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RESEARCH ARTICLE

MOVING BEYOND INTENTIONS AND TOWARD THE THEORY OF TRYING: EFFECTS OF WORK ENVIRONMENT AND GENDER ON POST-ADOPTION INFORMATION TECHNOLOGY USE[1]

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Abstract

Grounded in the theory of trying, this study examines the influence of the work environment and gender on trying to innovate with information technology. The study extends the innovation diffusion literature by offering a theory-driven explanation for examining trying to innovate with IT and a parsimonious measure for this construct. Drawing on the theory of reasoned action, we argue that work environment impediments render intentions inadequate for examining post-adoption IT use. Instead of examining intentions, we introduce the goal-based construct of trying to innovate with IT as an appropriate dependent variable for examining post-adoption IT use. Statistical analysis supports the reliability and validity of a parsimonious measure of trying to innovate with IT. The study focuses on two research questions. First, do perceptions of the work environment such as overload and autonomy influence individuals' trying to innovate with IT? Second, does gender influence the relationship between perceptions of the environment and trying to innovate with IT?

The model articulates how perceptions of the environment moderated by gender may influence trying to innovate with IT. Results provide evi-

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dence that overload and autonomy are antecedents to trying to innovate with information technology. Further, findings confirm that autonomy interacts with overload to determine trying to innovate with IT and that these relationships vary by gender. Implications for research and practice are offered.

Keywords: Theory of trying, trying to innovate with information technology, infusion of information technology, information technology innovation, IT use, intentions, technology acceptance model, adoption, stress, overload, autonomy, gender

Introduction

Continual information technology innovation (i.e., converting technology use into innovative processes and applications) is essential for swift organizational responses to changing environmental demands. In successful firms such as the Atlanta Braves, Microsoft, 3M, Nike, or Intel, organizational structures encourage employee innovation with IT in core organizational processes (Brown and Eisenhardt 1997). By encouraging employee innovation with technologies, new, flatter organizational structures help realize the full potential of existing information technologies (Ahuja and Carley 1999; Pierce and Delbecq 1977). However, it remains an everyday challenge for managers to find ways of facilitating IT-based innovation and creativity. One of the levers under direct managerial control is fostering a work environment that is conducive to innovation and creativity.

In many contemporary organizations, overload and autonomy increasingly characterize the work environment and may influence continual IT innovation. An unintended consequence of flatter organizational structures may be growing employee overload. In an era characterized by downsizing and restructuring, research suggests that employees feel a stronger need to visibly demonstrate organizational commitment by working longer and enjoying less leisure time. The practitioner literature on the IT and the general workforce frequently features discussion of employees being overworked and "asked to do more with less" (Goff 2001; King 2003). For example, surveys conducted in the United Kingdom found that more than three out of four employees regularly worked more than their contracted hours each week (Cooper 1999). Over 54 percent of managers reported working often or always every evening and over 34 percent always or often working over the weekends (Cooper 1999). From IT professionals to clerical workers, employees consistently report working more frequent and more intense hours than they prefer (Cooper 1999; Moore 2000).

Concurrently, recent academic research suggests that organizations are providing workers more freedom (i.e., autonomy) to decide how and when they accomplish assigned tasks (Hardwick and Salaff 2003). Autonomy frees employees from rigid schedules or tight control systems and is thought to be related to enhanced innovation with IT. Many organizations encourage employee autonomy by offering options such as flexible work hours, hotelling, and telecommuting. Studies predict that the ranks of over 9 million employees with alternate work arrangements will grow by 10 percent or more annually in the foreseeable future (Knight and Westbrook 1999). Autonomous employees have more opportunities to respond to their task demands by managing schedules or adapting technologies to fit their circumstances.

We believe that both overload and autonomy are likely to affect men and women differently (Ahuja 2002; Hardwick and Salaff 2003). Ahuja (2002) has suggested that there are structural as well as social factors responsible for women's status in the IT field. Structurally, women frequently occupy positions of less autonomy than men (Ross and Wright 1998). In spite of recent strides, gender socialization results in women still being more involved in child-rearing and household activities than men (ITAA 2000). Given this, while women are likely to attend to tasks that are required, they may feel too overloaded with their commitments to find the time and inclination to explore and play with technology within the confines of a work-day (Clark 1992; ITAA 1998). On the other hand, overload can act as a motivator for women to engage

in process innovations using technology to enhance their autonomy and flexibility (Hardwick and Salaff 2003). In either case, autonomy to arrange their own schedule will allow them to engage in activities that are more exploratory in nature, and may lead to innovations with IT.

Thus, we selected overload and autonomy because they are theoretically and practically important, and are likely to vary based on gender. We suggest that it is important for firms to carefully consider the implications of autonomy and overload for innovation-related behavior in order to realize continual IT innovation.

What are the effects of these work-environmental factors—autonomy and overload—on employees' innovation with IT? It is the first goal of this paper to address this question. We further suggest that specific managerial interventions aimed at influencing the environment, and therefore innovation, may not be equally efficacious for all people. One major factor that may differentiate among individual reactions to supervisory action is gender. We believe that examining the work environment's influence on employees is likely to extend our understanding of mechanisms used to foster innovation and maximize benefits of IT to firm value. It is, therefore, the second goal of this research to examine whether gender moderates this relationship. Specifically, this study examines two research questions.

- Do perceptions of overload and autonomy influence IT innovation?
- Do the relationships of perceived overload and autonomy with IT innovation vary by gender?

The paper unfolds as follows. The next section articulates a theoretical foundation that links overload, autonomy, and gender to trying to innovate with IT. The third section describes the research model and hypotheses. The fourth section discusses the methodology and data analysis techniques used to validate the scales and test the model. The fifth section presents the results. The paper concludes with a discussion of implications for theory and practice.

Theoretical Development

When examining individual attitudes and behaviors related to IT, the management of information systems literature has relied heavily on the technology acceptance model (TAM). TAM posits that individuals' attitudes and beliefs influence volitional IT-directed behavior (such as innovation) (e.g., Davis et al. 1989). This literature has demonstrated that perceptions of technology such as usefulness or ease of use influence individuals' intent to use a technology (a predictor of volitional IT-directed behavior). Other antecedents linked to volitional IT directed behavior include the availability of IT-related resources (Nambisan et al. 2000) and perceived behavioral control over IT use (Mathieson 1991). We are interested in extending this literature by examining more distal beliefs about the broader work environment (i.e., autonomy and overload) and individual differences (i.e., gender) that may impact volitional IT-directed behavior.

In this paper, we examine a specific type of IT-directed behavior termed *trying to innovate with IT*. Trying to innovate with IT has been identified as an important antecedent to successful innovation with information technologies (Ciborra 1991). Through trying to innovate, individuals identify successful applications of IT that may optimize task performance or organizational processes.

Although research has examined the links between work environment and IT (Lucas and Spitler 1999; Orlikowski and Baroudi 1991), and to a more limited extent, the relationship between gender and IT (Gefen and Straub 1997; Webster and Martocchio 1992), it is the relationship among the three that is of interest here. To examine this relationship, we draw on the innovation diffusion, creativity, and organizational stress literatures. The innovation diffusion literature directs attention to the critical role of employee innovation for IT's infusion into organizational work processes (Agarwal 2000). Theories of creativity and stress underscore the work environment's influence on employee innovation. Creativity research suggests that stimulants such as autonomy and impediments such as overload influence the level and frequency at which individuals try to innovate (Amabile et al. 1996). Further, stress research

supports direct effects of autonomy on trying to innovate, but also suggests autonomy moderates overload's deleterious effects (Kahn and Byosiere 1994).

Innovation Diffusion

When examining innovation diffusion, theorists suggest carefully selecting a dependent variable relevant to the stage of IT implementation under investigation. Innovation diffusion moves through at least four stages.

- *Adaption*, where IT is modified to foster a better fit between individuals, organizations and/or IT applications
- *Acceptance*, where efforts focus on encouraging employees to commit to using an application
- *Routinization*, where alterations to the system ensure that IT is no longer perceived as new or out of the ordinary
- *Infusion,* where IT applications become deeply embedded within the organization's work processes (Saga and Zmud 1994)

During this diffusion's early stages, employees learn both the new technologies and new work practices. However, long after initial learning and acceptance decisions, during the **infusion stage,** employees try to innovate with IT in order to meet existing (but unmet) needs and apply them to new job demands (Saga and Zmud 1994).

This study focuses on the infusion stage of IT implementation. Saga and Zmud (1994) identify a range of dependent variables linked to IT's infusion. They suggest infusion may be measured in three different ways.

- Extended use, where an individual uses a technology to complete a sophisticated array of tasks
- Integrative use, which reinforces links between different tasks
- Emergent use where the technology is applied in an innovative manner to support new tasks (Agarwal 2000)

Because of our interest in linking the work environment to innovation with IT, this section focuses on identifying and developing an appropriate predictor of emergent use of IT.

