AN EMPIRICAL INVESTIGATION OF THE INFLUENCE OF AGE, GENDER, AND OCCUPATIONAL LEVEL ON STRESS PERCEPTIONS, JOB SATISFACTION, ORGANIZATIONAL COMMITMENT, AND TURNOVER

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This study investigated relationships of age, gender, and supervisor level with job satisfaction, organizational commitment, stress perception, and turnover intention. The demographics were hypothesized to moderate the stress-satisfaction and commitment-turnover relationships. Hypotheses were tested using both parametric and non-parametric bootstrap methods. Subjects were taken from a national survey of 2,663 public sector IT workers. Missing data were imputed using NORM software. Ordinary least squares (OLS) regression indicated a significant direct effect from all main variables and covariates, except for age on turnover intent. No mediating effects were found. Age-Commitment was the only significant higher order modifier relationship, although Gender-Commitment explained substantial variance. LMG statistic results enabled the predictors to be rank ordered with confidence intervals. Best subset bootstrap regression explored all possible predictor orders to confirm which model explained the most variance. The original model and predictor sequence were confirmed. The bootstrap AIC statistic provided a model which maximized explained variance while optimizing parsimony. Since only age had a mediating effect, Hypotheses 1 and 2 were not supported. All other hypotheses were partially confirmed.

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CHAPTER I

LITERATURE REVIEW

Introduction to the Study

This study's purpose is to investigate the direct, mediating, and moderating influences of age, gender, and occupational level on perceived work stress, job satisfaction, organizational commitment, and turnover. Both turnover and stress are universally experienced business problems, and their interaction and relationship are of vital importance. In addition, as the workforce ages and retires, new sources of potential work strain and turnover may manifest. The study attempts to advance both theoretical and practical understanding of the relationship between age, gender, stress and turnover.

In order to ameliorate the universal impact of work stress, one must understand the nature of both turnover and stress, and their influence on work and social domains. Turnover can be involuntary, when a position is terminated, or voluntary, where the employee decides to leave a company. Voluntary turnover can be motivated by a desire to reduce stress and escape an unpleasant work environment, or to seek greater rewards and benefits. This study defines turnover as a voluntary decision and action taken to quit a company. For the last decade, turnover has increasingly become an important global challenge in both private and public sectors. In 2006, turnover reached historically high levels, and aggregate 12-month turnover presently stands at 44%, compared with 10% aggregate turnover reported in 2003 (Bureau of Labor

Statistics, 2007). While turnover is escalating in general, surveys indicate that the competition for and recruitment of top talent is an escalating trend (IOMA, 2004).

Like turnover, stress is a universally experienced problem affecting business performance, social relationships, and physical and psychological well-being. Increasing levels of stress stem from the ambiguity of change, layoffs and transitioning psychological contracts, and the business drive towards leanness, which mandates more output using less time and resources.

The Literature Review provides an overview of the research literature on the subjects of stress, job satisfaction, organizational commitment, turnover, the demographics of age, gender and occupational level, and proposed theoretical relationships among these elements.

Factors and Moderators

This section presents the characteristics and interaction of the study factors of work stress, job satisfaction, organizational commitment, and turnover intention. The influence of occupational level, age and gender on these factors will also be presented.

Work Stress

This section examines the nature and impact of work stress. Stress at work has been studied for decades (Arsenault, Dolan & Van Ameringen, 1991; Bogg

& Cooper, 1995; Caplan, Cobb, French, Van Harrison & Pinneau, 1975; Karasek & Theorell, 1990; Landeweerd & Boumans, 1994; McGrath, 1976; Russell, Altmaier & Van Velzen. 1987; Schabracq, Winnubst & Cooper, 1996; Warr, 1990). Legal and legislative actions continue to keep work stress study on the research and social agenda (EEC, 1989; Howard, 1995; Sauter, Murphy & Hurrell, 1990). While stress in many occupational settings has been examined, research in education and the health industry has been particularly predominant. Educational research offers convenient access to subjects. Research focus on health care may reflect higher reports of perceived work stress and minor psychiatric disorders among health care workers than that reported by their counterparts in the general working population (Bond, 1984; Charlton, Kelly, Dunnell, Evans & Jenkins, 1993; Hemingway & Smith, 1999; Hingley, 1984; Kapur, Borrill, Stride & Tonka, 1998; Phillips, 1982; Simmons & Nelson, 2001; Wall, Bolden, Borrill, Carter, Golya, Hardy, Haynes, Rick, Shapiro & West, 1997).

Work stress and its associated problems cost organizations an estimated $300 billion each year in decreased productivity, absenteeism, turnover, worker conflict, higher health care costs, and increased worker's compensation claims (DeFrank & Ivancevich, 1998; Farren, 1999; Simmons & Nelson, 2001). The impact of work stress on business is much more prevalent and severe than was predicted by federal occupational models (Lerner et al., 2000). Cross-study findings indicate that work demands produced six times the prevalence rates of job disability and impairment than was predicted by standard NHIS indicators, with over 34% of the U.S workforce reporting high levels of stress (NIOSH, 2007; Simmons & Nelson, 2001). Over half of workers report that work is their biggest source of life stress, and most are dissatisfied with their job (Gallup, 2007; Quick, Quick, Nelson & Hurrell, 1997).

Chronic stress deteriorates both physical and mental well-being (Agius, Blenkin, Dey, Zealley & Wood, 1996; Haynes et al., 1999; Richardson & Wood, 1991). Approximately 25% of the U.S. workforce was affected by debilitating stress-related emotional disorders (Jansen, 1986). Stress directly contributes to conditions such as heart attack, stroke, cancer, peptic ulcer, respiratory disease, high blood pressure, asthma, diabetes, hypertension, reduced immune response, allergies, back problems, depression, anxiety, irritation, sleeplessness, headache, back pain, and arthritis (Akerstedt, Knutsson, Westerholm, Theorell, Alfedsson & Kecklund, 2002; Broadbridge, Swanson & Taylor, 2000; Ganster & Schaubroeck, 1991; Wahlstedt, Bjorksten & Edling, 2001; Weldner, Boughal, Connor, Peiper & Mendell, 1997). In the workplace, stress also has direct impact on performance, satisfaction, fatigue, workman's comp claims, accidents, and absenteeism.

Work stress is a multi-dimensional concept incorporating contextual, role and individual characteristics. Such variables provide important frames of reference that enable individual perception and evaluation of the work environment (Adams, Laker & Hulin, 1977; Herman, Dunham & Hulin, 1975). Work stressors are demands which provoke a physiological response or require an adjustment in individual behavior (Holmes & Rhahe, 1967; Lai & Kwok, 2000).

The distinction between stress and stressor is well established in stress research literature. Stress is the subjective evaluation and experience of environmental events. Stressors have been divided into life events, chronic strain, and incidents of daily negative arousal (Thoits, 1995). Sources of occupational stress include: (1) inter-unit and interdepartmental conflict and communication difficulties, (2) resource inadequacies, (3) quality, efficiency, and production setbacks, (4) role frustration, favoritism and factionalism, excessive or increased work load, poor leadership support, and low status, (5) human resource shortages, (6) reduced cycle times, (7) meeting and time pressures (Paramuraman & Alutto, 1978). Role frustration and time constraints are particularly potent contextual factors. Political partisanship can be added to this list as a source for lower job satisfaction, higher levels of perceived stress, and greater intention to turnover (Poon, 2003). One common measure of work stress is work demands, the extent to which individuals feel they have the time and resources needed to properly carry out their work (Haynes et al., 1999; Jacobsson, Pousette & Thylefors, 2001; Lerner, Amick, Malspeis & Rogers, 2000; Lu, 1999). Higher stress levels stemming from increased workloads and time constraints were reported by management, planning, and decision-making subgroups (Seppala, 2001).

Major stress models such as the Michigan model or the demand-control-support model (Johnson & Hall, 1988; Karasek & Theorell, 1990) are global meta-theoretical models (Walker & Avant, 1995). They are general, conceptual, and difficult to test. Recent studies have proposed theoretical models based on narrowly bounded, specific variables and postulates of variable relationships (Houkes, Janssen, De Jonge & Bakker, 1999; Houkes, Janssen, de Jonge & Bakker, 2003a, 2003b; Houkes, Janssen, De Jonge & Nijhuis, 2001). Narrow-bounded or structural models are inherently testable and can provide empirical bases for application and interventions. This study will employ a narrow-bounded analysis in an attempt to better understand and mitigate the effects of stress. In order to mitigate the negative effects of workplace stress, it is essential to understand the human stress response and how individuals attempt to cope with stressors.

The stress response. Experience of an environmental event as stress is dependent on psychological perceptions, and the effectiveness of individual and group coping mechanisms. The stress response has both physiological and cognitive components. When an environmental stressor or threat is perceived, a non-conscious, instinctive reaction causes the brain to activate the "fight or flight" autonomic nervous system. The subsequent state of heightened awareness and anxiety is then either amplified or inhibited by a cognitive interpretation of the environmental factors. Stress is thus based on individual perceptions and evaluations of environmental events and characteristics. If work stress is ongoing through perceptions of inequity or increased workload, chronic anxiety is produced. The stressor-person-environment relationship is thus interdependent and reciprocal (Lazarus & Folkman, 1984).

The threat appraisal process can perceive an event as negative or positive (Lazarus & Folkman, 1984). The negative response to stressors is termed distress and is commonly studied for its relationship to adverse health and occupational outcomes. While distress is negative and dysfunctional, eustress is associated with healthy, positive outcomes (Quick et al., 1997; Selye, 1976a; Selye, 1976b; Simmons & Nelson, 2001). Little research has been done in the area of work eustress (Simmons & Nelson, 2001).

When well-being is perceived to be preserved or enhanced, a positive appraisal occurs, accompanied by positive psychological states such as exhilaration, meaningfulness, purpose, focus, or hope. Physiological reward systems are also triggered, sustaining and reinforcing the reaction to the environmental stimuli. Positive cognitive appraisal can produce positive outcomes even when leader support is low, work demands are high, and job satisfaction is low (Simmons & Nelson, 2001).

A perceived threat to well being produces a negative evaluation and negative psychological states such as fear or anxiety. The autonomic system and fight or flight mechanism continues to be engaged. Chronic experience of negative psychological states produces stress hormones, which in turn contributes to various debilitating psychological and physiological outcomes.

Negative stress appraisal has been conceptually linked with alienation, workplace violence, burnout, and anxiety. Thus, work stress is characterized by feelings of being emotionally overextended and depleted of emotional resources (Houkes et al., 2001). Depletion in turn can lead to exhaustion, burnout, and death (NIOSH, 2007).

The appraisal process is complex in that stressors may be simultaneously perceived to be both positive and negative. A threat stressor is negatively assessed when physical or psychological harm has been committed. A challenge stressor can be perceived as a positive growth opportunity and provide exhilaration and motivation. Threat and challenge stressors can exist simultaneously in an environmental context. In addition, the same stressor can produce a measure of positive and negative affect within a person. This complex appraisal process is richer than a one-dimensional disequilibria mechanism of autonomic stimulation found in many stress models.

Cognitive appraisal can also moderate the impact of chronic physiological states. Cortisol is a hormone produced during perceived stress and has traditionally been attributed to chronic physical impairment (Beard, 2007). However, longitudinal studies correlate the highest work performance with the highest cortisol levels (Csikszentmihalyi, 1990; Horning, Zeier, Brauchi & Joller-Jemelka, 2000). Persons highest in cortisol levels also reported higher job satisfaction and had fewer incidents of illness. This positive stressful state has been called "flow" or engagement. Engaged workers are enthusiastically and pleasurably involved in the demands of their workplace. Positive affect stemming from cognitive interpretations of eustress could reflect the degree to which sense is made of the emotional response, or anticipation of goal setting and achievement are contemplated.

Coping with stress. The initial processes of the stress response are threat appraisal and the assessment of ability for resolution (Lazarus & Folkman, 1984). After anxiety is generated through subjective appraisal, the second major component of the stress reaction is the attempt to mitigate the effects of that anxiety. This is a coping process.

Coping mechanisms can transform stress into eustress (Edwards & Cooper, 1988). Although stemming from the same autonomic nervous system activation, stress and eustress may represent two distinct constructs rather than a single perceptual continuum. The cognitive appraisal of stressors determines the stress reaction rather than mere exposure to the stressors themselves. Stress reactions are based on value ascriptions to stressors (Lazarus, 1966). This cognitive evaluation process produces individual differences in response to perceived stressors. Thus, the same event may be stressful to one person and engaging to another.

Coping is thus the process of matching internal and external stress-reducing strategies to reduce stress levels and attain equilibrium, thus protecting and enhancing individual well-being (Lazarus & Folkman, 1984). Much more research has connected stressors with distress than between coping strategies and distress (Latack & Havlovic, 1992).

Coping strategies fall within three general classifications: Problem-oriented, emotion-oriented, and appraisal-oriented coping (Bagley, 1998). Problem-oriented coping represents steps taken to develop plans and engage field, 2003in actions intended to respond directly to the problem creating the stress. Employment and success of problem-solving strategies is dependent on both individual differences and perceived efficacy (Maner et al., 2007). The higher the perceived stress level, the more difficult it is to tactically exercise decision-making. A systematic and strategic approach is more effective in addressing embedded environmental stressors (Lindenfield, 2003).

Emotion-oriented coping involves attempts to regulate the personal emotional response to the problem. Appraisal-oriented coping concerns redefining or reframing of the stressful situation in order to make it more palatable. Since emotional coping doesn't deal directly with the problem, problem-oriented coping is usually recommended. However, when the problem is assessed as unsolvable, or support is high, emotional strategies are appropriate.

Problem-, emotion-, and evaluative-oriented coping can be thought of as proactive/ control or escape/ avoidance strategies and may represent behavioral, affective, or cognitive forms of coping respectively. Problem oriented coping focuses on changing the stressor itself. Affective strategies attempt to adapt self-responses. Evaluative approaches seek disengagement from the problem. Individuals search for the strategy that will be efficacious during stress situations, but may have limited strategies to choose from. Persons may not have the ability to change behaviors or attitudes towards an aspect of the work environment.

Coping may directly tie into the psychological construct of autonomy or efficacy. Coping strategies rely on maintaining perceptions of personal control. For example, increased work hours are widely believed to be associated with higher perceived work demands and stress levels. Several studies failed to find a correlation between increased or decreased hours and stress, but rotational shifts are associated with lower job satisfaction, higher levels of perceived workload, and increased intention to turnover, primarily due to disruptions of social and sleep patterns (Akerstedt et al., 2002; Barnett & Gareis, 2000; Jamal & Baba, 1992). The lack of association between increased work hours and higher stress levels may be due to the voluntary nature of much overtime, providing both compensation and autonomy as psychological buffers. Jex and Gudanowski (1992) found that individual efficacy did not moderate anxiety or satisfaction reduction caused by long hours. Rather collective efficacy, a concept proposed by Bandura (1982), was shown to significantly moderate individual perceptions of equity and efficacy relative to long hours and debilitating outcomes.

While individual efficacy perceptions may not directly moderate the stress response, efficacy may affect which strategies persons choose when under stress. If problems are perceived as fixable, problem oriented strategies are often chosen, while adaptive or avoidant responses arise when the problem is not thought to be resolvable. Since most of the business environment is culturally reinforced and most workers feel powerless to effect changes, the most common business coping approach is passive-aggressive, emotional, and appraisal strategies. Studies have indicated that passive-aggressive behavior does alleviate stress, particularly if it's collectively practiced (Begley, 1998). However, individual employment of avoidant coping responses can exacerbate negative job attitudes and turnover intent (Hom & Kinicki, 2001). Social and cultural filters also enable coping with distressing environmental conditions by reframing perspectives and producing behaviors which reduce cognitive dissonance (Latack, 1986).

Efficacy and autonomy are crucial in the ability to cope during organizational transformations. A differentiation must be made between a person's perceived ability to change the environment, and self-confidence to deal with potential requirements during environmental change. Perceived controllability stems from the person's judgment concerning their capacity to modify or remove a stressor. A sense of personal control has often been broadly associated with the term efficacy. However, efficacy expectancy is differentiated as a person's level of confidence in his/ her ability to perform the behaviors necessary to deal with a stressor, a central determinant of adjustment. The ambiguity of organizational change directly challenges efficacy expectancy. Efficacy expectancy is increased through experience and effective training. Both authority to affect change and possession of necessary skills and resources to accomplish such change are both integral to the control element of the stress appraisal (Judge, Thoresen, Pucik & Welbourne, 1999).

Lack of efficacy and subsequent inadequate coping behaviors can conversely produce negative outcomes. Substance abuse or turnover intention represents common negative workplace disengagement strategies. Such strategies may increase employee stress due to their negative effects on health and personal relationships. The avoidant coping response and the ambiguity of a job search also contributes to increased depression and reduced job satisfaction.

In addition, contextual factors such as work overload, low status, time pressures, and low decision latitude produce chronic anxiety, which manifests as psychological strain (Paramuraman & Alutto, 1978). Such strain in turn produces the detrimental physical, psychological, and occupational outcomes previously noted. Other potent sources of work strain derive from survival within the company and career growth opportunity.

The stress of organizational change. Recent theories in turnover contend that satisfaction and anxiety are not decisive factors in the turnover decision. What instigates the decision to leave seems to be a precipitating event or shock

(Lee & Mitchell, 1994; Lee, Mitchell, Holtorn, McDaniel & Hill, 1999; Mitchell, Holtom, Lee, Sablynski & Erez, 2001). Widespread business practices of restructuring, downsizing, mergers and layoffs have increased levels of workplace anxiety, workloads, and time constraints (Huuhtanen, 1997; Lindstrom, Leino, Seitsamo, & Torstila, 1997). Negative effects on employees from organizational restructuring are manifested as worry, job insecurity, increased workload, stress and anxiety, decreased job satisfaction and commitment, trust in the company, and intent to quit (Ashford, Lee & Bobko, 1989; Brockner, Grover, Reed & DeWitt, 1992; Hellgran, Sverke & Isaksson, 1999; Mikkelsen & Saksvik, 1999; Schweiger & DeNisi, 1991; Swanson & Power, 2001).

Technological change is particularly important to address, as it fundamentally affects how daily work is performed. Such restructuring initiatives may be traumatic enough to produce the most compelling state for turnover decision making. The compulsory nature of much organizational change also serves as a negative psychological moderator, increasing ambiguity and anxiety (Kirjonen & Hanninen, 1986). Early and effective change management through providing information, timeframes, support, participation, and training are vital to moderating the confusion and ambiguity of change initiatives. In addition, reducing role ambiguity during times of major change has been shown to stimulate a eustress response (Simmons & Nelson, 2001).

In addition to facing the demands of rapid organizational and technological transformation, higher amounts of health sector stress may be due to a wider and more salient experience of occupational stress factors, such as high responsibility and job complexity (Gray-Toft & Anderson, 1981; Simmons & Nelson, 2001). Work demands are the most often reported stressor and increased stress is listed as a primary cause of medical staff turnover (Cangelosi, Markham & Bounds, 1998; Gray-Toft & Anderson, 1981; Healey, 2000; Simmons & Nelson, 2001; Tyler & Cushway, 1995).

Collective coping resources. Most coping research focuses on reducing daily work stressors, such as role conflict and work demands (Latack, 1986; Nelson & Sutton, 1990; Parkes, 1990). This is particularly salient during major redesign of technology or social infrastructure (Carayon, 1997; Korunka & Carayon, 1999; Moyle & Parkes, 1999). Major technological change is thought to be particularly stressful, as it challenges perceived competence as well as conventional psychological resistance to change (Fossum, Arvey, Paradise & Robbins, 1986; Korunka & Vitouch, 1999; Korunka, Zauchner & Weiss, 1997).

Employees create positive appraisals of their experiences during major redesign through belief that one's actions will produce positive results. Such beliefs enable more effective coping with the ambiguity and confusion of change. Reframing during change is a practical example of the importance of coping strategies. While turnover literature usually examines situational factors rather than coping mechanisms, times of organizational change were viewed as most likely to produce thoughts of quitting (Bagley, 1998).

Mismatched collective employment of emotion-oriented strategies during times of major change actually increased distress and frustration at the individual level (Baum, Fleming & Singer, 1983). It is thus important to choose an appropriate or efficacious coping response. However, Bagley (1998) found that neither coping strategies selected nor turnover intention arising during organizational transformation was a good predictor of actual turnover. The most likely predictor to turnover during organizational change is the pre-change distress level.

Limitations of current stress models. Research on the efficacy of coping strategies is quite contradictory (Ashford, 1988; Koese, Kirk & Koese, 1993; McRae & Costa, 1988; Parkes, 1990). Schaubroeck and Merritt (1997) found that perceived efficacy and perceived control are the key moderators of the stress response. Several other studies found no direct moderating effect for efficacy and perceived control. Bandura (1986) postulates that multi-faceted concepts, such as perceived stress, satisfaction, and turnover intent, should be measured within the context of a specific aspect of the work environment, such as during organizational change. An additional research consideration is that stress measures appear to more strongly correlate with psychological indices of anxiety and depression than organizational outcomes such as job satisfaction and organizational commitment (Mack et al., 1998; Schabracq & Cooper, 1998). Anxiety and depression appear to be the psychological underpinnings of workplace attitudes, assessments, and behaviors. They also appear to be the drivers for satisfaction and other theoretical constructs. It may be useful to routinely include and report measures of psychological well-being when assessing the impact of perceived stress.

The unitary constructs found in much of the literature may actually reflect a dozen different dimensions, few of which are captured by most models (Bagley, 1998; Carver, Scheier & Weintraub, 1989). The complexity of a nonlinear combination of individual and collective sense-making and coping responses may pose a daunting challenge to theoretical capture. The complexity and interactivity of human stress responses may also contribute to contradictions dealing with individual differences and coping strategy efficacy. The researcher is challenged to find a methodology which permits complex model creation, comparison, and cross-study integration.

This section presented the nature and impact of stress in the workplace. Stress, like satisfaction, commitment, and turnover, is a behavioral response to a psychological appraisal of the work environment. The same extrinsic stimulation can be assessed as a threat or a thrill and thus have positive or negative consequences. Coping strategies based on a sense of personal control reduce or reframe stress, but limited options or a mismatched response may exacerbate perceived stress. The individual appraisal process is embedded in a social network, and may draw on collective coping resources as well as reflect collective environmental evaluations. The next section elaborates on the nature and cognitive appraisal processes of voluntary turnover.

Turnover and Intent to Turnover

Turnover can be defined as a voluntary decision and action taken to quit a company. The average company completely turns over part time staff every three years and full time staff every six years. However, turnover averages vary widely when compared by industry. Depending on the type of business, average turnover ranges from 5 % to more than 200% annually (IOMA, 2004). Service sectors, such as hotel staff and fast food employees, have the highest turnover rates, while values-oriented businesses with strong cultures, such as Chatsworth Products, appear to have the least turnover.

While there is tremendous variance across sectors, the IOMA (2004) report indicates a median turnover of 15.6% for US businesses. Other private sector surveys indicate a much higher mean turnover rate (Gallup, 2007; NIOSH, 2007). Examples include manufacturing sectors, which average 11%, high tech (telecom, IT, semiconductor) sectors averaging about 14.5%, while R&D turnover averages about 7%. Turnover trends reflect higher levels in the Western region of the U.S., among workers less than 35 years old, and with employees at their job less than 5 years (Ramlall, 2004).

Business faces both direct and indirect turnover costs. Direct costs are associated with recruitment expenses, increased training and integration costs Indirect costs encompass losses in productivity/ revenue/ product quality, labor costs involved with new employee learning curves, reduced departmental morale, and diminished corporate reputation. Across sector turnover costs ranges from $30,000-50,000 per average new hire (IOMA, 2001).

Indirect costs account for about 80% of the variance of turnover costs (Phillips, 1990). Direct costs are usually estimated by a fixed ratio of salary to turnover, which varies between 1.2–3.0 times annual salary, depending on position and amount of training invested. Indirect cost varies most in the recruitment of top talent. In the last few years, the turnover costs associated with replacing critical technical and managerial performers has skyrocketed. The loss of 10 top performers costs the average company $1 million to replace (Leonard, 1998). Faced with such economic imperatives, business is challenged to predict and mitigate employee turnover.

During the twentieth century, over 1,000 studies on the subject of turnover were published (Steers & Mowday, 1981). This citation gives an indication of the popularity of turnover research. Over the decades, trends shifted from prediction and control of turnover, to developing and validating more comprehensive theoretical models of the turnover process.

Various psychological models of turnover have incorporated attitudinal, intentional, and situational factors as determinants of attrition (Cotton & Tuttle, 1996; Miller, Powell & Seltzer, 1990). Numerous studies have proposed orderings for such variables (Miller, Katerberg & Hulin, 1979; Mobley, Griffeth, Hand & Meglino, 1979; Mobley, Horner & Hollingsworth, 1978; Steers & Mowday, 1981).

These orderings predict that attitudinal and situational variables significantly influence the intention to quit.

Intention to quit is widely held to be a direct precursor and predictor of actual turnover (Bluedorn, 1982; Chen et al., 1998; Dougherty, Bluedorn & Keon, 1985; Elangovan, 2001; Irvine & Evans, 1995; Mitchel, 1981; Mobley, Griffith, Hand & Meglino, 1979; Richer, Blanchard & Vallerand, 2002; Vallerand et al., 1997). Intention to quit represents an attitudinal orientation or a cognitive manifestation of the behavioral decision to quit (Elangovan, 2001).

The strong and direct correlation of intention to actual quitting appears to be a fundamental assumption among researchers. A meta-analysis by Steel and Orvalle (1984) supported intention to quit as more highly correlated with turnover behavior than are attitudes such as job satisfaction or commitment. The superseding of intentional influence was contradicted by Arnold and Feldman's (1982) regression analysis, which found significant contribution from attitudinal variables.

The virtually universal predictive association of the intent-behavioral connection was also called into question by the longitudinal logistic regression analysis of Kirshenbaum and Wiesberg (1990). They found that intent and behavior had different antecedents and that intent was a poor predictor of actual turnover. Age, tenure, wage level and perceived opportunity for advancement significantly impacted behavior, but not intent. Work repetitiveness, job status, and perceptions of co-workers intent to leave influenced intent, but not behavior. Regression findings indicated that considering age, tenure, wages, and perceptions of co-worker intent to leave predicted 85.3% of actual turnover behavior. Such salient variable influences call into question the simple association and measure of turnover intent with turnover behavior.

Although intention is the most often encountered predictor of actual turnover, attitudinal factors are the precursors of intention and can have a direct effect on both intention and behavioral outcomes (Bentler & Speckart, 1979; Manstead, Proffitt & Smart, 1983; Schwartz, 1973; Zuckerman & Reis, 1978). Traditional models explaining voluntary turnover incorporate job satisfaction, the perceived availability of alternate jobs, and organizational commitment. Organizational commitment could be a better predictor of voluntary turnover than job satisfaction (Porter, Steers, Mowday, and Boulian, 1974). Commitment is in turn moderated by satisfaction, autonomy and team interdependence, and is negatively correlated to turnover (Williams & Hazer, 1986). Commitment appears to erode over time when these positive factors are low or missing, or when stress levels are high (Bateman & Strasser, 1984; Johnston, Parasuraman, Futrell & Black, 1990; Newman & Sabhenwal, 1996). Both low organizational commitment and high perceived stress levels have been shown to be direct, salient predictors of turnover (Paramuraman & Alutto, 1978; Steers, 1977).

