Three essays on the career transitions of information technology professionals

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THREE ESSAYS ON THE CAREER TRANSITIONS OF INFORMATION TECHNOLOGY PROFESSIONALS

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Dedication

I dedicate this thesis to

Jayanthi, Anisha Nicole, Praveen Michael and Dhiren Immanuel

And my parents, Rueben and Remina Joseph

Without whom, this thesis would have been completed much sooner.
But, with whom I share a wonderful and blessed life!

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THREE ESSAYS ON THE CAREER TRANSITIONS OF INFORMATION TECHNOLOGY PROFESSIONALS

ABSTRACT

This dissertation begins a research program examining why IT professionals leave their organization and occupation. In answering this broad research question, I conduct three studies to investigate the career transitions of IT professionals across organizational and occupational boundaries.

Study 1 is a qualitative and quantitative review of IT turnover intent literature. Based on the qualitative review, I develop an integrative model of IT turnover intent by placing antecedents of IT turnover intentions into a nomological network. This integrative model of turnover intent is subsequently tested with meta-analytic structural equation modeling. Results from meta-analytic structural equation modeling strongly support a partially mediated model where distal organizational, job and personal predictors have both direct as well as indirect paths through the proximal work attitudes to turnover intentions. An important implication arising from this review is the scarcity of research examining turnover behavior and its consequences. In addition, there is limited research investigating career transitions across occupational boundaries. To address this gap, I conduct two additional studies examining career transitions and their associated consequences.

Study 2 focuses on individuals' careers by asking whether there are prototypical career paths in IT and what their consequences are. In answering this question of prototypical careers, I draw on existing literature examining careers in the technical and professional occupations and on literature examining boundaryless careers. In answering the question of consequences, I draw on human capital theory to hypothesize differential returns to career paths. Using career sequence comparison and cluster analyses, I analyze longitudinal work history data to identify prototypical career paths of IT professionals. Results indicate that IT professionals'

careers follow one of three paths: IT technical; IT managerial; or protean. The consequences of following these careers are that the returns to IT managerial careers are higher than returns to IT technical or protean careers. In turn, returns to protean careers are lower than returns to IT managerial and IT technical careers.

Study 3 examines the components that make up a career path, that is, career transitions across organization and occupation. In Study 3, I investigate why IT professionals leave their organization and their occupation. In doing so, I employ research on career transitions, human capital theory and gender studies in IT and management to predict IT professionals' turnover and turnaway behaviors. Turnover refers to voluntarily leaving one's IT job in an organization for a similar IT job in another organization. Turnaway refers to voluntarily leaving for the IT profession for another profession. In this study, I use a proportional hazards model with archival work history data to find that the risk of turnover reduces when IT professionals accumulate firm specific human capital but increases for IT professionals with higher levels of cognitive ability, IT specific human capital and for males. In addition, increasing levels of cognitive ability, IT specific education and firm specific human capital reduce the risk of turnaway.

I conclude this thesis by summarizing the key findings and contributions to IT and management research. I also discuss the implications for research and practice, and suggest possible areas for future research.

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CHAPTER 1

INTRODUCTION

Information systems (IS) scholars have explored a range of issues on the career transitions of information technology (IT) professionals (e.g. Ginzberg and Baroudi, 1988; Reich and Kaarst-Brown, 1999). A career transition is defined as a change in an individual's role (Sullivan, 1999) across job, organization or occupation boundaries and across levels (Louis, 1980). Career transitions include lateral job transitions within an organization (e.g. Reich and Kaarst-Brown, 1999); upward as in promotions (e.g. Igbaria and Siegel, 1992); between organizations (e.g. Josefek and Kauffman, 2003), as in turnover; and between occupations, as in leaving one occupation for another (e.g. Lee, Ang and Slaughter, 1997). Combinations of these career transitions form a career path, defined as a sequence of work experiences over time (Bailyn, 1989; Hall, 1987).

The enduring interest in career transitions originates from challenges posed by a tumultuous IT labor market in the United States since the 1970s. A major challenge for organizations between 1970 and 1990 was the severe imbalance in demand and supply of IT professionals. The chronic shortage of skilled IT professionals led to turnover as a pervasive phenomenon in this period (U.S. Department of Commerce, 1998). During this period, a key issue with IT managers was attracting, retaining and developing IT professionals for critical IT jobs within the organization (Brancheau, Janz and Wetherbe, 1996; Brancheau and Wetherbe, 1987; Dickson, Leitheiser, Wetherbe and Nechis, 1984).

The chronic shortage of IT professionals abated with the outsourcing and offshoring of IT functions in the United States in the 1990s (Morello, 2003). The outsourcing and offshoring of IT functions meant that career opportunities were curtailed within user organizations (Morello, 2003). The major challenge for IT professionals, then, is in deciding whether to remain in IT by moving to the

outsourcing vendor organization, or to leave the IT profession by moving to line functions (Morello, 2003; Slaughter and Ang, 1996). Moreover, IT literature is silent on the transferability of IT professionals' skills and experiences to other occupations. In essence, we are unclear what the consequences are for IT professionals' career success should they choose either career options.

Over the next decade, we can expect the context within which IT professionals' careers develop to remain as tumultuous as the last decade. Analysts foresee the outsourcing trend reversing as organizations begin to insource part of their IT functions (Dreyfuss and Scardino, 2005). Insourcing may, again, open new career opportunities for IT professionals within user organizations (Morello and Lavalette, 2003) and within IT services organizations (Dreyfuss and Scardino, 2005). In fact, analysts expect the IT profession to be one of the top three fastest growing occupations (Berman, 2004) with the number of IT positions in the United States increasing from about 1.2 million in 2002 to about 1.8 million by 2014 (Hecker, 2005).

The global IT labor market appears to mirror the experience of organizations and IT professionals in the United States. Industry reports warn of an existing IT labor shortage in most countries around the world, with the expectation of India (Manpower Inc., 2006b). This global IT labor shortage is expected to become acute within the next 10 years and could threaten engines of technological innovation (Manpower Inc., 2006a). For IT professionals around the world, the global sourcing of IT talent implies that they are now expected to compete on a global level for IT jobs. This global competition for IT jobs, in turn, influences IT professionals' career related decisions concerning professional development, career choices and levels of compensation (Morello, 2003).

Within this environment, the study of career transitions is important because of its implication for IT professionals and for organizations. IT professionals will continue to have to decide whether to leave their organization or profession. The study of career transitions highlights the implications of their career decisions and its

associated impacts on career success (Ginzberg and Baroudi, 1988). For organizations, knowledge from this area of study informs on human resource practices that help organizations attract, retain and develop IT professionals for critical jobs (Ang and Slaughter, 2000).

Research Framework

This dissertation begins a research program to answer the broad research question of why IT professionals leave organization and occupation by conducting three studies that examine career transitions across organizational and occupational boundaries. Table 1 provides a comparison of these three studies by the types of career transition examined, research question, theory and method.

Table 1: Comparison of the Three Studies

	Study 1	Study 2	Study 3
Type of Career Transition	Turnover Intention	Career Path	Turnover and Turnaway
Research Question	Why IT professionals intend to turnover?	Whether there are prototypical career paths in IT and what their consequences are?	Why IT professionals turnover and turnaway?
Theoretical Lenses	Turnover theory, i.e. organizational equilibrium theory of turnover (March and Simon, 1958)	Human capital theory	Human capital theory and Gender
Method	Qualitative review of IT literature and meta-analytic structural equations modeling	Sequence comparison and cluster analyses of longitudinal work history data with cross-sectional analysis of impact on income	Analysis of career transitions of IT professionals using longitudinal work history data with survival analysis

The first study, “Toward an Integrative Model of Turnover Intent for the Information Technology Profession: A Qualitative and Quantitative Review”, focuses on career transition across organizational boundaries, i.e. turnover intent. Turnover intent is the most commonly examined career transition in IT literature. Study 1 reviews IT literature on turnover intent by asking: why do IT professionals intend to turnover. In doing so, I draw on turnover theories (e.g. March and Simon, 1958; Mobley, Horner and Hollingsworth, 1978) to explain the antecedents of turnover

intent. In conducting this study, I qualitatively and quantitatively review IT literature on turnover intent. Subsequently, I develop and test an integrative model of turnover intent for the IT profession using meta-analytic structural equation modeling.

Study 2, "Prototypical Career Paths in Information Technology and their Economic Returns," focuses on career transitions across occupational boundaries and its associated consequences. Study 2 addresses whether there are prototypical career paths in IT and what their consequences are. In doing so, I juxtapose the extant literature on technical and professional careers (Barley, 1996; Barley and Bechky, 1994; Zabusky and Barley, 1996; Zabusky and Barley, 1997) with recent theorizing about boundaryless careers (e.g. Arthur and Rousseau, 1996; e.g. Hall and Mirvis, 1996; Rousseau and Arthur, 1996) as theoretical foundations. Career related studies in the technical and professional occupations indicate that technicians and professionals subscribe to either a technical or a managerial career path. More recently, studies examining the boundaryless careers of individuals show that highly educated individuals may choose not to follow either a technical or a managerial career, but transit across occupational and organizational boundaries.

Using work history data, I analyze career transitions of individuals who have worked in IT. I use career sequence comparison (Abbott, 1995; Abbott and Hrycak, 1990) and cluster analyses to identify prototypical career paths. Subsequently, I explore the consequences of these career paths through the lens of human capital theory (Becker, 1975). In particular, I examine the returns to these career paths. Human capital theory is appropriate as a theoretical lens because it predicts income attained following the accumulation of varying types of training and experience. I argue, in Study 2, that individuals in different career paths amass different types of training and experiences, and therefore, attain different levels of income. As such, I extend our collective understanding of the career transition phenomenon by using human capital theory to explain the consequences of career transitions rather than its antecedents.