Innovation diffusion research suggests several personality traits and attitudes that may extend our understanding of emergent IT use (see Table 1). For example, Agarwal and Prasad (1999) suggest that personal innovativeness (PI) may be an important predictor and/or moderator of individuals' IT-directed behavior. They define PI as a trait that reflects the "willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998, p. 206). Because it is a trait, PI's influence should not vary across situations such as home or work use of IT. Given our goal of examining how behavior varies due to environmental or demographic differences, we focus on attitudes, not traits, that predict emergent IT use.

A substantial body of research has established that attitudes may be used to predict emergent IT use (Venkatesh et al. 2003). According to the theory of reasoned action (TRA), attitudes predict intentions that, in turn, predict individual behavior (Fishbein and Azjen 1975). However, theorists suggest that the usefulness of intentions as predictors of behavior may be limited due to environmental impediments (Davis et al. 1989; Nambisan et al. 2000). TRA theorists suggest that reasoned behaviors are preceded by a deliberate process that culminates in the decision or intention to act, but, even after an individual decides to act, barriers can prevent individuals from completing the behavior (Fishbein and Azjen 1975). Barriers exist when a decision maker believes that either external or internal impediments could thwart the performance of the action in a particular instance (Bagozzi et al. 1992). Key impediments include perceptions of resource scarcity, lack of abilities, or other contingencies such as limits on decision making or control over physical events. Regardless of whether actual impediments exist, perceived barriers are likely to influence individuals'

Table 1. Construct Definitions

Construct	Definition	Operationalization	Seminal Articles
Personal Innovativeness with IT	The willingness of an individual to try out any new information technology.	***Trait*** that is relatively stable across circumstances	Agarwal and Prasad 1998
Intent to Use IT	The strength of a person's intention to use IT.	***Attitude*** that varies with beliefs about a specific technology	Davis et al. 1989
Intent to Explore IT	A user's willingness and purpose to explore a new technology and find potential uses.	***Attitude*** that is influenced by beliefs about IT	Nambisan et al. 2000
Trying to innovate with IT	A user's goal of finding new uses of existing workplace information technologies.	***Goal*** influenced by beliefs about the context or personal ability	Bagozzi and Warshaw 1990; Bagozzi et al. 1992

beliefs and consequently their behavior (Bagozzi et al. 1990). Thus, when individuals perceive impediments, intentions may not effectively predict behavior (Sejwacz et al. 1980).

TRA suggests that when impediments exist, goals, rather than intentions, may be appropriate predictors of actual behavior (Ajzen 1985). Goals, in the context of TRA, have been conceptualized as trying to perform a behavior that may be problematic due to personal or work environment impediments (Bagozzi and Warshaw 1990). The theory of trying, an extension to TRA, suggests that impediments influence expectations and attitudes that shape the formation of the intent to try or actual trying. In an empirical test, Bagozzi and Warshaw (1990) found that expectations of success or failure influenced trying to lose weight. In an extension of this work, Bagozzi, Davis and Warshaw (1992) found that expectations about outcomes influenced trying to use IT. Although their study examined beliefs about success or failure, they called for additional research that links impediments embedded in the broader work environment to the formation of attitudes toward trying. This study responds to this call.

Next, we use the organizational creativity literature to lay a theoretical foundation for linking overload, autonomy, and trying to innovate.

Creativity

Creativity research suggests two relevant lenses for studying individuals and innovation: personality and environmental. Because personality's influence should not vary with the environment, we draw from the environmental perspective to link autonomy and overload to trying to innovate with IT. This perspective examines how the work environment influences the level and frequency of individuals' creative ideas and innovative behavior (Woodman et al. 1993). The componential approach to innovation suggests three factors influence innovation in organizations.

- *Organizational motivation to innovate,* which reflects the organization's attitude and support of innovation
- *Resources,* referring to everything in the work environment such as time or work pressure that influences innovation
- *Management practices,* which refer to factors such as freedom or autonomy in the work environment (Amabile 1988)

Extensions of this model (Amabile et al. 1996) suggest that environmental components fall into two broad categories: impediments and stimu-

lants. Impediments are obstacles such as overload or a lack of resources. Stimulants, on the other hand, refer to the presence of sufficient resources or control over basic job features such as scheduling or methods.

Research supports the notion that work environment impediments and stimulants directly influence individuals' level and quantity of attempts (trying) to innovate. In a study of high tech workgroup innovation, Amabile et al. (1996) found that teams rated high in innovation had significantly different work environments from their lower-rated counterparts. The high innovation projects benefitted from higher work environment stimulants and lower work environment obstacles to innovation. Although the study examined teams, the research collected data on individual perceptions of the climate for innovation within workgroups. In a follow-up study, Amabile and Conti (1999) found that stimulants and impediments mediated the influence of downsizing on attempts to innovate. These findings suggest that the work environment influences whether individuals try to innovate.

Organizational Stress

Research on organizational stress emphasizes a tight coupling between the influence of enduring personal and dynamic contextual properties on workplace behavior. Identified as stressors, impediments such as task overload lead to symptoms of strain such as anxiety or depression that have negative implications for employee performance (Kahn and Byosiere 1994). Since 1976, over 150 studies have examined job-related stress and its relationship with individual performance (Kahn and Byosiere 1994). In general, findings indicate that those individuals who feel greater conflict or overload perform at lower levels (for a review, see Kahn and Byosiere 1994).

Further, research suggests that gender serves as an important predictor of perceptions of overload and influences moderators such as job satisfaction or autonomy. For example, Cooper and Roden (1985) found stress had different implications for female and male tax officers. Although not significant for men, main effects were present between overload and job satisfaction among women. To better understand the influence of stressors, researchers suggest that studies should explicitly examine the interaction of stressors and potential moderators such as gender or autonomy on workplace beliefs and behavior (Kahn and Byosiere 1994).

Gender

Considering all functional areas, few women participate in the top management positions not only in the United States but worldwide. For instance, women held only 13.6 percent of all board seats in the Fortune 500 in 2003 (Catalyst Report 2003). It has been suggested that women's lack of access to power structures in organizations has resulted in differences in behaviors and perceptions between men and women (e.g., Kanter 1977). Because women may lack key relationships and information, they may behave in powerless ways (Mainiero 1986). From this perspective, changes in organizational structure should result in different behaviors and perceptions.

IT has become the backbone of organizational competitiveness. If the field of IT does not draw from and exploit the entire pool of competent and talented candidates, or draws them only evenly for the lower echelons, the quality of innovation may suffer. It is, thus, imperative that researchers try to understand how women as well as men can innovate to their fullest capacity. Contemporary organizations simply can not afford to underutilize half of the population if they are to stay competitive. In this paper, we suggest that more attention to issues related to gender will help organizations better understand how to better utilize this valuable resource and maximize IT use.

More specifically to the information technology fields, recent statistics indicate that women account for only about 20 percent of the United States technology workforce and 25 percent of the technology workers in the European workforce (Maitland 2001). Ahuja (2002) has identified social and structural issues that lead to reduced choice,

persistence, and performance of women in IT-related fields. She analyzed three distinct career stages of choices, persistence, and advancement and identified effects of social factors such as expectations, work–family conflict, and informal networks, as well as structural factors such as occupational culture, lack of role models and mentors, demographic composition, and institutional structures on women's performance at each stage.

The gender differences in roles have been captured by the *gender schema theory* developed by Bem (1981), who argues that the process is mediated by cognitions as children encode and organize incoming information according to the definition of "male" and "female" behavior current and active in that society at that time. This implies that cultural and social factors influence how men and women view themselves in relation to their work. For example, Gefen and Straub (1997) have argued that gender-related social expectations have roots in national culture. On Hofstede's (1980) scale of masculinity versus femininity, certain countries consistently show a masculine tendency. The United States and Switzerland show somewhat masculine tendencies (62 and 70 on a 1 to 100 scale where 1 is the lowest and 100 is highest), and Japan shows strong masculine tendencies (a score of 95 on the same scale).

These cultures establish gender differences in attitudes regarding computers in grade school (Collis 1985), and these attitudes widen with age (Smith 1986). Attitudes toward computers, in turn, have been correlated to achievement in computer-related classes (Computer Science and Telecommunications Board 1993; Fetler 1985). Gefen and Straub (2000) suggested that gender-related differences and stereotypes can be strong enough to create predetermined communication styles that are expected of women and men in many societies.

Effects of the social factors discussed above have been shown to manifest as gender differences in adoption and use of computer-mediated communication (Gefen and Straub 2000). In general, studies have reported differences in terms of communication styles, computer conferencing (Stowers 1995), and the use of the Internet (for a review of this literature, see Gefen and Straub 2000). Gefen and Straub (1997) found both cross-cultural (national) and gender effects on the perceptions of social presence, usefulness and ease of use, but showed only cross-cultural effects on self-reported e-mail use. Specifically, women were found to feel a stronger sense of social presence than did men in the same national culture, and a stronger perception of the usefulness of the software, but felt the software to be less easy to use than did the men.

