia and its antecedents in technology acceptance has practical implications for organizations that wish to reduce inertia by taking steps to (1) encourage habit disruption and reformation, and (2) change users' perceptions of the costs of switching to a new system. Several interventions for breaking and modifying habits have been suggested in the social psychology literature (see Verplanken and Wood 2006), and some of these could be argued to address inertia as well. For example, *upstream interventions* (which include large-scale initiatives, incentives, policy changes, and structural changes implemented at the organizational level) target social norms and contextual supports for the desired action (in this case, new system use), encouraging attitude changes that can help to both encourage and cement an individual's intentions to adopt the new system. Our findings support the view that social norms take on critical importance when users are in an inertial state.

Other upstream interventions might seek to decrease inertia by modifying features of the performance context to prevent habitual usage of the incumbent system altogether, or they might simply make the performance environment more conducive to practice of the new behavior in order to alleviate concerns over switching costs. For example, if concerns over switching costs relate to potential performance losses from using (or learning to use) the new system, then management could temporarily loosen performance requirements during the transition to the new system (see Kim and Kankanhalli, 2009). This might also decrease affect-based inertia, or continued incumbent system use due to perceptions of stress associated with the change to something new.

*Downstream interventions* focus on providing information and training to the individual user to impact their decision-making process concerning the new technology. We expect that information-based interventions will have limited success in changing the perceptions of users who are in an inertial state (see Verplanken and Wood 2006). Thus, normative pressures take on increased importance over behavioral beliefs in the presence of inertia. It might be more useful to focus information dissemination and training efforts on better understanding and allaying user concerns about the costs (real or perceived) associated with switching to the new system (Kim and Kankanhalli, 2009). Training and information-based interventions designed to make the user more comfortable with switching to and using the new system, and less stressed over the proposed change, could be helpful in overcoming inertia as well.

In conclusion, this study extends our understanding of the role of incumbent system constructs such as habit, perceived switching costs, and inertia in technology acceptance, and lays the foundation for further study of the interplay between perceptions and cognition with respect to the incumbent system and those with respect to a new system. Such studies will enable managers to plan more effective strategies to counteract the inhibiting impact of incumbent system factors, ultimately leading to more successful new system implementations.

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RESEARCH ARTICLE

# SHACKLED TO THE STATUS QUO: THE INHIBITING EFFECTS OF INCUMBENT SYSTEM HABIT, SWITCHING COSTS, AND INERTIA ON NEW SYSTEM ACCEPTANCE

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# Appendix A

## Psychometric Properties of Scales, Mediation Analysis, and Total Effects

**Table A1. Descriptive Statistics and Inter-Construct Correlations from PLS**

| | Mean (Std Dev) | Comp. Reliab. | ABI | AWARE | BBI | CBI | CTRL | CogRig | EFFCH | EReact |
|---|---|---|---|---|---|---|---|---|---|---|
| ABI | 3.87 (1.20) | 0.81 | 0.83 | | | | | | | |
| AWARE | 5.24 (1.18) | 0.94 | 0.13 | 0.90 | | | | | | |
| BBI | 5.10 (1.22) | 0.95 | 0.56 | 0.13 | 0.95 | | | | | |
| CBI | 4.32 (1.28) | 0.94 | 0.45 | 0.12 | 0.61 | 0.91 | | | | |
| CTRL | 4.16 (1.28) | 0.92 | 0.27 | 0.55 | 0.25 | 0.21 | 0.86 | | | |
| CogRig | 3.96 (1.20) | 0.90 | 0.28 | 0.03 | 0.14 | 0.15 | 0.18 | 0.90 | | |
| EFFCH | 5.79 (0.77) | 0.83 | 0.13 | 0.44 | 0.21 | 0.08 | 0.26 | 0.11 | 0.79 | |
| EReact | 4.42 (1.16) | 0.86 | 0.25 | 0.11 | 0.22 | 0.17 | 0.28 | 0.28 | 0.00 | 0.83 |
| GDExp | 0.69 (2.09) | 1.00 | -0.15 | -0.12 | -0.11 | -0.07 | -0.09 | -0.05 | -0.10 | -0.16 |
| GDIntent | 4.50 (1.32) | 0.96 | -0.46 | 0.06 | -0.42 | -0.36 | -0.05 | -0.24 | -0.08 | -0.09 |
| GDPEOU | 5.09 (0.92) | 0.89 | -0.41 | 0.03 | -0.27 | -0.37 | -0.12 | -0.19 | 0.02 | -0.13 |
| GDRA | 4.89 (1.06) | 0.93 | -0.37 | 0.12 | -0.30 | -0.23 | 0.03 | -0.17 | -0.10 | 0.02 |
| PIIT | 4.51 (1.16) | 0.91 | -0.22 | 0.04 | -0.22 | -0.27 | -0.08 | -0.25 | 0.04 | -0.26 |
| RoutSeek | 3.44 (1.06) | 0.80 | 0.34 | 0.12 | 0.16 | 0.20 | 0.25 | 0.45 | 0.04 | 0.50 |
| SE | 6.48 (2.30) | 0.95 | -0.28 | -0.01 | -0.13 | -0.14 | -0.11 | -0.12 | 0.09 | -0.25 |
| SN | 3.64 (1.11) | n/a | -0.19 | 0.06 | -0.24 | -0.19 | 0.04 | -0.15 | -0.13 | -0.06 |
| STFocus | 3.40 (1.13) | 0.83 | 0.20 | 0.10 | 0.06 | 0.11 | 0.17 | 0.28 | -0.07 | 0.47 |
| SunkCost | 3.84 (1.34) | 0.93 | 0.36 | 0.10 | 0.09 | 0.11 | 0.25 | 0.14 | -0.02 | 0.10 |
| TranCost | 3.01 (1.02) | 0.90 | 0.35 | -0.03 | 0.23 | 0.36 | 0.08 | 0.22 | -0.10 | 0.23 |