As Study 2 examines returns to prototypical career paths of IT professionals, Study 3 decomposes IT professionals' careers into its constituent career transitions. Study 3, "Examining the Role of Human Capital and Gender in Predicting IT Professionals' Exit from Organization and Occupation", examines why IT professionals turnover and turnaway. Turnover refers to voluntarily leaving one's IT job with an employer for an IT job with another employer. Turnaway is defined as voluntarily leaving one's IT job for a job in another profession (Lee, et al., 1997). By conceptualizing these career transitions as mutually exclusive behaviors (Allison, 1984), I go on to compare the differential effects of predictors on turnover and turnaway. In doing so, this study enriches the literature on career transitions by comparing the destination of individuals' career transitions. Thus, Study 3 fills a gap in the literature examining the destinations of individuals' career transitions (see Kirschenbaum and Weisberg, 2002).

Together, the three studies in this dissertation reflect different aspects of a broader research on why IT professionals leave organization and occupation. The three studies draw on established management and IT literature to approach the dissertation topic via different theoretical and methodological angles. Bringing together disparate streams of research in IT and management, this dissertation builds on prior research in these disciplines concerning the career transitions of professionals.

Contribution of Studies to Research

By building on disparate streams of research, this dissertation contributes to IT and existing management research in four ways. One, examining career transitions within the IT profession controls for the occupational context which may interact with individual factors (Ang and Slaughter, 2000). Management literature on career transitions typically ignores the occupational context that might bias the variance explained by individual factors (Arthur and Rousseau, 1996). For example, individuals in a profession have attachments to their occupation and their

organizations (Blau, 2000). The tension between occupational and organizational attachments tends to change the nature of employee-employer obligations (Rousseau and Arthur, 1996; Rousseau and Wade-Benzoni, 1995), and consequently, influence career transitions (Blau, 2000). At a macro level, IT technological trends create new competencies while destroying those currently held by IT professionals (Ang and Slaughter, 2000). Contrary to human capital predictions, the IT context is idiosyncratic in that a long career in IT may not necessarily lead to success because of the devaluing effects of professional obsolescence (see Dubin, 1971; Pazy, 1994).

Two, this dissertation extends IT and management research on career transitions by theorizing and testing the influence of career transitions across occupational boundaries on career outcomes (Sullivan, 1999). Much research in management, however, examines the antecedents of career transitions (Sullivan, 1999) and relatively little has been written about the consequences of career transitions (e.g. Marler, Barringer and Milkovich, 2002; Stroh and Reilly, 1997). As such, Study 2 extends current theories explaining career transitions to include their consequences in terms of returns to career paths.

Three, this dissertation extends IT research and adds to management research by enriching the definition of turnover by considering the destination of individuals' turnover behavior. By conceptualizing turnover as a career transition that is within an occupation but across organizations, Study 3 examines an added career transition, i.e. turnaway, defined as a career transition from an IT job to a non-IT job. Study 3 also adds to a limited but growing set of management papers examining transitions across organization and occupational boundaries (e.g. Kirschenbaum and Weisberg, 2002).

Four, Studies 2 and 3 add to IT research by examining actual behaviors instead of intentions. Prior turnover research in the IT discipline has almost always examined turnover intentions (e.g. Guimaraes and Igbaria, 1992; Igbaria and Greenhaus, 1992; Moore, 2000) rather than actual behaviors (e.g. Bartol, 1983;

Josefek and Kauffman, 2003). Although intentions and behaviors are closely related (Parasuraman, 1982), management scholars still call for studies which examine actual behaviors (Peters and Sheridan, 1988) as quit intentions do not necessarily lead to quit behaviors (Mitchell and Lee, 2001).

The following three chapters in this dissertation describe each study in detail. Each chapter describes a completed study following a similar template. Each chapter begins with an introduction to that study, followed by a discussion of theories employed. Based on the theories employed, I develop and proceed to test a set of hypotheses. In doing so, I report on the method adopted and on the results obtained. Each chapter ends with a discussion of the results and its implications for research and practice. This dissertation ends with Chapter 5, which contains a summary of the major findings, contributions to research and practice, and directions for future research.

CHAPTER 2

STUDY 1 - TOWARD AN INTEGRATIVE MODEL OF TURNOVER INTENT FOR THE INFORMATION TECHNOLOGY PROFESSION: A QUALITATIVE AND QUANTITATIVE REVIEW

INTRODUCTION

A continuing source of challenge for managing IT professionals is the high turnover rate in the industry. Turnover statistics for the last three decades ranged from 15 percent in the 1970s to 33 percent in the 1990s (e.g. Hayes, 1998). This high rate of turnover raised serious concerns among IT practitioners and scholars alike over how to entice valued IT professionals to stay in organizations. To address this issue, it is imperative the field first understand the factors causing individuals' turnover in the IT industry. This explains why IT scholars, for the past twenty years, have remained engaged in the study of the predictors of turnover intentions among IT professionals. During this critical endeavor, a multitude of predictors and models have been proposed and tested, with results ranging from the expected to the counterintuitive.

This disparate stream of research leads me to provide a review and synthesis of the expanding literature on IT turnover intentions. To this end, this study aims to conduct a qualitative as well as a quantitative review of the extant literature. The objectives of this review are: (a) to present a narrative account of the constructs used to predict IT turnover intention; (b) to establish the magnitude of the bivariate relationships for the various antecedents with turnover intent using meta-analytic techniques; and (c) to test the competing models of turnover intent using meta-analytic structural equation modeling.

In essence, this study contributes to IT research by combining a traditional qualitative review with advanced quantitative analytical techniques to systematically

synthesize existing findings relating to IT turnover intentions. Through this process, this review aims to identify important predictors of turnover intent for IT professionals, to resolve any inconsistencies among existing findings, and to establish a theoretical framework that offers a coherent organization of existing IT turnover intention studies. I note that several meta-analyses of turnover intent have emerged over the years in the management discipline (e.g. Cotton and Tuttle, 1986; Griffeth, Hom and Gaertner, 2000; Hom, Caranikas-Walker, Prussia and Griffeth, 1992; Hom and Griffeth, 1995). However, these studies do not specifically address the turnover intentions of IT professionals. Given that occupational groupings are characterized by particular value systems (Barley, 1996; Cohen and Hudecek, 1993; Van Maanen and Barley, 1984), these may result in different predictors or patterns of turnover intentions (Cohen and Hudecek, 1993; Fuller, Hester, Dickson, Allison and Birdseye, 1996; Hom and Griffeth, 1995; Lee, Carswell and Allen, 2000; Tubre and Collins, 2000). It will be of interest to examine the extent of convergence between IT turnover intent and general turnover intention reported in the management literature.

In the next section, I begin the qualitative review with a brief introduction to turnover theory, followed by a narrative summary of the antecedents to IT turnover intent.

QUALITATIVE REVIEW

Turnover intent is defined as an individual's decision to leave one's employer (Campion, 1991; Hulin, 1991; March and Simon, 1958). According to the seminal work of March and Simon (1958), turnover intentions occur when individuals perceive their contributions to the organization exceeding the inducements they receive from the organization. This inducement-contribution balance is influenced by two major factors: (1) one's perceived desirability to move, which is a function of one's satisfaction with the immediate work environment, and (2) one's perceived ease of movement, which is a function of both macro- and individual- level factors that determine one's employability.

Subsequent research in management and IT has built on March and Simon's (1958) model by expanding on the determinants of perceived desirability and ease of movement. In addition, studies have extended March and Simon's model by incorporating intermediate causal mechanisms that explain turnover decisions (e.g. Cohen and Hudecek, 1993; Cotton and Tuttle, 1986; e.g. Hom, et al., 1992; Hom and Griffeth, 1995; Porter, Crampon and Smith, 1976). In fact, an examination of the IT turnover intention literature published in the 1980-2002 period shows that all studies use March and Simon as their theoretical foundation (Guimaraes and Igbaria, 1992; Igbaria and Guimaraes, 1999; Lee, 2001).

Antecedents to IT Turnover Intention

This review focuses on the antecedents of IT professionals' turnover intentions. I performed an extensive literature search for articles on the turnover intentions of IT professionals on both electronic sources and hardcopies of IT journals. Specifically, I searched computerized databases (e.g., *ACM Digital Library* and *EBSCOhost*), and manually searched issues of IT journals listed on the ISWorld's Journal page (<http://catt.bus.okstate.edu/isworld/journal2.htm>), which includes *MIS Quarterly* and the various *ACM Transactions* until June 2002. To avoid biasing results towards published studies (Hunter and Schmidt, 1990; Rosenthal and DiMatteo, 2001), I requested for working and unpublished papers, and papers in press or under review on various listservs (e.g. ISWorld, OCIS, SIGCPR).

The search yielded forty-five (45) articles examining turnover intentions of IT professionals. I removed seventeen (17) research-in-progress papers for which there were no empirical analyses. The resultant twenty-eight (28) articles formed the basis of our literature review of IT turnover intentions of IT professionals.

An examination of the IT literature published in the 1980-2002 period shows that forty-eight (48) predictors of turnover intentions have been studied. Table 2 lists these predictors, organized according to broad categories of antecedents as summarized by Porter and Steers (1973): organization related factors (e.g., salary,

promotion), job related factors (e.g., job satisfaction, job autonomy), and personal attributes (e.g., demographics, human capital). Besides the broad categories of antecedents identified by Porter and Steers, I add a category to hold career related antecedents. This is because IT research on turnover intent has gone beyond traditional categories found in management research to examine the role of career related factor in turnover intent.

In the following the paragraphs, I review various predictors for their relationship with turnover intent. However, for reasons of parsimony and consistency (with the subsequent quantitative analyses), I focus on constructs that are examined in more than one study. This is because only predictors that have been examined in two or more studies can be included in a meta-analysis. This results in twenty-three (23) predictors, which I discuss in the following sections. I begin the review with career related factors and proceed to reviewing organization related factors, job related factors and end with a review of personal attributes.

Career Related Factors

Career related factors are a collection of factors that describe an individual's evaluation of his or her occupation (Super, 1957). In this section, I review two career related factors that IT research has examined in more than one study: perceived job alternatives and career satisfaction. The other career related factors in this category, i.e. career plateau, career stage, job search, professional commitment and turnaway are omitted as these are examined only once.