Further, significant differences have been shown to exist between electronic communication styles of women and men. Specifically, women tend to use electronic communication for rapport building and men for reporting (Gefen and Straub 2000). Stowers (1995), similarly, showed that there was a gender difference in the use of computer conferencing and found that men posted more informational items and women more discussion, personal, and support items. Interestingly, training and support reduced gender differences. Much of this literature is in its infancy, and many more studies are required to build a literature base in this area.

Gefen and Straub (2000) as well as Colley et al. (1994) showed that girls and women are less likely to enjoy, use, and fully adopt computers and computer tools at all stages of education. Women tend to participate less and are less comfortable with computers than are men (Moldafsky and Kwon 1994). The role of social expectations in the gender differences in computer abilities has been shown in Collis' (1985) work. Collis found that girls expressed general confidence in female abilities with regard to computers but did not display the same confidence in their own abilities as individuals, displaying a "we can, but I can't" syndrome.

It is, then, no surprise that, in general, women have been found to report lower computer aptitude (Fetler 1985) and higher levels of computer anxiety (Igbaria and Chakrabarti 1990; Morrow et al. 1986) compared to men. There is recent evidence from real-world settings that women tend to be more anxious than men about computer use (Bozionelos

1996). A significant body of research in psychology (e.g., Hunt and Bohlin 1993) has shown an inverse relationship between computer anxiety and computer self-efficacy, a known determinant of perceived ease of information systems use (Venkatesh and Davis 1996). Research also suggests that higher levels of computer anxiety among women can lead to lower self-efficacy, thus increasing their computer avoidance (Igbaria and Parasuraman 1989; Venkatesh and Morris 2000). Anxiety in general has also been found to be negatively related to performance and persistence in the profession (Brod 1982; Friend 1982; Humphreys and Revelle 1984).

Recent studies on effects of gender suggest that gender can play an important role in determining technology use (Gefen and Straub 1997; Venkatesh and Morris 2000). For instance, Venkatesh and Morris (2000) found gender differences in individual adoption and sustained usage of technology in the workplace. In their study, men's decisions in this regard were more strongly influenced by their attitude toward using the new technology, while women were more strongly influenced by subjective norm and perceived behavioral control. The findings were robust across income, organization position, education, and computer self-efficacy. In this paper, we suggest that all of these factors are likely to influence innovation efforts in IT by men and women.

Additionally, researchers have recognized that gender differences exist in job attribute preferences (for a meta-analytic review of this literature, see Konrad et al. 2000). In general, women are more likely to value extrinsic job attributes (e.g., opportunities to make friends and help others) and intrinsic factors (e.g., variety and task enjoyment) associated with interpersonal relationships. Men, on the other hand, are more likely to value salary, opportunities for advancement and leadership, and autonomy. This review also analyzed studies of undergraduate students in traditionally male-oriented majors (such as engineering). The authors reported that men valued earnings, promotion, and responsibility more highly than did women. Women, in contrast, were more likely to highly rate good coworkers and supervisors as well as helping others.

While sparse, the research on gender differences in work-environment preferences related to IT use has also shown gender differences (Igbaria et al. 1997; Panteli et al. 1999). Igbaria et al. (1997) showed that a higher percentage of men (25 percent versus 14 percent) identified themselves as primarily technically oriented while a higher percentage of women (21 percent versus 8 percent of men) rated themselves as primarily lifestyle integration oriented (that is, they valued integrating family and self-development as well as career concerns). This research suggests that value orientations frequently drive career choices.

The Model

The theoretical model (Figure 1) posits that overload and autonomy directly influence trying to innovate with IT. We propose that overload negatively influences trying to innovate with IT while autonomy positively influences trying to innovate with IT. In addition, we propose that autonomy moderates the influence of overload on trying to innovate with IT. Finally, we suggest that the strength of these relationships will vary based on gender. This section refines the constructs and discusses proposed hypotheses.

The Theory of Trying and the Dependent Variable of Trying to Innovate with IT

Bagozzi and Warshaw (1990) proposed a theory of trying in which they posit trying as an important outcome variable that should be included in studies of IT use and adoption. The theory of trying expands on the theory of planned behavior (Ajzen 1985) and the theory of goal pursuit (Bagozzi and Edwards 1998). According to this theory, intention reflects a state of mind that drives one to take action as opposed to trying, which reflects action and even some parts of actual behavior (Mathur 1998). Bagozzi and Warshaw suggest that trying is under volitional control while succeeding is not. Bagozzi and Edwards define

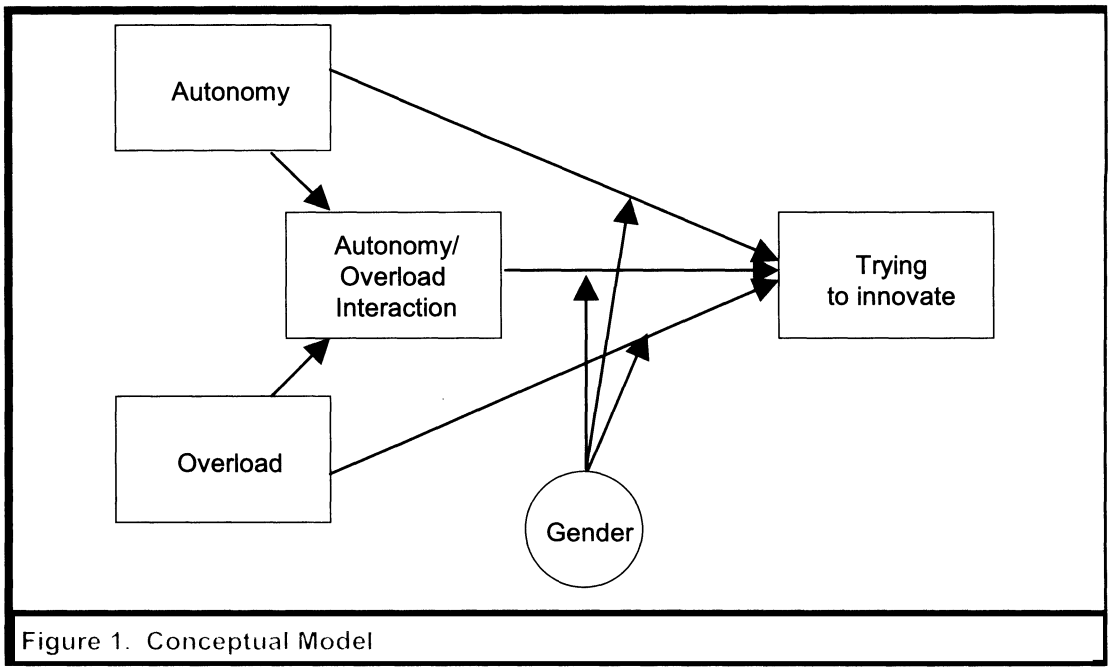

Figure 1. Conceptual Model

trying as a broad term incorporating volitional, motivational, and cognitive elements. They further suggest that processes involved in trying are needed to convert intentions into action. Thus, trying is a necessary but not sufficient precondition of behavior. It is defined as doing all the necessary pre-behaviors and otherwise satisfying all necessary conditions that are within volitional control for the performance of the subjective behavior. In response to calls to include trying in testing of TAM-related models, Mathur (1998) conducted a study to test whether trying is a mediator or moderator of the link between intention and behavior and found that trying mediates the relationship between intention and behavior.

We suggest that trying to innovate with IT is a particularly suitable volitional post-adoption measure. Generally, intention to use is a variable designed to measure pre-adoption beliefs and behavior. Thus, one contribution of this study is to present and test trying to innovate with IT as an alternative and suitable dependent measure when a post-adoption measure is desired.

We propose that contemporary fast-paced, stressful work environments create impediments that limit the usefulness of intentions (such as intention to use IT or intention to explore IT) for understanding innovation with IT. Hence, we focus on modeling the influence of the work environment on trying to innovate with IT (i.e., autonomy and overload). Trying to innovate with IT is conceptualized here as an individual's goal of finding novel uses of information technologies. We believe that examining trying to innovate with IT yields insight into links between the work environment and emergent IT use.

Overload

Overload refers to an individual's perception that they cannot perform a task because they lack critical resources. Overload has two dimensions: quantitative and qualitative (Sales 1970). *Quantitative overload* refers to people's perception that they cannot do something because of limitations

imposed by their environment such as time or accessibility to a resource. Even though adequate resources may exist, *qualitative overload* occurs when employees perceive assigned work as exceeding their capability or skill level. These dimensions reflect employees' beliefs about resources in their immediate task environment.

Overload has a negative influence on behavioral outcomes. When experiencing overload, individuals are thought to demonstrate negative reactions such as anxiety or burnout (Basowitz et al. 1955; Jackson et al. 1987; Levi 1972), which lead to lower job satisfaction, higher intention to turnover, or lower performance (Kahn et al. 1964; Kaufman and Beehr 1989; Lazarus and Folkman 1984). Research indicates that work stressors negatively influence behavior on the job and beyond (Reichel and Neumann 1993; Williams and Alliger 1994).