The integration of job satisfaction and ease of job mobility into the turnover process emerged from the seminal work of March and Simon (1958).

Larger contextual factors, such as job availability, unemployment rates, and economic climate are believed to affect attitudes towards turnover. (Hom & Kinicki, 2001). The influence of perceptions of alternative job opportunities on attitudes and turnover decision making was supported in a meta-analysis by Carsten and Spector (1987), which found higher intention-turnover correlations in studies conducted during periods of lower national unemployment. More plentiful perceived job alternatives correlated with higher turnover behavior rather than higher reported turnover intentions. Carsten and Spector (1987) concluded that people are more likely to act on their intentions if they perceive more job opportunities. Increased perceived job opportunities do not compel people to consider quitting, but do affect the behavior of those already intending to leave. While the influence of perceived job alternatives are widely accepted among researchers, perceived alternatives account for less than 10% of voluntary turnover variance (Griffeth, Hom & Gaertner, 2000).

Organizational commitment was incorporated in many models after the influential commitment framework provided by Meyer and Allen (1991). Traditional models account for only 15-25% of turnover variance (Mitchell et al., 2001). Later models emphasized cognitive elements of turnover decision making (Mobley et al., 1979).

Research focusing on contextual moderators indicates that interesting work and decision latitude are far more important in retention than pay or job security. This is particularly relevant for motivating and retaining knowledge workers. The psychological contract providing job security and career advancement for employee loyalty and hard work was stable for decades. The climate of recent economic downturns, globalization, and restructuring has elevated the importance of job security for all employees (Osterman, 2000).

The choice of intentional or attitudinal measures as a turnover predictor depends to some extent on the measurement time frame. The intention-behavior relationship is more volatile and can change quickly and decay over time. Intentions are effective predictors of actual turnover if measurements are taken short-term. However, attitudes are presumed to be more stable over time and may serve as better predictors of longer-term turnover tendencies (Bentler & Speckart, 1979). Pending a catastrophic organizational event, turnover intentions take time to develop and manifest as turnover behavior. Thus, the time interval between intention measurement and turnover behavior becomes a relevant consideration. The longer the interval, the more direct or attitudinal effects influence turnover activity. Sager (1991) contends that a longitudinal survey of turnover intention is a better predictor of actual turnover behavior than using the predictors of job satisfaction or stress measures. This view was contradicted by the findings of La Rocco (1983). His longitudinal study of the relationship between attitudes, intentions, and turnover found that over a two year period from initial assessment, the effect of intention on attitude was greater than the effect of attitude on intention relative to turnover behavior.

These dynamic and reciprocal relationships serve to illustrate the mixed findings inherent in the turnover research tradition.

Job Satisfaction

Job satisfaction is a widely studied outcome variable and a predominant metric collected by organizations. Job satisfaction is generally defined as a short-term positive emotional state that reflects an affective response to the job experience (Locke, 1976; Mowday, Porter & Steers, 1982). Several theoretical frameworks of job satisfaction have been proposed. These approaches include the task characteristics, dispositional, social information processing, and dual-attachment models (Baker, 2004).

The task characteristics approach associates employee attitudes with the five task dimensions of autonomy, feedback from the job, job variety, task identity, and task significance (Hackman & Oldham, 1980). These five dimensions impact three moderating psychological states of experienced meaningfulness, experienced responsibility, and knowledge of results. The influence of task dimensions is moderated by an individual characteristic of growth needs strength, the personal desire to grow and learn. There is support for the direct effect of the task characteristics variables with job satisfaction measures across diverse business samples (Bhuian, Al-Shamman, & Jefri, 1996; Bhuian & Manguc, 2002; Reiner & Zhao, 1999; Ting, 1996). There is, however, weak support in the literature for the association of the five task characteristics with the proposed mediating and moderating psychological states (Hogan & Martell, 1987; Seers & Graen, 1984; Walsh, Taber & Beehr, 1980).

The social information processing model was proposed as an alternative to task characteristics (Salancik & Pfeffer, 1978). Job attitudes are determined by processing social cues from the work environment. Both task characteristics and job attitudes are the consequences of the prevailing cultural, normative, and informational structure of the work environment (Pfeiffer, 1982). Validation of the social information processing approach shifted over time from laboratory studies to the effect of leadership style differences on employee job satisfaction (de Vries, Roe & Tailieu, 1998; Dubinsky, Yammarino, jolson & Spangler, 1995; White & Mitchell, 1979).

The dispositional paradigm of satisfaction contends that work attitudes are formed from stable, unobservable mental states (Staw & Ross, 1985). These stable internal states significantly influence affective and behavioral reactions to events in the work environment (Davis-Blake & Pfeffer, 1989). Employees will evaluate and process information in a manner consistent with their internal states (Staw, Bell & Clausen, 1986). Research has been generally supportive of dispositional and cross-situational stability, and the influence of dispositions on job satisfaction, intrinsic motivation, affectivity, self-esteem, and need for achievement (Connolly & Viswesvaran, 2000; Costa & McCrae, 1994; Mannheim, Baruch & Tal, 1997; Savery, 1996; Schoenfield, 2000; Simmons, Nelson & Neal, 2001; Staw & Ross, 1985; Steel & Rentsch, 1997).

Attempts have been made to integrate popular models of job satisfaction. The task characteristic model was combined with the social information processing model (Griffin, Bateman, Wayne & Head, 1987). In this approach, both job enrichment and social cues influence perceptions and attitudes. Other models have integrated task characteristics with leader-member exchange (Graen & Ginsburgh, 1977). While theoretically more complex, combined models tend to limit the impact of dispositional variables.

Job satisfaction is widely regarded as a significant predictor of turnover. For example, a reciprocal pattern emerges between departmental turnover activity and unit level satisfaction measures (LaRocco, 1983). Although a statistically significant association between job satisfaction and turnover intent appears in the literature, structural modeling indicates that satisfaction has weak associational linkages and is an ineffective predictor of turnover (Brough & Frame, 2004).

In addition, many researchers view the connection between stress and job satisfaction as tenuous. However, other researchers directly make such an association (Elangovan (2001); Kapur et al., 1998).

Organizational Commitment

Since 1975, over 500 studies have been published using organizational commitment as a focal variable (Eby, Freeman, Rush & Lance, 1999). Organizational commitment can be defined as the strength of identification with an organization and its objectives, values, and culture. Commitment is widely considered a key predictor of absenteeism and turnover (Bennett & Durkin, 2000; Lease, 1998).

Organizational commitment can be operationalized as: (a) a strong personal belief in an organization's values and goals, (b) a willingness to expend considerable effort for the organization, or (c) a strong intent or desire to stay employed by the organization (Porter, Steers, Mowday & Boulian, 1974). A person can be committed to his/ her daily work, career, occupation, organization, or union.

The linkage between organizational commitment and turnover was established by the influential work of Meyers and Allen (1991). Three types of commitment were differentiated: affective, continuance, and normative. Affective commitment is the emotional attachment and identification of employees with their organization. Continuance commitment involves the assessment of the costs involved in leaving the organization. Normative commitment is the sense of obligation of the employee to remain with the organization.

Organizational commitment was also influenced by personal characteristics, decision latitude, and leadership support levels (Meyers & Allen, 1991). Other job characteristics had apparently little impact on personal identification with the organization. Individual accrued investment in the organization, such as reflected by tenure, had the greatest effect on commitment (Ritzer & Trice, 1969). Reduced commitment and higher turnover were the outcomes when leadership promoted unethical behavior (Peterson, 2003).

Like perceived stress, commitment is the product of direct and indirect effects derived from task, personal, and interpersonal variables (Paramuraman & Alutto, 1978). Organizational commitment is one of three components of psychological hardiness, or the innate capacity to resist stress. Other components of hardiness are positive rather than negative supervisory style during performance evaluation, and having an effective personal social support network (Chan & Ko, 1991; Kobasa, 1974).

The degree of commitment may affect assessment and attitudes during the stress of major change. Tenure and retention are positively correlated, while anxiety from stress reduces commitment (Good, Grovalynn & Gentry, 1988; Paramuraman & Alutto, 1978). Begley and Czajka (1993) reported that reorganization of hospital workers produced increased stress levels only in persons low in organizational commitment. Persons in the medical profession report lower average commitment levels due to higher levels of perceived work stress and organizational restructuring (Brider, 1996; Gifford, Zammuto, Goodman & Hill, 2002; Gillian, 1997; Lacey & Beck-Warden, 1998).

In summary, the study variables of stress, turnover intent, job satisfaction, and organizational commitment all represent complex psychological appraisal processes and responses to the work environment. The next section presents the findings of structural models concerning the contribution and ordering of the main study variables of stress, commitment, satisfaction, and turnover intention.

Relationships and Ordering of Stress, Satisfaction, Commitment and Turnover

Research is sparse concerning antecedence and ordering in the turnover decision process (Bedeian & Armenakis, 1981; Bluedorn, 1979; Elangovan, 2001). There is little agreement about the direct influence and ordering of job satisfaction and organizational commitment on turnover, and even less is understood concerning salient influences of moderators in the turnover process (Farkas & Telrick, 1989; Lucas, 1985). Likewise it is not well understood if stress is directly related to turnover, whether it affects turnover decisions through job attitudes, or whether it moderates other variables that have more direct impact on the turnover decision process.

Another question arises concerning the reciprocal impact of turnover decisions on other variables. How does a decision to leave affect the perceptions of other job attitudes? An example can be seen relative to job satisfaction. According to self-perception theory (Bern, 1972), an intention to quit might modify employee perceptions about their job, and subsequently modify job attitudes. Such persons may attribute their decision to low satisfaction, or rationalize their decision to quit by noticing more negative aspects of their workplace. This forms a reciprocal, iterative negative perceptual feedback loop relative to intent to turnover and job satisfaction. Such reciprocal relationships have been noted in a few longitudinal studies (Bedeian & Armenakis, 1981; Farkas & Tetrick, 1989; Williams & Hazer, 1986).

Stress and outcome variables. A few studies associate stress with commitment, job satisfaction, and turnover (Lyons, 1971; Rizzo, House, & Lirtzman, 1970). Much research is based on the influential early model of role dynamics created by Kahn, Wolfe, Quinn, Snoek, and Rosenthal (1966), in which the source of stress was role ambiguity and conflict. Role ambiguity is the lack of understanding of work duties and expectations. Persons with higher role clarity reported psychological well-being. Work roles, or functional requirements and expectations, should be clearly understood by the employee. Ambiguity may also reflect conflicts and trade-offs experienced at the boundary between areas of responsibility, or when several types of jobs or functions are performed by a single employee. Role clarity is positively associated with job satisfaction and negatively associated with depression, anxiety, and stress measures (Haynes et al., 1999). Nurses report role ambiguity to be a leading cause of voluntary turnover (Revicki & May, 1989). Emotional support in the work or home domains moderates the psychological effects of role conflict as a stressor and overall turnover intention (Bliese & Castro, 2000; Himle, Jayanatne, and Thyness, 1989).

The relationship of commitment, satisfaction and turnover. Drawing from Meyers and Allen's (1991) classifications, organizational commitment is commonly differentiated into cognitive and affective dimensions. Affective commitment is derived from cognitive commitment. The congruence of an appraisal of the organizational environment with the cognitive commitment elements of personal values, beliefs, and perceptions produces affective commitment. Affective commitment is held to be a potent driver of retention and performance.

The construct of organizational commitment is not only moderated by theoretical factors, but is also particularly sensitive to methodological choices. Methodological issues, such as factor crossloading with other variables and moderators, have been proposed for the variance within the commitment-turnover relationship. The literature is sparse concerning proposed commitment-turnover moderators. The existence of such moderators may explain the lack of direct effect, and weak correlations and path coefficients found in many commitment-turnover studies (Lee, Carswell & Allen, 2000).

Controlling for methodological issues by meta-analyses failed to support commitment construct contribution to such variance (Mathieu & Zajac, 1990; Randall, 1990). Meta-analyses indicate that commitment measures must control for differences in conceptualization, operationalizations, research design, selection of the sample, and observation techniques. However, even when such methodological issues are accounted for, meta-analytical findings demonstrate an inability of methodological rigor alone to account for a large proportion of variance in the organizational commitment-turnover relationship (Cohen & Hudecek, 1993; Randall, 1990).

The organizational commitment-turnover relationship has historically produced lower correlations than job satisfaction and turnover correlates (Cohen & Husecek, 1993). Early turnover studies often failed to include both organizational commitment and job satisfaction as variables (Steers & Mowday, 1981). Both satisfaction and commitment have been accepted as important predictors of turnover, but explorations into their ordering are inconclusive (Mobley, 1982; Steel & Ovalle, 1984; Curry, Lakefield, Price & Mueller, 1986). Most path analyses examined direct influences between attitudinal variables and turnover intent, and few studies considered indirect or reciprocal variable relationships (Miller, Powell & Seltzer, 1990). The next section presents trends in the literature of the ordering and antecedent influence of satisfaction and commitment.

Antecedence and ordering of commitment, satisfaction, and turnover. Tett, Meyer & Roese (1993) differentiate three broad theoretical perspectives from the literature dealing with the ordering and antecedence of satisfaction and commitment. These different perspectives raise significant implications for conceptualization, research, and practice.

Their first perspective is that of the satisfaction-to-commitment model (Porter et al., 1974; Steers, 1977; Williams & Hazer, 1986). Commitment is believed to form over an extensive period of time and mediate the effects of satisfaction on turnover attitudes. The model suggests that commitment is more stable than satisfaction. Job satisfaction would thus have only indirect influence on turnover intent. Based on this perspective, practitioners would attempt to make satisfied workers more committed to the organization.

The second perspective is the commitment-to-satisfaction model (Bateman & Strassen, 1984). Commitment affects attitude through a rationalization process. High commitment enables coping rationalizations to minimize or overlook a negative work environment or relationships. Low commitment levels will shift cognitive attention and evaluations to adversely impact job satisfaction and increase the desire to quit. In some variants of this model, commitment has little or no direct influence on turnover attitudes. Practitioners would focus on satisfaction measures as a turnover predictor, and seek to alleviate acute employee dissatisfaction in order to reduce turnover.

The third view contends that job satisfaction and organizational commitment are unique and independent contributors in the turnover equation (Curry et al., 1986). While satisfaction and commitment are thought not to be antecedents to one another, some researchers propose possible reciprocal influences and interactive effects (Farkas & Tetrick, 1989).

Integrated turnover models. The research literature diverges when considering the relative contributions and ordering of stress, satisfaction, and commitment to the turnover process. Variable ordering is relevant theoretically, statistically, and practically. Ordering changes mis-represent variable antecedence and theoretical relationships. Re-sequencing could also increase intercorrelational error and outcome measures. It is vital to optimize predictor sequencing to maximize model precision and variance explanation. Proposed theoretical mediating and moderating relationships are well presented in three representative and influential models by the Mobley et al. (1978), Eby et al. (1999), and Elangovan (2001) process models.

The connection of turnover intention to the cognitive and affective spheres was the contribution of the influential model of Mobley et al. (1978). (See Figure 1.) This conceptual framework has generated more research than any other recent turnover model (Horn, Caranikas-Walker, Prussia & Griffith, 1992; Steel & Ovalle, 1984; Steers & Mowday, 1981). Mobley's framework proposes a relational chain of decision making between levels of job satisfaction, withdrawal cognitions, perceived job alternatives, negative affect, and intentions to quit. While Mobley et al.'s turnover model became conceptually pervasive and influential, empirical testing and validation has produced conflicting findings and failed to confirm its predicted structural parameter estimates.

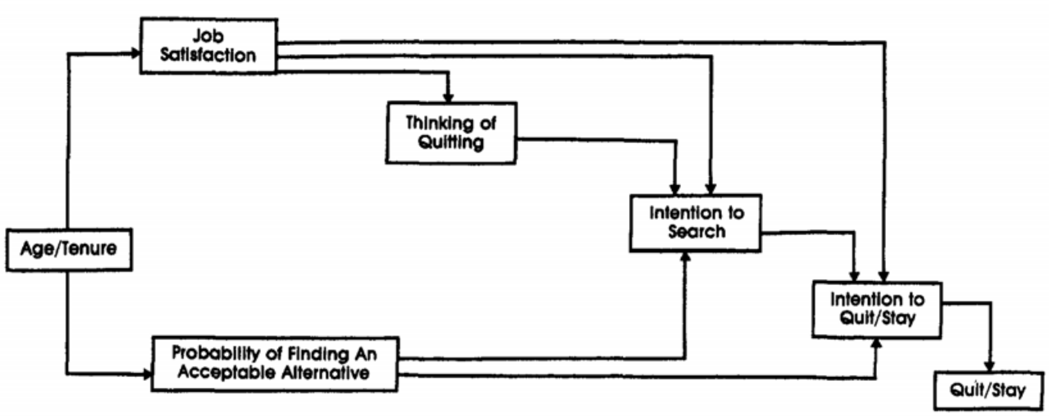

Figure 1. A simplified representation of intermediate linkages in the employee withdrawal decision process.

Figure 1. Mobley, Horner, and Hollingsworth (1978) process model.

Eby, Freeman, Rush, and Lance's (1999) process model of affective commitment built on the Mobley et al. (1978) model, and integrated past research on commitment, job satisfaction, motivation, self-efficacy, empowerment, exchange theory. (See Figure 2.) This model was tested using meta-analytical structural modeling. Results pointed toward the importance of intrinsic motivation within the turnover decision making process. Intrinsic work motivation was defined as the degree to which a person wants to work well in his/ her job in order to achieve intrinsic satisfaction. Intrinsic motivation was found to be a partial moderator and key process variable of the relationship between exogenous factors (job characteristics and perceived work context) and work attitudes.

Figure 2. Eby, Freeman, Rush, and Lance (1999) process model.

Results of the Eby et al. (1999) study also indicate that affective commitment and job satisfaction were found to relate to turnover behavior, while only affective commitment related to absenteeism. Job satisfaction appeared to partially moderate the relationship between motivation and commitment. Skill variety, managerial support, performance feedback, and perceived pay equity directly contributed to higher levels of job satisfaction and intrinsic motivation. These findings are in line with previous meta-analyses (see Cranny et al., 1992). Perceptions of both intrinsic and extrinsic factors of work context were found to add variance to affective commitment. This supports previous research (Angle & Perry, 1983).

Houkes, Janssen, Jonge and Nijhuis (2001) added work demands and burnout as variables to the Eby et al. (1999) model in their multi-sample SEM study. Model relationships were found to be stable across occupational groups and in agreement with other studies utilizing the same factors. Burnout was found to be predicted by increased workload and managerial support/ conflict. Turnover intent was predicted by unmet job expectations, such as pay equity and chance for advancement. Turnover intent was also predicted by levels of management support or conflict. Findings support the association between job variety and challenge, and intrinsic motivation (Hackman and Oldham, 1980). Also supported was the link between job challenge, autonomy, and burnout predicted by the job demand control model (Karasek & Theorell, 1990). The relationship between work demands and burnout was moderated by perceived autonomy.

Elangovan (2001) adopted a similar direction to theoretical integration. He studied the relationships between work stress, satisfaction, commitment and turnover. (See Figure 3.) His findings implied that the popular satisfaction-turnover inluential relationship is spurious. This runs counter to that found in many previous studies and models (e.g. Bedeian & Amenakis, 1981; Bluedorn, 1979). Stress did not have a direct effect on commitment. No reciprocal relationships with stress were found, indicating that stress primarily affects job satisfaction.

Satisfaction, in turn, was found to be a precursor and contributor to organizational commitment. Stress is thus a necessary antecedent in job satisfaction-organizational commitment models, and job satisfaction should be a dependent variable in stress models of turnover (Bedeian & Armenakis, 1981). Elangovan (2001) conducted a path analysis using work demands, job satisfaction, organizational commitment and intent to turnover as variables. He found a strong linear path from stress to satisfaction to commitment to turnover intention. Only commitment was directly found to affect turnover intention (0.756), and a strong reciprocal negative relationship was found between turnover intention and commitment ($\underline{r} = -0.583$). Stress and satisfaction only affected turnover intention through commitment. The indirect affect of stress is generally supported in the research literature (Porter et al., 1974; Steers, 1977; Williams & Hazer, 1986). These findings run counter to those of other researchers who proposed a causal contribution from these turnover antecedents. The Elangovan (2001) study also implies that the popular job satisfaction-turnover ordering is spurious. This runs counter to many studies and models (e.g. Bedeian & Amenakis, 1981; Bluedorn, 1979).

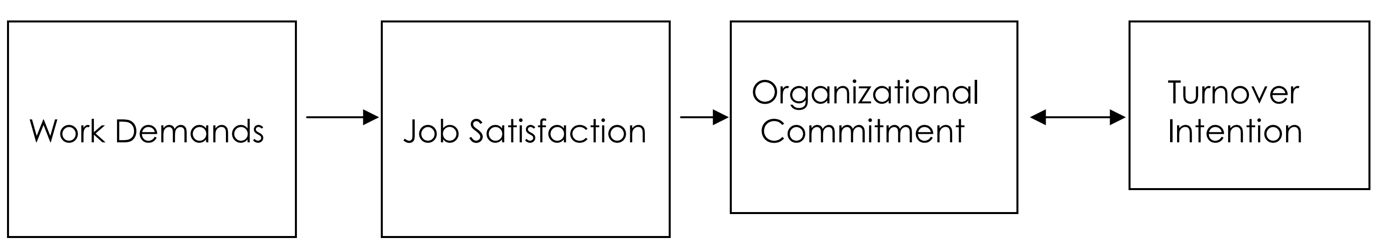

Figure 3. Elangovan (2001) stress-turnover model.

These findings indicate that the practical way to reduce turnover is to attempt to increase employee commitment. Once an employee has decided to quit, internal reassignments (transfers, rotation) are insufficient to deter turnover. Retention strategies should be based on increasing commitment rather than promoting workplace amenities to increase satisfaction.

There is some question concerning the generalizability of the Elangovan (2001) study. The sample was based on business students working full time in organizations, and relevance to established findings concerning age and tenure is called to question.

The influence of satisfaction on commitment in the Elangovan (2001) study was strong ($r = 0.538$), indicating that the higher the satisfaction, the higher the commitment. No reciprocal relationship was found between satisfaction and turnover intention. Satisfaction as an antecedent of commitment was also supported by the findings of Williams and Hazer (1986), Steers (1977), and Porter et al. (1974). This relationship runs counter to that found in other studies (Bateman & Strasser, 1984; Curry, Wakefield, Price & Mueller, 1986; Good, Grovalynn, & Gentry 1988). Implications of the Elangovan study indicate that satisfaction plays an antecedent role in the turnover process, and supports the need to build commitment in order to increase retention. The Houkes et al. (2001), Eby et al. (1999), and Elangovan (2001) models provide chains of intermediate linkages, which are important determinants when attempting to mitigate undesirable organizational outcomes. However, there are conceptual shortcomings with these methodological approaches.

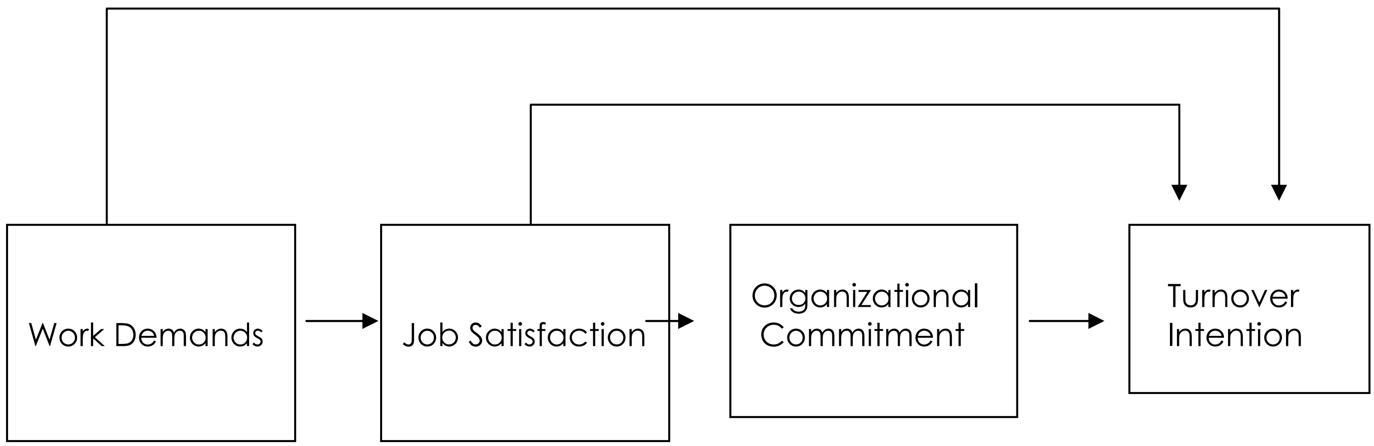

Figure 4. UNT stress-turnover model.

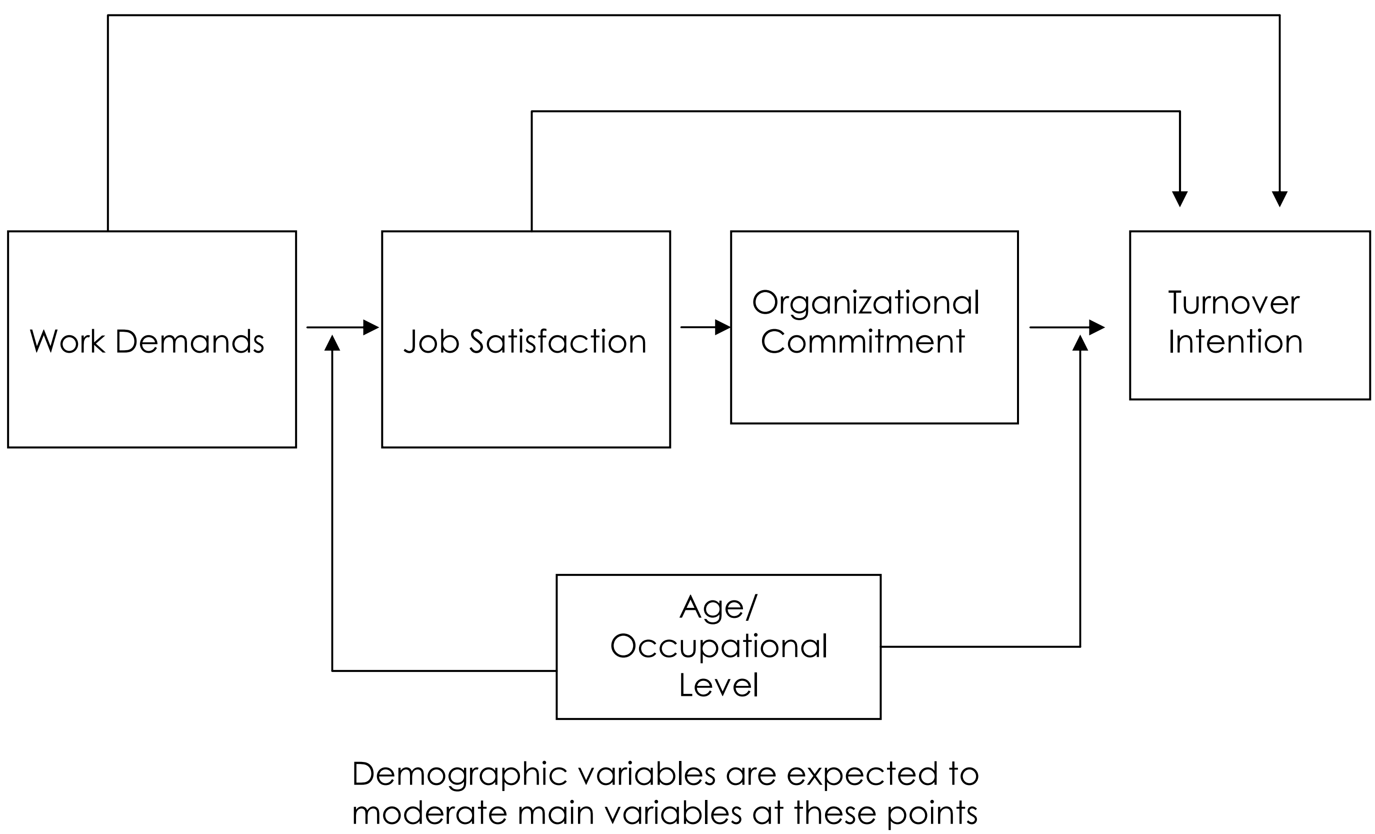

Figure 5. Modified UNT stress-turnover model.