Perceived Job Alternatives. Perceived job alternatives refers to one's perceived ease of movement between employers (March and Simon, 1958). Studies in IT operationalized this construct as an individual's subjective perception of progressing along to another employer. Results of these studies show a positive impact on turnover intention, thereby confirming the hypothesis that individuals who perceive more job alternatives are more likely to quit the organization (e.g. Paré, Tremblay and Lalonde, 2001).

Table 2: List of Constructs Examined in IT Turnover Intentions Research

Constructs	Number of Studies
Career Related Factors	
1. Perceived Job Alternatives	3
2. Career Satisfaction	2
3. Career Plateau	1
4. Career Stage	1
5. Job Search	1
6. Professional Commitment	1
7. Turnaway	1
Organization Related Factors	
8. Organizational Commitment	11
9. Salary	6
10. HR Practices	4
11. Fairness of Rewards	3
12. Hierarchical Position	2
13. Promotability	2
14. Organization-based Rewards	2
15. Work Unit Size	2
16. Internal Labor Market Structure	1
17. Organizational Citizenship Behavior	1
18. Procedural Justice	1
19. Social Support	1
20. Socialization Tactics	1
Job Related Factors	
21. Job Satisfaction	13
22. Role Ambiguity	13
23. Role Conflict	13
24. Boundary Spanning Activities	6
25. Job Autonomy	2
26. Task-based Rewards	2
27. Workload	2
28. Work Exhaustion	2
29. Job Involvement	1
30. Job Type	1
31. Motivating Potential Score	1
32. Performance Rating	1
33. Work-Family Conflict	1
Personal Attributes	
<i>Human Capital</i>	
34. Education	8
35. Organizational Tenure	11
36. IT Tenure	3
37. Job Tenure	1
<i>Demographics</i>	
38. Age	10
39. Gender	8
40. Marital Status	1
<i>Motivation</i>	
41. Career Orientations	3
42. Achievement Need Strength	1
43. Constriction of Control	1
44. Growth Need Strength	1
45. Negative Affect	1
46. Restriction of Information Processing	1
47. Social Affiliation Needs	1
48. Threat of Professional Obsolescence	1

Career Satisfaction. Career satisfaction refers to one's emotional reactions to one's career progress (Igbaria, Meredith and Smith, 1994; Igbaria and Wormley, 1992). Using the theory of work adjustment (Dawis and Lofquist, 1984), researchers argue that fit between person and environment will result in positive evaluations of one's career (Igbaria, et al., 1994; Igbaria and Wormley, 1992). Evaluation of one's career, in turn, will reduce the intent of individuals leaving the organization. Unlike the previous constructs of job satisfaction and organizational commitment, career satisfaction has received only limited attention in the IT turnover intentions literature. Results of these studies show mixed findings, with Igbaria and Siegel (1992) reporting a negative relationship, and Igbaria et al. (1994) reporting a nonsignificant relationship between career satisfaction and turnover intention.

Organization Related Factors

Several prominent turnover theories have recognized the role of organization factors in affecting turnover decisions, such as salary, integration and centralization (Price, 1977). In reviewing IT research for predictors that fall into this category, this review includes both objective (e.g., salary, work unit size) as well as perceptual measures (e.g., fairness of rewards, promotability), insofar as they relate to the organization.

The following review of organization factors focuses on seven (7) organizational constructs that were replicated in at least two studies: organizational commitment, salary, fair rewards, hierarchical position, promotability, organization-based rewards, and work unit size, which are discussed in greater length below. Table 2 shows that another five (5) organizational predictors were examined only once, and therefore, excluded from this review. They are internal labor market structures, organization citizenship behavior, procedural justice, social support and socialization tactics. Also excluded are human resource practices even though they were examined in four (4) studies, as none of the specific practices covered in the studies were the same.

Organizational Commitment. Defined broadly as the bond between the individual and the organization (Mathieu and Zajac, 1990), organizational commitment is expected to have a negative relationship with turnover. The theory proposes that individuals who have a positive attitude toward their organization are more likely to accept and believe in the organization's goals and values, and have a stronger desire to maintain a relationship with the organization (e.g. Mowday, Porter and Steers, 1982). Therefore, these individuals should perceive less desirability to move away from the organization.

This review finds that IT studies examine the effects of two out of the three possible types of organizational commitment as proposed by organizational commitment theories (e.g. Meyer and Allen, 1990). Affective or attitudinal organizational commitment is defined as emotional attachment to, and identification with, an organization (Mathieu and Zajac, 1990; Meyer, Stanley, Herscovitch and Topolnytsky, 2002). Specifically, affective or attitudinal organizational commitment received the most attention from IT researchers (e.g. Baroudi, 1985; Bartol, 1983; Igbaria and Chidambaram, 1997; Igbaria and Greenhaus, 1992). This is followed by continuance organizational commitment, defined as the perceived costs associated with leaving an organization (e.g. King and Xia, 2001; Paré, Tremblay and Lalonde, 2000). In contrast, no study has examined normative organizational commitment (defined as perceived obligation to remain in an organization) in relation to IT turnover intent.

IT research has consistently reported a negative relationship for both affective and continuance organizational commitment with turnover intention. The strength of the relationship reported in IT literature, however, ranges from strong (e.g. Ahuja, Chudoda, George, Kacmar and McKnight, 2002; e.g. Baroudi, 1985; King and Xia, 2001) to moderate (e.g. Baroudi and Igbaria, 1995; Igbaria and Guimaraes, 1993; Igbaria, et al., 1994) to weak (e.g. Guimaraes and Igbaria, 1992; e.g. Igbaria and Siegel, 1992).

Salary. Salary refers to the remuneration one earns in the course of work (Baroudi and Igbaria, 1995). The relationship between the salary individuals receive from the organization and turnover intention has received mixed findings in the existing turnover literature. Although March and Simon's (1958) theory would suggest a negative relationship between salary and turnover because of the greater inducements to stay (Bloom and Michel, 2002; Jones, 1998; Mueller and Price, 1990; Trevor, Gerhart and Boudreau, 1997), empirical research in the management discipline has not consistently supported this argument (e.g. Hom and Griffeth, 1995). Likewise, I found some mixed results in the IT literature. Although some studies obtained a negative relationship between salary and turnover intention (Dittrich, Couger and Zawacki, 1985; Igbaria and Chidambaram, 1997; Igbaria and Greenhaus, 1992), others reported a nonsignificant relationship (e.g. Igbaria, et al., 1994; Josefek and Kauffman, 2002).

Fairness of Rewards. Also known as distributive justice (e.g. Adams, 1965), this factor refers to an individual's perception of how fair the organization is in allocating rewards (e.g., salary, promotion) to its members (Bartol, 1983; Moore, 2000; Paré, et al., 2001). As such, fairness of rewards is a perception arising from the attributes of an organization. Based on equity theory (e.g. Adams, 1965), individuals perceiving fair rewards should be less likely to turnover, compared with those who perceive unfair rewards. Results from IT studies have largely supported this claim by showing a negative relationship between fairness of rewards and turnover intention (Bartol, 1983; Moore, 2000; Paré, et al., 2001).

Hierarchical Position. Defined as one's position in the organizational hierarchy (Baroudi and Igbaria, 1995), hierarchical position is argued to be negatively related to turnover intention because of the greater expected utility associated with the position (e.g. Mobley, Griffeth, Hand and Meglino, 1979). The expected utility includes status and benefits accruing from it (e.g. Baroudi and Igbaria, 1995; e.g. Igbaria and Chidambaram, 1997). Two studies in the IT turnover intentions literature

have examined this relationship, but their results are mixed. Although Baroudi and Igbaria (1995) found a negative effect for individuals' hierarchical position on turnover intention, Igbaria and Chidambaram (1997)'s study did not yield a significant relationship.

Promotability. Igbaria and Siegel (1992) define promotability as an individual's perception about his or her likelihood of promotion. Igbaria and associates (Baroudi and Igbaria, 1995; Igbaria and Siegel, 1992) argue that individuals with greater promotability in an organization should face greater inducements to stay on. Consistent with this theory, IT research has found a negative relationship between promotability and turnover intention (e.g. Baroudi and Igbaria, 1995; e.g. Igbaria and Chidambaram, 1997; Igbaria and Greenhaus, 1992; Igbaria and Siegel, 1992).

Organization-based Rewards. Developed by Igbaria and associates (Igbaria, Greenhaus and Parasuraman, 1991; Igbaria, et al., 1994; Igbaria and Siegel, 1992), organization-based rewards refer to conditions that enhance an individual's motivation for working in an organization. Organization-based rewards include respect and recognition by top management, prospects for advancement and salary increases. Consistent with March and Simon (1958)'s theory, individuals who perceive their organizations to extend these rewards to employees should experience less desire to leave. Research in IT however, has obtained mixed results, with one study reporting a significant negative relationship for organization-based rewards with turnover intention (Igbaria and Siegel, 1992), and another study reporting a nonsignificant relationship (Igbaria, et al., 1994).

Work Unit Size. Work unit size refers to the number of employees in the immediate organizational boundary. According to Price and Mueller (1986), employees working in larger departments or work units are less likely to be satisfied with their jobs and less committed to their organization. The theory is that individuals in larger departments feel alienated under such impersonal and anonymous settings.

This, therefore, suggests a positive relationship between work unit size and turnover intention. Studies on IT turnover intentions are mixed with Josefek and Kaufman (2002) reporting a strong positive relationship although King and Xia (2001) find a weak negative association.

Job Related Factors

Job related factors have received extensive research in the turnover literature. Turnover theory argues that individuals' perceived desirability to move is largely influenced by the extent to which they are satisfied with their job, which in turn, is determined by the nature of the work (March and Simon, 1958). Among the list of job factors examined by IT scholars, five (5) are excluded from this review because of insufficient frequency. They are job involvement, job type, motivating potential score, job performance and work-family conflict. The remaining job related factors are discussed below.