Overload is likely to be a negative correlate of trying to innovate with IT. Work overload, manifested in lengthy work weeks, due to pressure to keep up with technology in addition to performing assigned duties, is a common characteristic of many IT-related jobs. Work overload has been argued to be an antecedent of employee satisfaction and retention (Longenecker et al. 1999; Moore 2000). While we know of no such link in terms of innovation, we suggest that willingness to make efforts toward innovation will also be thwarted by an employee's perception of overload.

Research indicates that resources such as slack time directly correlate with innovation in laboratory settings (Delbecq and Mills 1985; Parnes 1961). When experiencing quantitative overload, an individual may perceive fewer external resources available to support trying to innovate with IT. Similarly, when they perceive qualitative overload, individuals may perceive the lack of personal skill or ability required to engage in behaviors such as trying to innovate with IT. In either case, individuals' perceived lack of resources reduces the likelihood that they try to innovate with IT. Hence,

H1a. Quantitative overload negatively influences trying to innovate with IT.

H1b. Qualitative overload negatively influences trying to innovate with IT.

Autonomy

Autonomy refers to "the degree to which the job provides substantial freedom, independence and discretion in scheduling the work and in determining the procedures to be used in carrying it out" (Hackman and Oldham 1975, p. 162). Two important facets of autonomy are work method and work scheduling (Breaugh 1985). *Work method autonomy* is the degree of discretion or choice individuals have over procedures (methods) they use to complete tasks. *Work scheduling autonomy* is the degree to which the worker schedules the pace of task initiation and completion. Together, work method autonomy and work scheduling autonomy serve as strong indicators of the degree of control, freedom,and accountability embedded in an employee's position (Karasek 1979) and the surrounding organizational environment (Sparks and Cooper 1999).

Typically, autonomy has a positive influence on worker performance (Ilgen and Hollenbeck 1991). When they perceive more freedom, the conventional wisdom suggests that workers will achieve higher levels of performance. When they have less autonomy, workers' performance may decline due to task monotony or perceived lack of choices (Grayson 1993; Melamed et al. 1995). When they perceive a fit between their autonomy level and task requirements, individuals perform at higher levels (Xie and Johns 1995).

Autonomy is likely to be a positive correlate of trying to innovate with IT. Studies in creativity suggest that individuals produce more innovative work when they perceive more control over the method and scheduling of their work (Amabile and Gitomer 1984). In contrast, individuals who believe they have extremely low autonomy may not try to innovate with IT. Due to perceived limits in their work environment, studies suggest that individuals may not feel they have the freedom or opportunities required to try to innovate with IT (Grayson 1993). We hypothesize

H2. Perceived autonomy positively influences trying to innovate with IT.

Role of Gender

Research question 2 examines the effect of gender on the relationship of overload and autonomy with trying to innovate with IT. Although gender has sometimes been conceived as a psychological state (Hofstede 1991; Oakley 1972), this study conforms with prior MIS research that models gender as biological sex (Gefen and Straub 1997; Venkatesh and Morris 2000; Webster and Martocchio 1992).

Individual differences are known to influence links between perceptions of the environment and IT use. Prior research has linked demographic differences such as gender to perceptions of the work environment and IT. For example, when compared to men, women frequently occupy positions that grant less autonomy (Ross and Wright 1998) and report more work–family conflict (Senatra 1988). Given different work experiences, theories of decision-making such as bounded rationality (Simon 1957) or social information processing (Salancik and Pfeffer 1978) suggest that individuals will demonstrate distinct understanding of, and responses to, environmental influences. Thus, examining whether links between perceptions of the work environment and trying to innovate with IT vary by gender may yield further insight into how to foster innovation.

Effect of Gender on the Relationship Between Autonomy and Trying to Innovate with IT

The organizational stress literature suggests that stressors and autonomy have different implications for women's and men's attitudes and behavior. A recent meta-analysis of the job attribute preference literature (Konrad et al. 2000) concluded that significant (although usually small) gender differences are found for a majority of job characteristics. They suggest that studies show differences among adults matched in occupation or among undergraduates in the same majors. In the information systems literature, Venkatesh and Morris (2000) have made similar arguments and found support for them. Further, Igbaria et al. (1997) suggested that women and men may select different career paths within IT because of their emphasis on different values. Igbaria et al. found that when asked about their primary career orientation, men were more likely to emphasize technological expertise than women.

Specifically, women and men show differences in emphasis and value on autonomy as a job characteristic (Senatra 1988). Researchers consistently report that men typically value autonomy in their work, while women emphasize social interaction and meaning (e.g., Schuler 1975; for a review, see Konrad et al. 2000). Because men value autonomy more, when provided with the flexibility, they are more likely to use it to engage in activities that are exploratory in nature, such as innovation with IT. Thus, we argue that gender plays a role in determining the strength of the relationship between autonomy and trying to innovate with IT. Based on the above, we posit

H3. The relationship between autonomy and the trying to innovate with IT will be stronger in men than in women.

Effect of Gender on the Relationship Between Overload and Trying to Innovate with IT

Long work hours and overload are a common and widely discussed problem in IT-related jobs. IT work can be unpredictable and requires many IT-related employees to work late in order to tackle glitches due to technological issues. It also entails a need to keep up with the changing state of technology, and so employees are expected to put in extra time for keeping up with the changing technologies.

We believe that women will be more sensitive to overload because they are still perceived (by themselves as well as others) as having the primary responsibility for child-rearing and housework (Ahuja 2002). Such role conflict is related to employee perceptions of exhaustion in a variety of

occupations (Schwab et al. 1986; Singh et al. 1994). Specifically, Bacharach et al. (1991) demonstrated a direct and significant link between work–family conflict and overload leading to work exhaustion. This is corroborated by the evidence that that women rate the importance of service aspects and physical environment more highly than men (Hofstede 1991).

This perception is shared by employers as well; for example, it has been suggested that many employers may have a bias against hiring women for jobs involving predominant use of IT in part because they assume women will be less willing and available for long hours and weekend work (ITAA 2000). In a meta-analytic review, Konrad et al. (2000) found that women show a preference for jobs with more normal workloads and "good hours." If women are frequently more overloaded than men, then perhaps it can be argued that they will be less likely to be satisfied and therefore less likely to try to innovate.

A second justification for gender differences is based on another consistent research finding that women frequently report high levels of computer anxiety (Bozionelos 1996; Igbaria and Chakrabarti 1990; Morrow et al. 1986; for a review, see Rosen and Maguire 1990) and low levels of self-efficacy (Ahuja et al. 2004; Bandura 1982; Venkatesh 2000; Venkatesh and Davis 1996). There is also recent evidence from academic settings that women tend to be more anxious than men about computer use (Ahuja et al. 2004). Given a combination of lower self-efficacy, higher levels of computer anxiety, and higher levels of overload due to role conflict, we suggest that women will show a stronger relationship of overload and trying to innovate with IT.

H4. The relationship between overload and trying to innovate with IT will be stronger in women than in men.

Interaction of Overload and Autonomy

One of the most influential stressor-strain models is demand–control theory. Developed by Karasek (1979), this model proposes that the joint effects of *demands* (i.e., overload) and the *range of decision-making freedom available to the worker* (i.e., autonomy) predict behavioral and perceptual outcomes. Extensions to this model posit an interactive relationship between overload and autonomy. Despite the presence of stressors, empirical research suggests that individuals with greater autonomy demonstrate less strain and higher performance (Karasek 1979; Schaubroeck and Merritt 1997). Providing further evidence for this argument, Perrewe and Ganster (1989) found that an increase in autonomy lessened the effect of overload on employee performance.

Thus, in general, autonomy is likely to moderate the influence of overload on individual behavior. Because they have little control over the amount of work or the environment in which they perform tasks, workers with little autonomy report higher levels of overload (Kahn and Byosiere 1994). Alternately, individuals with more autonomy are thought to perceive less overload because they have opportunities to create conditions *congruent* with their work preferences (Kaldenberg and Becker 1992). We hypothesize that autonomy will positively moderate the influence of quantitative and qualitative overload. However, we expect the direct effects of autonomy and overload on trying to innovate with IT (as hypothesized in H1 and H2) to persist. That is, the interaction effect is not expected to supercede the direct effect.

Further, we suggest that this effect will be even more pronounced in women because they are still considered to be more involved in child-rearing and household activities than men (ITAA 2000). Therefore, while women are likely to attend to tasks that are required, they may not explore and play with technology, especially within the confines of a work-day (ITAA 1998; Clarke 1992). If, however, they are allowed to do things at their own pace and time, they may be more able to engage in activities that are more exploratory in nature, which may lead to trying to innovate with IT.