**Table A1. Descriptive Statistics and Inter-Construct Correlations from PLS (Continued)**

| | GDExp | GDIntent | GDPEOU | GDRA | PIIT | RoutSeek | SE | SN | STFocus | SunkCost | TranCost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GDExp | 1.00 | | | | | | | | | | |
| GDIntent | 0.15 | 0.96 | | | | | | | | | |
| GDPEOU | 0.17 | 0.62 | 0.90 | | | | | | | | |
| GDRA | 0.10 | 0.71 | 0.55 | 0.90 | | | | | | | |
| PIIT | 0.23 | 0.32 | 0.29 | 0.16 | 0.87 | | | | | | |
| RoutSeek | -0.24 | -0.21 | -0.21 | -0.11 | -0.47 | 0.82 | | | | | |
| SE | 0.07 | 0.24 | 0.42 | 0.10 | 0.46 | -0.31 | 0.93 | | | | |
| SN | 0.15 | 0.55 | 0.35 | 0.45 | 0.27 | -0.10 | 0.10 | n/a | | | |
| STFocus | -0.18 | -0.09 | -0.16 | 0.00 | -0.26 | 0.50 | -0.21 | 0.02 | 0.80 | | |
| SunkCost | -0.03 | -0.21 | -0.25 | -0.20 | -0.03 | 0.20 | -0.20 | -0.04 | 0.04 | 0.93 | |
| TranCost | -0.14 | -0.48 | -0.68 | -0.30 | -0.42 | 0.31 | -0.57 | -0.29 | 0.20 | 0.25 | 0.90 |

**Legend:**
ABI = Affective-Based Inertia
AWARE = Habit: Awareness
BBI = Behavior-Based Inertia
CBI = Cognitive-Based Inertia
CogRig = Cognitive Rigidity
CTRL = Habit: Controllability
EFFCH = Habit: Mental Efficiency of Choice
EReact = Emotional Reaction
GDExp = Prior Google Docs Experience
GDIntent = Usage Intention (Google Docs)
GDPEOU = Perceived Ease of Use (Google Docs)
GDRA = Relative Advantage (Google Docs)
PIIT = Personal Innovativeness with IT
RoutSeek = Routine Seeking
SE = Self-Efficacy
SN = Subjective Norm (Google Docs)
STFocus = Short Term Focus
SunkCost = Sunk Costs
TranCost = Transition Costs

All constructs were measured on a 1–7 scale with the exception of Self-Efficacy, which was measured on a 10-point scale, and Prior Google Docs Experience, which was measured in number of months. Shaded diagonal represents square root of the AVE.

**Table A2. PLS Item Factor Loadings and Cross Loadings**

| Construct | Item | ABI | AWARE | BBI | CBI | CogRig | CTRL | EFFCH | EReact | GDExp | GDIntent |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ABI | ABI1 | 0.85 | 0.06 | 0.38 | 0.37 | 0.25 | 0.24 | 0.01 | 0.33 | -0.13 | -0.38 |
| | ABI3 | 0.80 | 0.16 | 0.55 | 0.38 | 0.21 | 0.20 | 0.21 | 0.07 | -0.11 | -0.38 |
| Aware | AWARE2 | 0.15 | 0.91 | 0.13 | 0.10 | 0.03 | 0.51 | 0.41 | 0.12 | -0.11 | 0.04 |
| | AWARE3 | 0.07 | 0.83 | 0.09 | 0.08 | 0.02 | 0.43 | 0.38 | 0.08 | -0.10 | 0.11 |
| | AWARE4 | 0.13 | 0.93 | 0.14 | 0.14 | 0.01 | 0.51 | 0.41 | 0.08 | -0.11 | 0.02 |
| | AWARE6 | 0.09 | 0.91 | 0.10 | 0.09 | 0.04 | 0.53 | 0.37 | 0.13 | -0.13 | 0.08 |
| BBI | BBI1 | 0.56 | 0.12 | 0.95 | 0.54 | 0.12 | 0.24 | 0.17 | 0.20 | -0.11 | -0.40 |
| | BBI3 | 0.50 | 0.13 | 0.95 | 0.61 | 0.15 | 0.23 | 0.23 | 0.22 | -0.09 | -0.39 |
| CBI | CBI1 | 0.42 | 0.14 | 0.57 | 0.90 | 0.12 | 0.19 | 0.08 | 0.15 | -0.04 | -0.25 |
| | CBI2 | 0.41 | 0.09 | 0.53 | 0.91 | 0.17 | 0.19 | 0.07 | 0.13 | -0.08 | -0.41 |
| | CBI3 | 0.41 | 0.12 | 0.57 | 0.93 | 0.11 | 0.19 | 0.07 | 0.19 | -0.08 | -0.29 |
| CogRig | CR1 | 0.26 | 0.04 | 0.13 | 0.14 | 0.91 | 0.17 | 0.07 | 0.28 | -0.01 | -0.21 |
| | CR3 | 0.25 | 0.01 | 0.13 | 0.13 | 0.90 | 0.16 | 0.13 | 0.22 | -0.08 | -0.23 |
| CTRL | CTRL1 | 0.24 | 0.34 | 0.24 | 0.22 | 0.17 | 0.80 | 0.23 | 0.28 | -0.09 | -0.12 |
| | CTRL2 | 0.23 | 0.52 | 0.20 | 0.16 | 0.16 | 0.90 | 0.21 | 0.20 | -0.07 | -0.05 |
| | CTRL5 | 0.20 | 0.52 | 0.16 | 0.12 | 0.11 | 0.84 | 0.21 | 0.22 | -0.11 | 0.06 |
| | CTRL7 | 0.23 | 0.54 | 0.23 | 0.20 | 0.16 | 0.88 | 0.25 | 0.22 | -0.06 | -0.02 |
| EFFCH | EFFCH1 | 0.07 | 0.19 | 0.21 | 0.07 | 0.06 | 0.13 | 0.77 | 0.03 | -0.09 | -0.09 |
| | EFFCH2 | 0.15 | 0.46 | 0.15 | 0.09 | 0.12 | 0.26 | 0.84 | -0.04 | -0.03 | -0.05 |
| | EFFCH5 | 0.07 | 0.43 | 0.11 | 0.01 | 0.07 | 0.27 | 0.74 | 0.01 | -0.15 | -0.03 |