Job Satisfaction. Job satisfaction is defined as the affective attachment to the job viewed either in its entirety or for particular aspects (Tett and Meyer, 1993). It is posited to be negatively related to intent to turnover because individuals who feel positively about their jobs should experience less desire to leave the organization (March and Simon, 1958). Not surprisingly, this review of IT literature demonstrates that job satisfaction is the most commonly researched predictor of turnover intent, with most studies reporting a moderate (e.g. Guimaraes and Igbaria, 1992; e.g. Gupta, Guimaraes and Raghunathan, 1992) to a strong negative relationship (e.g. King and Xia, 2001; Lee, 2000). One exception is a study by Rasch and Harrel (1989), where no significant relationship was found.

Roles. Roles, defined broadly as the expected patterns of behaviors, are construed as a broader construct encompassing both formal as well as informal elements of the job incumbents (Ilgen and Hollenbeck, 1990). Research in role theory has focused on two major role constructs: role ambiguity and role conflict. Role ambiguity refers to the lack of clarity surrounding expectations about one's role.

Role conflict refers to the incompatibility of demands facing the person in a particular role (Cook, Hepworth, Wall and Warr, 1981; King and King, 1990). Both are known as role stressors because they have been found to reduce individuals' job involvement, satisfaction with various aspects of the job, and one's commitment to the organization (e.g., see meta-analyses by Fisher and Gitelson, 1983; Jackson and Schuler, 1985). Therefore, individuals who experience greater role ambiguity and role conflict are more likely to leave their organizations. Studies in the IT domain have supported the positive impact of role stressors on intent to turnover, albeit with varying degrees in the strength of the relationships. For role ambiguity, Baroudi (1985) and Guimaraes and Igbaria (1992) found a moderate relationship with intentions to turnover, although others such as King and Xia (2001) and Lee (2001) reported only a weak relationship between the two. Likewise, for role conflict, some studies obtained a strong relationship with turnover intention (e.g. King and Xia, 2001) although others reported a weak association (e.g. Gupta, et al., 1992).

Boundary-spanning Activities. Boundary spanning is defined as the extent to which activities require interaction across functional units (Baroudi, 1985). This construct describes activities that require interactions and information exchange across functional units such as departments or organizations (e.g. Lysonski and Woodside, 1989). These activities are likely to create stress for incumbents because of the inherent uncertainty and potential conflict involved. IT professionals, for instance, are frequently required to cross boundaries during their work. These boundary spanning activities have been shown to correlate positively with perceived role ambiguity and role conflict (Baroudi and Igbaria, 1995; Igbaria and Guimaraes, 1993). Hence, it may be argued that boundary-spanning activities will have a positive impact on IT professionals' turnover intentions. Surprisingly, empirical findings in the IT literature have consistently reported no significant direct relationship between the two constructs (Baroudi, 1985; Baroudi and Igbaria, 1995; Igbaria and Greenhaus, 1992; Igbaria and Guimaraes, 1993). Instead, the relationship between boundary-

spanning activities and turnover intent is indirect, mediated by role ambiguity, role conflict, job satisfaction and organizational commitment (Baroudi, 1985; Baroudi and Igbaria, 1995; Gupta, et al., 1992; Igbaria and Greenhaus, 1992; Igbaria and Guimaraes, 1993).

Job Autonomy. Job autonomy is defined as the degree to which an individual perceives that the job provides discretion and freedom in scheduling and executing work (Hackman and Oldham, 1975). Job autonomy is posited to deter turnover intent because it offers individuals a more intrinsically motivating job by giving them the opportunity and power to manage their own work (Moore, 2000), thereby lowering their perceived desirability to move. In the IT turnover intentions literature, two studies find a moderate negative relationship between job autonomy and turnover intent (Ahuja, et al., 2002; Moore, 2000), hence supporting the theory.

Task-based Rewards. Building on Hackman and Oldham's (1980) theory of job design, Igbaria and associates (Igbaria, et al., 1991; Igbaria, et al., 1994; Igbaria and Siegel, 1992) developed the concept of task-based rewards. Task based rewards refers to the extent to which job elements are motivating to an individual (Igbaria, et al., 1994). These include the extent to which the job allows incumbents to pursue ideas, build professional reputation, work with competent colleagues, work on challenging technically tasks, work on professionally important projects, and to be creative and innovative. The thesis is that individuals with more exciting and stimulating jobs should have less intention to leave the organization. Results for task-based rewards and turnover intent, however, have been mixed. Although Igbaria and Siegel (1992) obtained a significant negative relationship, Igbaria et al.'s (1994) study obtained a nonsignificant finding.

Perceived Workload and Work Exhaustion. A heavy workload (or overload), defined as perceived quantitative work demands (Moore, 2000), occurs when one is faced with too much to do in the time available (e.g. Caplan and Jones, 1975; Kahn, Wolfe, Quinn, Soeck and Rosenthal, 1964). Workload has important

implications on employees' health, quality of work and overall feelings about themselves. For instance, overload is likely to cause work exhaustion, defined as the depletion of emotional and mental energy needed to meet job demands (Moore, 2000). Work exhaustion, in turn, results in a host of attitudinal consequences including turnover intention (Moore, 2000). Indeed, two studies in the IT literature reported a positive significant relationship for turnover intent with workload as well as with work exhaustion (Ahuja, et al., 2002; Moore, 2000).

Personal Attributes

Personal attributes refer to both ascribed and achieved attributes of individuals (Trevor, 2001). This review shows an extensive amount of research on a myriad personal attributes in IT turnover intention studies. As such, I have subclassified these variables into those that describe human capital (e.g. education and experience, Becker, 1975), demographics (e.g. age, gender) and motivation (e.g. career orientations, achievement need strength). Most personal attributes, however, were examined only once (e.g., marital status, job tenure, achievement need strength, constriction of control, growth need strength, negative affect), leaving only six (6) personal attributes to be discussed in length here. These are the human capital variables of education and work experience; demographic variables of age and gender; and the motivation construct of career orientation.

Education. Education refers to the highest attained level of formal training (Igbaria and Greenhaus, 1992). There is consensus that individuals with higher educational levels are more likely to turnover because of their greater ease of movement (March and Simon, 1958; Trevor, 2001). Human capital theory (Becker, 1975) and market signaling theory (Spence, 1973) posit that education and experience serve as indicators of ability that enhances the productivity of the individual. These personal attributes serve as indicators of potential productivity because individuals' potential productivity is not typically observable by the hiring firm. Turnover research in the IT literature however has been mixed. Although some

studies reported a positive but weak association between education and turnover intention (Igbaria and Greenhaus, 1992; Igbaria and Siegel, 1992), others did not find a significant relationship (Igbaria and Guimaraes, 1993; Josefek and Kauffman, 2002).

Tenure. The tenure variables examined in IT research are organization tenure, defined as the length of stay in an organization, and IT tenure, defined as the length of stay in the IT profession. Based on worker adjustment (George, 1989) and sunk costs (Becker, 1960) theories, tenure is posited to be negatively related to turnover intention. This is because of greater adjustment and greater investments one has made with respect to one's organization or profession (Becker, 1960; Igbaria and Chidambaram, 1997; Igbaria and Siegel, 1992; Wright and Bonett, 1993). Similarly, human capital (Becker, 1975) and market signaling (Spence, 1973) theories argue a negative impact of organization tenure on turnover because individuals with longer tenure in an organization potentially hold more knowledge and skills about the organization and thus, have lesser ease in movement (March and Simon, 1958). Studies in the IT literature find mixed results for organization tenure. Findings for the relationship between organizational tenure and turnover intent range from a negative (Igbaria and Chidambaram, 1997; Igbaria and Siegel, 1992), to positive (King and Xia, 2001; Paré, et al., 2001), and nonsignificant (Guimaraes and Igbaria, 1992; Josefek and Kauffman, 2002; Joseph and Ang, 2001).

For IT tenure (length of stay in the IT profession) however, results are clear in that individuals who have more years of experience in the IT profession are less likely to leave the organization. Thus, showing a negative impact of professional tenure on turnover intention (Igbaria and Chidambaram, 1997; Igbaria and Siegel, 1992).

Age. Several theories argue for a negative relationship between age and turnover intention. March and Simon (1958) find older employees less employable than their younger counterparts and so, perceive less ease of movement. Similarly, the side-bets theory (Becker, 1960) posits older employees having more vested

interests in their employer, that lock them in the organization. IT studies, however, have not found a direct relationship between age and turnover intent. Instead, IT studies infer that age influences through other mediating variables such as job satisfaction (Igbaria and Greenhaus, 1992; Igbaria and Guimaraes, 1993; Josefek and Kauffman, 2002; Moore, 1998; Paré, et al., 2001).

Gender. Findings on the gender-turnover intentions relationship have been mixed in the extant management literature. Scholars argue that women are more likely to turnover because women are more likely to experience stress and job dissatisfaction. The stress and dissatisfaction is a result of structural barriers to career opportunities at work (e.g. Gutek, 1993) as well as work-family conflict (e.g. Baroudi and Igbaria, 1995). In the IT profession, it has been further argued that women are less appreciated by their employers because such high technology jobs are considered nontraditional for females (Baroudi and Igbaria, 1995; Igbaria and Chidambaram, 1997). However, as with management research, empirical IT turnover intention studies did not show consistent effects of gender on turnover intention (Igbaria and Guimaraes, 1993; Igbaria and Siegel, 1992; Josefek and Kauffman, 2002; Lim and Teo, 1999). Only one study found a significant, albeit small gender effect, with women being more likely intent to turnover compared with men (Igbaria and Chidambaram, 1997).