Bretz and Judge (1994) found that individuals experiencing high levels of work–family conflict

placed greater weight on the presence of flexible organizational policies (such as child care, flex time, and alternate career paths). Honeycutt and Rosen (1997) showed that while all employees were attracted to organizations that offered flexible and alternative career paths, level of work–family conflict moderated this relationship. In a study of accountants, Senatra (1988) found that women are more likely than men to report links between stressors such as work–family conflict and volitional behavior such as turnover intent. In the specific context of IT-related work, Ahuja (2002) suggested that work–family considerations strongly influence career choices for women in jobs involving IT use. Igbaria et al. (1997) showed empirical evidence of this and concluded that a much higher percentage of women, compared to men, were concerned with balancing work and personal life in the IT profession. Hardwick and Salaff (2003) found that autonomy may be especially important to women because it provides them the freedom to perform their work at their own schedule so that they can balance work and family more effectively. We believe that this will result in a less stressed and more committed female employee, who is willing to try to innovate. Therefore, we hypothesize that the strength of the interaction effect between autonomy and overload will vary by gender. Hence,

H5a. Autonomy interacts with quantitative overload to positively influence individual's trying to innovate with IT.

H5b. The above interaction effect will be stronger in women than in men.

H6a. Autonomy interacts with qualitative overload to positively influence individual's trying to innovate with IT.

H6b. The above interaction effect will be stronger in women than in men.

Table 2 summarizes the research questions and hypotheses presented in this section. Next, we discuss the details of the research methodology used to examine these hypotheses.

Methodology

The current study was conducted at a public university in the Southeastern United States. Questionnaires were used to collect the data. The purpose of the study was to provide evidence of the model's predictive relevance.

Data Collection

Student volunteers at a large public university in the Southeastern United States participated in the study. Agarwal and Karahanna (2000) have argued that it may be reasonable to utilize student subjects when the phenomenon being examined is not one that crystallizes over time, such as effect of social norms or political views (Sears 1986). While effects of gender in work-environment preferences have been shown in many studies (e.g., Igbaria et al. 1997; Panteli et al. 1999; Rowe and Snizek 1995; von Hellens et al. 2003), some have argued that these results could be confounded by education level, socioeconomic status, and work experience. Use of college students who are employed but lack significant amounts of work experience may offer the advantage of reducing the number of potential confounds (Joshi and Kuhn 2001; Tolbert and Moen 1998).

As an incentive for participating, respondents received extra credit in a junior or senior level business course. To avoid selection bias, we provided questionnaires to all participants in the courses. A total of 800 surveys were distributed. We received 345 responses (43 percent). We examined surveys for employment status and consistency in terms of age, experience in the workplace, position, and tenure in position. If respondents were unemployed and supplied inconsistent or incomplete demographic information, they were dropped from the final dataset. This yielded 263 useable cases (33 percent). Table 3 reports sample characteristics.

Measurement

Likert-type items measured the constructs (see Appendix A). Trying to innovate with IT was mea-

Table 2. Research Questions and Hypotheses

Research Questions:

R1. Do perceptions of overload and autonomy influence individuals' trying to innovate with IT?
R2. Do the relationships of perceived overload and autonomy with IT innovation vary by gender?

Hypotheses:

H1a. Quantitative overload negatively influences trying to innovate with IT.
H1b. Qualitative overload negatively influences trying to innovate with IT.

H2. Perceived autonomy positively influences trying to innovate with IT.

H3. The relationship between autonomy and trying to innovate with IT will be stronger in men than in women.

H4. The relationship between overload and trying to innovate with IT will be stronger in women than in men.

H5a. Autonomy interacts with quantitative overload to positively influence individuals' trying to innovate with IT.
H5b. The above interaction effect will be stronger in women than in men.

H6a. Autonomy interacts with qualitative overload to positively influence individuals' trying to innovate with IT.
H6b. The above interaction effect will be stronger in women than in men.

Table 3. Sample Characteristics

Demographics	Males N = 132		Females N = 131	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Age	23.3	6.0	25.4	8.8
Years of college education	4.6	1.2	4.5	1.3
Hours using a computer each week	15.9	13.2	17.1	14.4
Years employed by firm	2.2	2.5	2.9	3.4
Years performing task	2.6	2.6	3.8	4.9
Position				
Executive	1.5%		1.5%	
Middle Management	6.8%		9.2%	
Supervisory	14.4%		16.8%	
Technical	8.3%		5.3%	
Administrative/Clerical	50.0%		48.1%	
Other	18.9%		19.1%	

sured using two items. This is consistent with IT implementation research. Bagozzi et al. (1992) used two items to measure trying to use IT. In a more recent study of IT acceptance, Venkatesh and Davis (2000) use several two-item scales to measure constructs such as job relevance or output quality. In the present study, each respondent evaluated the following items: (1) "I try to find new uses of IT"; (2) "I try to use IT in novel ways."

Validated items were used to measure overload and autonomy. Quantitative overload was assessed using three items drawn that directed respondents attention to the availability of time or resources to perform their job well (Seashore et al. 1982). Qualitative overload was assessed using three items adapted from Camman et al. (1979). Individuals identified whether they had the ability or IT skills required by their current job. Autonomy was assessed using four items that required respondents to assess their influence over work method and work scheduling (e.g., Breaugh 1985; Hackman and Oldham 1975). Consistent with prior research, we collected demographic variables tied to gender differences: age, education, tenure in position, work experience, and weekly computer use for work.

Preliminary Analysis

Preliminary analysis examined response distributions, demographic information, and construct validity. Splitting the sample along gender lines yielded a male subgroup with 132 cases and a female subgroup with 131 cases (Cole and Moss 1989; Jaccard et al. 1990; Joreskog 1970). An inspection of histograms and scatter-plots indicated that item responses were not normally distributed within subgroups. Table 4 reports the means and standard deviations for the subgroups as well as the results of Kolmogorov-Smirnov tests for differences across the subgroups.

Data Analysis

We used partial least squares (PLS) to analyze the data. Frequently used in MIS research, PLS uses a nonparametric approach to evaluate relationships within, and variance explained by, a structural equation model (Gefen et al. 2000; Venkatesh and Morris 2000). PLS is particularly useful for our study because it is robust to relatively lean sample sizes and non-normal distribution of the data (Chin 1998).

The measurement model was assessed separately for the full sample and each subgroup. All constructs in the model satisfied requirements for reliability (composite reliability greater than .70) and discriminant validity (average variance extracted greater than .50) (Table 5). We also examined the discriminant and convergent validity of each indicator (Chin 1998). To be discriminant and convergent, each indicator should load higher on the construct of interest than on any other latent variable. To be useful for subgroup analysis, items should load and cross-load consistently across samples (Carte and Russell 2003; Reynolds and Paget 1982). Results presented in Tables 5 and 6 demonstrate adequate discriminant and convergent validity.

Prior to estimating the structural models, we estimated interaction terms for autonomy, qualitative overload, and quantitative overload. First, to reduce inflation in path coefficients, we standardized and centered the indicators of each construct (Stone-Romero 1988). Then, we multiplied indicators of autonomy by indicators of qualitative and quantitative overload (Joreskog and Yang 1996; Yang Jonson 1998). Finally, the products were used to estimate the interaction of autonomy with quantitative or qualitative overload in the structural model (Chin et al. 2003; Kenny and Judd 1984).

Next, we estimated a series of structural models for the full sample and each subgroup. Given that there is some debate over the relative merits of moderation testing using interaction terms and subgroup analysis, a discussion of this subject is warranted. Some researchers have suggested that the moderated multiple regression or other techniques such as LISREL or PLS (that are based on the same basic principles) have greater capacity to detect moderation effects (i.e., more statistical power) than does

Table 4. Construct Characteristics and K-S Test Results by Subgroup

Constructs	Male Subgroup N = 132		Female Subgroup N = 131		Kolmogorov-Smirnov Test	
	Mean	Std. Dev.	Mean	Std. Dev.	Z-Score	Significance
Qualitative Overload	3.0	1.5	3.0	1.5	0.297	1.00
Quantitative Overload	3.5	1.4	3.0	1.5	1.58	0.01
Try to Innovate with IT	4.7	1.3	4.8	1.2	0.37	0.99
Autonomy	4.2	1.6	4.7	1.4	1.75	0.00

Table 5. Reliabilities and Discriminant Validity (Hypothesized Model)

Subgroup and Construct	Composite Reliability	Correlation of Constructs[a]			
Female		1	2	3	4
Qualitative Overload (1)	0.81	**0.85**			
Quantitative Overload (2)	0.89	0.34	**0.87**		
Trying to Innovate with IT (3)	0.87	0.08	0.23	**0.89**	
Autonomy (4)	0.86	0.04	–0.19	0.20	**0.81**
Male		1	2	3	4
Qualitative Overload (1)	0.78	**0.83**			
Quantitative Overload (2)	0.83	0.43	**0.82**		
Trying to Innovate with IT (3)	0.78	0.19	0.03	**0.88**	
Autonomy (4)	0.96	0.06	0.00	0.35	**0.83**

[a]Diagonal elements in the "correlation of constructs" matrix are the square root of the average variance extracted. For adequate discriminant validity, diagonal elements should be greater than corresponding off-diagonal elements.