**Table A2. PLS Item Factor Loadings and Cross Loadings (Continued)**

| Construct | Item | ABI | AWARE | BBI | CBI | CogRig | CTRL | EFFCH | EReact | GDExp | GDIntent |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EReact | ER1 | 0.21 | 0.09 | 0.18 | 0.11 | 0.29 | 0.28 | 0.02 | 0.84 | -0.17 | -0.14 |
| | ER2 | 0.25 | 0.12 | 0.22 | 0.21 | 0.24 | 0.27 | 0.00 | 0.91 | -0.14 | -0.06 |
| | ER3 | 0.12 | 0.05 | 0.13 | 0.06 | 0.12 | 0.06 | -0.03 | 0.72 | -0.07 | 0.03 |
| GDExp | GDExp | -0.15 | -0.12 | -0.11 | -0.07 | -0.05 | -0.09 | -0.10 | -0.16 | 1.00 | 0.15 |
| GDIntent | GDInt1 | -0.42 | 0.04 | -0.38 | -0.34 | -0.26 | -0.05 | -0.08 | -0.10 | 0.15 | 0.96 |
| | GDInt2 | -0.45 | 0.07 | -0.41 | -0.34 | -0.21 | -0.04 | -0.07 | -0.06 | 0.14 | 0.96 |
| GDPEOU | GDPEOU1 | -0.33 | 0.04 | -0.25 | -0.35 | -0.17 | -0.10 | 0.02 | -0.07 | 0.19 | 0.57 |
| | GDPEOU2 | -0.41 | 0.02 | -0.23 | -0.31 | -0.17 | -0.12 | 0.03 | -0.13 | 0.12 | 0.54 |
| GDRA | RA1 | -0.37 | 0.10 | -0.27 | -0.20 | -0.18 | 0.03 | -0.10 | 0.03 | 0.11 | 0.68 |
| | RA2 | -0.32 | 0.10 | -0.25 | -0.20 | -0.15 | 0.02 | -0.07 | 0.03 | 0.09 | 0.64 |
| | RA3 | -0.31 | 0.12 | -0.30 | -0.23 | -0.13 | 0.03 | -0.09 | 0.01 | 0.07 | 0.60 |
| PIIT | PIIT1 | -0.23 | 0.03 | -0.20 | -0.26 | -0.21 | -0.09 | 0.02 | -0.14 | 0.17 | 0.31 |
| | PIIT2 | -0.18 | 0.01 | -0.20 | -0.22 | -0.20 | -0.05 | 0.02 | -0.31 | 0.25 | 0.26 |
| | PIIT4 | -0.17 | 0.06 | -0.19 | -0.23 | -0.24 | -0.07 | 0.07 | -0.24 | 0.20 | 0.26 |
| RtSeek | RS1 | 0.26 | 0.06 | 0.09 | 0.12 | 0.30 | 0.21 | -0.09 | 0.52 | -0.19 | -0.12 |
| | RS3 | 0.30 | 0.13 | 0.17 | 0.19 | 0.43 | 0.20 | 0.13 | 0.32 | -0.21 | -0.21 |
| SE | SE1 | -0.30 | -0.02 | -0.15 | -0.15 | -0.10 | -0.10 | 0.07 | -0.24 | 0.10 | 0.26 |
| | SE2 | -0.26 | -0.01 | -0.15 | -0.14 | -0.07 | -0.10 | 0.08 | -0.22 | 0.06 | 0.21 |
| | SE3 | -0.24 | 0.02 | -0.06 | -0.11 | -0.15 | -0.09 | 0.11 | -0.22 | 0.05 | 0.19 |
| SN | GDSF1 | -0.19 | 0.08 | -0.19 | -0.16 | -0.15 | 0.05 | -0.10 | -0.07 | 0.13 | 0.50 |
| | GDSF3 | -0.13 | 0.04 | -0.24 | -0.18 | -0.10 | 0.02 | -0.13 | -0.03 | 0.16 | 0.49 |
| | GDSF5 | -0.14 | 0.02 | -0.18 | -0.12 | -0.11 | 0.01 | -0.11 | -0.04 | 0.09 | 0.38 |
| STFocus | STF3 | 0.18 | 0.09 | 0.04 | 0.09 | 0.30 | 0.14 | -0.12 | 0.41 | -0.16 | -0.06 |
| | STF4 | 0.15 | 0.07 | 0.06 | 0.09 | 0.16 | 0.15 | 0.00 | 0.39 | -0.15 | -0.09 |
| SunkCost | SnkCost1 | 0.30 | 0.08 | 0.06 | 0.06 | 0.10 | 0.20 | -0.04 | 0.09 | -0.01 | -0.15 |
| | SnkCost2 | 0.37 | 0.10 | 0.11 | 0.13 | 0.16 | 0.25 | 0.00 | 0.09 | -0.05 | -0.23 |
| TranCost | TrnCost1 | 0.33 | -0.04 | 0.22 | 0.33 | 0.21 | 0.08 | -0.09 | 0.22 | -0.14 | -0.45 |
| | TrnCost2 | 0.29 | -0.01 | 0.20 | 0.32 | 0.18 | 0.06 | -0.11 | 0.18 | -0.11 | -0.42 |