Career Orientations. Career orientations are defined as career aspirations which define an individual's self-concept (Igbaria, et al., 1991). Career orientations are derived from Schein's (Schein, 1971) work on career anchors and refer to a cluster of self-perceived needs, values and talents that steer an individual's career decisions. It is a multidimensional construct (comprising job autonomy, pure challenge, entrepreneurship, job security, geographic security, service, technical, managerial and lifestyle) that is posited to influence an individual's selection of specific occupations and work settings through evaluations of person-environment fit (Agarwal and Ferratt, 2000; Hsu, Jiang, Klein and Tang, 2003b; Igbaria, et al., 1991;

Igbaria, et al., 1995). The perception of fit, in turn, results in an individual's reactions to work experiences. Studies in the IT literature show that different dimensions of career orientation affected turnover intention differently (Hsu, et al., 2003b; Igbaria, et al., 1995). Specifically, these studies have reported a positive impact on turnover intent for the career orientation dimensions of job autonomy, pure challenge and entrepreneurship. However, these studies find a negative relationship for job security, geographic security and service career orientations; and a nonsignificant relationship for technical, managerial and lifestyle orientations.

To summarize, the preceding narrative reviews empirical work on the antecedents of turnover intention in IT literature, organized according to the Porters and Steers (1973) framework. IT research appears to focus on organization related factors, job related factors and personal attributes of human capital and demographics. The categories where there appears to be limited research are career related factors and motivation related constructs.

Of the constructs reviewed, IT turnover intentions literature consistently finds a negative relationship between turnover intent and the following: career satisfaction, organizational commitment, salary, fairness of rewards, hierarchical position, promotability, organization based rewards, job satisfaction, boundary spanning activities, job autonomy, task based rewards and IT tenure. In contrast, IT turnover intent literature consistently reports a positive relationship between turnover intentions and the following: perceived job alternatives, role ambiguity, role conflict, workload and work exhaustion. Finally, IT literature reports inconsistent findings for work unit size, age, gender, education and career orientations. Building on this list, I construct a theoretical model of turnover intention for the IT discipline that synthesizes these antecedents into a coherent explanation of the phenomenon.

An Integrated Model of IT Turnover

According to Bacharach (1989), a theory is a "statement of relations among concepts within a set of boundary assumptions and constraints" (p. 496). Although

the previous section had identified a diverse set of constructs related to turnover intentions, this section attempts to clarify their interrelationships and place them into a parsimonious theoretical model of turnover intentions for the IT discipline.

Based on the seminal theories of March and Simon (1958) and subsequent scholars, IT research has supported the notion that some antecedents are more proximal than others in predicting turnover intentions. March and Simon (1958) assert that work satisfaction is a primary determinant of one's perceived desirability of movement. Thus, many IT studies have inferred that job satisfaction and its related constructs such as organizational commitment and more recently, career satisfaction, are proximal antecedents of turnover intention (e.g. Baroudi, 1985; e.g. Bartol, 1983; Igbaria and Greenhaus, 1992; Igbaria and Guimaraes, 1993). Moreover, several studies have examined the interdependencies among these three constructs, demonstrating that job satisfaction predicts organizational commitment and career satisfaction (Igbaria and Greenhaus, 1992; Igbaria, et al., 1994).

Job satisfaction, organizational commitment, and career satisfaction are in turn, influenced by several organizational, job and personal determinants, as espoused by subsequent turnover theories (e.g. Hom and Griffeth, 1995; Porter and Steers, 1973; Price, 1977) and supported by empirical research. In IT turnover intent research, for instance, organizational predictors such as salary have been found to improve individuals' attitudes toward their job, organization and career (i.e., job and career satisfaction, and organizational commitment). In turn, these constructs affect turnover intentions and behavior (Guimaraes and Igbaria, 1992; Igbaria and Greenhaus, 1992; Igbaria, et al., 1994).

Likewise, IT research has also concluded that a number of job factors are distal antecedents of turnover intention but mediated via the attitudinal constructs. For instance, using role theory, Baroudi and others (Gupta, et al., 1992; Igbaria and Greenhaus, 1992; Igbaria and Guimaraes, 1993) found that role ambiguity and role conflict influence job satisfaction and organizational commitment which in turn,

influence turnover intent. Further, Baroudi (1985) and Guimaraes and Igbaria (1992) theorized that boundary spanning activities are a source of role ambiguity and role conflict. Results from these studies show that role stressors mediate the effects of boundary spanning on turnover intention. Similar conclusions are reached in IT turnover intention studies that focus on the role of personal attributes. In addition, findings indicate that gender, age, education and organizational tenure (Guimaraes and Igbaria, 1992; Igbaria and Greenhaus, 1992; Moore, 2000) exert an indirect influence on turnover intention by means of work attitudes.

In short, IT turnover intent research is consistent with seminal turnover theories in the broader management literature in identifying constructs that are distal versus those that are proximal. Using this framework, I organize the various antecedents of IT turnover intent discussed earlier into a model that distinguishes between distal and proximal predictors, thereby illustrating how and why (Whetten, 1989) turnover intent occurs for IT professionals. For example, a given individual characteristic (e.g. gender) can relate to turnover intention through one of three intervening mechanisms: (a) job satisfaction; (b) organizational commitment; or (c) career satisfaction. Moreover, to be consistent with research by Bartol (1983), Gupta et al. (1992) and Igbaria et al. (1994), job satisfaction is posited to be an intermediate factor relating distal predictors to organizational commitment and job satisfaction, which in turn, predict IT turnover intent.

Although Figure 1 depicts full mediation between the distal determinants with turnover intention, some IT studies have supported a partially mediated model in which the distal antecedents exert a direct impact on turnover intent. These paths are in addition to their indirect impact via the attitudinal constructs (e.g. Ahuja, et al., 2002; Guimaraes and Igbaria, 1992; Igbaria and Greenhaus, 1992; King and Xia, 2001; Moore, 2000). For instance, organizational tenure and salary have been found to relate directly to turnover intention, after accounting for their indirect effects via job satisfaction and organizational commitment (Guimaraes and Igbaria, 1992). Based

on these findings, a partially mediated model is a competing alternative to Figure 1. The partially mediated model proposes that the influences of organizational, job and individual factors operate in both direct as well as indirect ways in affecting IT professionals' turnover intent.

To examine the relationships and models reviewed in this section, I proceed to conduct a quantitative review of existing empirical findings from IT turnover intent research. To summarize, the quantitative analyses aim to accomplish two major goals: to estimate the correlations for the various antecedents with turnover intent, and to test the competing models of turnover intent advanced in the previous section. Although the qualitative review provides a broader view of the IT turnover intentions literature, the quantitative analysis complements it by focusing on the results obtained. At this juncture, an important limitation is warranted. Italicized constructs in Figure 1 will not be included in testing the path-analytic model either because these constructs are yet to be examined or are reported in insufficient number of studies to compute a full correlation matrix with other constructs.

Figure 1: An Integrative Model of Turnover Intentions in IT

Variables highlighted in **Bold** were included in the meta-analytic structural equation modeling. *Italicized* variables were not included due to insufficient data.

QUANTITATIVE REVIEW

The following quantitative analyses are based on meta-analytic procedures recommended by Hunter and Schmidt (1990) and Viswesvaran and Ones (1995). Meta-analysis is an increasingly popular technique that allows existing empirical results to be aggregated across primary studies, and at the same time, corrects for various artifacts that may bias these relationship estimates. Over the years, significant advances have been made in the meta-analysis technique to address different research questions. For instance, early meta-analyses were typically interested in estimating population correlations, corrected for sampling and measurement errors. Later meta-analyses began to include moderator analyses, which aim to account for variation in the results obtained across studies. This is achieved by coding for potential sources of variation such as differences in the measures used, the nature of the sample, and the research method adopted (Lipsey, 1994).

More recently, meta-analysis is combined with structural equation modeling (SEM) technique to test for theories involving structural paths (e.g. Viswesvaran and Ones, 1995). This important extension in the use of meta-analysis, therefore, allows researchers to conduct a more precise and theory-driven quantitative review. In addition, a major advantage of this combined technique is that not all relationships specified by theory need to be examined in each primary study, given that the population correlations required for the SEM analyses can be meta-analytically computed.

Table 3 provides a summary of the tasks undertaken for this quantitative review of the IT turnover intentions literature. The remaining paragraphs of this section on quantitative review are organized as follows. I first provide a more in-depth description of the meta-analytic and structural equation modeling procedures. I, then, report the meta-analysis results on (1) the bivariate relationships of the various predictors with turnover intention; (2) sources of variation in these relationships across studies, and finally; (3) the competing models of IT turnover intent.

Table 3: Summary of Tasks in the Meta-Analysis and Meta-Analytic Structural Equations Modeling (Viswesvaran & Ones, 1995)

Meta Analysis	
1.	Identify predictors and their relationships with turnover.
2.	Search the literature systematically to obtain all studies, attempting to find all published and as many unpublished research available.
3.	Review variability among the obtained effect sizes to Identify potential sources of variation across studies.
4.	Conduct a meta-analysis and estimate the true score correlations between the predictors identified in Step 1 and turnover.
Meta-Analytic Structural Equations Modeling	
5.	Estimate the true score correlations between constructs forming a matrix of correlations of all constructs identified in Step 1.
6.	Use structural equations modeling with the estimated true score correlations developed in Step 5 to test competing models.

Meta-analytic Procedures

Of the 28 articles employed for the qualitative review, I removed four (4) conference papers that were subsequently published in a journal to avoid double counting of bivariate correlations. With the remaining twenty-four (24) articles, I proceeded to conduct the meta-analysis. It should be emphasized again that only variables that were examined in at least two studies are included in the quantitative analyses.

Coding of study information. Meta-analysis requires each observed correlation from a primary study to be weighted by that study's sample size to provide a weighted mean estimate of the correlation. Further, artifacts such as sampling and measurement errors can be corrected if the requisite information, such as reliability statistics, is available. For these purposes, I coded the following information: zero-order effect sizes in the form of correlations (or other reported statistics such as the F- or t-values, that can be transformed using Hunter and Schmidt's (1990) formulae); sample size and reliability statistics (i.e., Cronbach's alpha).