While these studies test complex models to determine antecedents, they impose non-linear social network. Linear conceptualization overlooks the process of a linear framework on larger reflective psychological processes embedded in a sense-making and the creation of meaning and purpose which is inherent to stress, attitude, and turnover appraisals.

The model used in this study is derived from a portion of a UNT consulting team's research model, the UNT model. (See Figure 4.) The UNT model's sequence is reflective the Elangovan (2001) process model. The current study explores four variables from the UNT model representing the relationship of stress to outcome variables, and adds the demographic moderators of age, gender, and occupational level. (See Figure 5.) This is the model tested in this study.

In summary, this section examined the ordering and antecedence of stress, job satisfaction, organizational commitment, and turnover. Findings were inconclusive concerning ordering, but satisfaction, commitment, and turnover were consistently correlated. Stress appeared to directly influence satisfaction and had little direct effect on turnover.

The next section introduces environmental, perceptual and demographic moderators of the stress-outcome variable relationships. Support, a personal sense of control/ autonomy/ efficacy, and the demographic variables of age, occupational level, and gender have all been shown to be consistently and saliently moderate main variable relationships across occupational groups. While it could be argued that other demographic factors could have potential moderating influence, the variables of autonomy, support, age, tenure, and gender consistently demonstrated moderation across occupations.

Moderators of the Stress-Turnover Relationship

Occupational level and age are inter-related moderators correlating with tenure, maturity, autonomy, and efficacy. The influence of both age and occupational level must be parsed out in order to provide a theoretical framework for effective application and intervention.

Occupational level. Biographical variables, such as occupational level and tenure, have long been systematically correlated with turnover (Cotton & Tuttle, 1986). Organizational level refers to the status of a position within an organization. Common level distinctions are white collar vs. blue collar, management/ supervisor vs. employee, or administrative/ professional vs. support staff. Tenure is the length of time served in a position or organization. Tenure consistently tends to be significantly negatively associated with turnover.

Tenure is often related to occupational level, as persons providing extended service in a company tend to rise in position and job status. A sense of personal influence and efficacy often accompanies a rise in position and status. Occupational level appears to mitigate negative stress and turnover perceptions through this increased sense of personal control and decision latitude. Higher levels of decision latitude and status in turn potentially produce greater perceived autonomy and efficacy (Buck, 1972).

Autonomy may be defined as the perceived ability to make decisions and act independently within the work environment. Efficacy is the perceived ability to effect change within that environment. Autonomy, or decision latitude, is a significant moderator of the depression/ job satisfaction antecedents of turnover (Schmidt & Daume, 1993). Research indicates that low autonomy produces negative psychological and physiological conditions and may overlap with the stress construct (Bongers, de Winter, Komplier & Hildebrandt, 1993). Autonomy, efficacy and participation are all grounded in a sense of personal ability to influence and control of the environment. A work environment that promotes participation also fosters a sense of personal validation and contribution.

Occupational level and tenure may moderate the relationship between organizational commitment and turnover intent. This may explain the weak direct associations for these two variables consistently found by meta-analysis (Cohen, 1991; Mathieu & Zajac, 1990; Randall, 1990; Werbel & Gould, 1984). This moderation may be accomplished by moderating both stress and autonomy perceptions (Paramuraman & Alutto, 1978).

Commitment-turnover variance may be occupation specific. The commitment-turnover relationship was found to be stronger among white collar workers than blue collar workers across occupations (Cohen & Hudecek, 1993). No differences were found across white-collar occupational groups. The white collar commitment-turnover relationship was much stronger than found in previous meta-analyses, and controlling for differences of these occupational groups accounted for much of the variance within the commitment-turnover relationship. This is an important finding relative to motivating and retaining knowledge workers, persons communicating, innovating and leveraging ideas.

Occupational level and tenure are also associated with the moderator of age. Increased occupational status and tenure of often related to the increased maturity of older employees. Maturity may tend to enhance individual stress tolerance. A British Health System study (Haynes et al., 1999) failed to find a significant relationship between tenure, status, autonomy and stress for most occupational groups. The exceptions were for doctors and managers, who had reduced stress levels and turnover because of greater decision latitude in the bureaucratic health care system. Haynes et al. (1999) found the persons with limited autonomy correlated with higher anxiety and stress levels.

In summary, occupational level is correlated with tenure, age, autonomy, and efficacy. The maturity, status, and decision latitude usually accompanying higher occupational levels mitigates stress and turnover. Studies of white collar workers indicate higher commitment and lower turnover across occupations. Age is another demographic factor which moderates stress and turnover. The next section examines the influence of age on organizational outcomes.

Age. Many studies indicate an inverse relationship between age and turnover (Rhodes, 1983; Cotton & Tuttle, 1996). Reasons for this inverse relationship are unclear, since much of the research testing age differences utilized multi- and bi-variate methods, and few causal studies have been performed (Williams & Hazer, 1986).

Age cohorts may contribute to an inverse age-turnover relationship and create different patterns of organizational commitment and turnover. Persons under the age of 30 tend to commit to organizations which value work/life balance, while persons over 30 commit to firms emphasizing job security (Finegold, Mohrman, & Spreitzer, 2002). This does appear to reflect generational differences in core values. Younger workers tend to have a different work ethic than persons over 50. Older workers appear to find value in the work itself, and usually will stay to complete a project. Workers under 30 reflect less of a traditional work ethic, and often find motive value in work and social relationships and obligations (Finegold et al., 2002; Steers & Mowday, 1981). While generational differences in work attitudes are accepted by social psychologists, structural modeling fails to support such differences in attitudes. Generational differences may be important considerations to practitioners crafting stress and turnover reduction initiatives.

A structural study conducted by Miller, Powell, & Seltzer (1990) examined the influence of age cohorts on turnover. They found a direct effect of age on turnover, not moderated by turnover intentions. Older workers were less inclined to quit than younger workers, regardless of attitudinal and intentional levels. The explanation that age produced differences in job attitudes between older and younger workers was not supported. Miller et al. (1990) speculated on various perceptual and cohort explanations for age response differences, but none of these was directly tested. A likely explanation for this apparently linear relationship is that after a certain age, people perceive fewer opportunities for alternative and desirable work, and are less likely to leave their current position.

The moderation of age on stress perception is controversial. Workers over the age of 45 reported less stress during organizational change than did younger workers (Akerstedt et al, 2002; Jamal & Baba, 1992; Seppala, 2001). Older workers tended to cope better when changes were made to roles and responsibilities. Workers over 45 reported high stress levels when change involved new technology. Stress over technological change arose from a perceived threat to personal competency. Workers between 30 and 45 reported the highest levels of stress during organizational change initiatives.

Just as the findings of age and stress reduction were mixed, studies of gender, stress and turnover were also controversial. The next section presents the effects of gender on stress and turnover.

Gender. The influence of gender on stress perception and outcomes has been widely reported but findings are mixed. Early work stress research reported that women were more affected by stress than men and were more likely to carry over this stress into their private lives. More comprehensive studies and meta-analyses found no gender effect on stress perception or occupational outcomes (Lerner et al., 2000; Martoccio & O'Leary, 1988, 1989). Variants in research conclusions may stem from differences in frequency of report and coping strategies, as well as biological and hormonal differences. Women may well have different coping strategies than men, and look to different moderating sources within the workplace. In addition, women are more likely to express stress symptomology.

Studies that focus on a few specific moderating variables may find a disproportionate impact of environmental moderators than studies that examine more moderators. For example, women used computers for longer periods per day than men, consequently suffering a disproportionate amount of ergonomic environmental strain (Seppala, 2001). In addition, Seppala (2001) notes that when studies solicit stress responses rather than depend on archival reports, significant gender differences may disappear.

Many studies confirm that women have different coping strategies in the workplace than men (Christie & Schultz, 1998). Women are thought to express themselves emotionally and seek social support to moderate stress. Women were thought to be more concerned about change and security within the work environment. Men reported greater levels of role conflict than did women (Seppala, 2001). Stress affected women more psychologically, while affecting men more physiologically, and women were more likely to report stress related problems than men (Revicki & Whitley, 1997).

Hypotheses

Do the demographics of age, gender and occupational level have direct or moderating effect on perceptions of stress, satisfaction, commitment, and turnover intent?

1. Occupational status will have a high negative moderating effect on stress and job satisfaction, and a significant positive moderating effect on commitment and turnover.
2. Occupational level will highly correlate with turnover. Supervisors will highly negatively moderate the stress-satisfaction relationship.
3. Age will have a significant negative moderating effect with stress and satisfaction, and a strong positive moderating effect with commitment and turnover.
4. Older workers will have a significantly lower correlation with turnover intention.
5. Persons younger than 30 will have a direct correlation with highest turnover intention levels.
6. Persons from 30 – 45 will significantly positively moderate the stress-satisfaction relationship.
7. Gender does not significantly influence turnover or stress responses.
8. Any demographics are expected to only moderate the relationships of stress & satisfaction, and commitment & turnover intent.

CHAPTER 2

METHODOLOGY

This section provides a context for the development of the study and creation of the survey. This will include description of the participants, survey scales, and instruments. Also addressed will be issues of reliability, imputation, assumptions of normality, validation of the variables, validation of the model, and validation of the model's ability to predict new data. Finally, methods will be proposed to investigate the research question and hypotheses.

Context for the Study

In 2002, a large government agency faced a complete redesign of their computing infrastructure, as they attempted to comply with a Congressional mandate for a common technology architecture standard. The scope of this transformation would affect not only their technical support staff across the country, but would also redefine daily employee work performance.

Faced with such a massive transformation of the infrastructure, a strategic planning team from the agency collaborated with a coordinating consulting team from the University of North Texas in order to determine the attitudes of the national IT staff. Since most of the staff was approaching retirement age and worked primarily with legacy systems, the strategic team was interested in the potential turnover resulting from the restructuring. A model was developed and a survey prepared to assess several aspects of employee commitment, satisfaction, stress level, and intent to turnover. This paper tests part of the consulting team's research model, while exploring demographic direct and modifier influences. (See Figure 6.)

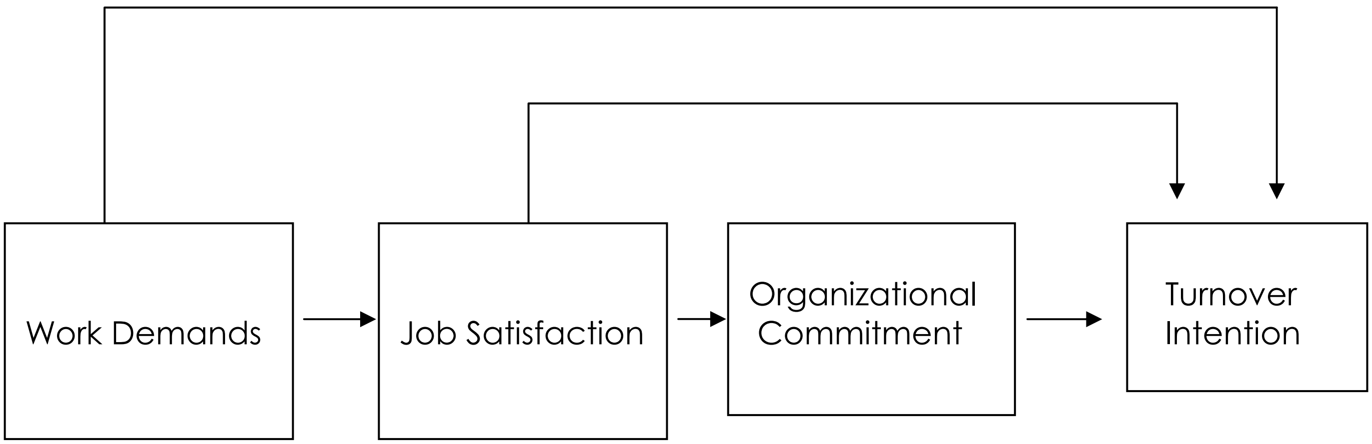

Figure 6. UNT stress-turnover model.

The implications of the literature review point out several challenges presented by the agency redesign. Technology change on the proposed scope produces particularly distressing reactions. Not only are the tools used to perform work changed, but how daily work itself is performed is changed. New systems, governance, and computer languages will likely challenge the competency and self-worth of older workers, and increase resistance and turnover. Low decision latitude and efficacy experienced in many positions will exacerbate stressful perceptions and heighten resistance to change. Historically avoidant cultural coping patterns will further limit the scope and speed of change. The agency redesign mandates great attention to the benefits of participation and change management. While stress, turnover, and resistance to change might be encountered in a major redesign of any organization, evidence indicates that the health care industry is particularly sensitive to change and experiences higher than average daily stress levels. The UNT research model states that the stress measure or work demands and work/ life balance directly influence turnover intention. This model is supported by the work of Dubinsky, Dougherty, and Wunder (1990), which found a direct correlation between work demands and turnover intention.

The UNT research design centered on developing and interpreting a self-report on-line survey. This study examined the direct relationship of stress, job satisfaction and organizational commitment on turnover intent. The stress-turnover elements of the UNT research model were derived in part from Warr's (1990; Warr et al., 1978) framework. Central features of Warr's models were anxiety, and depression measures, which were not included in the UNT research model due to tradeoffs of test length. Results of Warr's research indicated slight correlations between work demands and the factors of feedback, and leader/ peer support (Haynes et al., 1999). Ethical compromise and role frustration both had moderate correlation with work demands. A significant association between work demands and autonomy was not found. Work demands were negatively correlated to job satisfaction and measures of well-being, and positively correlated to anxiety and depression measures. Warr (1990) found little support for direct stress/ turnover interaction. Warr rather concluded that a lack of autonomy produced frustration and low satisfaction, and directly affected turnover intent. Due to design trade-offs, the UNT research team had to cut

Warr's anxiety and depression measures from their study, as well as several moderator variables.

The work demands (WD) scale in the UNT study was taken directly from a study of the British National Health Service (Haynes, Wall, Bolden Stride & Rick, 1999), which incorporated Warr's framework. The NHS study is of some interest, since both the government agency and NHS are large public sector health care systems. In the NHS study, eight theoretical dimensions were tested to discover the relationship between work characteristics and work outcomes. The work dimension scale was derived from Karasek and Theorell's (1990) demand-control model, also known as the decision latitude model, which predicts that psychological strain and physical illness occurs when work demands are high and decision latitude is low. This model was subsequently modified to include social support as a variable (Johnson & Hall, 1988). Research supports the relationship of these variables with negative psychological and physiological conditions (Wahlstedt, Bjorksten & Edling, 2001). Warr's (1987; 1990) framework and several other models contributed to the demand-control scale development and the NHS survey (Arnold, Robertson & Cooper, 1991; Borrill, Wall, West, Hardy, Shapiro, Carter, Golya & Haynes, 1996; Cooper, Cooper & Eaker, 1988; Katz & Kahn, 1978; Warr, Cook & Wahl, 1979).

Survey Creation

The purpose of the UNT research investigation was to assess readiness for change and ascertain reported levels of commitment, stress, satisfaction, and turnover concerning the impending organizational change. The UNT team met in conjunction with an agency taskforce of 27 people representative of all areas of the organization. The UNT team conducted theoretical and methodological research to identify relevant factors and measures to include in the assessment. Variables and measures were chosen that were well established in the research literature. The UNT team worked in conjunction with the agency taskforce to craft the items included on an online survey. The included variables and measures represented a tradeoff which limited test length and test taking time. Additional series of assessments which included alternative variable mixes were planned to be administered longitudinally, but subsequent assessments never occurred. An online survey method was chosen to provide anonymous access by all employees and facilitate the functional response of handicapped employees.

The survey was placed on a secured server for pilot testing. The agency taskforce provided feedback for survey refinement through multiple pilots. Both the psychometric characteristics of the test items and the functionality of the database and servers were tested during the pilot studies.

After revision and approval by all parties, the online survey was accessible to all employees. Multiple emails from supervisors were sent to employees encouraging them to participate. The emails included the web address, instructions for login and completion of the survey, and phone and email contact information. Participants were informed that participation was voluntary, all responses would be confidential and anonymous, and that only aggregated data would be sent to the agency. The survey remained online for six and a half weeks. During this time period, two email reminders were sent to workers encouraging them to complete the survey. After this time, the site was closed and data were finalized.

Participants

Data were collected from a national survey of 6,718 employees of a large Federal government agency. Of this potential population, 3,078 (45.82%) participated in the online survey. A decision was made not to substitute missing values concerning supervisor level, age, and gender, and since these persons also failed to answer over 40% of the survey questions, 78 subjects were dropped. The final *N* for this study was 2663.

Demographics for the sample are found in Table 1. Most subjects were technical support staff, but the sample also included administrators, managers, and many types of employees. Sixty-one percent of the agency workforce was employed for less than five years. To more normally distribute age across the population, the AGENUM was divided into eleven categories. This age distribution is found in Figure 7. Approximately 60% of the workforce was above the age of 46. Males made up 59% of workforce composition, with men more representative in higher service grades.

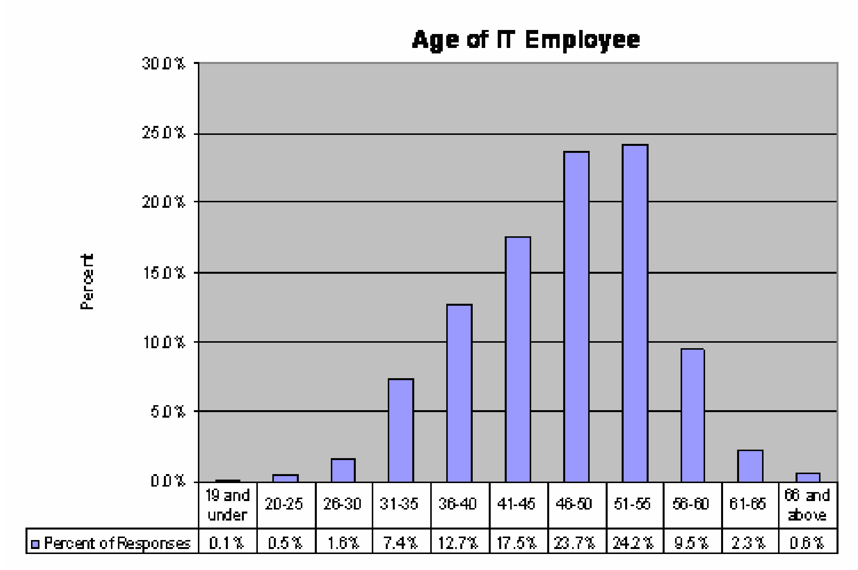

Figure 7. Age ranges of AGENUM categories.

Table 1

Participant Demographics

		Federal Agency Division 1	Federal Agency Division 2	Federal Agency Division 3	Federal Agency Division 4
Gender	Female	41.2*	38.2	32.0	49.4
	Male	58.8	61.8	68.0	50.6
Age	≤ 30	2.7	3.6	4.3	4.9
	31-40	23.5	21.7	19.0	17.3
	41-50	42.6	40.9	39.2	42.8
	51-60	29.0	31.1	34.5	31.2
	61 +	2.2	2.7	3.0	3.8
Highest Level of Education	Some High School	0.0	.3	.3	.4
	High School	6.4	6.7	7.4	6.4
	Some College	25.5	25.3	23.6	30.1
	A.A.	19.2	18.7	13.9	16.5
	B.A/B.S.	25.8	25.3	33.4	24.4
	Some Graduate School	8.6	6.1	12.2	9.0
	MBA/MS /MA	12.7	15.3	9.1	11.3
	Ph.D./M.D./J.D.	1.8	2.4	0.0	1.9

*Measured in percentages. From Besich (2005)

Table 2

Survey Items

Turnover Intention

2. How likely is it that you will take steps during the next year to secure a job at a different organization?
3. I will be with the VA five years from now.

Job Satisfaction

1. All in all I am satisfied with my job.
2. In general, I don't like my job.

Organizational Commitment

1. I am willing to put in more than the expected effort to help the organization be successful.
2. I talk up the organization as a great place to work.
4. I find that my personal values are similar to the organization's values.
5. I am proud to tell others that I am part of this organization.
8. I really care about the fate of this organization.

Perceived Workload

1. I do not have enough time to carry out my work.
2. I cannot meet all the conflicting demands made on my time at work.
3. I never finish work feeling I have completed everything I should.
4. I am asked to do work without adequate resources to complete it.
5. I cannot follow best practice in the time available.
6. I am required to do basic tasks which prevent me from completing more important ones.

Instrumentation

The UNT research survey consisted of an online, 65-item questionnaire that incorporated many employee attitude measures. This paper focuses on seven of these variables and 18 items. Scale items are found in Table 2. The UNT survey instruments were based on existing published measurement scales. A factor analysis was performed on the scales by the UNT team, and only questions loading greater than .5 were retained, indicating a common clustering of theoretical factors and that the questions measured what they were supposed to measure. Items employed a 7-unit Likert scale. The categories were (1) *Strongly disagree* to (7) *Strongly agree*.

Factor Aggregation

Factor analysis calculates optimal factor scores and item error, or the "uniqueness" of the items contribution to variance in the correlation matrix. Factor analysis also verifies that the items contributing to the reliability of the composite score estimates. Factor analysis assumptions included: (1) Errors and residuals are normally distributed in the population, (2) The relationship between latent trait scores and observed scores is linear, (3) Observed score variance is additively summed as measurement error and true score variance, and (4) True score variance is a result of individual's differences on the measured trait. Large factor loadings on an item indicate that that an item measures, or accounts for, a larger percentage of true variance. Low item uniqueness or error indicates the item is contributing to the overall reliability of the summed score across all items. The subsequent factor scores indicate true score estimates of the summed rating scales, and the removal of item error variance. Cronbach's alpha estimated reliability and internal consistency. A high Cronbach alpha indicates that items have high factor loadings and low uniqueness.

In this study, five items were eliminated from the original UNT survey scales based on maximum likelihood factor analysis of the items. Eliminated items not only had low primary loadings, but inclusion of the items lowered the overall alpha. The retained two item scales were combined using PCA (principal component analysis) and were found to have a high reliability. There are several reasons to warrant such abbreviated factors. When less than three items aggregate into a scale, questions could be raised concerning lack of convergence and measurement error assessment. However, since all the items were taken from validated measures, each item is expected to reflect that measure's alpha reliability. Composite reliabilities are likely to underestimate the true reliability, due to an undetermined amount of measurement error. A two item scale with good reliability estimate would be even higher in reliability should the error be known. In addition, the PCA technique is superior to reducing error than simply averaging the items. Reliability results are found in Table 3. Factor analysis results are presented in Table 4.

Table 3

Reliability Comparisons

	Factor Analysis Crombach α	Original Scale Crombach α
Perceived Workload	.79	.90 (Haynes et al., 1999)
Organizational Commitment	.84	.80 (Mowday et al., 1979)
Job Satisfaction	.78 (PCA)	.74 (Cammann et al., 1981)
Turnover Intention	.86 (PCA)	.88 (Jackson & Turner, 1987)

Table 4

Factor Analyses

Factor Analysis of PW

Uniquenesses:

PW1	PW2	PW3	PW4	PW5	PW6
0.739	0.668	0.657	0.749	0.413	0.388

Loadings:

	Factor1
PW1	0.511
PW2	0.576
PW3	0.585
PW4	0.501
PW5	0.766
PW6	0.782

	Factor1
SS loadings	2.385
Proportion Var	0.397

Test of the hypothesis that 1 factor is sufficient.

Alpha reliability = 0.7887
Standardized alpha = 0.79

Reliability deleting each item in turn:

	Alpha	Std.Alpha	r(item, total)
PW1	0.7795	0.7802	0.4460
PW2	0.7595	0.7613	0.5272
PW3	0.7586	0.7603	0.5310
PW4	0.7767	0.7781	0.4549
PW5	0.7328	0.7342	0.6373
PW6	0.7295	0.7305	0.6521

Alpha reliability = 0.8372
Standardized alpha = 0.8398

Reliability deleting each item in turn:

	Alpha	Std.Alpha	r(item, total)
COM1	0.8011	0.8018	0.6605
COM2	0.7876	0.7907	0.7001
COM4	0.8043	0.8078	0.6425
COM5	0.8369	0.8393	0.5223
COM8	0.7901	0.7944	0.6889

Factor Analysis of COM

Uniquenesses:

COM1	COM2	COM4	COM5	COM8
0.449	0.369	0.487	0.677	0.420

Loadings:

	Factor1
COM1	0.742
COM2	0.794
COM4	0.716
COM5	0.568
COM8	0.761

	Factor1
SS loadings	2.596
Proportion Var	0.519

Test of the hypothesis that 1 factor is sufficient.
The chi square statistic is 110.93 on 5 degrees of freedom.
The p-value is 2.61e-22

Alpha reliability = 0.7887
Standardized alpha = 0.79

Reliability deleting each item in turn:

	Alpha	Std.Alpha	r(item, total)
PW1	0.7795	0.7802	0.4460
PW2	0.7595	0.7613	0.5272
PW3	0.7586	0.7603	0.5310
PW4	0.7767	0.7781	0.4549
PW5	0.7328	0.7342	0.6373
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Reliability deleting each item in turn:

	Alpha	Std.Alpha	r(item, total)
COM1	0.8011	0.8018	0.6605
COM2	0.7876	0.7907	0.7001
COM4	0.8043	0.8078	0.6425
COM5	0.8369	0.8393	0.5223
COM8	0.7901	0.7944	0.6889

The job satisfaction measure was derived from Cammann, Fichman, Jenkins, and Klesh (1979) Michigan Organizational Assessment Subscale. The job analysis measure analyzed by this study retained two questions from the UNT survey, “All in all I am satisfied with my job,” and “In general, I don’t like my job.” The two items were aggregated into a factor using PCA. Job satisfaction was the appraisal of their job and work environment (Besich, 2005).