**Table A2. PLS Item Factor Loadings and Cross Loadings (Continued)**

| Construct | Item | GDPEOU | GDRA | PIIT | RtSeek | SE | SN | STFocus | SunkCost | TranCost |
|---|---|---|---|---|---|---|---|---|---|---|
| ABI | ABI1 | -0.40 | -0.24 | -0.25 | 0.36 | -0.34 | -0.11 | 0.29 | 0.30 | 0.42 |
| | ABI3 | -0.27 | -0.38 | -0.11 | 0.19 | -0.12 | -0.21 | 0.02 | 0.30 | 0.15 |
| Aware | AWARE2 | 0.06 | 0.10 | 0.05 | 0.14 | 0.00 | 0.06 | 0.12 | 0.10 | -0.02 |
| | AWARE3 | 0.04 | 0.14 | 0.02 | 0.10 | 0.00 | 0.07 | 0.07 | 0.10 | -0.03 |
| | AWARE4 | 0.00 | 0.08 | 0.03 | 0.07 | -0.01 | 0.05 | 0.05 | 0.09 | -0.02 |
| | AWARE6 | 0.02 | 0.13 | 0.03 | 0.13 | 0.00 | 0.06 | 0.12 | 0.07 | -0.03 |
| BBI | BBI1 | -0.27 | -0.29 | -0.20 | 0.14 | -0.13 | -0.23 | 0.05 | 0.11 | 0.22 |
| | BBI3 | -0.24 | -0.28 | -0.23 | 0.16 | -0.12 | -0.22 | 0.06 | 0.07 | 0.21 |
| CBI | CBI1 | -0.29 | -0.14 | -0.23 | 0.16 | -0.11 | -0.15 | 0.10 | 0.11 | 0.28 |
| | CBI2 | -0.39 | -0.30 | -0.29 | 0.20 | -0.15 | -0.22 | 0.07 | 0.11 | 0.36 |
| | CBI3 | -0.33 | -0.17 | -0.22 | 0.17 | -0.14 | -0.14 | 0.12 | 0.08 | 0.33 |
| CogRig | CR1 | -0.19 | -0.15 | -0.23 | 0.42 | -0.10 | -0.12 | 0.25 | 0.16 | 0.21 |
| | CR3 | -0.15 | -0.15 | -0.22 | 0.40 | -0.11 | -0.15 | 0.25 | 0.09 | 0.18 |
| CTRL | CTRL1 | -0.20 | -0.03 | -0.16 | 0.24 | -0.13 | -0.02 | 0.12 | 0.21 | 0.13 |
| | CTRL2 | -0.09 | 0.01 | -0.03 | 0.20 | -0.08 | 0.05 | 0.14 | 0.21 | 0.08 |
| | CTRL5 | -0.03 | 0.10 | -0.03 | 0.22 | -0.05 | 0.08 | 0.17 | 0.17 | 0.01 |
| | CTRL7 | -0.08 | 0.04 | -0.05 | 0.19 | -0.09 | 0.03 | 0.17 | 0.23 | 0.03 |
| EFFCH | EFFCH1 | -0.07 | -0.12 | -0.03 | 0.04 | 0.00 | -0.13 | -0.07 | -0.03 | -0.03 |
| | EFFCH2 | 0.06 | -0.06 | 0.08 | 0.02 | 0.10 | -0.08 | -0.07 | 0.00 | -0.10 |
| | EFFCH5 | 0.10 | -0.03 | 0.06 | 0.04 | 0.15 | -0.10 | -0.01 | 0.00 | -0.15 |
| EReact | ER1 | -0.19 | -0.04 | -0.31 | 0.44 | -0.30 | -0.10 | 0.40 | 0.14 | 0.25 |
| | ER2 | -0.09 | 0.05 | -0.19 | 0.46 | -0.18 | -0.02 | 0.45 | 0.06 | 0.18 |
| | ER3 | 0.05 | 0.05 | -0.11 | 0.29 | -0.10 | -0.03 | 0.30 | 0.04 | 0.09 |
| GDExp | GDExp | 0.17 | 0.10 | 0.23 | -0.24 | 0.07 | 0.15 | -0.18 | -0.03 | -0.14 |
| GDIntent | GDInt1 | 0.57 | 0.66 | 0.32 | -0.20 | 0.21 | 0.52 | -0.09 | -0.19 | -0.44 |
| | GDInt2 | 0.62 | 0.70 | 0.29 | -0.19 | 0.25 | 0.53 | -0.07 | -0.20 | -0.48 |
| GDPEOU | GDPEOU1 | 0.90 | 0.53 | 0.25 | -0.14 | 0.32 | 0.37 | -0.17 | -0.23 | -0.60 |
| | GDPEOU2 | 0.90 | 0.45 | 0.28 | -0.24 | 0.44 | 0.26 | -0.12 | -0.23 | -0.62 |
| GDRA | RA1 | 0.51 | 0.92 | 0.14 | -0.09 | 0.11 | 0.42 | -0.01 | -0.22 | -0.27 |
| | RA2 | 0.47 | 0.90 | 0.11 | -0.10 | 0.11 | 0.38 | -0.02 | -0.20 | -0.27 |
| | RA3 | 0.49 | 0.87 | 0.19 | -0.10 | 0.05 | 0.42 | 0.02 | -0.10 | -0.27 |
| PIIT | PIIT1 | 0.28 | 0.21 | 0.89 | -0.41 | 0.38 | 0.24 | -0.22 | -0.01 | -0.32 |
| | PIIT2 | 0.20 | 0.08 | 0.82 | -0.38 | 0.43 | 0.25 | -0.23 | -0.03 | -0.40 |
| | PIIT4 | 0.28 | 0.13 | 0.90 | -0.45 | 0.41 | 0.22 | -0.24 | -0.04 | -0.39 |
| RtSeek | RS1 | -0.19 | -0.07 | -0.30 | 0.76 | -0.23 | -0.05 | 0.49 | 0.16 | 0.25 |
| | RS3 | -0.16 | -0.10 | -0.45 | 0.87 | -0.27 | -0.11 | 0.34 | 0.17 | 0.26 |
| SE | SE1 | 0.41 | 0.12 | 0.44 | -0.31 | 0.96 | 0.12 | -0.20 | -0.18 | -0.55 |
| | SE2 | 0.36 | 0.06 | 0.43 | -0.28 | 0.92 | 0.09 | -0.17 | -0.16 | -0.51 |
| | SE3 | 0.40 | 0.10 | 0.41 | -0.28 | 0.92 | 0.05 | -0.22 | -0.20 | -0.54 |
| SN | GDSF1 | 0.32 | 0.41 | 0.24 | -0.12 | 0.13 | 0.90 | -0.02 | -0.05 | -0.29 |
| | GDSF3 | 0.27 | 0.38 | 0.27 | -0.10 | 0.06 | 0.88 | 0.05 | 0.00 | -0.25 |
| | GDSF5 | 0.29 | 0.34 | 0.13 | 0.00 | 0.02 | 0.68 | 0.03 | -0.07 | -0.15 |
| STFocus | STF3 | -0.15 | 0.01 | -0.24 | 0.43 | -0.13 | 0.02 | 0.86 | 0.05 | 0.18 |
| | STF4 | -0.13 | -0.01 | -0.20 | 0.41 | -0.23 | 0.02 | 0.83 | 0.03 | 0.15 |
| SunkCost | SnkCost1 | -0.17 | -0.12 | -0.02 | 0.15 | -0.17 | -0.02 | 0.03 | 0.91 | 0.19 |
| | SnkCost2 | -0.29 | -0.23 | -0.03 | 0.22 | -0.19 | -0.06 | 0.05 | 0.95 | 0.27 |
| TranCost | TranCst1 | -0.61 | -0.29 | -0.42 | 0.32 | -0.56 | -0.28 | 0.20 | 0.22 | 0.91 |
| | TranCst2 | -0.61 | -0.25 | -0.33 | 0.25 | -0.48 | -0.25 | 0.16 | 0.24 | 0.90 |