Table 6. Item Loadings and Corss Loadings*

	Female Subgroup				Male Subgroup			
Items	Trying to Innovate with IT	Autonomy	Qualitative Overload	Quantitative Overload	Trying to Innovate with IT	Autonomy	Qualitative Overload	Quantitative Overload
Trying 1	**.88**	.06	.10	.05	**.85**	.13	.02	.05
Trying 2	**.87**	.09	.06	.17	**.83**	.19	.14	.01
Autonomy 1	.01	**.81**	.06	.11	.02	**.82**	.20	.04
Autonomy 2	.02	**.81**	.02	.11	.17	**.81**	.06	.19
Autonomy 3	.01	**.79**	.01	.06	.11	**.79**	.11	.19
Autonomy 4	.27	**.71**	.02	.26	.23	**.70**	.19	.02
Qualitative 1	.04	.05	**.90**	.07	.05	.07	**.80**	.31
Qualitative 2	.01	.03	**.70**	.44	.22	.05	**.80**	.19
Quantitative 1	.04	.13	.15	**.86**	.09	.08	.20	**.86**
Quantitative 2	.13	.03	.05	**.83**	.09	.03	.12	**.84**
Quantitative 3	.02	.15	.21	**.82**	.07	.03	.19	**.80**

*Because they are products of other items, indicators for interaction terms are typically not included in a confirmatory factor analysis of the measurement model. Their inclusion would violate assumptions about the item's independence (Yang Jonson 1998).

the subgroup analysis strategy (Cohen and Cohen 1983; Stone-Romero and Anderson 1994). These researchers identify two objections to subgroup analysis. First, when researchers artificially dichotomize a continuous variable, they lose statistical power and richness of data. Second, use of interaction terms are said to be superior when the context is one of *form* moderation testing rather than *strength* moderation testing (Stone-Romero and Anderson 1994). Researchers have concluded that the subgroup analysis is appropriate for testing strength moderation in the case of nominal moderating variables.

The approach we selected and the procedure we used is consistent with recent research examining the influence of nominal group membership on the nomological network of relationships between IT-related constructs. For example, Kiel et al. (2000) used this approach to test for the influence of national culture on risk taking and the willingness to continue a project. To test the moderating effect of gender, we closely patterned our analysis after Venkatesh and Morris as well as Keil et al. We estimated three separate models in PLS: the full sample, the male subsample, and the female subsample. We then tested for differences across all three models using the test for differences suggested by Chin (2004) and implemented by Keil et al. Results are presented following the Venkatesh and Morris model.

To evaluate the predictive power of the structural models, we calculated R^2's for trying to innovate with IT. Interpreted like multiple regression results, the R^2 indicates the amount of variance explained by the exogenous variables (Barclay et al. 1995). Using a bootstrapping technique, path estimates and t-statistics were calculated for hypothesized relationships. Results suggest that distinct antecedents influence the formation of trying to innovate with IT within each subgroup. The following discussion focuses on the research questions and associated hypotheses. Implications of the results are discussed in the subsequent section.

Results

The Work Environment and Trying to Innovate with IT

The first research question examined whether perceptions of the work environment such as autonomy, overload, and their interaction influenced an individual's trying to innovate with IT. To examine the research question, we estimated three models. The first established a baseline model using the demographic data. In prior research, researchers have suggested that certain demographic variables may confound the results of gender-related analysis (Lefkowitz 1994; Venkatesh and Morris 2000). To control for the influence of these demographic variables, we incorporated control variables such as age, education, tenure on the job, computer use in hours a week, and computer use in years in our data analysis. We found that education, job tenure, and years of computer use did not significantly influence trying to innovate. We believe that our use of students at a certain level of education and experience levels may have helped mitigate their confounding effect in our study.

The results are summarized in Table 7. Because age and hours of computer use a week were significant, we included them in our baseline structural model. Not surprisingly, our analysis indicated that hours of information technology use and age each week explained a small to moderate amount of variance in trying to innovate (full sample $R^2 = .12$; female subgroup $R^2 = .11$; male subgroup $R^2 = .14$). To control for the influence of age and technology use each week, we incorporated them in the following structural models.

Our second structural model incorporated the direct effects of quantitative overload, qualitative overload, and autonomy on trying to innovate. Within the full dataset and female subgroup, Autonomy (**H2**: full sample: .27, $p < .01$; female subgroup: .15, $p < .05$) exerted a direct significant effect and explained a small, yet significant amount of, additional variance on trying to inno-

Table 7. Model Summary

Model	Full	Female	Male	Full to Female	Full to Male	Female to Male
Control Variables[a]						
R^2	0.12	0.11	0.14			
IT use a week	**0.29****	**0.29****	**0.33****	*	*	*
Age	**0.17***	0.11*	0.22**	**	**	**
Direct Effects						
R^2	0.21	0.16	0.26			
Qualitative Overload	0.12	–0.06	0.19**	–	**	**
Quantitative Overload	0.07	–0.12	0.00	–	–	–
Autonomy	**0.27****	**0.15***	**0.29****	**	*	**
Final Model: Two-Way Interactions						
R^2	0.23	0.20	0.33			
Qualitative Overload	0.11	–0.09	**0.32****	–	**	**
Quantitative Overload	0.06	**–0.27***	0.09	**	–	**
Autonomy	**0.22****	0.07	**0.44****	**	**	**
Qualitative Overload × Autonomy	×0.04	0.04	0.29**	–	**	**
Quantitative Overload × Autonomy	–0.03	**0.23***	–0.10	**	–	**

[a]Control variables include age, education, tenure on the job, computer use in hours a week, and computer use in years.

* = .05 significance

** = .01 significance

vate with IT (ΔR^2 full sample = .07, F = 19.7, p < .01; ΔR^2 female subgroup = .05, F = 9.28, p < .01) (Carte and Russell 2003; Cohen 1988). Within the male subgroup, qualitative overload (**H1b**: .19, p <.01) and autonomy (**H2**: .29, p < .01) exerted a direct effect on and explained a moderate, significant amount of additional variance (ΔR^2 = .11, F = 24.6, p < .01) in trying to innovate.

In the final structural model, we added the interaction terms between autonomy and overload to the direct effects model. For the full sample, no significant interaction effects were observed and our results remained unchanged. In the female subgroup, autonomy no longer demonstrated a direct effect on trying to innovate, but quantitative overload (**H1a**: –.27, p < .05) and its interaction with autonomy (**H5**: .23, p < .05) showed significant effects. In the male subgroup, qualitative overload (**H1b**: .32, p < .01), autonomy (**H2**: .44, p < .01), and their interaction (**H6**: .29, p < .01) showed significant effects on trying to innovate. Within both subgroups, the addition of the interaction terms helped explain a significant amount of variance in trying to innovate with IT (ΔR^2 female subgroup = .04, F = 13.0, p < .01; ΔR^2 male subgroup = .06, F = 27.1, p < .01). We had expected that even when interaction terms were

introduced, the main effects would persist. This was true for the full sample and also for the male subgroup. This suggests that the interaction effects here explain the residual effects, left over after the main effects have been considered. In women, while some main and interaction effects were found, once the interaction effect was introduced, autonomy did not appear to have a direct effect, suggesting that the main utility of autonomy is in softening the effect of quantitative overload. These findings are discussed in detail in the discussion section. Taken together, these findings suggest that the interaction of autonomy and overload influence trying to innovate with IT.

Gender and Trying to Innovate with IT

The second research question examined whether strength of the relationship between perceptions of the work environment and trying to innovate with IT varies by gender. When examining subgroups, researchers suggest comparing the model's explained variance (R^2) and the associated regression results (Clearly 1968; Linn 1982). A comparison of results suggests that differences exist across subgroups. When compared to the female subgroup, the final structural model predicted 13 percent more of the variation of trying to innovate with IT within the male subgroup. In terms of the structural model, a simple comparison of standardized path coefficients suggests perceived overload, autonomy, and their interaction have different influences on each subgroup's trying to innovate with IT.

To more rigorously compare the results across subgroups, we calculated t-statistics to evaluate the differences in path coefficients across models. Because we met assumptions for comparing gamma's suggested by Carte and Russell (2003), we used procedures described by Chin et al. (1996) as follows:

$$\text{Spooled} = \text{sqrt}[(N1 - 1) / N1 + N2 + 2)] \times SE12 + [(N2 - 1) / (N1 + N2 + 2)] \times SE22$$

$$t = (PC1 - PC2) / [\text{Spooled} \times \text{sqrt}(1/N1 + 1/N2)]$$

where Spooled = pooled estimator for the variance
t = t-statistic with N1 + N2 + 2 degrees of freedom
Ni = sample size of dataset for gender i
Sei = standard error of path in structural model for gender i
Pci = path coefficient in structural model of gender i

The results (see Table 8) indicate that the path coefficients from each antecedent to trying to innovate with IT for men and women are significantly different from the corresponding coefficient in the structural model for the full sample. Further, the male and female samples differ from the full sample in different ways. These results provide strong support for gender effects on the relationships between autonomy, overload, and trying to innovate. The discussion section will address the implications of these results.