Organizational commitment was measured by an abbreviated version of Mowday, Porter, and Steer’s (1979) Organizational Commitment Scale. Five items were retained from the UNT survey. Organizational commitment was defined as the strength of a person’s identification with an organization and its objectives (Besich, 2005).

The perceived workload scale was taken directly from Haynes et al. (1999) measure. Six items comprise the perceived workload scale, although almost most item loadings hovered around the cutoff. Perceived workload is the degree to which an individual feels stress from time constraints and insufficient resources to accomplish their job.

The scale measuring turnover intention was derived from the Jackson and Turner (1987) Turnover Intention Scale. Two scale items were retained and combined into a factor using PCA. Turnover intention was operationalized as the likelihood that a person will seek employment elsewhere rather than remain in their present job (Besich, 2005).

The demographic factors of occupational level and gender were bivariate. In the present dataset, age was an 11 category item. The eleven categories were retained as they served to increase variability and intercorrelational discrimination, and better reflect a parametric distribution, although somewhat positively skewed.

Replacement of Missing Data

Since the UNT survey was not forced choice, the non-response rate of the agency population was much higher than the standard 20-40% non-response rate for most surveys. A conventional practice for dealing with non-response is setting a cutoff criterion in order to eliminate severe non-responders. This practice would eliminate an unacceptably high percentage of subjects from this dataset, subsequently reducing power, affecting point estimates and ranges, and increasing bias. Subjects were only omitted in this study when they failed to volunteer basic demographic information. While statistical averaging can be used to retain these subjects, the logic for exclusion is that the research question centers on investigating demographic influences, and the provision of such data is essential. Since only 78 subjects failed to provide such information and constitute well under 3% of total respondents, their omission will not affect overall results. Other subjects should be retained and their data statistically imputed.

There are several statistical alternatives for replacing missing data. EM algorithms and other computational methods calculate maximum-likelihood estimates based on the observed data alone. These methods reflect a likelihood function averaged over a predictive distribution for the missing values (Wijnen, Vermier & van Kenhove, 2007). While a few values can be replaced by such methods, the utility of direct maximization of the likelihood is called into question in large datasets (Schafer, 1997).

Imputation is recommended for large datasets. Imputation is the practice of replacing missing data with plausible values. NORM software written and supported by the Department of Statistics at the University of Pennsylvania will be used for imputation of missing values. NORM utilizes multiple imputation (MI) to obtain valid inferences. MI is a Monte Carlo technique which utilizes the complete dataset, and combines multiple samples of responses and non-responses to produce estimates and confidence intervals that incorporate missing-data uncertainty.

The NORM software utilizes algorithms based on Rubin's (1987) rules for MI inference. These rules were proposed to not only elucidate the mathematical foundations of combining inferred samples, but also to reduce distorted estimates, standard errors and hypothesis tests (Little & Rubin, 1987). NORM employs a relatively new approach to applied parametric modeling called Markov chain Monte Carlo (MCMC). MCMC imputations are created under Bayesian arguments and provide a natural interpretation as an approximate Bayesian inference for missing quantities (Rubin, 1987). It should be noted that while multiple imputation is quite forgiving of departures from the imputation model, joint normality of distributions is assumed.

MCMC is a collection of methods for simulating random draws from nonstandard distributions via Markov chains (Gilks, Richardson & Spiegelhalter, 1996). A small number of independent draws of the missing data is taken from the missing data relative to a predictive distribution, and these draws are combined for multiple-inference imputation. MCMC generates imputations for missing values by imposing a Bayesian parametric probability model of the complete dataset. NORM, which incorporates MCMC modeling, uses a multivariate normal distribution model. The model parameters simulate independent draws from the conditional distribution of the missing data given the observed data using Bayes' theorem.

It is notable that other studies utilizing this data set did not impute missing data (Besich, 2005; Kappleman et al., 2007). Failure to impute missing data produces biased point estimates and confidence intervals and can skew toward either Type 1 or Type 2 errors. This calls into question the validity of inferences made from a non-imputed dataset. Imputation both corrects inherent non-normality and produces more accurate betas and parametric estimates. Imputation corrects dataset non-normality, such as outliers and non-parametric distributions. This bootstrap technique adjusts for bias by subtracting averaged betas from original observed betas. Imputation generates such optimum adjusted beta coefficients by using many iterative samplings to create a new data matrix of averaged beta weights. The power of the imputation technique increases as the sample size increases (Rubin, 1987).

Parametric and Non-Parametric Sequential Regression Considerations

Linear regression is a modeling technique that predicts a random variable Y from an additive, linear combination of random (or fixed) predictors $(X_1, X_2, \ldots X_p)$, assuming normally distributed residuals (ex. $Y = B_0 + B_1 * X_1 + e$). In simple linear regression, a single observed predictor variable, *X1*, is modeled to maximize prediction of a single observed outcome variable, *Y*. The general linear model regression (GLM) incorporates ANOVA/ANCOVA methods as specials cases of linear regression with specially coded fixed and continuous predictors of the outcome variable, *Y*.

A main goal in linear regression is to estimate the proportional change in Y as *X1* changes for a population under study. This coefficient of the change is referred to as a beta or model coefficient (*B*). Standardized beta coefficients depend on transforming observed data into standard scores. Specifically, the *Y* and *X*'s of observed values are transformed to standard normal scores, or '*z*' scores. Standardized betas are derived from estimating the linear regression model on the transformed observed data. The resulting standardized beta coefficient, in the case of simple regression, provides a Pearson correlation coefficient, the linear association between the *Y* and the X_1 predictor. In the case of multiple regression, standardized beta coefficients are referred to as semi-partial correlation coefficients. Semi-partials correlate a particular predictor on the criteria (X_1 on Y). All of the other predictors are added (X_p), and the association of X_1 on *Y* is subtracted from the overall explainable variance in *Y*. A partial correlation coefficient is thus a measure of the unique contribution of predictors association with Y (Velicer, 1978).

Issues arise when analyzing semi-partial coefficients. Both standardized and unstandardized semi-partial coefficients in multiple linear regression do not take into account the inter-correlation between the predictor variables ($X_1 \ldots X_p$). Such multicollinearity between predictors can cause biased statistical significance tests, and make the resulting interpretation of the magnitudes of the beta coefficients problematic. Additional concerns arise when rank ordering the sizes of beta coefficients for purposes of delineating those predictors that have the most relationship with the outcome variable. In addition, the sum of the squared semi-partial correlations do not necessarily add back up to the total R^2 accounted for by the model.

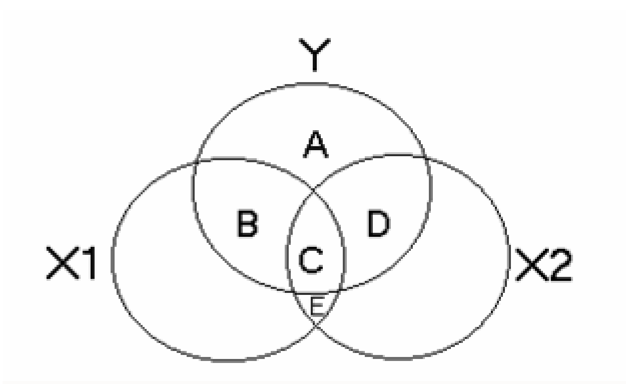

Figure 8. Partial and semi-partial correlations.

These issues concerning partial and semi-partial correlations might be better illustrated by reference to Figure 8. The squared semi-partial correlation between X_1 and Y is represented by the area of the Venn diagram as

B/(A+B+C+D). Area C is the association between both X_1 and Y, and X_2 and Y. If not accounted for, this inter-correlation between X_1 and X_2 can mislead the interpretation of X_1 with Y, and the interpretation of X_2 with Y. The area depicted by B/(A+B) is a fully partialed effect, and represents the partial correlation of Y with X_1 after the effects of Y with all other effects (C and D) have been removed.

While the partial correlation coefficient may be appropriately chosen whenever there is a high degree of predictor inter-correlation, both semi-partial and partial coefficients are affected by the order of entry when testing a sequential regression model. When sequentially testing a set of predictors to yield an R-squared increase, the contribution of variance accounted for by a predictor variable is subtracted from Y. The remaining variance in Y, not accounted for by the currently tested predictor, will be accounted for by the remaining predictor variables that have not yet entered the model. Theoretical guidance must inform the sequential ordering and entry, or a mis-specification can occur, an improper retention and ordering of predictors. In addition, multicollinearity can cause biased confidence intervals for those beta coefficients, and confound subsequent interpretation. Another concern of mis-specified ordering is suppressor and enhancer effects. The point estimates of the beta coefficients can be biased with regard to their underlying true values in the population, depending on which predictors are included in the model.

An additional consideration relevant to sequential regression covariance is the balance of data sets. In cases of unbalanced data sets, sequential regression tests are affected by unequal sample sizes across the cells or stratum of the predictor variables. Employing Type III sums of squares can be useful under such conditions. Even if covariance of unbalanced data sets is addressed through use of Type III sums of squares, theoretical predictor order of entry still remains a consideration. Balanced data sets pose less of a problem since the calculation of the sums of squares is equivalent for type I, type II, or type III sums of squares. For our purposes, missing values imputation procedures provides a balanced data set for further analyses. This study employs both Type I and Type III sums of squares comparisons in the interpretation and control of covariance and order effects.

Variable Ordering and Predictor Effects

Ordering and multicollinearity affects the variance partitioning of the predictor variables, and subsequent interpretation of the relative importance of the predictors to the criteria (Kruskal, 1987). It is important to discern which predictors have the largest degree of relationship with the outcome variable would provide initial candidates for practical intervention and control of the outcome variable.

Several methodological approaches exist to appropriately rank order regression predictors (Kruskal & Majors, 1989). The approach taken in this study is to assess relative importance by calculate the LMG statistic (Grömping, 2007). The LMG statistic can be interpreted as the average squared semi-partial correlation coefficient for a predictor, where the averaging takes place over all possible permutational orderings of that predictor variable within the set of all predictors. For example, (Reg_1: $Y = B_0 + B_1 {*} X_1 + B_2 {*} X_2 + e$) and ($Reg_2$: $Y = B_0 + B_2 {*} X_2 + B_1 {*} X_1 + e$) might give different results depending on whether X_1 or X_2 enters first into a sequential regression of the two terms X_1 and X_2. The LMG statistic would give (avg.B_1 = (seq$_1$.B_1+seq$_2$.B_1)/2) and (avg.B_2 = (seq$_1$.B_2+seq$_2$.B_2)/2) as the resulting respective average semi-partial correlation coefficients for B_1 and B_2. In addition, the unique predictor contributions provided by LMG can be rank ordered with non-parametric confidence intervals, and the average squared semi-partials sum to 1 (Grömping, 2006).

Interpretation of predictor effects is conducted by comparing the LMG statistic with appropriate confidence intervals. Interpretation using the size of the standardized or unstandardized beta coefficients is avoided and is replaced by the size of the relative average semi-partial *R*-squared statistic, where the sum of relative effects across predictors equal 1. This study will provide relative importance indices and nonparametric bootstrap confidence intervals for all model terms and predictor LMGs.

Concepts of mixed modeling and relative importance in industrial organizational psychology are growing in importance (Johonson & Lebreton, 2004). In addition to confirmatory parametric and nonparametric methods, this study uses nonparametric bootstrap resampling techniques to explore model parsimony and ordering effect validation. Bootstrap resampling involves sampling with replacement from the original data set, with model estimation for each bootstrap sample.

Mediation, Moderation, and Causality

In addition to direct predictor – criteria relationships, the research question inquires of the mediating and moderating relationships between the predictors. Variable interactions raise questions of causal influence between predictor relationships. Claims of cause and effect require stronger evidence in theory, experimental design, and statistical analysis than this study's regression approach can provide. Establishing causal association requires some degree of control over the mediating or moderating variable. Causal claims are best supported with an experimental design, in which the mediation variable is systematically controlled prior to the measurement of the outcome variable. Experimental designs provide: (1) initial random assignment of subjects prior to measurement, (2) a control group of subjects to differentiate effect efficacy, and (3) outcome variable measurement which involves the systematic manipulation of the mediation variable. The greater the degree of control that is exercised in the research design, the greater the degrees of certainty in the causal logic.

Organizational settings often employ a quasi-experimental design, in which some non-random form of control is exercised before measurement. Mediator/moderator models based on observational data where the researcher has exercised no control over the outcomes before measurements were performed provides weak evidence for claims of cross-variable influence. In addition, regression modeling can only make inferential claims of association and influence.

Procedure

The Procedure section provides the rationale and methods chosen to explore the predictor/ outcome relationships posed by the research question. Data and factor preparation is presented. Next, an overview of the logic used to select (1) confirmatory methods for a priori hypothesis testing, and (2) exploratory methods that test model fit and parsimony. Finally, the specific methods selected to implement these two strategies is presented. Model selection strategies were chosen that are known to downwardly adjust for upward bias in model coefficients and model fit indices.

The R software (http://cran.r-project.org/) was used to perform parametric and nonparametric sequential regressions. R v. 2.06, is a suite of modules provided by the CRAN (Comprehensive R Archive Network) network. R is a versatile open source statistical language and environment.

Predictors of perceived workload (PW) and organizational commitment (COM) were aggregated using singe item maximum likelihood factor analysis to determine item retention and variable reliabilities. Principal components analysis (PCA) is a technique used to aggregate factors from two scale items. PCA derives optimally weighted composite scores which account for all of the observed variance in the original scores. PCA was used to aggregate turnover intent (TI) and job satisfaction (JSAT), both of which had two scale items. These composite scores are like factor analysis scores in that they are optimally weighted scores centered at zero with a variance of one.

The dataset variables that will be sampled for imputation include: age (AGENUM), gender (GENDERNUM), supervisor status (SUPNUM), perceived workload (PW), job satisfaction (JSAT), commitment (COM), and turnover intention (TURN). These variables will be imputed using the NORM software (http://www.stat.psu.edu/~jls/misoftwa.html). Integers from 1 to 2663, having an equal probability of selection with replacement, will be sampled to form a new sample set called a bootstrap sample. One thousand bootstrapped samples will be used to construct confidence intervals and tests for significance. Once resampling is finished, a new data set with slightly different sample characteristics will be treated as new population sample. Less biased estimates of model coefficients will be produced by estimating many bootstrap samples, and then averaging the bootstrapped model parameter estimates to get a single less biased estimated model coefficient. Standard errors of these bootstrap coefficients are then obtained by taking the standard deviation of all of the bootstrap parameter estimates. The standard error is essentially the variation in the distribution of bootstrap estimated coefficients. The 2.5^{th} and 97.5^{th} percentiles will be calculated from the distribution of bootstrap estimated coefficients to produce nonparametric confidence intervals on the bootstrap averaged parameter. This imputed dataset will serve as the normalized dataset for future analysis.

The model used in this study is found in Figure 5. Reference to the model raises two questions this study attempts to answer: (1) Are there significant mediating and moderating relationships present among the predictors? and (2) Drawing from all the elements contained in the theoretical model, which predictors and ordering optimally explains turnover variance without overfitting?

Stepwise regression will be used to test mediator and moderator relationships. The mediator-moderator model approach adopted in the current study is that of Kenny, Kashy, and Bolger (1998), hereafter referred to as the Kenny model. Mediation is based on the equation: $X \rightarrow M_1 \rightarrow Y$. This model can be tested in a four step process (Baron & Kenny 1986; Judd & Kenny, 1981).

In step one, an outcome variable (DV or Y) is predicted by X_1 to estimate an effect - B_1. This step establishes that there is an overall direct effect that may be mediated: $Y = B_0 + B_1 * X_1 + e$. B_0 is the intercept, and B_1 is the effect of X_1 on Y. B_1 should be nonzero.

In step two, the mediator (M_1) is predicted by the predictor variable X_1: $M_1 = C_0 + C_1 * X_1 + e$. $C1$ should be nonzero.

In step three, the mediator (M_1) is demonstrated to predict the outcome variable Y_1. Note that both the predictor X_1 and the mediator M_1 are used to predict the outcome variable Y: $Y = B_0 + B_1 + X_1 + B_2 * M_1 + e$. B_2 should be zero.

In step four the results of step 1 and step3 are compared. If the mediator completely mediates the $X \rightarrow Y$ relationship, then the effect of B_2 in step 3 should be zero and statistically non-significant.

The current study uses the following mediator model:

PW → JOBSAT → COM → TURN (*)

PW: Perceived Workload

JOBSAT: Job Satisfaction

COM: Organizational Commitment

TURN: Turnover Intention

Regression models test mediation with the following sequence: (a) JOBSAT predicted by PW; (b) COM predicted by JOBSAT; (c) TURN predicted by PW; (d) TURN predicted by JOBSAT; (e) TURN predicted by COM; (f) TURN predicted by PW and JOBSAT; (g) TURN predicted by PW, JOBSAT and COM.

Moderator effects are regarded as interaction effects which affect the levels of an existing relationship between two variables. The moderating effects (interaction) of age (AGE), gender (GENDERNUM), and supervisor status (SUPNUM), on PW and COM will be tested using sequential regression.

Additionally, the moderating effects of AGENUM, GENDERNUM, and SUPNUM amongst themselves will also be tested using sequential regression. All of the R script for testing the hypotheses of mediating and moderating effects are presented in Table 5.

Table 5

R Script for Mediator Relationships

```
 Model:  PW -> JOBSAT -> COM -> TURN (DV)

 For JOBSAT AND COM to qualify as mediators:   a-e should be sig.
                      and, f,g should be NON sig.


Hypotheses and Accompanying R Script

a) Expect that JOBSAT SHOULD BE SIGNIFICANT predicted from PW

LinearModel.4p.1 <- lm(JOBSAT ~ PW, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")

b) Expect that COM SHOULD BE SIGNIFICANT predicited from JOBSAT

LinearModel.4p.1 <- lm(COM ~ JOBSAT, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")

c) Expect that TURN SHOULD BE SIGNIFICANT predicited from COM

LinearModel.4p.1 <- lm(TURN ~ COM, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")

d) Expect that TURN SHOULD BE SIGNIFICANT predicited from JOBSAT

LinearModel.4p.1 <- lm(TURN ~ JOBSAT, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")

e) Expect that TURN SHOULD BE SIGNIFICANT predicited from PW

LinearModel.4p.1 <- lm(TURN ~ PW, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")

f) Expect that JOBSAT SHOULD BE NON-SIGNIFICANT

LinearModel.4p.1 <- lm(TURN ~ PW + JOBSAT, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")

g) Expect that JOBSAT & COM SHOULD BE NON-SIGNIFICANT
```

(*table continues*)

Table 5 (*continued*).

```
LinearModel.4p.1 <- lm(TURN ~ PW + JOBSAT + COM, data=cordas)
summary(LinearModel.4p.1)
Anova(LinearModel.4p.1, type="III")


Moderator Relationships

h) (GENDERNUM, AGENUM, SUPNUM) as moderators for (PW & COM)

LinearModel.4p.3 <- lm(TURN ~ GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM +
               PW:GENDERNUM + PW:AGENUM + PW:SUPNUM +
                   COM:GENDERNUM + COM:AGENUM + COM:SUPNUM,
```

The second question raised by the theoretical model concerns maximizing explained variance while optimizing model fit. This study's strategy answers this question by using multiple statistical methods to achieve convergent statistical validity. The first approach that will be used to determining factor inclusion and model fit is to compare parametric linear regression results with non-parametric LMG results. LMG is the averaged R^2 over all possible variable permutations. The LMG statistic indicates the unique contribution of each variable without ordering effects, and results can be rank ordered with confidence intervals. The testing strategy will involve the creation and comparison of increasingly complex nested sequential models. That is, initial models will test a few variables (stress, satisfaction, and commitment) to discover their degree of explained variance and significance levels. Other variables will be added to the regression model (age, gender, supervisor status) to asses their contributions. Finally, two-factor higher order relationships will be introduced to create the full model. The full model will have 21 terms. As predictors are sequentially added to the regression model, attention will be paid to variable masking and suppression, the loss of power, and other indications of overfitting. The full model thus serves as a baseline standard for model fit and comparisons with other exploratory modeling results.

The sequence of testing of each nested model will include (1) parametric multiple sequential regression, providing unstandardized beta coefficients, adjusted R^2, and Type III sum of squares, and (2) LMG permutation, which provides relative importance indices for each term, rank ordering and nonparametric bootstrap confidence intervals.

Linear regression has some issues that are compensated for by the LMG method. It is a common practice to rank standardized beta coefficients as approximate relative importance measures, but these coefficients have inherent multicolinearity, the lack of independent contribution, which creates biased *p* values and confidence intervals. Linear regression is also sensitive to the order in which predictors are entered. Linear regression assumes that one has specified the correct model. While Type III sums of squares addresses ordering effects to some degree, they are still sensitive to the last variable entered, and multicolinearity remains an issue. Additionally, the sum of squared semi-partial correlations do not necessarily add back up to the total R^2 accounted for by the model.

The LMG statistic addresses the issue of multicolinearity, ordering effects, and relative importance. LMG represents each variable's R^2 contribution in a regression model averaged over all possible permutational orderings. LMG p values indicate a predictor's unique contribution regardless of order effect, and adding the *p* values sums to 1. If confidence intervals don't overlap, predictors can be rank ordered relative to their amount of contribution to explaining variance. Comparing the explained variance and *p* values of the linear regression and the LMG indicates the extent of ordering effect and model bias in the parametric model. Confidence intervals of the parametric beta weights can be compared with LMG confidence intervals obtained from bootstrapped resampling with replacement, with model estimation of each bootstrap sample. Convergence of parametric and nonparametric confidence intervals indicates the degree of model bias and how well assumptions of normality have been met. In addition, confidence intervals which overlap with 0 (ex. negative to positive) calls into question whether observed variable influence can be attributed to random chance.

In addition to comparisons of linear regression and LMG, statistically significant variable relationships will be confirmed during exploratory model fitting to determine optimal predictor subsets. Finally, the mediator/ moderator stepwise regression modeling will directly confirm results obtained from nested multiple sequential regression models.

When a model contains many predictor variables, prediction variability increases, resulting in poor prediction of new cases based on the fitted model. Some of these variables can be considered good predictors, while others contribute little or nothing towards increasing model precision. Too many or too few variables result in noise, model mis-specification and subsequent bias.

While comparisons of the R^2 of nested models addresses issues of covariance, measurement error, assumptions of normality, and the percentage of explained variance, the issue of fit must be addressed. If one discovers noise and model mis-specification, how can optimum and parsimonious model fit be determined? While predictor entry is to some degree subjective, the ordering in this study was heavily informed and weighted from theory. In addition to theoretical considerations, determining if one has the right model is also based on appropriate model selection and model validation practices. While confirmatory techniques are based on comparisons of R^2 in nested models, exploratory models should use indices that allow for non-nested model comparisons (Anderson & Burnham, 2002). Exploring model fit is important in order to increase parsimony, precision, and predictive power. Two exploratory methods will be used to confirm theoretical model parsimony and maximize fit and explained variance: (1) best subsets linear regression, and b) backward-stepwise AIC variable selection combined with bootstrap resampling (Austin & Tu, 2004; Sauerbrei & Schumacher, 2007).

Best subsets regression performs an exhaustive search for the best subsets of the predictor variables for predicting the outcome variable. This regression technique permutates all possible element orderings in order to create, rank order, and select the model which maximizes explained variability (adjusted R^2).

Best subsets regression has some shortcomings. It is computationally very intensive. It also doesn't take sampling variability into consideration and produces artifacts and an inflated, overfitted model. It is used in this study to confirm the results of the other exploratory method (stepwise AIC) and thus provide convergent statistical validation.

Rather than using comparisons of R^2, variable and model selection can be based on relative model comparisons using fit indices such as Akaike's information criterion (AIC), or the Bayesian information criterion (BIC). This study will use the AIC measure to assess variable selection and model parsimony. AIC is a measure which balances precision and complexity, providing a tradeoff between the optimum number of parameters and potential error/ noise. While other bootstrap methods such as best subsets regression fail to take into account sample to sample variation, AIC takes into account the artifacts arising from random variable selection statistical validation. In addition to estimating model parsimony, the difference between the original theoretical model fit and the AIC model indicates the amount of original model bias (Austin & Tu, 2004; Sauerbrei & Schumacher, 2007).

AIC is also relevant to exploring the predictive validity of the fitted model. Bootstrap model selection is based on optimizing appropriate model fit indices, such as adjusted R^2, AIC, and BIC, adjust for population bias in R^2 and other measures of predictive accuracy. Since all-subsets regression does not allow sampling variability to enter into the model selection process, selecting a model based on maximizing an adjusted R-squared index will generally lead to larger models than those selection strategies based utilizing subsetting or resampling schemes (Sauerbrei, 1999). The present study compares an all-subsets regression selected model based on the maximum adjusted R-squared, to a model selected using a bootstrap resampled, AIC based, backward-stepwise regression selection method. The final model selected is based on the bootstrap stepwise AIC selected regression model.

The confirmatory methods used in this study are: (1) ordinary least squares (OLS) based multiple sequential regression as the principle parametric statistical modeling methodology; (2) the non-parametric LMG statistic averages semi-partial coefficients based on all possible variable permutations to confirm explained variance, rank order unique predictor contribution, and produce bootstrapped confidence intervals that reflect predictive power.

The two exploratory methods used to derive optimal subsets of predictor variables to maximally explain variance while optimizing fit are: (1), backward-stepwise variable selection combined with bootstrap resampling, which produces an AIC optimization measure; and (2) best subsets linear regression, which randomly all possible orderings of model elements to generate a model maximizing adjusted R^2.

In summary, this section presented context and logic for how the measures formed and methods chosen to test hypotheses and the central research question. After presenting issues relevant to linear regression, context for survey creation was provided. Methods were described for testing hypotheses and resolving issues of overfitting and model parsimony. The conrirmatory techniques of Ordinary Least Squares and the LMG relative importance measure were introduced, as well as the exploratory model building methods of best subsets linear regression and backward-stepwise variable selection combined with bootstrap resampling, and the AIC optimization measure. The next section presents the data accumulated from empirical testing of the dataset.

CHAPTER 3

RESULTS

The results section presents and describes data from statistical tests of a priori hypothesis testing. The results section is divided into: (1) descriptives, (2) factor scores and reliabilities, (3) multiple linear regression results, (4) model testing and selection results, and (5) mediation and moderation testing results, and (6) hypothesis testing results.

Descriptives

Univariate and bivariate descriptives are provided in Table 6. The total sample consisted of *N*=2,663. The sample was composed of: *n*=2,166 non-supervisors and *n*=497 supervisors, and *n*=1,072 female respondents and *n*=1591 male respondents. Age was divided into 11 categories and is roughly symmetrically normally distributed across the 11 categories, with the mode in category 7 with a frequency of 599 responses. Spearman correlations and Pearson correlations are provided for the seven variables being modeled: turnover intention (TURN), perceived workload (PW), job satisfaction (JOBSAT), commitment (COM), age (AGENUM, gender (GENDERNUM), supervisor status (SUPNUM). The high degree of similarity between the Spearman correlations (nonparmetric rank correlation) and the Pearson correlation (parametric correlation with assumptions of normality) provide statistical validation for the assumptions of the Spearman bivariate normality and linearity of the response variable as a function of the predictor variable (Lindeman, Merenda & Gold, 1980).