| **Table A3. Weights for Aggregate and Formative Constructs** | | |
|---|---|---|
| **Construct** | **Dimension/Item** | **Weight** |
| Habit | Summated Scale | 1.000*** |
| Inertia | Affective-Based | 0.742*** |
| | Behavior-Based | 0.076 (n.s.) |
| | Cognitive-Based | 0.334 *** |
| Propensity to Resist Change | Cognitive Rigidity | 0.533 *** |
| | Emotional Reaction | 0.080 (n.s.) |
| | Routine Seeking | 0.554** |
| | Short-Term Focus | -0.023 (n.s.) |
| Subjective Norm (first-order formative) | GDSF1 (friends) | 0.499*** |
| | GDSF3 (teammates) | 0.413*** |
| | GDSF5 (professors) | 0.259 * |

*p <.05, **p < .01, ***p <.001

**Table A4. Inter-Construct Correlations for PLS Model with Second Order Aggregate Constructs**

| | GDExp | GD Intent | GDPEOU | GDRA | HABIT | INERTIA | I*SN | PIIT | RESIST | SE | SN | Sunk Cost | Tran Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDExp | 1.00 | | | | | | | | | | | | |
| GDIntent | 0.15 | 0.96 | | | | | | | | | | | |
| GDPEOU | 0.17 | 0.62 | 0.90 | | | | | | | | | | |
| GDRA | 0.10 | 0.71 | 0.55 | 0.90 | | | | | | | | | |
| HABIT | -0.14 | -0.03 | -0.03 | 0.02 | 1.00 | | | | | | | | |
| INERTIA | -0.14 | -0.49 | -0.45 | -0.38 | 0.25 | n/a | | | | | | | |
| I*SN | -0.05 | 0.13 | 0.01 | 0.05 | -0.03 | 0.06 | 1.00 | | | | | | |
| PIIT | 0.23 | 0.32 | 0.29 | 0.16 | 0.00 | -0.28 | 0.04 | 0.87 | | | | | |
| RESIST | -0.18 | -0.26 | -0.23 | -0.15 | 0.19 | 0.36 | 0.04 | -0.43 | n/a | | | | |
| SE | 0.07 | 0.24 | 0.42 | 0.10 | -0.01 | -0.27 | 0.04 | 0.46 | -0.26 | 0.93 | | | |
| SN | 0.15 | 0.55 | 0.35 | 0.45 | -0.01 | -0.22 | 0.01 | 0.27 | -0.14 | 0.10 | n/a | | |
| SunkCost | -0.03 | -0.21 | -0.25 | -0.20 | 0.14 | 0.31 | -0.03 | -0.03 | 0.20 | -0.20 | -0.04 | 0.93 | |
| TranCost | -0.14 | -0.48 | -0.68 | -0.30 | -0.20 | 0.40 | -0.10 | =0.41 | 0.32 | -0.57 | -0.29 | 0.25 | 0.90 |

**Legend:** GDExp = Prior Google Docs Experience, GDIntent = Usage Intention (Google Docs), GDPEOU = Perceived Ease of Use (Google Docs), GDRA = Relative Advantage (Google Docs), HABIT = Habit (Email), INERTIA = Inertia, PIIT = Personal Innovativeness with IT, RESIST = Propensity to Resist Change, SE = Self-Efficacy, SN = Subjective Norm (Google Docs), SunkCost = Sunk Costs, TranCost = Transition Costs

Shaded diagonal represents the square root of the AVE.

**Table A5. Model Constructs and Measures**

| Construct | Item | Item Wording |
|---|---|---|
| Habit – Awareness (Polites 2009) | AWARE2 | Whenever I need to collaborate / share files with my teammates, I choose to use [EMAIL] without even being aware of (making) the choice. |
| | AWARE3 | Whenever I need to collaborate / share files with my teammates, I unconsciously start using [EMAIL]. |
| | AWARE4 | Choosing [EMAIL] when I want to collaborate / share files with my teammates is something I do without being aware. |
| | AWARE6 | Choosing [EMAIL] to collaborate / share files with my teammates is something I do unconsciously. |
| Habit – Controllability (Polites 2009) | CTRL1 | I (would) find it difficult to overrule my impulse to use [EMAIL] to collaborate / share files with my teammates. |
| | CTRL2 | I (would) find it difficult to overcome my tendency to use [EMAIL] to collaborate / share files with my teammates. |
| | CTRL5 | It would be difficult to control my tendency to use [EMAIL] to collaborate / share files with my teammates. |
| | CTRL7 | It is [would be] hard to restrain my urge to use [EMAIL] to collaborate / share files with my teammates. |
| Habit – Mental Efficiency (Polites 2009) | EFFCH1 | I do not need to devote a lot of mental effort to *deciding* that I will use [EMAIL] to collaborate / share files with my teammates. |
| | EFFCH2 | *Selecting* [EMAIL] to collaborate / share files with my teammates does not involve much thinking. |
| | EFFCH5 | *Choosing* [EMAIL] to collaborate / share files with my teammates requires little mental energy. |
| Indiv Diff – Cognitive Rigidity (Oreg 2003) | CR1 | Once I've come to a conclusion, I'm not likely to change my mind. |
| | CR3 | I don't change my mind easily. |
| | CR4 | My views are very consistent over time. *[item dropped due to poor loading in LISREL CFA]* |
| Indiv Diff – Emotional Reaction (Oreg 2003) | ER1 | If I were to be informed that there's going to be a significant change regarding the way things are done in my classes, I would probably feel stressed. |
| | ER2 | When I am informed of a change of plans, I tense up a bit. |
| | ER3 | When things don't go according to plans, it stresses me out. |
| Indiv Diff – Routine Seeking (Oreg 2003) | RS1 | I generally consider changes to be a negative thing. |
| | RS3 | I like to do the same old things rather than try new and different ones. |
| | RS4 | Whenever my life forms a stable routine, I look for ways to change it. *[reverse coded item dropped due to poor loading in LISREL CFA]* |
| Indiv Diff – Short-Term Focus (Oreg 2003) | STF3 | When someone pressures me to change something, I tend to resist it even if I think the change may ultimately benefit me. |
| | STF4 | I sometimes find myself avoiding changes that I know will be good for me. |
| Indiv Diff – PIIT (Agarwal and Prasad 1998) | PIIT1 | If I heard about a new information technology, I would look for ways to experiment with it. |
| | PIIT2 | Among my peers, I am usually the first to try out new information technologies. |
| | PIIT4 | I like to experiment with new information technologies. |
| Inertia – Affective Based (new) | I [will] continue using my existing method for collaborating / sharing files with my teammates… | |
| | ABI1 | …because it would be stressful to change. |
| | ABI2 | …because I am comfortable doing so. |
| | ABI3 | …because I enjoy doing so. |