In addition to these statistics, I also coded for study characteristics that might account for variation across individual studies. These characteristics, also known as moderator variables, may be classified into three broad categories: substantive, method, and extrinsic (Lipsey, 1994). Substantive variables are those that may theoretically relate to the effects sizes of the relationships of interest, e.g. mean age of sample (e.g. Cohen and Hudecek, 1993) and gender proportions of sample (e.g. Griffeth, et al., 2000). Method variables refer

to those associated with the methodology and procedures of data-collection such as operationalization of constructs (e.g. Cohen and Hudecek, 1993; Fuller, et al., 1996; Griffeth, et al., 2000; Meyer, et al., 2002; Tett and Meyer, 1993). Finally, extrinsic variables refer to characteristics beyond the research itself and include considerations such as publication attributes (e.g. journal versus conference and date of publication) (Hunter and Schmidt, 1990; Lipsey, 1994).

Not all moderator variables, however, could be coded because of the consistency of information reported across studies. Based on this criterion, only the following variables were amenable to coding as their information was reported in all studies included in this review: mean age of study sample; gender proportion of the study sample; type of operationalizations for predictors as well as turnover intent itself; and the type of publication.

For age, I coded for whether the mean age of a study's sample was under or over 40 years old. Based on demographic data provided by the Bureau of Labor Statistics, 80% of individuals in the IT profession are under the age of 40 (Meares and Sargent, 1999). Similarly, I also noted whether the proportion of female to male was more or less than 40% because the IT profession is dominated by males (70%) (Meares and Sargent, 1999). Moreover, the 40% benchmark is the point at which the chi-square for 1 degree of freedom reports a significant difference ($\chi^2=4.0$, $df=1$, $p<0.05$). For operationalization of turnover intent, I coded whether the turnover intent variable was conceptualized as intention for staying or quitting (e.g. see Fuller, et al., 1996 for implications on these conceptualizations); and whether it was measured by a single-item measure or by multiple items. Likewise, antecedents of IT turnover intention are operationalized in multiple ways. Hence, I coded the ways in which the antecedents were operationalized. They include age and organizational tenure (years versus logarithmic transformation of years), salary (actual dollar value versus ranges of value with varying granularity), education (differing number of categories), and the source of measurement for role ambiguity, role conflict, job satisfaction, and organizational commitment (original scale versus adapted scale). Finally, for publication type, I coded for whether a study was reported in a journal versus a conference paper.

Population correlation estimates. I computed the population correlation estimates for the various antecedents of IT turnover intention using Hunter and Schmidt's (1990) meta-analysis program. As described earlier, inputs into the meta-analyses were zero-order effect sizes in the form of correlations, sample sizes and Cronbach's alphas. In instances where articles reported statistics other than correlations (e.g. F statistics or t-values), I transformed these using formulae provided by Hunter & Schmidt (1990). To correct for measurement error, I used correlations that were adjusted individually for reliability. In cases where reliability statistics were not reported, I adjusted the correlation using a weighted mean reliability computed from the artifact distribution method, which was based on studies that reported reliability information (Hunter and Schmidt, 1990, p.158).

Moderator Analyses. To indicate the presence of moderators, I computed the Q homogeneity chi-square statistic for all the estimated correlations. A significant chi-square for a given relationship indicates that there is substantial variation in the effect size reported across studies. In such cases, I tested for variation by dividing the data into subsets grouped together by the moderator variables described earlier. I then conducted separate meta-analyses within each subset. Using the Z statistic, I compared their estimated population correlations to see if they differ in strength or direction of relationship. A significant Z statistic indicates that the characteristic used to divide the data is a moderator (Hunter and Schmidt, 1990, p. 438).

Power Analyses. Finally, following the procedures prescribed by Hedges and Pigott (2001), I conducted a power analysis for all the computed statistics (i.e., population correlation estimates, Q statistic and Z statistic) to ascertain their robustness. I use Hedges and Pigott (2001)'s power analysis approach instead of Rosenthal's (1979) fail-safe N to assess the robustness of the population correlation estimate for three reasons (see Hunter and Schmidt, 2004, pp. 499 to 509). (1) fail-safe N focuses on the statistical significance of the effect size as a precursor to robustness instead of the also considering the strength of the effect size; (2) fail-safe N ignores the effect size altogether in determining the robustness of the effect size; and (3) fail-safe N yields weak conclusions when true population

correlation estimates are close to zero. As such, Hunter and Schmidt (2004, pp 503-509) recommend that meta-analysts use more recently developed tests of robustness.

Accordingly, I use Hedges and Pigott's (2001) power analysis approach to indicate the robustness of the results obtained. The power analysis approach overcomes the weaknesses of Rosenthal's (1979) fail-safe N approach by incorporating the effect size and the sampling variance. In addition, the power analysis approach directly addresses concerns about detecting second order sampling error, which fail-safe N does not. Hence, I report the results of power analysis instead of fail-safe N.

Power analysis of effect sizes (Table 4) show that the estimated population correlations obtained in this meta-analysis are robust for most constructs, with power values close to or equal to 1.00. The constructs with low power for effect sizes are continuance commitment, age, gender, education and promotability.

Having established the population correlation estimates for all the bivariate relationships and accounted for potential variation in these estimates across studies, I proceeded to test the competing models of IT turnover intent proposed in Figures 1 and 2.

Meta-Analytic Structural Equation Modeling

In this series of analyses, I combined the techniques of meta-analysis with structural equation modeling to examine which of the two models better fit the data reported in existing IT studies. To accomplish this, I first estimated the true score correlations between all twenty-three (23) constructs in the model to obtain a meta-analytically derived correlation matrix, which is the input required by subsequent SEM analyses. The resulting meta-analytically derived correlation matrix required 276 individual correlations to complete the matrix. However, of these 276 correlations, I could not impute 133 (or 48%) correlations because there were insufficient studies in the IT turnover intentions literature and in broader IT literature examining these constructs with each other.

Following the advice of Viswesvaran and Ones (1995) and Hom et al. (1992), I trimmed the number of constructs to be examined by meta-analytic structural equation modeling. In doing so, I remove the following 10 constructs: continuance commitment,

career satisfaction, fairness of rewards, work unit size, organization-based rewards, job autonomy, perceived workload, work exhaustion, task-based rewards and perceived job alternatives. These 10 constructs accounted for 129 or 47% of missing correlations.

The resulting trimmed meta-analytically derived correlation matrix consisted of bivariate correlations for turnover intentions and thirteen (13) predictors. This trimmed correlation matrix required 91 individual correlations, of which I was unable to impute four (4) correlations. These missing correlations were for: IT tenure and age, IT tenure and education, hierarchical position and age; and hierarchical position and education. I replaced these four missing correlations with the average correlation in the matrix. This strategy, advocated by Viswesvaran and Ones (1995), prevents unnecessary loss of information.

Because the bivariate relationships examined in these 91 cells had varying sample sizes, an important decision was determining the sample size to use for the SEM analyses. Following Bangert-Down (1986)'s recommendation on data pooling, I took the total sample size, which is the aggregation of all individual sample sizes across the studies used to generate the correlation matrix. This resulted in a total N of 5,732. This strategy was also successfully adopted by Hom et al. (1992) in their meta-analytic tests of competing turnover intent models.

As in management literature, IT research proposes two competing models of turnover intent. Although some researchers argue that proximal predictors (e.g. Moore, 2000 25) mediate the effects of distal predictors on turnover intentions, others argue that the effects of predictors have both direct as well as indirect effects through mediators (e.g. Igbaria and Greenhaus, 1992) on turnover intentions. Hence, I evaluate the viability of a fully mediated model and a partially mediated model.

I used the maximum likelihood estimation method in LISREL 8.53 (Jöreskog and Sörbon, 2002) for the SEM analyses. Following the suggestions from several authors (e.g. Byrne, 1998; Kelloway, 1998), I assessed the fit of the models by using multiple indicators including variance explained in the dependent variable, the reasonableness of the parameter estimates, the existence (or non-existence) of improper solutions, and overall fit indices.

Given that a fully mediated model is nested within a partially mediated model, I compared the fit of these models with a chi-square difference test ($\Delta\chi^2$). A significant difference in the chi-squares between the two models suggests that the less constrained model provides a better fit to the data (Kelloway, 1998).

I adopt Hu and Bentler's (1998; 1999) suggestions of evaluating model fit using standardized root-mean-square residual (SRMR, Bentler, 1990), root-mean-square approximation of error (RMSEA, Steiger and Lind, 1980), nonnormed fit index (NNFI, Tucker and Lewis, 1973), and comparative fit index (CFI, Bentler, 1990). According to Hu and Bentler (1998; 1999), a good fit is indicated by values below .08 for SRMR and RMSEA, and above .90 for NNFI and CFI.

RESULTS

In this section, I present the results of the quantitative analyses for (1) estimated population correlations between turnover intent and its antecedents; (2) moderator analyses, and (3) meta-analytic SEM analyses.

Estimated Population Correlations

Table 4 presents the results of the meta-analyses. Two decision rules are used in interpreting the results for the estimated population correlations. First, a population correlation is taken to be statistically significant if the 95% confidence interval does not include a zero (Whitener, 1990). Second, I used Cohen and Cohen's (1983) criteria of strong (.50), moderate (.30), and weak (.10) effect sizes to describe the magnitude of the correlations. Results of individual predictors are discussed within their broader categories.

Career Related Factors. Both career related factors examined are significantly related to turnover intentions. Specifically, perceived job alternatives is positively related to turnover intentions ($\rho=0.26$) and career satisfaction is negatively related to turnover intentions ($\rho=-0.35$).

Organization Related Factors. Three out of the eight organization related factors were significantly associated with turnover intentions in the expected direction. Specifically,

affective commitment ($\rho=-0.45$), fairness of rewards ($\rho=-0.42$) and hierarchical position ($\rho=-0.28$) were negatively related to turnover intentions. Continuance commitment, salary, promotability, organization-based rewards and work unit size however, were not significantly related to turnover intentions.