Table 6

Descriptive Statistics

Descriptives Univariate

Frequencies (total N=2263):

Variable AGENUM

Category	1	2	3	4	5	6	7	8	9	10	11
Frequency	1	22	69	200	379	493	599	598	229	61	12

Variable SUPNUM

Category	1	2
Frequency	497	2166

Variable GENDERNUM

Category	1	2
Frequency	1072	1591

	0%	25%	50%	75%
AGENUM	1	5	7	8
GENDERNUM	1	1	2	2
SUPNUM	1	2	2	2

Standardized Composite Score:	mean	sd	0%	25%	50%	75%
JOBSAT	-1.657e-16	1.286	-4.103	-0.468	0.220	1.1661865
PW	4.055e-17	0.908	-1.986	-0.681	0.024	0.7217069
TURN	-5.272e-17	1.328	-1.575	-1.173	-0.322	0.9065287
COM	-1.537e-16	0.924	-2.841	-0.625	0.222	0.7627487

Descriptives Bivariate

Spearman Correlations

	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM	TURN
GENDERNUM	1.00000000	0.061496888	-0.09643603	-0.01647345	-0.051799061	-0.04956249	0.06593046
AGENUM	0.06149689	1.000000000	-0.11628208	0.06164092	0.001953759	0.01049371	0.02819298
SUPNUM	-0.09643603	-0.116282078	1.00000000	-0.19551717	-0.026421656	-0.07327863	0.03785459
PW	-0.01647345	0.061640923	-0.19551717	1.00000000	-0.217502173	-0.17101267	0.14614903
JOBSAT	-0.05179906	0.001953759	-0.02642166	-0.21750217	1.000000000	0.72717730	-0.33792285
COM	-0.04956249	0.010493706	-0.07327863	-0.17101267	0.727177299	1.00000000	-0.31063631
TURN	0.06593046	0.028192982	0.03785459	0.14614903	-0.337922847	-0.31063631	1.00000000

Pearson Correlations

	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM	TURN
GENDERNUM	1.00000000	0.047350760	-0.09643603	-0.01621690	-0.05822430	-0.059877995	0.07127186
AGENUM	0.04735076	1.000000000	-0.11463853	0.06204645	-0.01568577	-0.004240989	0.02149432
SUPNUM	-0.09643603	-0.114638534	1.00000000	-0.19002153	-0.04550920	-0.078183128	0.04194819
PW	-0.01621690	0.062046452	-0.19002153	1.00000000	-0.21383742	-0.181499612	0.15766913
JOBSAT	-0.05822430	-0.015685768	-0.04550920	-0.21383742	1.00000000	0.735020936	-0.37745865
COM	-0.05987799	-0.004240989	-0.07818313	-0.18149961	0.73502094	1.000000000	-0.33558097
TURN	0.07127186	0.021494324	0.04194819	0.15766913	-0.37745865	-0.335580969	1.00000000

Factor Scores and Reliabilities

Factor analysis results of the scale data are provided in Table 4, Factor Analyses, or commitment (COM) and perceived workload (PW) respectively. Table 4 indicates that PW accounts for approximately 40% of the true score covariance in the items that make up the perceived workload scale (PW). The lowest factor loading for the PW scale was .501 (item 4) and the largest loading was .782 (Item 6). Table 4, Factor Analyses, also indicates that 52% of the true score covariance in the COM scale is accounted for by its constituent items. The lowest loading for the COM scale was .568 (item 5) and the largest loading was .794 (item 2).

Corresponding reliabilities for PW and COM are reported in Table 3. In addition, since all items were derived from previously validated measures, Table 3, Reliability Comparisons, presents the reliabilities found in the original instruments. Internal consistency reliability was .79 for PW, and .84 for COM. Items that correspond to loadings larger than .5 are usually considered good items in the sense that unique item variance is considered low (item uniquenesses). Conversely, covariance with other items is high. Additionally, reliabilities that are near a low range of .70 and upward can be considered acceptable reliabilities (Nunnally, 1967). For the purposes of the current study, the PW and COM scales can be considered to have low measurement error (item uniqueness), and factor loadings indicate good discrimination of true score responses across individuals in the population.

Job satisfaction (JOBSAT) and turnover intention (TURN) each had two items composing their scales in the present study. Items were removed from JOBSAT and TURN scales upon initial examination due to high degrees of non-normality (skewness in the data distributions – ceiling and floor effects). An initial "item to remove improvement" in internal consistency reliability (Cronbach's coefficient alpha) was calculated for each item displaying high degrees of skewness. Items were removed when their removal improved the overall reliability of the JOBSAT and TURN scales. Two items make a scale very weak when you are creating and validating your own scale. That's not the case in this study. All items came from previously validated instruments and each item reflects the original scale apha. One could compose a survey taking a single item from several validated instruments for this reason. Why did these items lower the reliability, and why don't the scales reflect the original instruments? Reliabilities are sample dependent, and the amount of non-response bias and skew was so extreme that the items actually lowered overall scale alphas. The two retained scale items were aggregated using PCA, which reduces inherent measurement error by providing a weighted average not much different from FA results of 3 items taken from the validated scale. In addition, a two items don't permit parsing out measurement error. Measurement error reduces overall reliability. Logically, if one has acceptable alpha levels, any measurement error further removed would only serve to increase reliability and subsequent parametric measures. So the two items scales are acceptable.

The JOBSAT alpha coefficient was .78 based only on two items. The TURN alpha coefficient was .86 based only on two items. To combine the two scale items into a single composite for the JOBSAT and TURN predictors, a principal components analysis (PCA) was performed and a single optimally weighted composite score was generated from original responses to the retained items. The correlation of the JOBSAT component score with the raw score of the two items was approximately .90 for each item. The correlation of the TURN component score with the raw score of the two items was approximately .94 for each item.

Multiple Regression Results

A linear multiple regression analysis was performed which included all main effects (TURN as dependent variable with PW, JOBSAT and COM as main effects), covariates(AGENUM, GENDERNUM and SUPNUM), and all two-way interaction terms between the main effects and covariates. This model was labeled as the full two-variable interaction model. (See Table 7.) Full two-variable interaction model results are important as a baseline comparison for any model selection strategies that remove unimportant terms that do not contribute to a parsimonious, predictive model for turnover intention (TURN) (Harrell et al., 1996).

The full two-variable interaction model contains 21 terms and is overfitted. Ordinary least squares (OLS) estimation was applied to produce the multiple regression output in Table 7, full two-variable interaction model OLS. Table 7 indicates that approximately 1% in observed R^2 is due to noise in an overfit and inflated model. That is, observed R^2 minus adjusted R^2 (.17-.16~.01) yields 1% of the total observed variance in TURN. The loss in power and suppression of significant relationships is due to too many irrelevant variables in the model. One goal of the present study is to reduce this inflated model to a more parsimonious model that will predict well with new samples.

Table 7

Full Two-Variable Interaction Model OLS

```
TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT +
  COM + GENDERNUM:AGENUM + GENDERNUM:SUPNUM + AGENUM:SUPNUM +
  GENDERNUM:PW + AGENUM:PW + SUPNUM:PW + GENDERNUM:JOBSAT +
  AGENUM:JOBSAT + SUPNUM:JOBSAT + PW:JOBSAT + GENDERNUM:COM +
  AGENUM:COM + SUPNUM:COM + PW:COM + JOBSAT:COM

Residuals:
 Min    1Q   Median    3Q    Max
-3.3414 -0.9696 -0.1776  0.8084 3.8245

Coefficients:
                   Estimate  Std. Error   t value Pr(>|t|)
(Intercept)                  -0.288602  0.789401  -0.366  0.71470
GENDERNUM                    -0.209438  0.335977  -0.623  0.53310
AGENUM                       0.006509   0.097368  0.067   0.94671
SUPNUM                       0.133727   0.361726  0.370   0.71164
PW                 0.251340  0.214536  1.172  0.24148
JOBSAT                       -0.679769  0.220320  -3.085  0.00205 **
COM                          0.110066   0.292600  0.376   0.70682
GENDERNUM:AGENUM             0.023317   0.030372  0.768   0.44271
GENDERNUM:SUPNUM             0.109984   0.137377  0.801   0.42344
AGENUM:SUPNUM                -0.020455  0.041782  -0.490  0.62448
GENDERNUM:PW                 -0.003124  0.056363  -0.055  0.95580
AGENUM:PW                    -0.005082  0.016988  -0.299  0.76484
SUPNUM:PW                    -0.045937  0.074885  -0.613  0.53964
GENDERNUM:JOBSAT             0.074619   0.057433  1.299   0.19397
AGENUM:JOBSAT                0.012149   0.017119  0.710   0.47796
SUPNUM:JOBSAT      0.114570  0.078565  1.458  0.14488
PW:JOBSAT                    0.064405   0.029762  2.164   0.03055 *
GENDERNUM:COM                -0.143330  0.078185  -1.833  0.06688 .
AGENUM:COM         0.026913  0.023675  1.137  0.25573
SUPNUM:COM                   -0.121581  0.104979  -1.158  0.24691
PW:COM                       -0.038869  0.041984  -0.926  0.35463
JOBSAT:COM                   0.027000   0.020039  1.347   0.17798
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.218 on 2641 degrees of freedom
Multiple R-Squared: 0.166,   Adjusted R-squared: 0.1593
F-statistic: 25.03 on 21 and 2641 DF, p-value: < 2.2e-16
```

(*table continues*)

Table 7 (*continued*).

Anova Table (Type III tests):
Response: TURN

	Sum Sq	Df	F value	Pr(>F)	
(Intercept)	0.2	1	0.1337	0.714696	
GENDERNUM	0.6	1	0.3886	0.533096	
AGENUM	0.006629	1	0.0045	0.946711	
SUPNUM	0.2	1	0.1367	0.711643	
PW	2.0	1	1.3725	0.241483	
JOBSAT	14.1	1	9.5195	0.002054	**
COM	0.2	1	0.1415	0.706824	
GENDERNUM:AGENUM	0.9	1	0.5894	0.442713	
GENDERNUM:SUPNUM	1.0	1	0.6410	0.423436	
AGENUM:SUPNUM	0.4	1	0.2397	0.624476	
GENDERNUM:PW	0.004559	1	0.0031	0.955799	
AGENUM:PW	0.1	1	0.0895	0.764837	
SUPNUM:PW	0.6	1	0.3763	0.539641	
GENDERNUM:JOBSAT	2.5	1	1.6880	0.193972	
AGENUM:JOBSAT	0.7	1	0.5037	0.477958	
SUPNUM:JOBSAT	3.2	1	2.1266	0.144883	
PW:JOBSAT	6.9	1	4.6828	0.030555	*
GENDERNUM:COM	5.0	1	3.3607	0.066882	.
AGENUM:COM	1.9	1	1.2923	0.255729	
SUPNUM:COM	2.0	1	1.3413	0.246912	
PW:COM	1.3	1	0.8571	0.354625	
JOBSAT:COM	2.7	1	1.8153	0.177985	
Residuals	3918.5	2641			

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

The model depicted in Table 9 was generated as the reduced two-variable interaction model. The best fit full model creation was based on a sequential sums of squares strategy (type I sums of squares). The use of balanced data resulted in type I, II and III sums of squares being in agreement. Contrast the results from the reduced model OLS results (Table 9) with those obtained an OLS excluding demographics (Table 8).

It is important to note that the fitted model depicted in Table 9, reduced two-variable interaction model OLS, depends on the order of entry of terms in the model. In addition, the collinearity or intercorrelation of predictor terms renders either standardized or unstandardized beta coefficients as deficient relative importance metrics for purposes of ranking the importance of predictors in the model. This parametric model makes standard assumptions about normality of the residuals of the fitted model, as well as homogeneity of variance assumptions (homoscedasticity) about the conditional distribution of the outcome variable, given joint values of the predictor variables. When these assumptions are violated, parameter estimates can become biased (Austin & Tu, 2004). This would be the case should sample based beta coefficient estimates systematically differ from the “true” population beta coefficients. Such violations would in turn reduce power for the corresponding statistical hypothesis tests (Type I and Type II errors).

Literature indicates that bias in parameter estimates will decrease (consistency) as sample size gets larger, even when statistical assumptions have been violated, increasing consistency and the robustness of statistical measures (Harrell, Lee & Mark, 1996). In the present study, the sample size is *N*=2,663. The large sample size tends to normalize error and bias inherent within the dataset.

Table 8

Main Effect Model OLS

Model: TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM
Residuals:

Min	1Q	Median	3Q	Max
-3.3226	-0.9730	-0.1832	0.8238	3.8198

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.57863	0.17907	-3.231	0.00125	**
GENDERNUM	0.14556	0.04862	2.994	0.00278	**
AGENUM	0.01104	0.01428	0.773	0.43937	
SUPNUM	0.15043	0.06288	2.392	0.01681	*
PW	0.12829	0.02731	4.698	2.76e-06	***
JOBSAT	-0.27705	0.02730	-10.149	< 2e-16	***
COM	-0.16642	0.03787	-4.395	1.15e-05	***

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.219 on 2656 degrees of freedom
Multiple R-Squared: 0.1599, Adjusted R-squared: 0.158
F-statistic: 84.26 on 6 and 2656 DF, p-value: < 2.2e-16

(*table continues*)

Table 8 (*continued*).

Anova Table (Type III tests)

Response: TURN

	Sum Sq	Df	F value	Pr(>F)	
(Intercept)	15.5	1	10.4408	0.001248	**
GENDERNUM	13.3	1	8.9632	0.002780	**
AGENUM	0.9	1	0.5981	0.439374	
SUPNUM	8.5	1	5.7231	0.016812	*
PW	32.8	1	22.0714	2.761e-06	***
JOBSAT	153.1	1	103.0008	< 2.2e-16	***
COM	28.7	1	19.3152	1.152e-05	***
Residuals	3946.9	2656			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 9

Reduced Two-Variable Interaction Model OLS

Model: TURN ~ GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT +
COM + PW:JOBSAT + GENDERNUM:COM + AGENUM:COM, data = cordas)

Residuals:

Min	1Q	Median	3Q	Max
-3.2472	-0.9670	-0.1725	0.8151	3.8545

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.597769	0.178927	-3.341	0.000847	***
GENDERNUM	0.153338	0.048604	3.155	0.001624	**
AGENUM	0.009198	0.014268	0.645	0.519189	
SUPNUM	0.165038	0.062936	2.622	0.008783	**
PW	0.127330	0.027270	4.669	3.17e-06	***
JOBSAT	-0.283834	0.027579	-10.29	2 < 2e-16	***
COM	-0.288035	0.136239	-2.114	0.034592	*
PW:JOBSAT	0.037971	0.020449	1.857	0.063439	.
GENDERNUM:COM	-0.080671	0.053487	-1.508	0.131614	
AGENUM:COM	0.037843	0.015699	2.410	0.016000	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.217 on 2653 degrees of freedom
Multiple R-Squared: 0.1634, Adjusted R-squared: 0.1606
F-statistic: 57.59 on 9 and 2653 DF, p-value: < 2.2e-16

Anova Table (Type III tests)

Response: TURN

	Sum Sq	Df	F value	Pr(>F)	
(Intercept)	16.5	1	11.1613	0.0008468	***
GENDERNUM	14.7	1	9.9529	0.0016240	**
AGENUM	0.6	1	0.4156	0.5191886	
SUPNUM	10.2	1	6.8765	0.0087834	**
PW	32.3	1	21.8025	3.173e-06	***
JOBSAT	156.9	1	105.9197	< 2.2e-16	***
COM	6.6	1	4.4698	0.0345916	*
PW:JOBSAT	5.1	1	3.4480	0.0634388	.
GENDERNUM:COM	3.4	1	2.2748	0.1316145	
AGENUM:COM	8.6	1	5.8103	0.0160005	*
Residuals	3930.3	2653			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

To provide additional support for the statistical validity of the parametric linear regression methods employed in this study, the results of nonparametric bootstrap estimation was utilized (resampling data with replacement using 1000 bootstrap samples). Nonparametric methods based on averaged adjusted R^2 across all combinations (LMG statistic) enabled comparing the LMG relative importance measures with the parametric Beta coefficients and confidence intervals. It is concluded that the high degree of similarity of the confidence intervals for the bootstrap estimation and the parametric estimation method (standard OLS) is evidence of the large sample validity of the parameter estimates and their corresponding confidence intervals, despite potential deviations from normality or homoscedasticity.

The bootstrap estimation portion of Table 10, reduced two-variable interaction model LMG, displays the confidence intervals for the best fit full model based on nonparametric bootstrap estimation and parametric multiple linear regression. Compare the reduced model LMG results with the full two-variable interaction model LMG results. (See Table 11). The confidence intervals in Table 10 demonstrate practical equality of the nonparametric intervals with the parametric intervals. Any differences that exist appear to be due to slight rounding error differences.

Model Testing and Selection Results

Two model selection strategies were used in the current study. Best subsets regression was applied to the baseline full two-variable interaction model displayed in Table 7. Additionally, a stepwise variable selection procedure was applied to the baseline full two-variable interaction model. In the case of the best subsets regression, all models were ranked by their adjusted R^2 value (See Table 12.) The 21 "best" models are displayed from a larger superset of possible models, where Model 1 is the best of all 1-term models, Model 2 is the best of all 2-term models, Model 3 is the best of all 3-term models, and so forth. All 21 models are displayed with their corresponding model fit indices are displayed in Table 10.

Table 10

Reduced Two-Variable Interaction Model LMG

Relative Importance of Predictors

Response variable: cordas.TURN
Total response variance: 1.764918
Analysis based on 2663 observations

9 Regressors:

GENDERNUM AGENUM SUPNUM PW JOBSAT COM GENDERNUM:COM AGENUM:COM
PW:JOBSAT

Proportion of variance explained by model: 16.34%
Metrics are normalized to sum to 100%
Relative importance metrics:

	lmg	square-root-lmg
GENDERNUM	0.020594714	.14
AGENUM	0.001614603	.04
SUPNUM	0.009673752	.09
PW	0.070281219	.26
JOBSAT	0.378886335	.53
COM	0.184470346	.42
GENDERNUM:COM	0.173822809	.41
AGENUM:COM	0.155569915	.39
PW:JOBSAT	0.005086307	.07

Note: "lmg" is the R^2 contribution averaged over orderings among
regressors, cf. e.g. Lindeman, Merenda and Gold 1980,
p.119, or Chevan and Sutherland (1991).

Relative Importance Confidence Intervals:

Confidence interval information (1000 bootstrap replicates, bty= perc):

(*table continues*)

Table 10 (*continued*).

Bootstrap Estimation of Reduced Two-Variable Interaction Model

Original Model Fit:

Model: TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM + PW:JOBSAT + GENDERNUM:COM + AGENUM:COM

Coefficients:

(Intercept)	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM
-0.597769	0.153338	0.009198	0.165038	0.127330	-0.283834	-0.288035

PW:JOBSAT	GENDERNUM:COM	AGENUM:COM
0.037971	-0.080671	0.037843

Bootstrap SD's:

(Intercept)	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM
0.17198394	0.04803080	0.01409721	0.06217401	0.02779706	0.02908133	0.13684435

PW:JOBSAT	GENDERNUM:COM	AGENUM:COM
0.02169160	0.05463649	0.01529318

Nonparametric Bootstrap Confidence Intervals:

	(Intercept)	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM	PW:JOBSAT
2.5%	-0.9234434	0.06115424	-0.01818903	0.04761541	0.07031167	-0.3384812	-0.54947267	-0.004106085
97.5%	-0.2635800	0.24842371	0.03793010	0.28035444	0.17825412	-0.2256562	-0.01936064	0.078679248

	GENDERNUM:COM	AGENUM:COM
2.5%	-0.18876752	0.007664862
97.5%	0.02104689	0.066615436

Parametric Normal Theory Confidence Intervals:

	2.5 %	97.5 %
(Intercept)	-0.948619764	-0.24691882
GENDERNUM	0.058031593	0.24864373
AGENUM	-0.018779112	0.03717569
SUPNUM	0.041629512	0.28844662
PW	0.073858276	0.18080179
JOBSAT	-0.337912139	-0.22975576
COM	-0.555180113	-0.02089050
PW:JOBSAT	-0.002126219	0.07806833
GENDERNUM:COM	-0.185551841	0.02420978
AGENUM:COM	0.007058294	0.06862677

Table 11

Full Two-Variable Interaction Model LMG

Resample “data” with replacement; resamples =1000

Original Model Fit:

```
TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM + GENDERNUM:AGENUM + GENDERNUM:SUPNUM +
AGENUM:SUPNUM +
    GENDERNUM:PW + AGENUM:PW + SUPNUM:PW + GENDERNUM:JOBSAT + AGENUM:JOBSAT + SUPNUM:JOBSAT +
PW:JOBSAT +
    GENDERNUM:COM + AGENUM:COM + SUPNUM:COM + PW:COM + JOBSAT:COM
Coefficients:
  (Intercept)    GENDERNUM     AGENUM     SUPNUM       PW     JOBSAT
   -0.288602    -0.209438   0.006509   0.133727   0.251340  -0.679769

      COM GENDERNUM:AGENUM GENDERNUM:SUPNUM   AGENUM:SUPNUM   GENDERNUM:PW     AGENUM:PW
   0.110066     0.023317     0.109984    -0.020455    -0.003124    -0.005082

   SUPNUM:PW GENDERNUM:JOBSAT   AGENUM:JOBSAT   SUPNUM:JOBSAT     PW:JOBSAT   GENDERNUM:COM
   -0.045937     0.074619     0.012149     0.114570     0.064405    -0.143330

  AGENUM:COM    SUPNUM:COM      PW:COM    JOBSAT:COM
   0.026913    -0.121581    -0.038869     0.027000
Bootstrap SD's:
  (Intercept)    GENDERNUM     AGENUM     SUPNUM       PW     JOBSAT
  0.75796815   0.32705421   0.09632354   0.34214633   0.21622134   0.22640776

      COM GENDERNUM:AGENUM GENDERNUM:SUPNUM   AGENUM:SUPNUM   GENDERNUM:PW     AGENUM:PW
  0.29769672   0.03108789   0.13125548   0.04084607   0.05702329   0.01737010

   SUPNUM:PW GENDERNUM:JOBSAT   AGENUM:JOBSAT   SUPNUM:JOBSAT     PW:JOBSAT   GENDERNUM:COM
  0.07111376   0.06067330   0.01829850   0.07982623   0.03106101   0.08311881

  AGENUM:COM    SUPNUM:COM      PW:COM    JOBSAT:COM
  0.02495513   0.10678654   0.04495570   0.02043978
```

Bootstrap Confidence Intervals:

```
      (Intercept) GENDERNUM   AGENUM   SUPNUM     PW
2.5%     -1.713293 -0.8388226 -0.1819775 -0.5491768 -0.1548815
97.5%     1.162997 0.4508273 0.1932305 0.8491654 0.6493486

     JOBSAT    COM  GENDERNUM:AGENUM  GENDERNUM:SUPNUM
2.5% -1.1177323 -0.4688962     -0.03625747     -0.1496754
97.5% -0.2410734 0.7009654     0.08570949      0.3648916

    AGENUM:SUPNUM GENDERNUM:PW   AGENUM:PW     SUPNUM:PW
2.5%   -0.10200823  -0.1153220  -0.03777602    -0.18958921
97.5%   0.06270913   0.1071050  0.02875853     0.09220212

   GENDERNUM:JOBSAT  AGENUM:JOBSAT SUPNUM:JOBSAT   PW:JOBSAT
2.5%    -0.0411614   -0.02421976  -0.04030897  0.002859797
97.5%    0.1960186   0.04728284   0.26857192  0.121794568

   GENDERNUM:COM AGENUM:COM SUPNUM:COM   PW:COM JOBSAT:COM
2.5%  -0.29523178 -0.02395386 -0.33995948 -0.12240085 -0.01286188
97.5%  0.02101323 0.07420337 0.08953806 0.04865587 0.07111724
```

(*table continues*)

Table 11 (*continued*).

Parametric Normal Theory Confidence Intervals:

	2.5 %	97.5 %
(Intercept)	-1.83650925	1.259305956
GENDERNUM	-0.86824282	0.449367484
AGENUM	-0.18441692	0.197433972
SUPNUM	-0.57556896	0.843022501
PW	-0.16933591	0.672015512
JOBSAT	-1.11178677	-0.247751751
COM	-0.46368274	0.683814685
GENDERNUM:AGENUM	-0.03623746	0.082872456
GENDERNUM:SUPNUM	-0.15939309	0.379360345
AGENUM:SUPNUM	-0.10238464	0.061473715
GENDERNUM:PW	-0.11364503	0.107396462
AGENUM:PW	-0.03839441	0.028229666
SUPNUM:PW	-0.19277618	0.100901994
GENDERNUM:JOBSAT	-0.03799827	0.187236944
AGENUM:JOBSAT	-0.02141864	0.045716848
SUPNUM:JOBSAT	-0.03948565	0.268625447
PW:JOBSAT	0.00604552	0.122765451
GENDERNUM:COM	-0.29663938	0.009979372
AGENUM:COM	-0.01950968	0.073336177
SUPNUM:COM	-0.32743083	0.084269346
PW:COM	-0.12119385	0.043455147
JOBSAT:COM	-0.01229458	0.066294789

The best overall model produced by the best subsets regression approach maximized explained variance and has 10 terms, with an adjusted R^2 of .165, and a corresponding observed R^2 of .162. (See Table 12.) The linear regression model for model 10 is based on type I (sequential) sums of squares estimates.

The final model chosen by the best subsets regression method includes the following terms (note that ":" denotes interaction terms):

TURN = PW + JOBSAT + GENDERNUM:SUPNUM +GENDERNUM:JOBSAT +

SUPNUM:JOBSAT + PW:JOBSAT + GENDERNUM:COM +

AGENUM:COM+ SUPNUM:COM + JOBSAT:COM

Notice that in the best subsets output, the lower order terms (main effects) for the interaction terms of GENDERNUM, SUPNUM and COM are not included in the model. Normally, sequential regression methods do not leave out lower order terms when higher order terms are included in the model. Additionally, best subsets regression does not take into account sampling variability in its estimates of model fit. This method also doesn't factor in model uncertainty whenever a "best" selected model is chosen. All of these shortcomings tend to inflate and overfit the best subsets model. It maximizes explained variance at the expense of parsimony (Gromping, 2007). For these reasons a backward-stepwise procedure was applied to the baseline full two-variable interaction model. (See Table 7.)

Once a model is chosen using the backward-stepwise AIC strategy, a comparison is made of the newly generated reduced model with the baseline model. The method then identifies and eliminates a term that causes the largest increase in the Akaike's Information Criterion (AIC) index when the variable is in the model. AIC is a model fit index that balances the complexity of a model with its prediction accuracy. Overfitting and underfitting a model reduce predictive power and increase bias. AIC is thus an index of model parsimony that selects optimal models that both do not over-fit and have good predictive validity. Models with smaller AIC values are preferred over models with larger AIC values.