| Table A5. Model Constructs and Measures (Continued) | | |
|---|---|---|
| **Construct** | **Item** | **Item Wording** |
| Inertia – Behavioral Based (new) | | I [will] continue using my existing method for collaborating / sharing files with my teammates… |
| | BBI | …simply because it is what I have always done. |
| | BBI2 | …simply because it is part of my normal routine. |
| | BBI3 | …simply because I've done so regularly in the past. |
| Inertia – Cognitive Based (new) | | I [will] continue using my existing method for collaborating / sharing files with my teammates… |
| | CBI1 | …even though I know it is not the best way of doing things. |
| | CBI2 | …even though I know it is not the most efficient way of doing things. |
| | CBI3 | …even though I know it is not the most effective way to do things. |
| Transition Costs (Moore 2000) | TrnCost1 | Learning how to use Google Docs to collaborate / share files with my teammates would not take much time. [reverse coded item] |
| | TrnCost2 | Becoming skillful at using Google Docs to collaborate / share files with teammates would be easy for me. [reverse coded item] |
| Sunk Costs (Moore 2000) | SnkCost1 | I have already invested a lot of time in learning to use my current method for collaborating / sharing files with teammates. |
| | SnkCost2 | I have already invested a lot of time in perfecting my skills at using my current method for collaborating / sharing files with teammates. |
| Perceived Ease of Use (Karahanna et al. 2006; Venkatesh et al. 2003) | GDPEOU1 | I would find Google Docs easy to use for collaborating / sharing files with teammates. |
| | GDPEOU2 | Using Google Docs to collaborate / share files with teammates would be clear and understandable. |
| Relative Advantage (Karahanna et al. 2006; Venkatesh et al. 2003) | RA1 | Using Google Docs to collaborate / share files with my teammates, rather than our current method of collaborating / sharing files, would enhance my group's effectiveness. |
| | RA2 | Using Google Docs to collaborate / share files with my teammates, rather than our current method of collaborating / sharing files, would increase my group's productivity. |
| | RA3 | Using Google Docs to collaborate / share files with my teammates, rather than our current method of collaborating / sharing files, would improve my group's performance. |
| Subjective Norm (formative) (Venkatesh et al. 2003) | GDSF1 | My friends think I should use Google Docs to collaborate / share files with my teammates. |
| | GDSF3 | My teammates think I should use Google Docs to collaborate / share files with them. |
| | GDSF5 | My professors think I should use Google Docs to collaborate / share files with my teammates. |
| Internal Self-Efficacy (Thatcher et al. 2008) | SE1 | I could use Google Docs to collaborate / share files with teammates if there was no one around to tell me what to do. |
| | SE2 | I could use Google Docs to collaborate / share files with teammates if I had never used a system like it before. |
| | SE3 | I could use Google Docs to collaborate / share files with teammates if I had only the online help for reference. |
| New System Usage Intention (Venkatesh et al. 2003) | GDInt1 | I intend to use Google Docs to collaborate / share files with my teammates on my future group projects. |
| | GDInt2 | I plan to use Google Docs to collaborate / share files with my teammates on my future group projects. |
| Experience with Google Docs | GDExp | Please indicate how much experience, in months, you currently have using Google Docs. *(If you have never used Google Docs before, please enter "0.")* |

| Table A6. Total Effects (Listed in Decreasing Order by Size) | | |
|---|---|---|
| **Dependent Variable** | **Independent Variable** | **Total Effect** |
| Intention | Relative Advantage | 0.40*** |
| | Perceived Ease of Use | 0.40*** |
| | Inertia | -0.38*** |
| | Subjective Norm | 0.24*** |
| | Self-Efficacy | 0.12*** |
| | Inerta × Subjective Norm | 0.11*** |
| | Transition Costs | -0.10*** |
| | PIIT | 0.10* |
| | Propensity to Resist Change | -0.10 (n.s.) |
| | Sunk Costs | -0.07** |
| | Habit | -0.07*** |
| | GD Experience | 0.40 (n.s.) |
| Relative Advantage | Perceived Ease of Use | 0.48*** |
| | Inertia | -0.34*** |
| | Self-Efficacy | 0.14*** |
| | Transition Costs | -0.09** |
| | Sunk Costs | -0.07** |
| | Habit | -0.06*** |
| | Propensity to Resist Change | -0.06 (n.s.) |
| | GD Experience | 0.05 (n.s.) |
| | PIIT | 0.02 (n.s.) |
| Perceived Ease of Use | Inertia | -0.35*** |
| | Self-Efficiency | 0.30*** |
| | GD Experience | 0.10** |
| | Transition Costs | -0.09** |
| | Sunk Costs | -0.07** |
| | Propensity to Resist Change | -0.07 (n.s.) |
| | Habit | -0.06*** |
| | PIIT | 0.06 (n.s.) |
| Inertia | Transition Costs | 0.27*** |
| | Sunk Costs | 0.19*** |
| | Habit | 0.18*** |
| | Propensity to Resist Change | 0.17** |
| | PIIT | -0.08 (n.s.) |
| | GD Experience | -0.02 (n.s.) |