Discussion

This study sought to respond to calls for examining work environment perceptions that influence employee goals toward IT (Davis et al. 1989). We addressed two major research questions. First, we attempted to link perceptions of the work environment with trying to innovate with IT. Results provide support for linkages from autonomy and overload to trying to innovate with IT. Second, the study sought to examine the influence of gender on the relationship between the perceived work environment and trying to innovate with IT. Results indicate that gender does make a difference in the strength of the link between perceptions of work environment and trying to innovate with IT.

The Work Environment and Trying to Innovate with IT

Grounded in the theory of trying as well as creativity and organizational stress literatures, this study

Table 8. Model Summary. Statistical Comparison of Paths

Construct	Males (R^2 = 0.33)		Females (R^2 = 0.20)		Statistical Comparison of Paths
	Standardized Path Coefficient	T-Value	Standardized Path Coefficient	T-Value	T-Value
Autonomy	0.44	2.67**	0.07	0.45	13.66**
Quantitative Overload	0.09	0.27	–0.27	1.72*	5.39**
Qualitative Overload	0.32	2.79**	–0.09	0.59	7.10**
Quantitative × Autonomy Interaction	–0.10	0.12	0.23	1.68*	4.89**
Qualitative × Autonomy Interaction	0.29	2.25**	0.04	0.23	3.49**

* = .05 significance
** = .01 significance

provides evidence that individual perceptions of autonomy and overload in their work environment influence the manner in which individuals interact with IT. The findings support our proposed model, which suggested that autonomy, overload, and their interaction are antecedents to trying to innovate with IT. The work environment perceptions accounted for 20 to 33 percent of the variation of trying to innovate with IT.

The study's contribution includes extending the innovation diffusion literature by offering a theory-driven explanation for examining trying to innovate with IT and a parsimonious measure for this construct. Drawing on TRA, we argued that work environment impediments render intentions inappropriate for examining emergent uses of IT. Instead of examining intentions, we introduced the goal-based construct of trying to innovate with IT as an appropriate dependent variable for examining emergent IT use. Statistical analysis supports the reliability and validity of a parsimonious measure of trying to innovate with IT.

The findings also theoretically supplement our understanding of how the work environment influences trying to innovate with IT. By incorporating moderating effects suggested by the organizational stress literature, this study extends our understanding of the work environment's influence on individuals' trying to innovate with IT. In this study, autonomy has an overall positive effect on trying to innovate and is specifically shown to ameliorate the influence of overload on trying to innovate. This finding underscores the importance of examining how complex interactions influence individual goals towards IT. Thus, this study empirically and theoretically extends our understanding of the work environment's influence on trying to innovate with IT.

Gender and Trying to Innovate with IT

A second objective of the study was to examine the interaction of a worker's gender with perceptions of the work environment and trying to innovate with IT. In men, we found a significant direct effect of qualitative overload as well as a significant interaction effect with autonomy. Likewise, we found similar results for quantitative overload in women. Consistent with the stress literature (Cooper and Roden 1985), women and men reported distinct perceptions and implications of overload. The negative (but significant) relation-

ship between quantitative overload and trying to innovate with IT implies that for women, an increase in workload significantly lowers the possibility that they will try to innovate with IT. A plausible explanation of this may be that many female IT workers juggle work and family responsibilities to a greater extent than do men (Hardwick and Salaff 2003). Any increase in their workload may result in a reduction in trying to innovate with IT.

In contrast, analysis of the male subgroup revealed a distinct pattern of relationships between overload and trying to innovate. For men, qualitative overload is a positive correlate of trying to innovate with IT. This finding is in the opposite direction of what we had hypothesized. One possible explanation of this result may be that men are motivated by the challenge presented by not knowing a skill. Men's desire to acquire the skills may challenge them to explore and learn the technology, and the process of exploration may lead them to trying to find different ways of using it. In part, this finding may also result from differences in men's and women's susceptibility to social cues in their work environments. In a longitudinal study, Venkatesh and Morris (2000, p. 129) found that subjective norms did not influence men's IT-related decisions. Although their influence dissipated over time, subjective norms influenced women's decision making when making initial IT usage decisions. Although this study examines a later stage of implementation (i.e., infusion), Venkatesh and Morris's results suggest that men's general disregard for IT-linked subjective norms may contribute to their relatively robust attempts to innovate, no matter how unskillfully, with IT.

The good news is that autonomy provides managers with a lever that can be used to counter the effect of quantitative overload among women. In our study, autonomy ameliorated the negative effects of quantitative overload on women's trying to innovate with IT. Despite perceiving overload, women who possess autonomy more frequently try to innovate with IT. When they perceive overload, women may see advantages of trying to innovate with IT as means to resolve issues presented by shortages in time or other resources. In simple terms, women with autonomy have more opportunities to find innovative uses of IT that reduce their overload, and therefore will be more likely to try to innovate with IT.

Our findings are consistent with research suggesting that female employees, who typically have high levels of work–family conflict, place greater weight on the presence of flexible organizational policies such as child care, flex time, and alternate career paths (Bretz and Judge 1994; Honeycutt and Rosen 1997). Similar suggestions have been made for the specific context of IT. Ahuja (2002) suggested that work–family considerations strongly influence career choices for women in jobs involving IT use. Igbaria et al. (1997) empirically demonstrated that a much higher percentage of women, compared to men, were concerned with balancing work and personal life in the IT profession. Most recently, Hardwick and Salaff (2003) showed that autonomy provides women the flexibility to perform their work at their own schedule, allowing them to balance work and family more effectively.

For men, autonomy demonstrated a direct positive effect on trying to innovate with IT and a negative moderating effect on the relationship between qualitative overload and trying to innovate with IT. This moderating effect may be of interest to managers as well as scholars. Typically, positions with higher levels of autonomy involve more skill, decision-making authority, and accountability (Barrick and Mount 1993). Among male employees, we suspect that the moderating effect of autonomy reflects awareness of links between trying to innovate with IT and personal or firm performance. Even though they pay less attention to the context, Venkatesh and Morris found that men reported perceived usefulness as an important predictor of intention to use IT. Because autonomy may imply accountability, increasing amounts of autonomy may diminish "unskillful" experimentation and encourage men to engage in purposeful or focused attempts to innovate with IT. This analysis is admittedly speculative and requires further empirical investigation.

These results both confirm and extend recent research on gender differences and IT. When

evaluating the technology acceptance model, Venkatesh and Morris found that gender made a significant difference on formation of the intent to use IT, a dependent variable used to study acceptance of IT. Our results suggest that different perceptions of the work environment influence women's and men's decision-making processes about trying to innovate with IT and infusing IT in work processes.

Conclusions

Prior to discussing implications, it is important to consider the study's limitations. The main limitation relates to the study sample. Sampling was limited to voluntary respondents enrolled in undergraduate classes in a business school. Therefore, there exists a possibility of sampling bias. However, we eliminated responses from students who were not working, thus providing a sample of organizational workers. In addition, we examined each case in terms of age, experience in the workplace, tenure in position, and position. When these indicators were incomplete or inconsistent, we dropped the case. While the sample is not representative of all technology users, it does represent a subset very likely to be involved in technology use in the future.

As indicated earlier, Agarwal and Karahanna (2000) as well as Sears (1986) have argued that it may be reasonable to utilize student subjects when the phenomenon being examined is not one that crystallizes over time, such as effect of social norms or political views. Also, when compared to prior research, our respondents reported comparable levels of autonomy (Nyhan 1999). In terms of autonomy, Denton and Kleiman (2001) reported a mean value of 4.5 and standard deviation of 1.6 for a sample of organizational workers. In the present study, autonomy's mean for men was 4.2 with a standard deviation of 1.6 and that for women was 4.7 with a standard deviation of 1.4. We were not able to find studies that measured qualitative and quantitative overload in organizational settings. Thus, because we rigorously screened the data and construct values are similar to those reported in prior research, we believe the sampled population is appropriate for examining links between the work environment and trying to innovate with IT. Finally, some believe that there may be added value in using student samples in gender studies. While gender differences in job preferences have been found to be influential in many studies (e.g., Igbaria et al. 1997; Panteli et al. 1999; Rowe and Snizek 1995; von Hellens et al. 2001), some have argued that these results could also be due to age, education, socioeconomic level, and work experiences. Use of college students in a narrow age range who are employed but lack significant amounts of work experience offers the advantage of reducing the number of potential confounds. Thus, while our use of a student sample is consistent with other TAM studies in IS research (e.g., Agarwal and Karahanna 2000), we suggest that future research replicate these studies in different organizational contexts to identify the boundary conditions for proposed models.