Job Related Factors. All, except one job related factor, were significantly related to turnover intentions in the anticipated direction. Specifically, job satisfaction had a strong negative correlation ($\rho=-0.53$), job autonomy ($\rho=-0.42$) reported a moderate, negative correlation and boundary spanning activities ($\rho=-0.16$) had a weak and negative relationship with turnover intentions. Of the job related factors that were positively related to turnover intentions, work exhaustion ($\rho=0.45$) and role conflict ($\rho=0.30$) each had a moderate relationship, workload ($\rho=0.22$) and role ambiguity ($\rho=0.21$) were also positively related to turnover intent, albeit with weaker effect sizes. Only task-based rewards did not yield a significant correlation estimate.

Personal attributes. Results demonstrate that all personal attributes, except IT tenure, were not significantly related to turnover intentions. Only IT tenure was significantly related to turnover intention, with IT tenure ($\rho=-0.32$) demonstrating a moderate and negative relationship.

Table 4: Meta-Analysis of the Antecedents of Turnover Intentions

Antecedents	K	N	r	ρ	V _(art) (%)	95% Confidence Interval		Effect Size Power	Q	Power of Q
						Lower	Upper			
Career Related Factors										
Perceived Job Alternatives ¹	3	683	0.228	0.259 *	24.73	0.113	0.405	0.999	12.133 ***	0.033
Career Satisfaction	2	576	-0.312	-0.352 *	100.00	-0.352	-0.358	1.000	0.009	0.952
Organization Related Factors										
Organizational Commitment	11	2,224	-0.401	-0.454 *	8.97	-0.581	-0.327	1.000	122.595 ***	0.000
Affective Commitment	2	381	0.017	0.037	22.94	-0.209	0.284	0.073	8.718 ***	0.026
Continuance Commitment ¹	6	1,868	-0.127	-0.134	7.76	-0.285	0.017	1.000	77.334 ***	0.000
Salary	3	605	-0.189	-0.420 *	29.59	-0.573	-0.268	1.000	10.139 ***	0.063
Fairness of Rewards ¹	2	812	-0.167	-0.276 *	38.29	-0.390	-0.163	0.999	5.229 *	0.100
Hierarchical Position ¹	2	812	-0.053	-0.054	6.22	-0.336	0.227	0.158	32.178 ***	0.000
Promotability ¹	2	576	-0.171	-0.221	6.70	-0.545	0.102	0.911	29.843 ***	0.000
Organization-Based Rewards ¹	2	919	0.081	0.065	31.91	-0.054	0.184	0.227	6.268 *	0.067
Work Unit Size ¹										
Job Related Factors										
Job Satisfaction	13	2,591	-0.455	-0.525 *	100.00	-0.583	-0.466	1.000	4.663	1.000
Role Ambiguity	10	2,430	0.180	0.212 *	10.41	0.078	0.345	1.000	96.049 ***	0.000
Role Conflict	10	2,430	0.264	0.300 *	30.96	0.222	0.377	1.000	32.299 ***	0.042
Boundary Spanning Activities	5	1,325	-0.143	-0.162 *	68.35	-0.234	-0.089	1.000	7.316	0.482
Job Autonomy	2	423	-0.359	-0.420 *	100.00	-0.454	-0.386	1.000	0.025	0.924
Task-Based Rewards ¹	2	576	-0.230	-0.262	3.23	-0.710	0.186	0.976	62.005 ***	0.000
Workload	2	423	0.187	0.215 *	100.00	0.112	0.318	0.785	1.982	0.350
Work Exhaustion	2	423	0.408	0.449 *	100.00	0.401	0.496	1.000	0.598	0.628
Personal Attributes										
Human Capital										
Education	6	1,860	0.039	0.040	47.83	-0.029	0.120	0.458	12.54 **	0.277
Organizational Tenure	10	2,971	-0.077	-0.083	9.22	-0.204	0.039	1.000	108.428 ***	0.000
IT Tenure	2	812	-0.0296	-0.316 *	100.00	-0.357	-0.275	1.000	0.759	0.582
Demographics										
Age	8	2,193	-0.038	-0.038	58.75	-0.096	0.019	0.583	13.617 *	0.468
Gender (1=Male; 2=Female)	8	2,456	-0.037	-0.029	27.33	-0.110	0.051	0.434	29.267 ***	0.024

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001
¹Insufficient number of studies to conduct moderator analyses.

Moderator Analyses

The presence of potential moderators in a given relationship is indicated by a significant Q homogeneity statistic (Hunter and Schmidt, 1990 p.168), upon which further tests to identify the moderators are conducted (see earlier discussion on moderator analyses). Tables 6 to 11 present the results for each potential moderator examined in this study. To reiterate, these moderators examined are substantive moderators of mean age (Table 5) and gender ratio (Table 6) of study samples; method moderators of conceptualization of turnover intent (Table 7), operationalization of turnover intent (Table 8) and operationalizations of predictors (Table 9); and extrinsic moderator of source of publication (Table 10).

The overall bivariate population estimates in Table 4 show that the correlation estimates of seven (7) predictors with turnover intent did not vary substantially across studies. These are career satisfaction, job satisfaction, boundary spanning activities, job autonomy, workload, work exhaustion and IT tenure. The relationships for the remaining sixteen (16) predictors with turnover intentions are moderated by study characteristics other than sampling and measurement errors. However, eight (8) of these sixteen (16) predictors could not be examined for moderators because of insufficient number of studies (indicated by the superscript 1 in Table 4). Hence, moderator analyses were conducted for the remaining eight (8) predictors, which I discuss in the following paragraphs.

Mean Age of Sample. Results in Table 5 show that the mean age of the sample moderated the impact of organization commitment (affective and continuance commitment), role ambiguity and personal attributes (gender, education and organizational tenure) on turnover intent. Specifically, studies conducted on younger samples (i.e. mean sample age of 40 years and below) obtained significantly stronger associations between turnover intent and organizational commitment ($Z=3.56$, $p<0.001$), role ambiguity ($Z=2.44$, $p<0.05$) and education ($Z=4.36$, $p<0.001$), compared to studies conducted on older samples (mean sample age above 40 years). In contrast, studies conducted on older samples yielded significantly stronger associations between turnover intent and gender ($Z=11.03$, $p<0.001$)

indicating that younger males and older females are more likely to quit. I also found a significant association between older samples organizational tenure ($Z=13.21$, $p<0.001$).

Gender Ratio of Sample. Results in Table 6 show that the proportion of females to males in the sample moderated the effect of role ambiguity, role conflict, education and organizational tenure on turnover intent. I find significantly stronger associations between turnover intent and role conflict ($Z=7.87$, $p<0.001$), education ($Z=3.17$, $p<0.001$) and organizational tenure ($Z=4.26$, $p<0.001$) for male dominated samples (>60% male), compared to more proportionate samples. On the contrary, I find a weaker relationship for role ambiguity in male dominated samples ($Z=2.35$, $p<0.05$).

Conceptualization of Turnover Intention. Turnover intention has been conceptualized as either intent to stay or intent to quit. Here, I examined conceptualization of turnover intent as a potential moderator for only two predictors: affective organization commitment and salary. Other predictors could not be examined either because there was no variation in the conceptualization of turnover intent, or because there was only one study with a different conceptualization of turnover intent. Results, presented in Table 7, suggest that the conceptualization of turnover intent moderated only the effect of salary, with the correlation for salary with turnover intention significantly higher when turnover intention was conceptualized as intent to stay, compared to intent to quit ($Z=5.13$, $p<0.001$). Organizational commitment however, was not affected by conceptualization of turnover intent.

Operationalization of Turnover Intention. Turnover intention has also been measured differently, with either single or multiple items across studies. Results, presented in Table 8, show that the type of turnover intent measure moderated the effect of organizational commitment, education and organizational tenure on turnover intent. The relationship between organizational commitment and turnover intentions were stronger when turnover intention is measured with multiple items, rather than with a single item ($Z=3.77$, $p<0.001$). In contrast, single-item turnover intent measures produced stronger relationships for education ($Z=4.36$, $p<0.001$) and organizational tenure ($Z=6.30$, $p<0.001$).

Predictor Operationalizations. Various predictors have also been measured differently across studies. The predictor operationalizations examined here include the measurement of organizational commitment (use of the Organizational Commitment Questionnaire (OCQ) versus others), salary (categories versus actual dollar value), role ambiguity and conflict (original versus modified scale), age (years versus log of years), education (four levels or less, versus levels or more), and organizational tenure (years versus log of years). Results of these predictor operationalizations are presented in Table 9.

The relationship between organizational commitment and turnover intention was not found to be different between studies using the established OCQ instrument (Porter, et al., 1976) and those using other organizational commitment scales.

Significant differences were found for the way salary was measured. Salary, when measured in categories, yielded a significantly higher correlation with turnover intent than when it was measured in dollar value ($Z=10.95$, $p<0.001$).

Operationalizations of role conflict also had an impact on its relationship with turnover intent. Role conflict measured with Rizzio et al.'s (1970) original items yielded significantly lower correlations, compared to measures which have modified the original scale by adding or dropping items ($Z=2.04$, $p<0.01$). However, no impact was observed for the modification of the role ambiguity scale.

For operationalizations of personal attributes, age in logarithmic form resulted in a significantly higher correlation for age, compared to age in years ($Z=26.75$, $p<0.001$). The granularity of categories used to measure education also seems to matter, with finer grained measurement (i.e., more levels) yielding higher correlations for education and turnover intent, compared to coarser measurement ($Z=7.22$, $p<0.001$). For organizational tenure, an interesting difference emerged for studies using actual years versus the logarithmic transformation of years. Specifically, the number of years of organizational tenure was negatively related to turnover intent ($\rho=-0.11$), whereas the log transformation of years was positively related to turnover intentions ($\rho=0.03$; $Z=3.32$, $p<0.001$).