*p < .05, **p < .01, ***p < .001

**Table A7. Sobel Mediation Test Results**

| Test | Path | Beta | S.E. | Path | Beta | S.E. | T-Stat |
|---|---|---|---|---|---|---|---|
| H → I → PEOU | H → I | .191 | .048 | I → PEOU | -.365 | .051 | -3.48 |
| H → I → RA | H → I | .191 | .048 | I → RA | -.192 | .055 | -2.62 |
| H → I → GDInt | H → I | .191 | .048 | I → GDInt | -.180 | .039 | -3.01 |
| SC → I → PEOU | SC → I | .183 | .049 | I → PEOU | -.322 | .052 | -3.20 |
| SC → I → RA | SC → I | .183 | .049 | I → RA | -.165 | .055 | -2.34 |
| SC → I → GDInt | SC → I | .183 | .049 | I → GDInt | -.173 | .039 | -2.86 |
| TC → I → PEOU | TC → I | .268 | .054 | I → PEOU | -.223 | .044 | -3.55 |
| TC → I → RA | TC → I | .268 | .054 | I → RA | -.181 | .053 | -2.81 |
| TC → I → GDInt | TC → I | .268 | .054 | I → GDInt | -.166 | .038 | -3.28 |
| I → PEOU → GDInt | I → PEOU | -.348 | .050 | PEOU → GDInt | .211 | .044 | -3.95 |
| I → RA → GDInt | I → RA | -.171 | .053 | RA → GDInt | .406 | .042 | -3.06 |
| I → SN → GDInt | I → SN | -.223 | .054 | Sn → GDInt | .224 | .037 | -2.85 |

# Appendix B

## Brief Introduction to Google Docs

Google Docs is a free program that allows you to create and share work online. It includes an online word processor, spreadsheet, and presentation editor. Your project team members can upload existing documents in a number of common formats (including HTML, Microsoft Office, and several more), or you can create and save new documents online. These documents can be exported to your PC at any time. Since all of your documents are stored securely online, they can be accessed and edited from anywhere, using only a web browser. Using Google Docs can help your project team ensure that there is always one single master copy of each of your project documents that each member of the team can access any time. In addition, Google Docs enables real-time collaboration, meaning that all of your group members can log in simultaneously to view and edit documents together in real time, as well as chat with each other. Google Docs is completely free, and requires only a Google email account to get started.

To take a quick tour of Google Docs, or to get more detailed information on the capabilities of Google Docs, please follow the steps below.

(1) Go to the following website by opening a NEW BROWSER WINDOW: http://www.google.com/google-d-s/intl/en/tour1.html.

(2) Review this website to get additional information on Google Docs and how it may be useful to you for collaborating/sharing files in future group projects. You may scroll up and down the pages, click on any links that you wish, and use any feature on the site. (NOTE: The "Help" link at the bottom of the Google Docs tour page provides a lot of helpful information on features and limitations of the Google Docs application, including the “Top 5 Questions” about Google Docs.)

(3) After reviewing the site, return to the survey and answer the questions below. (You may find it convenient to leave the Google Docs browser window open until you complete the survey.)

If you are finished with steps (1) and (2) above and are ready to proceed with answering questions (step 3), please click “submit” below.

# Appendix c

## Testing for Common Method Bias

We used several different methods to alleviate and test for common method bias.

### *Temporal Separation of Survey Administration*

First, we collected data over two time periods, as described in the "Methodology" section of the paper (under "Procedure"). Items related to incumbent system habit and individual difference variables were administered two weeks prior to administration of items related to perceptions of the new system. Temporal separation of survey administration reduces common method bias concerns (see Podsakoff et al. 2003).

### *Marker Variable Technique*

Next, we examined the matrix of item-to-item correlations. The lowest correlation between pairs of items in a given dataset can be viewed as the upper limit to how much method bias can be present in the data (Lindell and Whitney 2001; Malhotra et al. 2006). There were a large number (473) of nonsignificant item-to-item correlations in the dataset, including 59 nonsignificant correlations associated with items from constructs hypothesized to be either positively or negatively correlated, as well as 44 statistically significant correlations between 0.09 and 0.10 in our sample. This indicates the absence of widespread method bias.

### *CFA with Method Construct*

Finally, we ran a CFA in LISREL that included a method construct. This allowed not only comparison of the loadings of each item on its own factor and the method factor, but it also allowed calculation of the amount of method bias present in the entire dataset, using the technique described by Podsakoff et al. (2003) and Malhotra et al. (2006). The estimated amount of method bias present in the dataset was only 1.2 percent. Further, all factor loadings remained significant in the presence of the method factor. As such, common method bias does not appear to be a significant threat to the validity of the results.

### *The Podsakoff et al. (2003) Method in PLS*

Liang et al. (2007) have suggested that the Podsakoff et al. method of assessing common method bias can be carried out in PLS. We conducted this test and obtained an estimate of method bias similar to that obtained from the CFA method above.

Each of the approaches above has limitations (see Podsakoff et al. 2003; Richardson et al. 2009; Sharma et al. 2009; Straub and Burton-Jones 2007).Thus, it is still possible that some method bias may exist. We therefore recommend that future research test the theoretical model via different methods to determine the extent to which it is immune to such biases.