Table 12

Best Subsets Full Model Regression

Num	**p**	**rsq**	**rss**	**adjr2**	**cp**	**bic**	**stderr**
1	2 0.	142	4029	0.142	56.396	-394	1.23
2	3 0.	150	3993	0.150	33.996	-410	1.23
3	4 0.	156	3966	0.155	18.167	-420	1.22
4	5 0.	160	3945	0.159	5.906	-426	1.22
5	6 0.	162	3936	0.161	1.817	-424	1.22
6	7 0.	163	3931	0.161	0.447	-420	1.22
7	8 0.	164	3929	0.162	1.159	-413	1.22
8	9 0.	164	3927	0.162	1.976	-406	1.22
9	10	0.164	3926	0.162	2.971	-399	1.22
10	**11**	**0.165**	**3923**	**0.162**	**3.167**	**-393**	**1.22**
11	12	0.165	3922	0.162	4.351	-386	1.22
12	13	0.165	3921	0.162	5.863	-379	1.22
13	14	0.165	3921	0.161	7.602	-371	1.22
14	15	0.166	3920	0.161	9.094	-364	1.22
15	16	0.166	3919	0.161	10.660	-356	1.22
16	17	0.166	3919	0.161	12.377	-349	1.22
17	18	0.166	3919	0.161	14.234	-341	1.22
18	19	0.166	3919	0.160	16.095	-333	1.22
19	20	0.166	3918	0.160	18.008	-326	1.22
20	21	0.166	3918	0.160	20.003	-318	1.22
21	22	0.166	3918	0.159	22.000	-310	1.22

model with largest adjr2
10

Number of observations
2663
:

Model: TURN ~ PW + JOBSAT + GENDERNUM:SUPNUM + GENDERNUM:JOBSAT +
SUPNUM:JOBSAT + PW:JOBSAT + GENDERNUM:COM + AGENUM:COM +
SUPNUM:COM + JOBSAT:COM

Residuals:

Min	1Q	Median	3Q	Max
-3.3120	-0.9777	-0.1787	0.8107	3.8568

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.26357	0.06995	-3.768	0.000168	***
PW	0.12739	0.02695	4.728	2.39e-06	***
JOBSAT	-0.58970	0.13705	-4.303	1.75e-05	***
GENDERNUM:SUPNUM	0.08624	0.02241	3.849	0.000121	***
JOBSAT:GENDERNUM	0.07745	0.05110	1.516	0.129687	
JOBSAT:SUPNUM	0.10900	0.06337	1.720	0.085547	.
PW:JOBSAT	0.04646	0.02106	2.207	0.027423	*
GENDERNUM:COM	-0.14493	0.06501	-2.229	0.025868	*
AGENUM:COM	0.03962	0.01439	2.753	0.005938	**
SUPNUM:COM	-0.10771	0.06324	-1.703	0.088640	.
JOBSAT:COM	0.02929	0.01990	1.472	0.141199	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.216 on 2652 degrees of freedom
Multiple R-Squared: 0.165, Adjusted R-squared: 0.1618
F-statistic: 52.39 on 10 and 2652 DF, p-value: < 2.2e-16

(table continues)

Table 12 (*continued*).

Anova Table (Type III tests)

Response: TURN

	Sum Sq	Df	F value	Pr(>F)
(Intercept)	21.0	1	14.1984	0.0001681 ***
PW	33.1	1	22.3497	2.391e-06 ***
JOBSAT	27.4	1	18.5130	1.749e-05 ***
GENDERNUM:SUPNUM	21.9	1	14.8133	0.0001215 ***
JOBSAT:GENDERNUM	3.4	1	2.2977	0.1296873
JOBSAT:SUPNUM	4.4	1	2.9584	0.0855466 .
PW:JOBSAT	7.2	1	4.8694	0.0274228 *
GENDERNUM:COM	7.4	1	4.9704	0.0258682 *
AGENUM:COM	11.2	1	7.5812	0.0059381 **
SUPNUM:COM	4.3	1	2.9010	0.0886403 .
JOBSAT:COM	3.2	1	2.1661	0.1411994
Residuals	3923.2	2652		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

In backward-stepwise elimination, all model comparison starts with the full 21-term baseline model and then eliminates non-contributing or overfitted terms new bootstrap (resampled with replacement from the original dataset) sampled data set is selected to produce a new sample of size N=2663, and the entire backward-stepwise procedure starts again using the baseline full two-variable interaction model's 21 total terms.

This procedure is iterated to produce 500 stepwise selected AIC models, for the 500 bootstrap resampled data sets. The output from the stepwise AIC process is found in Table 13, full two-variable interaction model AIC. The stepwise selected model with the smallest AIC, from the 500 stepwise model fits, was reported. This is the reduced two-variable interaction model found in Table 9.

Three frequency measures for terms are tabulated across the 500 bootstrap samples, and percentages are calculated. (See Table 13.) "Coefficient sign" is the percentage of samples in which a term coefficient was positive and negative in value. Good candidate terms for inclusion in a final model will not reverse in sign across resampled data sets, i.e. going from a positive beta coefficient to a negative beta coefficient and vice-versa. “Covariance Selected” is the percentage of time a term was selected for inclusion. Good candidate terms for inclusion in a final model will be found to be predictors consistently selected across resampled data sets, and meeting a threshold criterion.

Table 13

Full Two-Variable Interaction Model AIC

Model: TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM + GENDERNUM:AGENUM + GENDERNUM:SUPNUM + AGENUM:SUPNUM + GENDERNUM:PW + AGENUM:PW + SUPNUM:PW + GENDERNUM:JOBSAT + AGENUM:COM + SUPNUM:COM + PW:COM + JOBSAT:COM

Method:

Bootstrap samples: 500 (Percentages in table below are out of 500 bootstrap samples)
Stepwise Direction: Backward
Penalty Term: 2 * df

Coefficients Sign	+ (%)	- (%)	**Covariates selected**	(%)	**Stat Significance**	(%)
PW	92.40	7.60	COM	100.0	JOBSAT	98.00
SUPNUM	75.41	24.59	JOBSAT	100.0	PW	88.80
GENDERNUM	59.56	40.44	PW	100.0	GENDERNUM	62.78
AGENUM	57.02	42.98	GENDERNUM	99.4	SUPNUM	60.16
COM	51.60	48.40	SUPNUM	98.4	COM	41.00
JOBSAT	0.20	99.80	AGENUM	96.8	AGENUM	20.25
PW:JOBSAT	100.00	0.00	PW:JOBSAT	76.6	PW:JOBSAT	82.77
SUPNUM:JOBSAT	100.00	0.00	GENDERNUM:COM	67.6	AGENUM:COM	82.24
JOBSAT:COM	99.17	0.83	AGENUM:COM	51.8	AGENUM:JOBSAT	80.37
AGENUM:COM	97.30	2.70	JOBSAT:COM	48.2	GENDERNUM:COM	70.71
GENDERNUM:JOBSAT	95.58	4.42	SUPNUM:JOBSAT	46.8	JOBSAT:COM	61.41
GENDERNUM:AGENUM	95.38	4.62	GENDERNUM:JOBSAT	45.2	SUPNUM:COM	61.08
AGENUM:JOBSAT	94.98	5.02	AGENUM:JOBSAT	43.8	SUPNUM:JOBSAT	60.26
GENDERNUM:SUPNUM	92.68	7.32	SUPNUM:COM	40.6	GENDERNUM:JOBSAT	59.73
GENDERNUM:PW	42.86	57.14	PW:COM	34.6	PW:COM	50.87
AGENUM:PW	23.23	76.77	GENDERNUM:AGENUM	26.0	GENDERNUM:SUPNUM	48.78
AGENUM:SUPNUM	21.51	78.49	GENDERNUM:SUPNUM	24.6	GENDERNUM:AGENUM	48.46
PW:COM	12.72	87.28	SUPNUM:PW	24.6	SUPNUM:PW	42.28
SUPNUM:COM	6.90	93.10	AGENUM:PW	19.8	GENDERNUM:PW	38.10
SUPNUM:PW	3.25	96.75	AGENUM:SUPNUM	18.6	AGENUM:PW	37.37
GENDERNUM:COM	0.30	99.70	GENDERNUM:PW	16.8	AGENUM:SUPNUM	36.56

(table continues)

Table 13 *(continued).*

TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM + PW:JOBSAT + GENDERNUM:COM + AGENUM:COM

	Step	Df	Deviance	Resid. Df	Resid. Dev	AIC
1				2641	3918 .453	1072.567
2	- GENDERNUM:PW	1	0.004558840	2642	3918 .458	1070.570
3	- AGENUM:PW	1	0.136135950	2643	3918 .594	1068.663
4	- AGENUM:SUPNUM	1	0.281329864	2644	3918 .875	1066.854
5	- SUPNUM:PW	1	0.491147881	2645	3919 .366	1065.187
6	- AGENUM:JOBSAT	1	0.861849014	2646	3920 .228	1063.773
7	- GENDERNUM:AGENUM	1	1.037777040	2647	3921 .266	1062.478
8	- GENDERNUM:SUPNUM	1	0.897508418	2648	3922 .164	1061.087
9	- PW:COM	1	1.188524961	2649	3923 .352	1059.894
10	- SUPNUM:COM	1	1.815868429	2650	3925 .168	1059.126
11	- SUPNUM:JOBSAT	1	1.104705344	2651	3926 .273	1057.876
12	- GENDERNUM:JOBSAT	1	1.899186202	2652	3928 .172	1057.164
13	- JOBSAT:COM	1	2.132030799	2653	3930 .304	1056.609

"Stat Significance" is the percentage of samples that a term was deemed statistically significant at an alpha criterion of .05. Good candidate terms for inclusion a final model are those found statistically significant across resampled data sets. The final model chosen by the bootstrapped stepwise procedure is displayed in Table 9:

TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM + PW:JOBSAT + GENDERNUM:COM + AGENUM:COM

All of the terms in this final AIC model were included in 50% or more of the 500 best subsets bootstrap stepwise model fits (bold relationships in Table 12). Additionally, all of these terms were statistically significant in 70% or more of the 500 AIC bootstrap samples, stepwise model fits. (See Table 13.)

Note that in the stepwise method output, all of the lower order terms are present for the higher order interaction terms that contain them. Comparing these results to the best-subset fit in 10 shows that all the interaction terms in the stepwise selected model are also in the best subsets selected model, including the main effects of PW and JOBSAT.

The main difference when comparing the two outputs is that the best subsets selected model includes five other interaction effects that do not include their lower order main effects, AGENUM, GENDERNUM and SUPNUM. In addition, the terms that appear in the best subsets fit, but do not appear in the bootstrap stepwise model fits are: GENDERNUM:SUPNUM, JOBSAT:GENDERNUM, JOBSAT:SUPNUM, SUPNUM:COM, and JOBSAT:COM.

The adjusted R^2 for the best subsets and the bootstrap stepwise AIC fits are comparable: .1618 (best subsets) and .1606 (bootstrap stepwise). The main difference is that the bootstrap stepwise AIC selected model has a smaller number of interaction terms. It produced a simpler model) while still achieving the same levels of prediction.

Furthermore, the stepwise AIC selected model has one less term for the whole model (9 terms versus 10 terms for the best subsets selected model). These differences are likely due to the fact that best subsets does not take sampling variability into account when optimizing model fit. The bootstrap stepwise AIC procedure takes into account model uncertainty, sampling variability, and produces a simpler predictive model.

For these reasons, the bootstrap stepwise AIC selected model referred to as the reduced two-variable interaction model (Table 9) was selected for final data analysis and interpretation. Table 9 displays the OLS multiple regression parameter estimates. The reduced model has a residual standard error of 1.217 on 2653 degrees of freedom. The multiple R^2 is 0.1634 with the adjusted R^2 being equal to 0.1606. The F-statistic is 57.59 on 9 and 2653 df, with the observed ***p***-value for the model less than .000.

Terms that appear statistically significant for an alpha criterion less than .05 are for main effects of GENDERNUM, SUPNUM, JOBSAT, COM, and for interaction effects of AGENUM by COM. Interaction effects of PW by JOBSTAT appear statistically significant at an alpha criterion cutoff of .10. The relative importance of the terms in the model (LMG statistic), rank ordering, and confidence intervals are displayed in Table 10.

The total observed variance accounted for in TURN by the predictor set is 16.34%. Of this 16.34% accounted for in the outcome variable TURN, each statistically significant term (alpha<.05) independently contributes the following proportion of variance explained (variance is normalized to sum to 100%): JOBSAT (.38); COM (.18); AGENUM by COM (.16); PW (.07); GENDERNUM (.02); and SUPNUM (.01).

We can see from Table 10 that the non-parametric bootstrap confidence intervals for the relative importance metrics do not overlap (see Overlap Status column) for terms JOBSAT (A), PW (E) and the interaction term AGENUM by COM (D). The coefficient for JOBSAT is negative, implying that as job satisfaction increases turnover intention decreases. The coefficient for PW is positive implying that as perceived workload increases turnover intention increases.

For those terms whose confidence intervals do overlap, we cannot distinguish the relative independent contributions of the terms from those overlapped. For example, AGENUM, SUPNUM, GENDERNUM and PW by JOBSAT confidence intervals overlap (FGH). Also, the confidence intervals for COM and GENDERNUM by COM overlap (BC).

The bootstrap confidence intervals are useful for not over-interpreting the relative importance metric whenever there is too much uncertainty as to the true rankings of the independent effects of the predictors within the population.

Mediator and Moderator Testing Results

The confirmatory hypotheses being tested in this study suggest that moderator rather than mediator effects are prevalent in the data set under study. Even though not hypothesized, mediating effects and relationships are central to the models that this study's research model is based on, and are of interest.

For potential mediator relationships (JOBSAT and COM as mediators) to be present in the data set, it is expect that sequentially tested regression models necessary that the following models have statistically significant coefficients: (a) JOBSAT predicted by PW, (b) COM predicted by JOBSAT, (c) TURN predicted by COM. Additionally, the mediators (JOBSAT and COM) need to have statistically non-significant coefficients in: (d) TURN predicted by PW and JOBSAT, and (e) TURN predicted by PW, JOBSAT and COM.

The results of mediation testing are found in Table 14. All results were evaluated at an alpha threshold of .05. The results indicate that: (a) JOBSAT = PW is statistically significant with an adjusted R^2 of .04, (b) COM = JOBSAT is statistically significant with an adjusted R^2 of .54, (c) TURN = PW is statistically significant with an adjusted R^2 of .024, (d) TURN = PW + JOBSAT indicates JOBSAT has a statistically significant relationship (JOBSAT should go to zero if JOBSAT is a mediator variable), (e) TURN = PW + JOBSAT + COM indicates JOBSAT and COM have significant effects (JOBSAT and COM should also go to zero in this model to support mediation). The results tentatively support the lack of any mediation effects, but do support a moderated effect of AGE on commitment level in predicting turnover intention (TURN).

Table 14

Mediator Relationships

Model:

JOBSAT = PW

```
Residuals:
  Min   1Q   Median   3Q    Max
-4.4419 -0.5663 0.3464   0.9235 1.9017

Coefficients:
         Estimate   Std. Error   t value    Pr(>|t|)
(Intercept) -1.551e-16 2.436e-02  -6.37e-15    1
PW       -3.029e-01 2.683e-02  -11.29     <2e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.257 on 2661 degrees of freedom
Multiple R-Squared: 0.04573,               Adjusted R-squared: 0.04537
F-statistic: 127.5 on 1 and 2661 DF, p-value: < 2.2e-16
```

Anova Table (Type III tests)

```
Response: JOBSAT
       Sum Sq  Df    F value   Pr(>F)
(Intercept)  0.0        1           4.056e-29   1
PW          201.4   1  127.51    <2e-16 ***
Residuals  4203.8 2661
```

(table continues)

Table 14 (*continued).*

Model:

COM = JOBSAT
Med2 = Med1

```
Residuals:
 Min    1Q    Median   3Q   Max
-2.9104  -0.3676   0.1136   0.4341 2.2680

Coefficients:
        Estimate    Std. Error     t value    Pr(>|t|)
(Intercept) -6.635e-17  1.214e-02        -5.46e-15    1
JOBSAT    5.280e-01  9.441e-03           55.92     <2e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6266 on 2661 degrees of freedom
Multiple R-Squared: 0.5403,  Adjusted R-squared: 0.5401
F-statistic: 3127 on 1 and 2661 DF, p-value: < 2.2e-16
```

<u>Anova Table (Type III tests)</u>

```
Response: COM
         Sum Sq    Df     F value   Pr(>F)
(Intercept)    0.0     1             2.985e-29   1
JOBSAT      1227.9  1             3127     <2e-16 ***
Residuals    1044.9 266          1
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Model:

TURN = JOBSAT
DV = Med1

```
Residuals:
 Min    1Q    Median   3Q    Max
-3.1749  -1.1095  -0.2676   0.9123 3.8430

Coefficients:
        Estimate     Std. Error    t value   Pr(>|t|)
(Intercept) -1.175e-16   2.384e-02   -4.93e-15    1
JOBSAT   -3.898e-01   1.854e-02    -21.03     <2e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.23 on 2661 degrees of freedom
Multiple R-Squared: 0.1425,  Adjusted R-squared: 0.1422
F-statistic: 442.1 on 1 and 2661 DF, p-value: < 2.2e-16
```

<u>Anova Table (Type III tests)</u>

```
Response: TURN
        Sum Sq     Df     F value   Pr(>F)
(Intercept)  0.0                    1            2.428e-29   1
JOBSAT    669.4      1             442.12   <2e-16 ***
Residuals  4028.8 266           1
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

(table continues)

Table 14 (*continued).*

Model:

TURN = COM
DV = Med2

```
Residuals:
 Min     1Q    Median   3Q    Max
-2.7171  -1.0494  -0.1970   0.8685  3.8423

Coefficients:
        Estimate     Std. Error     t value   Pr(>|t|)
(Intercept) -1.267e-16          2.426e-02              -5.22e-15    1
COM     -4.825e-01              2.626e-02              -18.38    <2e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.252 on 2661 degrees of freedom
Multiple R-Squared: 0.1126,  Adjusted R-squared: 0.1123
F-statistic: 337.7 on 1 and 2661 DF, p-value: < 2.2e-16
```

<u>Anova Table (Type III tests)</u>

```
Response: TURN
       Sum Sq      Df    F value    Pr(>F)
(Intercept)  0.0                   1             2.73e-29   1
COM       529.1       1               337.7   <2e-16 ***
Residuals   4169.1 266           1
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Model:

TURN = PW
DV = X1

```
Residuals:
 Min      1Q   Median    3Q    Max
-1.9657   -1.1427  -0.1940   0.9056  3.6701

Coefficients:
       Estimate      Std. Error     t value    Pr(>|t|)
(Intercept) -6.198e-17          2.543e-02              -2.44e-15    1
PW      2.307e-01   2.801e-02                 8.236     2.75e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.312 on 2661 degrees of freedom
Multiple R-Squared: 0.02486,              Adjusted R-squared: 0.02449
F-statistic: 67.84 on 1 and 2661 DF, p-value: 2.75e-16
```

<u>Anova Table (Type III tests)</u>

```
Response: TURN
       Sum Sq      Df     F value    Pr(>F)
(Intercept)  0.0                   1             5.942e-30    1
PW        116.8         1             67.838    2.75e-16 ***
Residuals  4581.4 2661
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

(*table continues*)

Table 14 (*continued*).

Model:

TURN = PW + JOBSAT
DV = X1 + Med1

```
Residuals:
  Min     1Q     Median   3Q    Max
-3.2349   -1.0126   -0.1791   0.8346  3.8371

Coefficients:
        Estimate     Std. Error   t value   Pr(>|t|)
(Intercept) -1.197e-16          2.376e-02 -            5.04e-15    1
PW          1.180e-01           2.679e-02   4.403    1.11e-05 ***
JOBSAT   -3.720e-01             1.891e-02            -19.669   < 2e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.226 on 2660 degrees of freedom
Multiple R-Squared: 0.1487,  Adjusted R-squared: 0.148
F-statistic: 232.3 on 2 and 2660 DF, p-value: < 2.2e-16
```

<u>Anova Table (Type III tests)</u>

```
Response: TURN
        Sum Sq      Df     F value     Pr(>F)
(Intercept)  0.0                   1            2.537e-29       1
PW          29.2        1            19.390      1.108e-05 ***
JOBSAT                 581.7       1            386.887      < 2.2e-16 ***
Residuals  3999.7 2660
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Model:

TURN = PW + JOBSAT + COM
DV = X1 + Med1 + Med2

```
Residuals:
 Min    1Q   Median   3Q    Max
-3.2245  -0.9981 -0.1758   0.8328 3.8470

Coefficients:
        Estimate    Std. Error   t value    Pr(>|t|)
(Intercept) -1.313e-16          2.367e-02             -5.55e-15      1
PW          1.134e-01            2.671e-02             4.247                    2.24e-05 ***
JOBSAT   -2.798e-01             2.734e-02             -10.234    < 2e-16 ***
COM      -1.759e-01             3.781e-02             -4.652      3.44e-06 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.221 on 2659 degrees of freedom
Multiple R-Squared: 0.1556,  Adjusted R-squared: 0.1546
F-statistic: 163.3 on 3 and 2659 DF, p-value: < 2.2e-16
```

<u>Anova Table (Type III tests)</u>

```
Response: TURN
       Sum Sq      Df      F value      Pr(>F)
(Intercept)  0.0                   1            3.076e-29       1
PW          26.9        1            18.034     2.244e-05 ***
JOBSAT                156.3       1            104.725   < 2.2e-16 ***
COM       32.3        1            21.646     3.440e-06 ***
Residuals  3967.4 2659
```

The reduced two-variable interaction model (Table 9) indicates that age moderation of the commitment-turnover relationship is significant at the .05 level. Table 15 restates the moderator relationships found in this model.

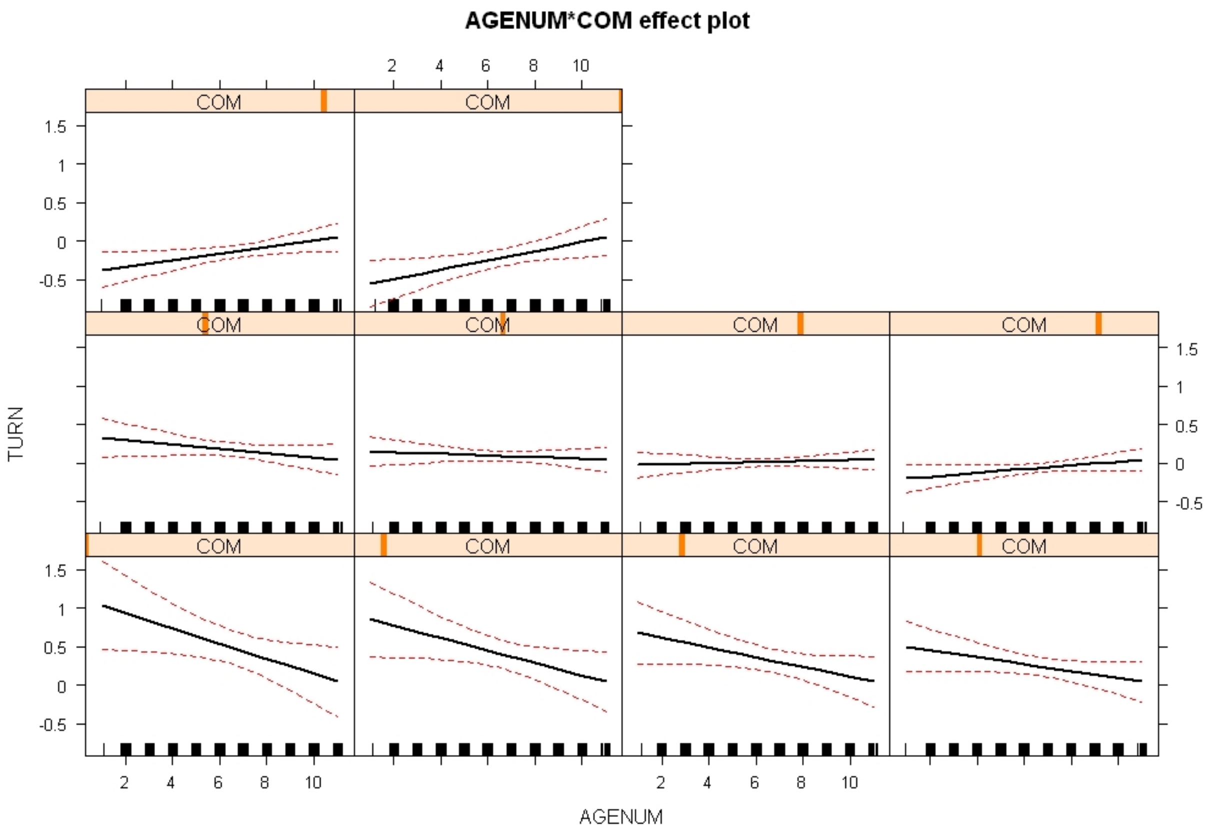

Figure 9. The moderating effect of age on the commitment-turnover relationship.

The TURN ~ AGENUM:COM relationship is graphically represented in Figure 9. This figure is essentially a three way relationship, where the x axis (AGENUM) and y-axis (TURN) have common scaling across 10 levels of COM. The graph is read left to right and bottom to top. Each of the 10 boxes represents a different level of commitment, with the least on the bottom left, and the highest at the top right. Note the movement of the orange bar across the COM panel from box to box. This movement indicates level changes in commitment relative to the relationship between AGENUM and TURN.

Table 15

Moderator Relationships

```
TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT +
   COM + GENDERNUM:COM + AGENUM:COM + SUPNUM:COM + PW:JOBSAT

Residuals:
  Min     1Q   Median   3Q    Max
-3.2556  -0.9668  -0.1773  0.8161 3.8552

Coefficients:
                 Estimate   Std. Error  t value    Pr(>|t|)
(Intercept)      -0.601887   0.179645   -3.350   0.000818 ***
GENDERNUM         0.153816   0.048647    3.162   0.001585 **
AGENUM            0.009034   0.014284    0.632   0.527173
SUPNUM            0.167114   0.063442    2.634   0.008485 **
PW                0.127147   0.027283    4.660   3.31e-06 ***
JOBSAT           -0.283555   0.027604  -10.272    < 2e-16 ***
COM              -0.250235   0.198277   -1.262    0.207043
GENDERNUM:COM    -0.081770   0.053660   -1.524   0.127666
AGENUM:COM        0.037586   0.015733    2.389    0.016961 *
SUPNUM:COM       -0.018718   0.071323   -0.262   0.793003
PW:JOBSAT         0.037467   0.020542    1.824   0.068281 .
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.217 on 2652 degrees of freedom
Multiple R-Squared: 0.1635,   Adjusted R-squared: 0.1603
F-statistic: 51.82 on 10 and 2652 DF, p-value: < 2.2e-16

Anova(LinearModel.4p.3)

Anova Table (Type II tests)

Response: TURN
               Sum Sq   Df  F value  Pr(>F)
GENDERNUM       14.3     1   9.6489   0.001915 **
AGENUM           0.7     1   0.4930   0.482649
SUPNUM          10.2     1   6.8741   0.008795 **
PW              32.2     1  21.7438   3.270e-06 ***
JOBSAT         151.6     1 102.2855   < 2.2e-16 ***
COM             28.1     1  18.9544   1.390e-05 ***
GENDERNUM:COM    3.4     1   2.3221   0.127666
AGENUM:COM       8.5     1   5.7076   0.016961 *
SUPNUM:COM       0.1     1   0.0689   0.793003
PW:JOBSAT        4.9     1   3.3266   0.068281 .
Residuals     3930.2  2652
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Figure 9 implies that at the lowest levels of commitment (COM), the relationship between turnover intention and age of respondent is the highest (steepest negative slope). At the lowest levels of COM, young respondents indicate a higher intention to leave than do older respondents. As commitment levels rise, this relationships drops to zero then reverses such that at the highest levels of commitment, older respondents have an increasing intention to turnover.