Another possible criticism of this study is that the sample represents a relatively young population of workers that may not be generalizable to larger populations. We believe that examining young, student workers may be a particularly useful sample for examining overload, autonomy, and trying to innovate with IT. Given trends toward higher levels of student employment, our respondents may be as prone to reporting overload as individuals who attempt to balance work with family and other nonwork issues. In addition, young individuals are as apt to try to innovate as their older coworkers (Steenkamp et al. 1999). As a result, it is of particular interest to examine overload and the influence of autonomy on young employees' trying to innovate with IT. Thus, we believe that these factors mitigate concerns usually associated with student samples and suggest that results may yield insight into trying to innovate with IT.

Despite the above explanations, it is possible that some of the factors associated with a student population (such as low overload and lower level positions) are responsible for the relatively low amount of variance (.20 to .33) explained in this

study. Although Cohen (1988) suggests that an R^2 of .15 indicates moderate variance and an R^2 of .35 indicates a large amount of variance explained, our R^2's are relatively low for the innovation diffusion literature. This may also indicate that there are other factors that can help explain additional variance in trying to innovate. Later in this section, we will speculate on additional factors that may influence trying to innovate.

Finally, readers should note that our study does not speak to differences in the role or presence of IT in respondents' jobs. The paper's goal is not to examine how trying to innovate varies with IT's role or presence in individuals' jobs. Rather, it focuses on examining how perceptions of the work environment influence individuals' trying to innovate with IT. Hence, we focused on measuring environmental variables that influence trying to innovate with IT, not the depth to which their tasks require usage of IT.

In spite of these limitations, the study makes several important contributions. First, the study introduced the theory of trying to articulate and empirically examine a parsimonious model linking the work environment to trying to innovate with IT. Findings provide evidence that work environment characteristics (i.e., overload and autonomy) serve as antecedents to trying to innovate with IT. In addition, the study found that gender can influence links between work environment perceptions and trying to innovate with IT.

These findings have significant implications for research and practice related to issues of overload and autonomy due to the contemporary realities of our hyper-environment. Given the rapidly changing work environment, it would be useful to examine how environmental changes influence innovation over time across or within organizations. Although this study provides strong preliminary evidence of the usefulness of this theoretical model, its results do not speak to how changes in the environment influence individual goals toward IT such as trying to innovate. Another research avenue may be to examine the process by which individuals' goals toward IT change in response to environmental stimuli. We encourage future researchers to engage in process research examining the influence of work environment indicators on trying to innovate and the infusion of IT in organizations.

Much of the research on IT adoption and use has looked at intentions but not at the processes that might facilitate intentions into behavior. Trying can provide additional insight into IT innovation or perhaps even IT adoption. New strategies might focus on reducing or eliminating structural or procedural impediments to the performance of desired behavior for those who may show a lower propensity to try (Bobbit and Dabholka 2002). On the other hand, assisting others who show an inclination to try will also help in building a critical mass of early initiators. Such strategies can assist in improving innovation with IT as well as IT adoption.

Examining innovation with IT through the lens of creativity may yield useful insight into our understanding of the work environment's influence on emergent IT use. While prior research has linked creativity to IT developers and systems development processes (Cooper 2000), this research focused on work environment factors (i.e., overload and autonomy) that influence innovation among a broader population of workers who hold a wider range of jobs. Having provided evidence of the model's predictive validity, future extensions of this work should examine the influence of other stimulants and obstacles on trying to innovate with IT. Theory suggests that at least two other classes of factors may stimulate or obstruct innovation: (1) encouragement of creativity via free information flow and top management support and (2) organizational impediments such as conservatism or internal strife. Empirically examining the influence of these factors on emergent or innovative uses of established IT might offer additional insight into how firms can maximize the utilization of existing IT. One avenue for future research may be to operationalize the construct "trying to innovate with IT" in the context of specific technologies and at different managerial levels.

In addition, this paper introduces the organizational stress literature as a relevant source of theory for examining the work environment's

influence on innovation diffusion. Where past IS research has focused on stress as an antecedent to turnover (Igbaria and Greenhaus 1992), this study draws attention to environmental stressors as antecedents to employees' attitudes toward IT and the importance of identifying alternative dependent variables such as trying to innovate when such stressors exist. The stress literature has rich potential for informing our understanding of individuals' perceptions and reactions to shifts in technologies or the work environment. For instance, research could examine the influence of constructs such as role ambiguity (a lack of definition in job requirements) or role conflict (the influence of conflicting job requirements) on the innovativeness of user or IT personnel's response to challenges presented in the system design and implementation processes.

In future research, researchers may also want to examine two additional sources of innovation—individual differences and managerial support—that may further explain trying to innovate with IT. Although we examine gender, enduring personality traits such as personal innovativeness and less enduring traits such as computer self-efficacy may directly affect individuals' innovation with technology. Personal innovativeness refers to "the willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998, p. 206). Individuals high on personal innovativeness are more likely to engage in risky or new behaviors such as exploring the features of information technologies. Computer self-efficacy refers to individuals' judgment of their capabilities to use computers in diverse situations (Compeau and Higgins 1995; Marakas et al. 1998). When individuals are predisposed to change their interaction with information technology as well as feel like they have the ability to successfully do so, it is likely they would be willing to attempt to innovate with information technology.

Managerial support may be a second source of innovation with technology. Research has shown that individuals are more likely to accept new technologies when they perceive strong top management support for the innovation (Leonard-Barton and Deschamps 1988). Although users may accept new information technology, research suggests that they underutilize the features of IT (see, for example, Davenport 1998). To encourage innovation, Jasperson, Carter and Zmud (2005) argue that managers need to aggressively support continuing innovation with information technology. After implementing technologies, they argue that managers must have a plan to support extending the use of, and providing resources for using, new or underutilized features of information technology. If users have appropriate resources, Jasperson et al. suggest they are more likely to innovate and realize the full potential of information technology in the workplace.

For practitioners, this research has important implications for job design and management of IT-enabled work environments. Although exploratory, this study's findings suggest IT-related goals of different demographic groups may be influenced by different aspects of job design. Specifically, the findings suggest that autonomy has distinct effects on each subgroup. For women, autonomy is shown to ameliorate the negative effects of quantitative overload. Some studies report that by 2010, the number of women in the U.S. labor force will have increased by almost 10 million, a growth rate almost one-third higher than that for men (Fullerton and Toosi 2001). With such trends, it is increasingly important to examine the factors that make can women more innovative. Here, we have shown that by granting them control over the scheduling and manner in which they complete tasks, women can be encouraged to try to innovate with IT and subsequently identify solutions to obstacles with existing technologies.

Also, autonomy may ameliorate the effects of qualitative overload on men's unskilled attempts to innovate with IT. If autonomy's introduction also signals greater accountability, it may encourage men to direct their attempts to innovate down fruitful, rather than playful, paths. Identifying successful, emergent applications of IT could yield substantial savings and increase firm profitability (Nambisan et al. 2000).

Another implication relates to managing IT-enabled workplaces. Innovation can be fostered

by paying attention to the work environments. Monitoring employee perceptions of the work environment may yield insight into their patterns of IT usage (Leonard-Barton and Deschamps 1988). By doing so, when perceptions of overload or autonomy inhibit the effective utilization of existing IT, perhaps the tasks can be redefined. For example, where trying to innovate is desirable, innovation can be encouraged by providing autonomy and minimizing overload. Alternately, if trying to innovate undermines task performance, autonomy can be restricted and employees' interaction with IT can be directed to be more focused. Through careful management of workplace perceptions, we can influence whether and how employees try to innovate (Amabile et al. 1996). While it may appear intuitively clear that these are things a good managers should do anyway, our study provides empirical evidence that should provide additional motivation for managers to follow these guidelines.

This study contributes to a foundation for future studies of the work environment, gender differences, and trying to innovate with IT. By building on this study, researchers and managers alike may identify techniques which enhance IT-related innovation through job design and managing perceptions of the work environment.

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Appendix A

Measurement Constructs

Autonomy

1. I have a lot of freedom to decide how I perform assigned tasks.
2. I control the content of my job.
3. I have the authority to initiate projects at my job.
4. I set my own schedule for completing assigned tasks.

Qualitative Overload

1. To be successful on my job requires more IT skills than I currently have.
2. To be successful on my job requires more abilities than I currently have.
3. My job requires me to do things for which I have insufficient IT training.*

Quantitative Overload

1. The amount of work I am given prevents me from doing my job as well as I would like.
2. It often seems that I have too much work for one person to do.
3. I never have enough time to do what is expected of me at work.

Trying to Innovate with IT

1. I try to find new uses of IT.
2. I try to use IT in novel ways.

*Item dropped due to low loading on the latent construct.