# Appendix D

## Comparison of Alternative Models

**Table D1. Comparison of Alternative Models**

| Relationship | Reported Model (Habit as Summed Score) | Reported Model (Habit as Three Dimensions) | Inertia as a Moderator of PEOU-Intention and RA-Intention | SN as a Mediator of the Inertia-Intention Relationship | Final Model (Both Mediated and Moderated Effects for SN) |
|---|---|---|---|---|---|
| **Core Model** | | | | | |
| GDPEOU → GDIntent | 0.21*** | 0.21*** | 0.23*** | 0.21*** | 0.21*** |
| GDPEOU → GDRA | 0.48*** | 0.48*** | 0.54*** | 0.48*** | 0.48*** |
| GDRA → GDIntent | 0.40*** | 0.40*** | 0.39*** | 0.41*** | 0.41*** |
| HABIT → INERTIA | 0.19*** | 0.21*** | 0.19*** | 0.19*** | 0.19*** |
| INERTIA → GDIntent | -0.17*** | -0.17*** | -0.17*** | -0.16*** | -0.17*** |
| INERTIA → GDPEOU | -0.35*** | -0.35*** | | -0.34*** | -0.34*** |
| INERTIA → GDRA | -0.17** | -0.17* | | -0.17** | -0.18** |
| INERTIA → SN | | | | **-0.23***** | **-0.24***** |
| I × PEOU → GDIntent | | | **-0.05** | | |
| I × RA → GDIntent | | | **0.06** | | |
| I × SN → GDIntent | 0.11*** | 0.11*** | 0.11*** | | **0.11***** |
| SN → GDIntent | 0.24*** | 0.24*** | 0.23*** | 0.23*** | 0.23*** |
| SunkCost → INERTIA | 0.19** | 0.17** | 0.18** | 0.18*** | 0.17** |
| TranCost → INERTIA | 0.27*** | 0.26*** | 0.27*** | 0.26*** | 0.27*** |
| **Controls** | | | | | |
| GDExp → GDIntent | -0.00 | -0.00 | -0.01 | -0.01 | -0.00 |
| GDExp → GDPEOU | 0.09** | 0.09** | 0.11*** | 0.09** | 0.09** |
| GDExp → GDRA | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| GDExp → INERTIA | -0.02 | -0.04 | -0.03 | -0.03 | -0.02 |
| PIIT → GDIntent | 0.06 | 0.07* | 0.07 | 0.07* | 0.07 |
| PIIT → GDPEOU | 0.04 | 0.04 | 0.06 | 0.03 | 0.03 |
| PIIT → GDRA | -0.03 | -0.02 | -0.01 | -0.02 | -0.02 |
| PIIT → INERTIA | -0.08 | -0.07 | -0.08 | -0.09 | -0.09 |
| RESIST → GDIntent | -0.03 | -0.03 | -0.04 | -0.02 | -0.02 |
| RESIST → GDPEOU | -0.00 | -0.00 | -0.11 | -0.01 | -0.01 |
| RESIST → GDRA | -0.00 | 0.00 | -0.04 | 0.00 | 0.00 |
| RESIST → INERTIA | 0.17** | 0.16** | 0.18** | 0.17** | 0.17** |
| SE → GDIntent | -0.00 | -0.00 | -0.00 | 0.00 | -0.00 |
| SE → GDPEOU | 0.30*** | 0.30*** | 0.36*** | 0.30*** | 0.30*** |
| **$R^2$** | | | | | |
| GDIntent | 0.67 | 0.67 | 0.68 | 0.66 | 0.67 |
| GDPEOU | 0.31 | 0.31 | 0.21 | 0.31 | 0.31 |
| GDRA | 0.32 | 0.32 | 0.30 | 0.32 | 0.32 |
| SN | | | | 0.05 | 0.05 |
| INERTIA | 0.30 | 0.30 | 0.29 | 0.29 | 0.29 |

*p < .05,**p < .01,***p <.001

**Legend**: GDExp = Prior Google Docs Experience, GDIntent = Usage Intention (Google Docs), GDPEOU = Perceived Ease of Use (Google Docs), GDRA = Relative Advantage (Google Docs), HABIT = Habit (Email), INERTIA = Inertia, I × GDPEOU = Inertia × Perceived Ease of Use Interaction, I × GDRA = Inertia × Relative Advantage Interaction , I × SN = Inertia × Subjective Norm Interaction, PIIT = Personal Innovativeness with IT, RESIST = Propensity to Resist Change, SE = Self-Efficacy, SN = Subjective Norm (Google Docs), SunkCost = Sunk Costs, TranCost = Transition Costs.

# Appendix E

## Partial Derivative Analysis

Since Intention = $\beta_1$Inertia + $\beta_2$SN + $\beta_3$RA + $\beta_4$PEOU+$\beta_5$(Inertia*SN), then $C_{SN} = (\beta_2 + \beta_5\text{Inertia})$ shows the relationship between SN and new system intention holding Inertia, RA, and PEOU constant and represents the partial derivative of Intention with respect to SN ($\partial I/\partial SN = \beta_2 + \beta_5\text{Inertia}$). Similarly, $C_{Inertia} = (\beta_1 + \beta_5 SN)$ shows the relationship between Inertia and Intention holding SN, RA, and PEOU constant and represents the partial derivative of Intention with respect to Inertia ($\partial I/\partial \text{Inertia} = \beta_1 + \beta_5 SN$) (for a description of the procedure, see Ping 2003; Titah and Barki 2009).

The factored coefficients from each of the two partial derivatives indicate the slope of the regression line between new system intention with SN (Table E1) and with Inertia (Table E2) respectively, while holding the other independent variables constant. In other words, the factored coefficient of SN shows the relationship between SN and new system intention while holding inertia, RA, and PEOU constant.

**Table E1. SN to New System Intention Relationship at Different Levels of Inertia**

| Inertia Levels (Scale 1-7) | Partial Derivative of Intention to Use New System with Respect to SN | Standard Error | T-Statistic |
|---|---|---|---|
| 7 | 0.61 | 0.21 | **2.85** |
| 6 | 0.50 | 0.18 | **2.71** |
| 5 | 0.39 | 0.16 | **2.51** |
| 4 | 0.28 | 0.13 | **2.21** |
| 3.64 (Mean of Inertia) | 0.24 | 0.12 | **2.06** |
| 3 | 0.17 | 0.10 | **1.72** |
| 2 | 0.06 | 0.07 | **0.83** |
| 1 | -0.05 | 0.05 | **-1.00** |

Table E2. **Inertia** to New System Intention Relationship at Different Levels of SN

| SN Levels (Scale 1-7) | Partial Derivative of Intention to Use New System with Respect to Inertia | Standard Error | T-Statistic |
|---|---|---|---|
| 7 | 0.11 | 0.22 | 0.52 |
| 6 | 0.00 | 0.19 | 0.01 |
| 5 | -0.11 | 0.16 | -0.68 |
| 4.43 (Mean of SN) | -0.17 | 0.14 | -1.21 |
| 4 | -0.22 | 0.13 | **-1.69** |
| 3 | -0.33 | 0.10 | **-3.25** |
| 2 | -0.44 | 0.07 | **-5.90** |
| 1 | -0.55 | 0.05 | **-10.64** |

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