Hypotheses Testing Results

No moderating effects other than age-commitment were found, so Hypotheses 1, 2, and 6 were not supported. Hypothesis 3 was partially supported. Although no significant moderating relationship was found between age and the stress-satisfaction association, a significant moderating effect of age on the commitment-turnover relationship was supported. Hypotheses 4 and 5 were supported only when the TURN ~ AGENUM:COM results were exploded into 10 subpopulations of commitment so that a rate of change might be observed. Both Hypotheses 4 and 5 were supported only in the presence of low commitment levels. At moderate to high commitment levels, the relationship between age and turnover was insignificant. Hypothesis 7 was not supported in that gender did have a significant though small direct effect on turnover intention. Finally, Hypothesis 8 was partially supported in that moderation did occur with the commitment-turnover relationship, but not the stress-satisfaction association.

The discussion section will analyze and interpret the data results presented in this section. Unexpected results will be explored, implications for research and practice offered, as well as limits of this study and recommendations for future research.

CHAPTER 4

ANALYSIS AND DISCUSSION

The discussion section is organized into four sections to examine data findings and implications: (1) assessment of data results and methods, (2) assessment of hypothesis testing and subsequent explanation of unexpected findings, (3) implications for application and research, and (4) limitations of the study and recommendations for future research. This study built on a previous turnover model by adding demographics and exploring subsequent variable interactions (see Figure 5). The central research question concerned whether the demographics of age, gender and occupational level have direct or moderating effect on perceptions of stress, satisfaction, commitment, and turnover intent.

Findings of Results and Methods

In order to explore main variable and covariate relationships, Ordinary Least Squares sequential linear regression was performed on the three main variables (perceived workload, job satisfaction, organizational commitment) of the UNT turnover model. These three factors have been held to be crucial predictors in turnover research for a quarter century (Hackman & Oldham, 1980; Steers & Mowday, 1981). Of interest was how much variance these three factors would explain, and in particular what was the percent variance explained by JSAT and COM.

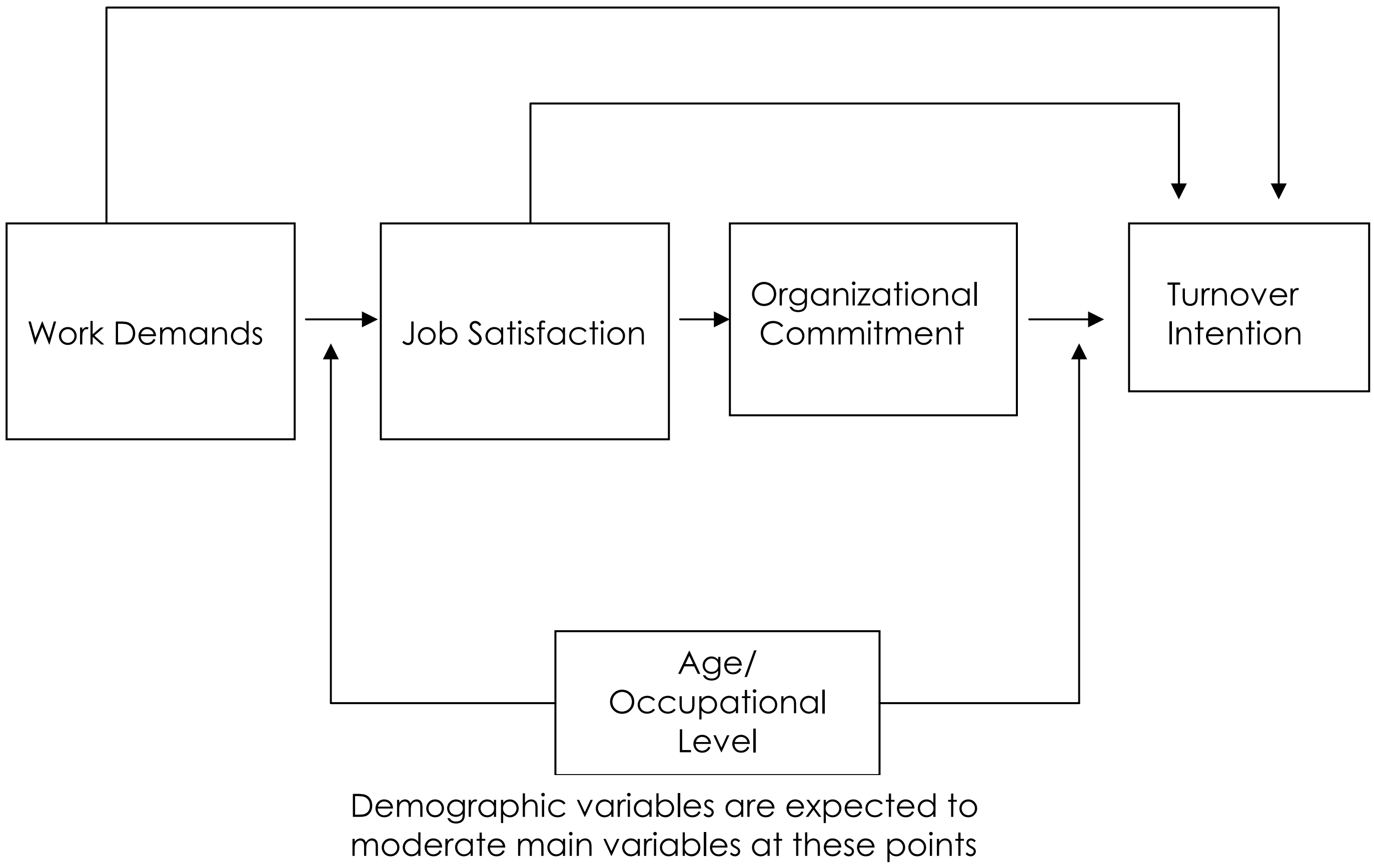

Figure 10. Modified UNT stress-turnover model.

The main point of adding demographics to previous turnover models (see Figures 3-4), was that many modern turnover models contend that commitment is the preeminent predictor of turnover, but get lackluster correlations of this relationship (Lee, Carswell & Allen, 2000). Attempts have been made to rigorously control for differences in conceptualization, operationalization, research design, sample selection, and observation techniques, but most of the variance from these studies of the commitment-turnover relationship remained unaccounted for (meta-analyses by Cohen & Hudecek, 1993, Randall, 1990).

The conclusion reached from several meta-analyses of this issue was that the commitment-turnover relationship was moderated by unidentified confounding effects or latent variables and variables (Randall, 1990).

The demographics of age, gender, and occupational level all had bodies of research associating these covariates with turnover in specific ways. Most turnover models don't conceptualize or include these demographics as moderators, and they were included in this study to see if they significantly explained variance through moderation of the commitment-turnover relationship. These same variables are associated with moderating the stress-satisfaction relationship, and this is reflected in this study's hypotheses.

The results of an ordinary least squares linear regression of the three main variables indicated them to all be highly significantly associated with turnover intent (Table 16), and the variance explained by model was substantial (adjusted R^2 = .1546)(Adjusted R^2 is used in order to increase predictive power and better account for shrinkage and R^2 inflation from overfitting).
When the demographic covariates were added to the three main variables in another OLS regression, two points were striking. (See Table 8.) The first point is that all covariates except for age had significant direct relationships with turnover intention, even though they are widely viewed theoretically as moderators. These divergences from theoretical expectation will be addressed in more detail in a subsequent section. The second point is the remarkably small contribution to explained variance provided by the added demographics.

(adjusted R^2 = .1546 for the main variables vs. adjusted R^2 = .158 when covariates were added). (See Tables 4 and 6.) It was unclear at this point if collinearity or ordering effect was masking or reducing covariate contribution.

Table 16

Reduced Main Effect Model OLS

Model: TURN = PW + JOBSAT + COM

Residuals:

Min	1Q	Median	3Q	Max
-3.2245	-0.9981	-0.1758	0.8328	3.8470

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-1.313e-16	2.367e-02	-5.55e-15	1	
PW	1.134e-01	2.671e-02	4.247	2.24e-05	***
JOBSAT	-2.798e-01	2.734e-02	-10.234	< 2e-16	***
COM	-1.759e-01	3.781e-02	-4.652	3.44e-06	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.221 on 2659 degrees of freedom
Multiple R-Squared: 0.1556, Adjusted R-squared: 0.1546
F-statistic: 163.3 on 3 and 2659 DF, p-value: < 2.2e-16

Anova Table (Type III tests)

Response: TURN

	Sum Sq	Df	F value	Pr(>F)	
(Intercept)	0.0	1	3.076e-29	1	
PW	26.9	1	18.034	2.244e-05	***
JOBSAT	156.3	1	104.725	< 2.2e-16	***
COM	32.3	1	21.646	3.440e-06	***
Residuals	3967.4	2659			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Of particular importance to the research question was the bivariate relationships of the predictors, and another regression was run which added all bivariate associations. (See Table 7.) While the adjusted R^2 was slightly raised to .1593, no significant variables from previous regressions achieved significance, other than job satisfaction. It was likely that the model was losing power and suppressing significant relationships because of overfitting and noise from its 21 elements.

In addition to exploring the relationships posed by the research question, another major issue had now been raised. What was the unique contribution of each predictor, how could the 21-term full model be reduced to one which maximized explained variance and optimized predictor parsimony?

The LMG relative contribution measure served to produce discrete contributions for each predictor, as well as rank orderings and non-parametric bootstrapped confidence intervals (Gromping, 2007). LMG is a metric of relative contribution of a variable and represents the unique predictor R^2 averaged over all possible orderings (permutations). Comparing the parametric results of the OLS regression with the averaged non-parametric results indicated the degree of bias, error, and violations of normality inherent in the dataset. Another consideration is that the LMG measures all sum to 100, so all variance is accounted for by this method.

A comparison of parametric adjusted R^2 (.1546) of the main variables (Table 16) and the LMG averaged adjusted R^2 (.1558) indicates that the parameter estimates of the original OLS regression were quite accurate and little bias or measurement error was apparent.

This interpretation is made based on the nature and products of the OLS and LMG statistic. The OLS statistic produces Type I, or sequential sums of squares. These are fine variance estimates, but presume you have the right model. Different orders of entry will produce different R^2, potential bias and model misspecification, which subsequently adversely affects parameter estimates. Type III sums of squares, which are not sensitive to ordering effects, are often compared with Type I findings, and are provided in the outputs of this study. However, Type III sums of squares are sensitive to the last term entered, and both Type I and Type III sums of squares are biased by multicolinearity. In addition, the R^2 provides an inflated estimate and the adjusted R^2 is often used as a more accurate predictor of true variance within the population. However, even adjusted R^2 is upwardly biased to a degree and predictor variances will not sum to 100% using OLS.

The LMG statistic is obtained by bootstrapping all possible permutations of the predictors. Bootstrap validation can be considered a competitor to cross-validation methods (Gromping, 2007). LMG goes beyond Type I and Type III sums of squares and provides the averaged R^2 contribution for each predictor, similar to model averaging. Averaging models gives better estimate of R^2 and predictor contribution to explained variance than parametric sequential regression. LMG is not subject to ordering effects, multicolinearity, or interaction effects. The LMG relative importance statistic accounts for all variance (sums to 100%) and provides a better estimates of the true R^2 for the population. Comparing the LMG results with the OLS results will give an idea of the degree of bias and error is in the model. LMG and OLS comparisons in this study indicate very similar results, and thus not much bias in the first two OLS regressions. (See Tables 4 and 6.)

This similarity of results from the correlated methods is probably in part due to the large sample size (N = 2663). Parametric regression methods become quite robust to violations of normality with large samples, and error/ bias approaches 0.

Table 17

Reduced Main Effect Model LMG

Relative Importance of Predictors

Response variable: TURN
Total response variance: 1.764918
Analysis based on 2663 observations

3 Regressors:

PW JOBSAT COM
Proportion of variance explained by model: 15.56%
Metrics are normalized to sum to 100%.

Relative importance metrics:

	lmg	square-root-lmg
PW	0.08256567	.29
JOBSAT	0.54911114	.74
COM	0.36832319	.61

Note: "lmg" is the R^2 contribution averaged over orderinç
regressors, cf. e.g. Lindeman, Merenda and Gold 1980,
p.119, or Chevan and Sutherland (1991).

Relative Importance Confidence Intervals:

Confidence interval information (1000 bootstrap replicates; percentile method):

	percentage 0.95	Lower 0.95	Upper 0.95	
PW.	0.0825	__C	0.044	0.138
JOBSAT	0.5491	A__	0.479	0.611
COM	0.3683	_B_	0.308	0.431

Letters indicate the ranks covered by bootstrap CIs.

Differences between Relative Contributions:

	Difference 0.95	Lower 0.950	Upper 0.950	
PW-JOBSAT	-0.466	*	-0.552	-0.361
PW-COM	-0.285	*	-0.369	-0.191
JOBSAT-COM	0.181	*	0.052	0.297

* indicates that CI for difference does not include 0.

Comparing the relative contribution of job satisfaction (square root LMG = .74) and organizational commitment (square root LMG = .69) showed them to be dominant predictors of this model's explained variance with turnover intent (Table 17), particularly when compared with covariate contribution (Table 18). The product of taking the square root of the LMG statistic might be thought of as an effect size (Gromping, 2007). Our results indicate the both job satisfaction and organizational commitment have a substantial impact on turnover decision making, and should be considered when planning organizational interventions.

Convergence is also seen in the similar amount of variability of the parametric OLS confidence intervals and the non-parametric LMG confidence interval bootstrapped estimation. (See Table 17.) This convergence confirms that assumptions of normality have been met and that parametric results don't contain much bias.

Table 18

Main Effect Model LMG

Relative Importance of Predictors

Response variable: TURN
Total response variance: 1.764918
Analysis based on 2663 observations

6 Regressors:

GENDERNUM AGENUM SUPNUM PW JOBSAT COM

Proportion of variance explained by model: 15.99%
Metrics are normalized to sum to 100% (rela=TRUE).

Relative importance metrics:

	lmg	square-root-lmg
GENDERNUM	0.022601778	.05
AGENUM	0.001831939	.04
SUPNUM	0.011678382	.11
PW	0.085707389	.29
JOBSAT	0.527142350	.73
COM	0.351038162	.59

Note: "lmg" is the R^2 contribution averaged over orderings (regressors, cf. e.g. Lindeman, Merenda and Gold 1980, p.119, or Chevan and Sutherland (1991).

Relative Importance Confidence Intervals:

Confidence interval information (1000 bootstrap replicates; percentile method)

	percentage 0.95	Lower 0.95	Upper 0.95	
GENDERNUM	0.0226	___DE_	0.0047	0.0560
AGENUM	0.0018	____EF	0.0001	0.0164
SUPNUM	0.0116	___DEF	0.0016	0.0355
PW	0.0857	__C___	0.0433	0.1407
JOBSAT	0.5271	A_____	0.4623	0.5936
COM	0.3510	_B____	0.2904	0.4051

Letters indicate the ranks covered by bootstrap CIs.

Differences between Relative Contributions:

	difference 0.95		Lower 0.95	Upper 0.95
GENDERNUM-AGENUM	0.0207		-0.001	0.0535
GENDERNUM-SUPNUM	0.0109		-0.018	0.0502
GENDERNUM-PW	-0.063	*	-0.120	-0.007
GENDERNUM-JOBSAT	-0.504	*	-0.580	-0.423
GENDERNUM-COM	-0.328	*	-0.391	-0.256
AGENUM-SUPNUM	-0.009		-0.033	0.0084
AGENUM-PW	-0.083	*	-0.136	-0.036
AGENUM-JOBSAT	-0.525	*	-0.591	-0.455
AGENUM-COM	-0.349	*	-0.402	-0.287
SUPNUM-PW	-0.074	*	-0.128	-0.025
SUPNUM-JOBSAT	-0.515	*	-0.587	-0.438
SUPNUM-COM	-0.339	*	-0.394	-0.272
PW-JOBSAT	-0.441	*	-0.537	-0.339
PW-COM	-0.265	*	-0.345	-0.171
JOBSAT-COM	0.1761	*	0.0701	0.2870

* indicates that CI for difference does not include 0.

(*table continues*)

Table 18 (*continued*).

Bootstrap Estimation of Main Effect Model (resample "data" with replacement; resamples =1000)

Original Model Fit:

Model: TURN = GENDERNUM + AGENUM + SUPNUM + PW + JOBSAT + COM

Coefficients:

(Intercept)	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM
-0.57863	0.14556	0.01104	0.15043	0.12829	-0.27705	-0.16642

Bootstrap SD's:

(Intercept)	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM
0.17309164	0.04671374	0.01480461	0.06093479	0.02793927	0.02944763	0.04089104

Nonparametric Bootstrap Confidence Intervals:

	(Intercept)	GENDERNUM	AGENUM	SUPNUM	PW	JOBSAT	COM
2.5%	-0.9040415	0.05398519	-0.01836863	0.03053945	0.06890674	-0.3353942	-0.24646720
97.5%	-0.2310922	0.24119199	0.03968609	0.26701576	0.17804082	-0.2208439	-0.08670408

Parametric Confidence Intervals (Normal Distribution Theory Assumptions):

	2.5 %	97.5 %
(Intercept)	-0.92976584	-0.22749006
GENDERNUM	0.05022256	0.24088842
AGENUM	-0.01695511	0.03903952
SUPNUM	0.02712895	0.27372495
PW	0.07474473	0.18183632
JOBSAT	-0.33057663	-0.22352046
COM	-0.24067804	-0.09217179

While LMG is a useful measure for parsing explained variance contributions, other methods were needed to address model fit and parsimony. Best subsets regression is a relatively common exploratory approach to model building and maximizing a model's explained variance (Sauerbrei & Schumacher, 2007). Best subsets regression rank orders models which maximize explained based on permutational bootstrapping of all 21 elements of the baseline model. (See Table 7.)

The model chosen by best subsets regression increased explained variance to .1618 and reduced the baseline 21-term model to 10 terms. (See

Table 12.) While explained variance was maximized using best subsets, this method didn't account for sample to sample variation, and the sampling variability was inflating and overfitting the results. This is evident in that the highly significant COM doesn't appear in the significant variables list for the selected model. (See Table 12.)

Best subsets regression results would serve as validation for alternative modeling results. Automated variable and model selection using backward elimination and bootstrap resampling was used to both identify variables that are independent predictors of the outcome variable, and develop parsimonious prediction models (Austin & Tu, 2004). Instead of using the adjusted R^2, as in the best subsets regression, the AIC (Akaike Information Criteria) measure is a tradeoff metric that balances model error/ noise with the number of variables. It is essentially a measure of parsimony and a selection criteria for recommended model fit. The bootstrap AIC technique used to determine the recommended model accounts for both the bias and sampling variation problematic with the best subsets method (Austin & Tu, 2004). In addition, comparison of the model obtained from Stepwise AIC with the original OLS results further validates the amount of bias in the original findings.

The model produced by the stepwise AIC process is named the reduced two-variable interaction model. (See Table 9.) The stepwise AIC method reduces the baseline 21-term model to 9 terms and has an adjusted R^2 of .1606, retaining predictive power while increasing parsimony. Comparison of the confidence intervals in the bootstrap estimate section of Table 10 confirms earlier observations concerning low bias and error in the parametric models.

All of the variables previously identified as significant by previous OLS regressions have been retained. About 70% of these significant terms were identified in the 500 runs of the best subsets regression, providing convergent statistical validity for the AIC model results.

A significant moderator relationship was identified by the AIC model: TURN ~ AGE:COM. Rank ordering of this moderator (Table 10) places it in competition with organizational commitment as the second or third most influential predictor relationship (square root LMG = .42 for COM vs. square root LMG = .41 for AGE:COM), a substantial real world effect. More concerning the implications of this moderation will be discussed in a moment when hypothesis testing results are examined.

No mediating relationships between the main variables were found (Table 14) as all the predictors retained significance when they should have zeroed out. Not finding mediation is surprising, since both the UNT turnover model included main and mediating paths, and many modern models explicitly state such relationships (Elangovan, 2001). More will be said concerning these unexpected results and their implications in a later section.

A final point concerns the ranking and confidence intervals provided by the LMG method. Examining the AIC model (Table 10) rank ordering has implications of what to pay attention to during an organizational intervention.

While interventions aimed at raising a single ranked construct will doubtlessly affect others, the rank ordering does offer a prioritization of importance for applied strategic planning.

The confidence intervals are predictive in nature (Gromping, 2007). If the AIC model were used to collect 100 new samples from diverse populations, results for each predictor are expected to fall within the upper and lower confidence interval boundaries. This information is also useful when planning and prioritizing interventions.

In summary, the results from the AIC model answered clearly the questions concerning variable interactions posed by the main research question: (1) all main variables and covariates except age had a significant direct relationship with turnover intention (2) demographics had a direct rather than moderating relationship, except for AGE:COM, (3) no mediating relationships were found, and (4) only one moderating relationship (AGE:COM) was significant.

Findings of Hypotheses Testing

This study's hypotheses are mostly based on moderating effects of demographics predicted in the literature. The moderating relationship of age on the commitment-turnover relationship might shed some light on unexpected non-confirmatory results. While AGE:COM is significant at the .05 level and account for a substantial portion of explained variance (square root LMG = .41), the dynamics of this moderation is not appreciated until the univariate commitment measure is exploded into 10 subpopulations. (See Figure 8.) The slope and intercept of the regression line relative to turnover intention changes relative to the level of commitment. Treating AGE:COM as a univariate measure not only misses the subtlety of the influence, but also salience in the moderator's rate of change. Note that in the presence of moderate to high commitment, the relationship of age to turnover intent falls to zero. Age may not be significant in the AIC model (Table 9) because of a suppression effect of the rate of change in variable relationships. Masking and suppression was seen earlier due to model overfitting and inflation. Without viewing the relationships between variables in terms of the rate of change, one might miss important information and the information overlooked because the predictor failed to achieve significance. One could posit that all variable interactions can profit from this approach.

Hypotheses 1 and 2 relate to moderation by supervisor level. Both stress-satisfaction, and commitment-turnover relationships were predicted to be moderated by occupational level (Randall, 1990; Schmidt & Daume, 1993). The moderating effect of occupational level is occupation specific, as well as group specific (managers versus non-managers)(Cohen & Hudecek, 1993). While occupational level consistently moderated commitment and turnover intent in white collar workers across occupations, it is unclear if IT professionals were included in the administrative sample used in the Cohen and Hudecek (1993) study. In addition to occupational generalizability, there may be differences posed by a public sector rather than a private sector work environment. Future research could explore these questions.

Hypothesis 3 was partially supported. (See Table 15.) No moderating relationship was found between age and stress-satisfaction. A strong significant moderating influence (beta = .038, LMG = .16, square root LMG = .39) was found for age and the commitment-turnover relationship, and indicates that age has a real and substantial moderating effect on turnover decision making. (See Tables 12 and 13.)

It was predicted that the stress-satisfaction relationship would be moderated by age (Akerstedt et al., 2002). This moderation is predicted through the tenure and maturity of older workers to better handle stress. Older workers were also presumed to experience lower stress due to higher levels of autonomy, efficacy, and tenure (Seppala, 2001). It is suspected that the rate of perceived stress changes relative to commitment levels within the organization, as evidenced by the trends in Figure 8. When commitment levels are polarized low or high within the organization, the influence of demographics such as age cohort and gender may become more salient to turnover decision making. An understanding of such rate change may also explain the mixed results of some studies in the field.

Hypotheses 4 and 5 were partially confirmed. Younger workers were predicted to have highest levels of turnover intention, while oldest worker the lowest. Figure 8 explodes the univariate measure of AGE:COM into 10 levels of commitment. The figure is read left to right, bottom to top. Each box represents varied levels of commitment, the lowest in the bottom left, and the highest in the top right. Note how the orange bar moves in the COM area as one moves across the boxes. The *X* axis is age, divided into 11 categories. The eleven bars at the bottom are density plots, indicating that age is well distributed and representative across the sample. The *Y* axis is turnover intent.

The figure indicates that older workers are indeed less likely to leave and the youngest workers more likely to leave when commitment is lowest. When commitment is moderate to high, there is no moderating relationship between age and turnover intent. There does appear to be a trend that older workers are more likely to leave during the highest levels of organizational commitment. Future research is needed to determine if the slope in box 10 is significant.

The trends indicated by the figure are supported and predicted by the literature. Persons low in commitment reported higher stress levels than those in the same organization with higher commitment levels (Begley and Czajka, 1993). Higher stress, in turn, lowers commitment (Good, Grovalynn & Gentry, 1988; Paramuraman & Alutto, 1978). The hypotheses of this study investigate paired relationships of a moderator with a predictor. Exploding the univariate construct of commitment into subpopulations indicated a change in relational salience between age, commitment and turnover. The literature cited here indicates a higher order issue. The predictors (commitment, stress, and satisfaction) and moderators (supervisor level, age, gender) are inter-related and interdependent, and a rate change in one may influence the salience of other relationships. Such inter-relationships have been found in longitudinal studies, and pose a significant challenge to research and a potential explanation for contradictory research results (Bedeian & Armenakis, 1981; Farkas & Tetrick, 1989; Williams & Hazer, 1986).

Hypothesis 6 was not supported, in that no demographics were found to moderate the stress-satisfaction relationship. The literature predicted higher reported stress levels from persons between 30-45, stemming from increased workload as they advance their career, increased stress from family obligations and work/ life balance concerns, and the conflict between the demands of the organization and cohort values of time for interpersonal relationship (Akerstedt et al., 2002; Jamal & Baba, 1992; Seppala, 2001; Loughlin & Barling, 2001; Watson, Slade, Buske & Topper, 2006). The oldest cohort of workers were predicted by the literature to report less stress, which may be attributable to increased tenure, autonomy, maturity and coping skills, cohort values and work ethic, and decreased child-rearing work-life obligations (Buck, 1972; Bongers, de Winter, Komplier & Hildebrandt, 1993; Schmidt & Daume, 1993). Research findings don't support such direct links between age and stress/ satisfaction relationships, and support the results of this study (Brough & Frame, 2004 Hogan & Martell, 1987; Seers & Graen, 1984; Spinks & Moore, 2007; Tugan, 2004; Walsh, Taber & Beehr, 1980).

Hypothesis 7 predicted that gender would not significantly moderate stress-satisfaction, or commitment-turnover. This hypothesis was supported, as the gender-commitment relationship was not found to be significant at the .05 level. Predictions for the lack of gender influence stem from meta-analyses, which conclude no such bias exists (Lerner et al., 2000; Martoccio & O'Leary, 1988, 1989).

Gender did appear to be influential in explaining turnover variance. The gender-commitment relationship was significant at the .01 level. In addition, LMG results for the commitment-gender relationship explained quite a bit of variance (squared LMG = .41). The lack of .05 significance may be due to a rate change in commitment relative to gender similar to that seen by commitment-age. (See Figure 9.)

While no significant moderating relationships were found for gender, LMG results indicated a real and substantial effect for the GENDERNUM:COM relationship. The lack of statistical significant might be explained by reference to the Bootstrap Estimation section of Table 10. The non-parametric bootstrapped confidence intervals (2.5% = -0.189 and 95% = 0.021) cross signs and include zero, indicating results may be indistinguishable from chance, and the probability of Type I and Type II error is increased.

Explanations of observed turnover variance of the gender-commitment and gender-stress relationships might stem from gender specific responses to environmental stressors. Women report higher psychological levels of stress than men, while men tended towards physiological manifestations of stress (Revicki & Whitley, 1997). Women also appeared to have different coping strategies for workplace stress than men, relying more on social and supervisor support to mitigate stress (Christie & Schultz, 1998). In addition, women's social roles and responsibilities of child-rearing often increase work-life stress, which reciprocally raises overall perceived stress levels (Greenhaus, Collins & Shaw, 2003; Lingard & Sublet, 2002).

Hypothesis 8 was partially supported. While no moderating effects were found for the stress-satisfaction relationship, the commitment-turnover relationship was moderated by age and to some degree gender. In addition, no moderating effects were found for the satisfaction-commitment relationship, as predicted. Lack of moderation among predictor variables implies independence or indirect relationships. The findings of this study were supported by several studies (Curry et al., 1986; Miller, Powell & Seltzer, 1990; Mobley, 1982; Steel & Ovalle, 1984).

The results of hypotheses testing raise important methodological and theoretical questions for research and practice. The complexity and inter-relationships of constructs challenge conventional linear conceptualization and point towards limitations in methodological model building. Traditional psychological tendencies to explain missing variance in terms of individual differences may miss the fundamental dynamic of cognitive processing embedded in a social system. Such processing and assessment is grounded in non-linear informal social networks, which challenge conventional measurement and prediction. Intervention at the level of a social network further challenges traditional conceptualization and practice.

Implications for Research and Practice

The parsimonious and powerful Stepwise AIC model used in this study accounted for 16.34% of turnover intent variance. (See Table 10.) Where is the rest of the variance? There might be a tendency to ascribe missing variance to individual differences in learning and cognition, personality, temperament, and traits (Akerstedt et al., 2002; Barnett & Gareis, 2000; Bhuian, Al-Shamman, & Jefri, 1996; Bhuian & Manguc, 2002; Griffith, Horn & Gaertner, 2000; Jamal & Baba, 1992; Johnson & Hall, 1988; Karasek & Theorell, 1990; Reiner & Zhao, 1999; Salgado, 2002; Ting, 1996). Many environmental factors have been theoretically advanced as influencing turnover behavior, yet these only account for a fraction of potential variance (Griffith, Horn & Gaertner, 2000). While individual differences are an important consideration, fixation on individual level measurement and theory may miss the true nature of the turnover motive and decision making process.

Dealing with Complexity: Integrated Research Methodologies

A traditional approach to turnover research is to add more variables to a model, producing a model extremely difficult to practically test. These complex linear, direct relationships often don't explain much turnover variance and continue to produce controversial and contradictory results (Houkes et al., 2001). Challenges to turnover research are found in the complexity and inter-relationships of tested variables.

Complex variables, predictors and criteria have multiple operationalizations and testable components. These components have different rates of change, and can differ in sensitivity to measurement, Unitary constructs of complex paradigms may produce different results under different circumstances due to such measurement sensitivity and change rates. One example of such complexity is when commitment is differentiated into component parts, each affecting a different cognitive domains or motives (Kappleman et al., 2007; Meyers & Allen, 1991). A practical example of measuring a complex construct is performance assessment of assembly line workers, who can control both speed and the accuracy of production. Complex constructs such as commitment can be operationalized in hundreds of ways, making linear modeling inadequate (Viswesvaran & Ones, 1995).

Longitudinal studies have proven to be effective at verifying initial results, correlating self-report with behavior, revealing rate change within and between variables, and identifying emergent organizational response patterns (Houkes et al., 2003a, Houkes et al., 2003b; Parasuraman & Alutto, 1984). However, longitudinal studies continue to reflect the shortcomings of limited, linear, unitary constructs and relationships.

One approach to dealing with complexity and inter-relationship within linear models is to make extensive use of the powerful two and three dimensional graphic representations built into the latest statistical packages such as R and S-Plus. An example of parsing factor inter-relationships is the AGE:COM graph of Figure 9. This graph shows the relationship of a criterion relative to changes in two predictors. There are dozens if not hundreds of new graphical representations available to researchers to address the challenge of complexity.

A productive approach to deal with construct complexity and inter-relationship is the integration of established statistical methods. An example is the integration of meta-analysis and structural or path modeling.

Meta-analysis weights study correlations by sample size, scale reliabilities, and the degree of split on dichotomous variables (Hunter, Schmidt & Jackson, 1982; Tett & Meyer, 1993). Meta-analysis also corrects for statistical artifacts and improves parameter estimates (Hunter & Schmidt, 1990; Premack & Hunter, 1986). The accumulation of studies before model estimation accounts for uneven sample sizes, subsequently generating more robust model estimates. However, meta-analysis does not enable causal inferences to be drawn or alternatively test models and constructs.

Structural modeling refers to a technique that is used to examine the causal relationships between multiple exogenous and endogenous variables placed in a path model reflecting a theoretical foundation (Hayduk, 1987). SEM studies are often limited by incomplete, single-sample data limitations. Such limitations reflect difficulty in data collection and the need for overly lengthy questionnaires. A single sample study may also limit scope, size and diversity, thus reducing power and generalizability.

Integrating meta-analysis and structural modeling compliments each technique, leverages the benefits of each method, and enables additional research utility to be obtained. Meta-analytic structural equation modeling (MASEM) developed as a methodology over the last twenty years and has been used to investigate many psychological research questions (Brown & Peterson, 1993; Horn, Caranikas-Walker, Prussia & Griffeth, 1992; Hunter, 1983; Peters, Hartke & Pohlmann, 1985; Premack & Hunter, 1988; Schmidt, Hunter & Outerbridge, 1986).

The MASEM methodology was codified by Viswesvaran and Ones (1995). While most researchers have used the meta-analytic component of MASEM to include and test multiple constructs from multiple studies, the MASEM codified methodology expands the potential for this integrated method. A myriad of potential operationalization of a complex construct are defined and studies are identified for each of these operationalizations. Studies of each operationalization are placed within the meta-analytical matrix, and the resulting correlation matrixes then used as data input for comparative structural modeling (Gaertner, 1999). This complimentary process yields more credible data for SEM analysis, which more accurately infers causal process with path coefficients, given a correctly specified model (Bollen, 1989). MASEM enables the same construct to be more thoroughly and validly tested from conceptually different perspectives (Hunter & Schmidt, 1990).

MASEM thus enables theory testing of specified relationships when such relationships are not contained in a single study. All constructs of a theory can be tested, even when they are not included in any single study. The meta-analytic component of MASEM makes it possible to synthesize data across studies and investigate to what extent a postulated pattern of relationships is actually consistent with observed data in multiple samples (Joreskog & Sorbom, 1993; Schumacker & Lomax, 1996). This bolsters overall statistical power over that of a single-sample study. In addition, one can examine if a postulated pattern of relationship is invariate across multiple samples, providing validation of the pattern (Byrne, 1994, 1998). One can specify certain relationships as invariate relative to a specific sample in order to test differences between the samples (Houkes, Janssen, de Jonge & Nijhuis, 2001). MASEM can thus enable the researcher to test cross-validate complex and inter-related post hoc theoretical alternatives, and has the promise of providing a fuller and more complete understanding of the phenomenon under investigation.

Several fit indices can be used in the structural analysis portion of MASEM to determine the best model fit. Researchers have used the adjusted goodness-of-fit index (AGFI), the root mean square error of approximation (RMSEA), the Akaike information criterion (AIC), the non-normed fit index (NNFI), and the comparative fit index (CFI)(Bentler, 1990; Hu & Bentler, 1998, Joreskog, 1993; Joreskog & Sorbom, 1993; Schumacker & Lomax, 1996). Comparative SEM testing can partial out the effects of common cause variables to give a better indication of the true relationship between variables, and eliminate spurious relationships. The integrated process increases generalizability by cumulating samples from diverse settings to increase sample size and power. The MASEM technique is thus one example of an integrated methodology used to test and cross-validate complex and inter-related constructs and theories.

Dealing with Levels of Analysis: Non-linear Social Networks

While complexity is address to some degree by integrated methodologies, a second conceptual issue is raised by level of analysis. Turnover research literature is sparse in two areas: (1) how individual environmental sense-making, assessment, and decision making processes are embedded and dependent on a larger social system, and (2) how peer support, supervisor support, and organizational culture contributes to personal adaptation, coping, and positive organizational outcomes.

Social and cognitive psychology has long acknowledged that individual perceptions, assessment, and decision making are informed by interpersonal social cues, and that individuals are agents within a larger social system (Christensen, 2006; Griffin, Bateman, Wayne & Head, 1987; O'Reilly & Caldwell, 1985; Paramuraman & Alutto, 1978). Job attitudes are influenced by the prevailing cultural, normative, and informational structure of the work environment (Pfeiffer, 1983). In spite of this acknowledgement, most turnover research continues to focus on individual level differences in dispositional and cognitive factors to explain turnover variance (Eby et al., 2000; Mack et al., 1998).

Little research has been conducted correlating group level appraisal and decision making processes with individual psychological well-being measures or organizational outcomes (Pettigrew, Woodman & Cameron, 2001; Terry et al., 1996). Group members not only have to make sense of a changing environment, but also collectively evaluate their experiences. Group members must then adapt and cope with environmental changes, based on their perceptions and assessments of threat or opportunity.

One way to look at the turnover appraisal process is to examine the individual and collective stress response. When examining group level coping resources, research has primarily been limited to examining the influence of peer and superior support on the stress response (Kumari & Sharma, 1990; Parkes, 1990; Terry, Callan & Satori, 1996).

The cognitive-phenomenological theory of stress and coping posits that the cognitive and affective assessments and subsequent adjustment during stressful events are based on a reflective interaction with the social and organizational environment (Lazarus, 1990; Lazarus & Folkman, 1984). The cognitive-phenomenological approach is based on the meaning derived from the interaction between the individual and their environment, called the person-environment relationship. Lazarus (2000) states that meaning is created from appraisals of the confluence of the social and physical environment with personal goals, beliefs about self and the world, and the perceived availability of resources. The environmental component of the sense-making relationship consist of non-linear and informal social networks, which reinforce shared assessments, interpretations, and support, as well as coping resources.

This view is similar to Bandura's (1982) concept of collective efficacy, which states that social networks at the work group or departmental level contain and enable coping responses by group members that are more effective in dealing with environmental change than individual level coping responses. Group reframing can change individual stress into eustress.

The same mechanism that governs the stress response governs turnover decision making. Whether turnover motives stem from avoidance of a negative work environment, or from perceived beneficial opportunities, the same biologic responses and cognitive processes are employed (Quick et al., 1997; Selye, 1976a; Selye, 1976b; Simmons & Nelson, 2001). Like the coping response, turnover decision making is embedded in a social context, and decisions are made relative to the strength of that reflective network (Mobley, 1982). The social support literature elaborates on how peer and supervisor support creates meaning, motivation, coping and positive organizational outcomes at the individual level.

Social Support

Support has both direct and indirect effects on appraisal processes. Sense is ade of daily work experience through the interactions and interpretations of peers and direct report supervisors. Senior executives, direct report managers, and peer relationships all influence appraisal in different ways, and serve as an organizational level resource for coping and adaptation (Harris & Mossholder, 1996). Peer relationships have been shown to have a direct effect on job satisfaction and psychological well-being (Martin, Jones & Callan, 2005). The effects of senior executive support is more indirect.

The most important relationship for sense making within the daily work experience is interaction with the direct repost manager. Direct report managers have both direct and indirect effect on the appraisal process and subsequent employee assessments and responses. The direct report manager both frames daily work and filters downward organizational values, directions and directives into the work environment.

Direct report managers translate the corporate vision espoused by senior executives into tangible and relatable behaviors, objectives, and goals. Connecting an employee's daily work to a greater, important organizational context builds meaning and value to the daily work experience (Larkin & Larkin, 1995). Regular manager communication with employees can enable perspective shifts and reframing of perceived sources of stress within the work environment. In addition to direct communication, visible and consistent modeling of expected behaviors and values by the direct report supervisor has also been shown to increase commitment and motivation (Kotter, 1995). Perceived organizational support directly contributes to improved performance, satisfaction, affective commitment, retention, and organizational citizenship (Eisenberger, Fasolo & Davis-LaMastro, 1990; Eisenberger et al., 1997; Griffeth, Horn & Gaertner, 2000; Rhoades, Eisenberger & Armeli, 2001).

In addition to directly influencing environmental appraisal, direct management support indirectly mediates such assessment by increasing perceived control and efficacy. Feelings of autonomy, competence, and relatedness to coworkers are three factors directly linked to discretionary effort and motivation (Deci & Ryan, 1985; Fortier, Vallerand & Guay, 1995; Reeve & Dici, 1996; Ryan, 1995). These linkages increase job satisfaction and moderates burnout and turnover intent (Hellman, 1995; Ilardi et al., 1993; Keaveney & Nelson, 1993; Wright & Cropanzano, 1998). Appropriate management style was also a mediator of the job satisfaction-turnover relationship (Harter, Schmidt & Hayes, 2002). Such managerial support is efficacious and is more effective in changing collective perspectives than individual level change initiatives. Both direct and indirect support by managers serve to positively affect worker perceptions and sense of self-efficacy and control. Research findings indicate that the perceived control and self-efficacy provided by managerial support indirectly contributes to increased job satisfaction, commitment, and psychological well-being (Lazarus & Folkman, 1984; Martin, Jones & Callan, 2005;

Terry et al., 1996). In addition to enabling personal adaptation and positive organizational outcomes, management support promotes coping and enables success of major organizational change.

Major organizational change is largely non-linear, unpredictable, and uncontrollable once initiated. Understanding, predictability and a sense of control is essential to sense-making and adaptability. This sense-making mechanism during change is called situational control. Situational control is enhanced by a participative approach to developing and initiating the change direction. Keeping employees informed during change clarifies ambiguity and reduces stress. Managers help make sense of the stressful environment during organizational change, and can empower employee adaptation. Consistent communication and modeling of organizational direction, purpose and values provides stability during times of ambiguous change. Senior leadership also contributes to successful adaptation during change by presenting a clearly articulated vision and direction for the company. Such stabilizing interactions have been shown to increase organizational commitment and performance (Covin & Kilmann, 1990).

The creation of a daily experienced motivational and empowering culture is supervisory initiated. Such initiation is based on managerial perceptions upward of the larger organizational environment and downward towards the capabilities of the employees. The elements that managers choose and decide to emphasize and value to the employee serve as a filter conveying the larger values of the organization. Direct report managers can in this manner influence employee perceptions and assessment of their workplace. Connecting employee's daily work with larger organizational objectives and personal goals promotes employee engagement. Engagement is based on the reciprocity principle of social exchange theory (Barden & Mitchell, 2007). Through the process of engagement, employees develop global beliefs about the extent that their contributions are valued (Allen, Shore & Griffeth, 2003). These perceptions in turn are the foundations of perceived organizational support. Perceived organizational support results in greater affective attachment and feelings of obligation (Shore & Wayne, 1993).They can also choose to emphasize values and practices that reinforce a motivating and empowering culture and climate.

Culture and Climate

Another research area examining group level assessment and resources is organizational and psychological climate study. Psychological climate refers to the perceptual and experiential components of a reciprocal interaction between the organizational environment and the employee (Michela, Lukaszwski & Allegrante, 1995). Climate is thought to shape employees' perceptions of daily work and organizational change (Armenakis & Bedeian, 1999; Eby et al., 2000; Martin, Jones & Callan, 2005). Psychological climate has been characterized as a construct "comprising an individual's psychologically meaningful representations of proximal organizational structure, process and events, and a means of explaining an individual's motivational and affective reactions to change" (Parker et al., 2003, p. 390). Positive perceptions of psychological climate have pointed to direct effects on psychological well-being and higher levels of commitment (Hemmingway & Smith, 1999). Parker et al. (2003) note that while there is little agreement among researchers about the dimensions comprising psychological climate, employee perceptions can be broadly categorized as job, role, leader, work group, and organizational characteristics.

It is important to differentiate the individual level experience of psychological climate from organizational climate. Organizational climate is a group level construct based on a statistical measure of the degree to which the climate is shared by organizational members (Pettigrew, Woodman & Cameron, 2001). Organizational climate incorporates shared mental models of identity, commonly held assessments of the work environment, and common coping resources. Environmental resources are seen as characteristics of an individual's environment that assist in the process of adjustment during stressful situations (Martin, Jones & Callan, 2005).

A growing body of evidence supports the notion that the sense making elements provided by senior leadership communication and modeling, peer relationships, and direct manager support creates the stable experiential framework that is measured in climate research. These stable elements are key predictors of organizational attitudes such as satisfaction, commitment, and turnover (Martin, Jones & Callan, 2005; Parker et al., 2003). In particular, a stable and positive psychological climate appears to have a direct effect on the appraisal processes involved in organizational commitment, and subsequent behaviors of absenteeism and turnover (Bennett & Durkin, 2000; Lease, 1998).

Implications of organizational climate level processes and influences.

While positive organizational climates are shown to provide adaptive resources and promote positive organizational outcomes, a negative climate can adversely affect organizational outcomes. Corporate assessments and evaluations are passed along informal communication networks (Krackhardt et al., 1981; Krackhardt & Porter, 1986).

Informal Social Networks

The conceptual integration of individual and corporate sense making, coping resources, social support, and climate/ culture enables the paradigm of the individual within an informal social network. Such a concept is relevant and vital to turnover research and intervention. Assessment and intervention at a work group level (peers & supervisor) leverages more effective and efficient solutions and predictions to turnover. One reason for the efficacy of group level interventions is the distribution of social networks within the organization.

Regardless of the predicted likelihood of a particular person to leave the organization, turnover does not appear to occur randomly. Rather, turnover appears to occur in clusters (Krackhardt et al., 1981; Krackhardt & Porter, 1986). Patterns of cluster turnover can be observed, for example, after a significant traumatic internal or external organizational event. Group processes of sense making, appraisal, coping, support, and culture all intersect to create this phenomena.

Although reflected in only a handful of studies, nodes are formed around key employees whose voice and opinion carries weight within their social network. In one of the only research papers on this subject, Krackhardt & Porter (1986) refer to this phenomenon as “snowballing.”

A key employee becomes dissatisfied and the rest of the team or office becomes dissatisfied. A key person leaves and several others follow suit. A key manager leaves and takes his staff with him. These are examples of turnover clusters and optimum targets for retention. Just as star performers or key contributors are being identified for retention by the most progressive corporate retention programs, key employees contributing to turnover clusters should become a prime retention target.

Group level research poses difficulties. Each organization has unique salient variables that must be attended to. Shein (2000) advocated both a qualitative and quantitative approach to identify such salient variables. Conventional statistics used for turnover research, such as regression, is linear and presumes independence of observations. The social network is innately non-linear and dependent in nature. Alternative non-linear methods must be employed or invented. In addition, the higher one aggregates data collection, the smaller the sample size, with subsequent reductions in power and significance. For example, branch-unit level studies contain very small sample sizes, i.e. the number of business units measured.

Informal social networks also hold challenges and opportunities for interventions. Greater ROI could be experienced through curtailing and aligning negative perceptions, while nurturing a healthy and supportive social system and work environment. In other words, negative social elements should be mitigated while positive social elements enhanced and promoted. Culture/ climate level elements influence collective perceived stress and work attitudes, and have a broader span of influence, and are more readily altered than individual determinants (Burke, 1993; Eby et al., 2000; Fogarty et al., 1999). Culture level interventions are more salient and productive because they are commonly experienced (Gunnarson & Niles-Jolly, 1996). Higher order interventions are more beneficial than team level development, which doesn't appear to moderate members' attitudinal outcomes (Kleinman, Siegel & Eckstein, 2002; Lease, 1998; Reynolds & Briner, 1994).

In addition to individual level coping skills, counseling, and relaxation training, managerial communication and modeling, and HR resources should be integrated and aligned (Reynolds & Shapiro, 1991). Specifically, management and HR programs emphasizing participation in decision making, fairness of rewards, and growth opportunities promote perceived organizational support, with subsequent beneficial organizational outcomes (Wayne et al., 1997).

As well as shifting job attitudes about daily work and building corporate coping resources, higher order interventions can affect attitudes and motivations during major organizational change. Resistance to change stems in part from an individual's fear of being unable to perform under new work requirements. While individual-level training directly contributes to building perceived personal efficacy, efficacy is also derived from collective knowledge, experience, and peer support (Schabracq & Cooper, 1998). Shared appraisals about the positive nature of the change are essential to convert stress into eustress. Collective alignment during major change is based on Bandura's (1982) concept of enactive mastery, the gradual accumulation of increasingly complex skills. Actualizing this principle enhances efficacy expectancy and minimizes the stress caused by limited individual-level coping and automatic reactions when dealing with novel or potentially threatening situations.

The methodological approach of this study is useful in analyzing subpopulation characteristics within the organization. The AIC methodology provides the most parsimonious and powerful model from a number of prospective variables. The LMG technique provides a means to determine if responses are actual or questionable, relative to a shift in sign. It also provides confidence intervals which indicate the power of the phenomenon in the workforce, and predicted range of future data collection. Such predictive and prioritization ability is essential when planning future interventions, once a target

In summary, complexity and level of analysis pose challenges and opportunities for research and practice. The results of this study must be placed within the contexts of its limitations.

Limitations of the Study

The survey represents a single snapshot of an organization facing a potential major change. A longitudinal design would enable observation of change over time, giving much more insight into trends and dynamics. Longitudinal study provides a baseline that permits quantifiable differences over the transition process of both the positive and negative impact of change. They also serve to validate previous results and assumptions. Graphics features of statistical programs such as R and S-Plus can more intuitively represent complex trends and inter-relationships within a longitudinal study.

The study was based on surveying a public sector national organization. The generalizability of results is called into question when applied to non-IT or public sector environments.

A self-report approach in itself raises issues of response bias, and additional data collection methods should be employed to get a baseline state of the organization. Organizational members find it virtually impossible to distinguish perceptions of the environment from reactions to the environment, making it very difficult to objectively assess work conditions. Creating a multi-trait/ multi-method matrix of additional data collection methods such as interviews, focus groups or observations could provide contextual information and validate findings of the online survey (McEvoy & Cascio, 1987).

Pragmatic choices made to limit the number of items presented on the survey left three to five items to compose each factor. Including more items would probably raise the reliability, representativeness, and the predictive ability of the instrument.

Since responses on the survey were not forced choice, an unusual amount of missing data biased and skewed findings. Forced choice should have been utilized to reduce response bias. Of course, forced choice opens one to alternative issues of bias such as central tendency.

Another limit of the study is that actual turnover was not measured, only turnover intent. As stated in the literature review, there is some question of the predictive association of turnover intent with turnover. It would be better to measure both and establish the strength of this correlation. A longitudinal study design could better correlate turnover over time with changes within the work environment.

Only a few conventional predictors of turnover were used in the original UNT model. Psychological measures of anxiety and depression should be included, since the literature contends these psychological states underpin job satisfaction and organizational commitment, and serve as the emotional motivators for turnover decision making (Warr et al., 1979; Warr, 1987, 1990).

This study data collection design surveyed IT departments and other staff throughout the organization. This study design might be more productive if based on a pilot approach, or true quasi-experimental design. Control groups and sub-population aggregation would enable a more accurate organizational baselines and the degree of cross-group comparisons and differences sought by a demographic analysis in this study (Bedeian, Mossholder, Kemery & Armenakis, 1992).

Recommendations for Future Research

The AIC model could be tested on new populations to validate the predictions made by the LMG bootstrapped confidence intervals. Acquiring new samples would also support model generalizability and utility.

Established psychological measures should be included in future research models to correlate psychological states with well-being and organizational attitudes. Future research models design should be longitudinal and include multiple data collection schemes for validation and contextual purposes.

The role of demographic influences should be explored since age and gender were significantly associated with turnover and commitment. Gender or ethnic perceptual filtering may be more culture-specific in salience and influence, producing greater subpopulation differences. Highly integrative cultures (high culture) may ameliorate demographic filtering to a greater degree than less integrating cultures (low cultures).

Actual turnover should be longitudinally studies to verify the prediction of turnover intent measures.

The predictor constructs of this study all represent complex, multi-dimensional constructs. Construct components could be studied using integrated methodologies to compare and contrast alternatives, and test model fit with observed data. Exploring rates of change and alternative operationalizations within complex constructs may reconcile mixed results in other studies, and indicate under what conditions and relationships demographics become salient during turnover decision making.

Cohen and Hudecek (1993) found consistent and predictable responses and attitudes among white collar workers across organizations and work settings. Future research could determine if the IT workers included in this survey responded in the same manner as the white collar workers in Cohen's study.

A figure in this study represented the moderating effect of age on the commitment-turnover relationship. (See Figure 8.) This descriptive approach of exploding univariate predictors and observing the rate of associated change could be empirically tested using this same dataset. Ten subpopulations were identified within the sample population, each representing a different degree of commitment. Commitment could be filtered so that only the single level for that subpopulation was included in a linear sequential regression, using the AIC model. Ten models could be run based on a different filtered level of commitment. Results from the ten regressions could be compared to the rate of change represented in Figure 8 to validate the findings and indicate statistically significant differences within the subpopulations. Additional demographic inter-relationships, such as GENDER:COM, which was not statistically significant yet explained substantial variance, might also be examined in this manner. Dividing additionally obtained samples into subpopulations and exploding univariate measures to observe rates of change in variable relationships would test the calibration and discrimination of predictors.

Conclusion

This investigation of the mediator and moderator relationships of stress, job satisfaction, organizational commitment, and age, managerial status, and gender demographics on turnover intent explained less than 20% of the variance of turnover decision making. Individual differences in personality, coping responses, and cognitive style may explain some of the remainder. Missing variance may also be an artifact of limited, linear modeling of complex and inter-related constructs. Higher order social networks may also be major contributors to individual environmental appraisals and responses. Although study design and data collection practices were not ideal, this study produced a powerful and parsimonious predictive model of turnover. It is up to future research to both validate this study's model and explore proposed directions for future research.

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