Table 5: Analysis of Moderators – Mean Age of Sample

Antecedents	K	N	r	ρ	V _(art) (%)	95% Confidence Interval		Effect Size Power	Q	Power of Q	Z	Power of Z
						Lower	Upper					
Organizational Commitment												
Mean age below 40 years	7	1,141	-0.481	-0.565 *	7.65	-0.789	-0.340	1.000	52.292 ***	0.000	3.564 ***	0.000
Mean age above 40 years	4	1,083	-0.316	-0.354 *	12.51	-0.516	-0.192	1.000	31.970 ***	0.000		
Salary												
Mean age below 40 years	2	212	-0.070	-0.080	3.53	-0.590	0.430	0.109	56.730 ***	0.000	0.449	0.117
Mean age above 40 years	4	1,656	-0.135	-0.141	11.53	-0.285	0.003	0.999	34.685 ***	0.000		
Role ambiguity												
Mean age below 40 years	7	1,366	0.249	0.295 *	41.88	0.197	0.372	1.000	16.714 ***	0.198	2.435 *	0.000
Mean age above 40 years	3	1,064	0.091	0.113	4.66	-0.194	0.419	0.791	64.353 ***	0.000		
Role conflict												
Mean age below 40 years	7	1,366	0.273	0.304 *	23.14	0.185	0.423	1.000	30.247 ***	0.009	0.414	0.110
Mean age above 40 years	3	1,064	0.252	0.293 *	100.00	0.238	0.349	1.000	2.181	0.627		
Gender												
Mean age below 40 years	5	921	-0.066	-0.062	100.00	-0.127	0.003	0.445	4.243	0.760	11.030 ***	1.000
Mean age above 40 years	3	1,544	-0.019	0.108	14.24	-0.028	0.244	0.894	21.072 ***	0.001		
Education												
Mean age below 40 years	4	664	0.015	0.056	22.61	-0.059	0.171	0.240	8.845 ***	0.214	4.356 ***	0.997
Mean age above 40 years	2	1,196	0.053	0.012	91.85	-0.072	0.096	0.058	4.355	0.140		
Organizational Tenure												
Mean age below 40 years	6	1,175	0.096	0.100 *	72.53	0.030	0.170	0.954	8.272	0.564	13.210 ***	1.000
Mean age above 40 years	4	1,796	-0.191	-0.204 *	10.12	-0.349	-0.060	1.000	39.543 ***	0.000		

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
Z = Z-statistic for the critical ratio (Z=1.96, p=0.05; two-tailed test) that indicates whether moderator subgroups are significantly different.
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 6: Analysis of Moderators – Gender

Antecedents	K	N	r	ρ	$V_{(ant)}$ (%)	95% Confidence Interval		Effect Size Power	Q	Power of Q	Z	Power of Z
						Lower	Upper					
Organizational Commitment	4	649	-0.369	-0.429 *	15.07	-0.626	-0.231	1.000	26.538 ***	0.001	0.560	0.140
	7	1,575	-0.414	-0.464 *	7.08	-0.626	-0.302	1.000	98.933 ***	0.000		
Role ambiguity	2	284	0.271	0.317 *	72.19	0.167	0.468	0.922	2.770	0.257	2.347 *	0.000
	8	2,146	0.168	0.198 *	8.82	0.044	0.352	1.000	90.671 ***	0.000		
Role conflict	2	284	0.160	0.107	38.78	-0.115	0.330	0.198	5.157 *	0.102	7.865 ***	0.000
	8	2,146	0.278	0.322 *	44.90	0.256	0.389	1.000	17.818 *	0.248		
Age	3	1,135	-0.042	-0.042	100.00	-0.099	0.014	0.189	2.531	0.576	0.753	0.008
	5	1,004	-0.034	-0.033	44.61	-0.128	0.061	0.177	11.209 *	0.223		
Education	3	1,133	0.023	0.022	100.00	-0.029	0.073	0.086	2.055	0.646	3.165 **	0.000
	3	727	0.065	0.068	31.00	-0.068	0.204	0.281	9.677 **	0.073		
Organizational Tenure	4	1,327	0.030	0.028	46.40	-0.056	0.112	0.143	8.620 *	0.226	4.264 ***	0.996
	6	1,644	-0.163	-0.169	8.02	-0.339	0.002	1.000	74.797 ***	0.000		

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
Z = Z-statistic for the critical ratio (Z=1.96, p=0.05; two-tailed test) that indicates whether moderator subgroups are significantly different.
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 7: Analysis of Moderators – Conceptualization of Turnover Intention

Antecedents	K	N	r	ρ	$V_{(art)}$ (%)	95% Confidence Interval		Effect Size Power	Q	Power of Q	Z	Power of Z
						Lower	Upper					
Organizational Commitment												
Intent to Stay	2	460	-0.460	-0.520 *	100.00	-0.554	-0.497	1.000	0.165	0.800	1.482	0.317
Intent to Quit	9	1,764	-0.385	-0.437 *	7.59	-0.592	-0.281	1.000	118.542 ***	0.000		
Salary												
Intent to Stay	2	460	-0.261	-0.278 *	100.00	-0.356	-0.201	0.964	1.420	0.440	5.134 ***	0.999
Intent to Quit	4	1,408	-0.084	-0.087	6.01	-0.276	0.102	0.812	66.543 ***	0.000		

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
Z = Z-statistic for the critical ratio (Z=1.96, p=0.05; two-tailed test) that indicates whether moderator subgroups are significantly different.
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 8: Analysis of Moderators – Operationalization of Turnover Intention

Antecedents		K	N	r	ρ	$V_{(art)}$ (%)	95% Confidence Interval		Effect Size Power	Q	Power of Q	Z	Power of Z
Organizational Commitment													
Single item	Multiple item	4	1,083	-0.316	-0.354 *	12.51	-0.516	-0.192	1.000	31.970 ***	0.000	3.771 ***	0.965
		7	1,141	-0.481	-0.552 *	10.76	-0.709	-0.395	1.000	65.044 ***	0.000		
Role Ambiguity													
Single item	Multiple item	2	812	0.219	0.259 *	100.00	0.245	0.272	0.996	0.006	0.960	1.031	0.178
		8	1,618	0.161	0.189 *	8.47	0.009	0.369	1.000	94.495 ***	0.000		
Role Conflict													
Single item	Multiple item	2	812	0.240	0.276 *	100.00	0.221	0.331	0.999	1.095	0.500	1.598	0.359
		8	1,618	0.276	0.312 *	25.91	0.208	0.416	1.000	30.875 ***	0.020		
Gender													
Single item	Multiple item	3	1,544	-0.019	-0.020	12.02	-0.170	0.129	0.092	24.957 ***	0.000	1.387	0.284
		5	921	-0.066	-0.046	100.00	-0.112	0.021	0.270	4.432	0.743		
Age													
Single item	Multiple item	3	1,221	-0.023	-0.021	59.79	-0.094	0.053	0.084	5.103	0.290	1.115	0.200
		5	918	-0.058	-0.062	64.93	-0.147	0.023	0.447	7.701	0.450		
Education													
Single item	Multiple item	2	1,196	0.053	0.056	26.59	-0.059	0.171	0.221	7.521 ***	0.040	4.356 ***	0.992
		4	664	0.015	0.012	91.85	-0.072	0.096	0.059	4.355	0.580		
Organizational Tenure													
Single item	Multiple item	3	1,544	-0.179	-0.192 *	7.98	-0.386	-0.017	1.000	37.600 ***	0.000	6.300 ***	1.000
		7	1,427	0.033	0.036	19.56	-0.086	0.158	0.344	35.795 ***	0.000		

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
Z = Z-statistic for the critical ratio (Z=1.96, p=0.05; two-tailed test) that indicates whether moderator subgroups are significantly different.
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 9: Analysis of Moderators – Operationalization of Predictors

Antecedents	K	N	r	ρ	$V_{(art)}$ (%)	95% Confidence Interval	Effect Size Power	Q	Power of Q	Z	Power of Z
Organizational Commitment											
OCQ	8	1,784	-0.389	-0.437 *	7.64	-0.589	1.000	104.755 ***	0.000	1.635	0.373
Others	3	440	-0.449	-0.530 *	14.73	-0.729	1.000	14.725 ***	0.014		
Salary											
In categories	4	1,111	-0.246	-0.259 *	100.00	-0.301	1.000	2.067	0.836	10.949 ***	1.000
Dollar value	2	757	0.047	0.051	5.39	-0.182	0.138	37.104 ***	0.000		
Role ambiguity											
Original scale	6	1,202	0.140	0.167	7.34	-0.057	1.000	81.725 ***	0.000	1.122	0.202
Modified scale	4	1,228	0.219	0.256 *	36.48	0.155	1.000	10.965	0.123		
Role conflict											
Original scale	6	1,202	0.251	0.277 *	34.34	0.170	1.000	17.471 **	0.098	2.036 **	0.530
Modified scale	4	1,228	0.277	0.321 *	28.7	0.211	1.000	13.935 ***	0.054		
Age											
Years	6	1,854	-0.021	-0.019	68.05	-0.077	0.143	8.818	0.522	26.754 ***	1.000
Log of years	2	285	-0.149	-0.159 *	100.00	-0.202	0.380	0.261	0.753		
Education											
4 or less levels	3	1,071	0.004	0.003	100.00	-0.037	0.051	1.141	0.795	7.220 ***	1.000
5 or more levels	3	843	0.082	0.086	34.49	-0.035	0.465	8.698 *	0.099		
Organizational Tenure											
Years	7	2,369	-0.105	-0.114	6.9	-0.270	1.000	101.442 ***	0.000	3.320 ***	0.913
Log of years	3	602	0.033	0.033 *	100.00	0.025	0.092	0.024	0.996		

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
Z = Z-statistic for the critical ratio (Z=1.96, p=0.05; two-tailed test) that indicates whether moderator subgroups are significantly different.
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 10: Analysis of Moderators – Publication Source

Antecedents	K	N	r	ρ	$V_{(art)}$ (%)	95% Confidence Interval		Effect Size Power	Q	Power of Q	Z	Power of Z
						Lower	Upper					
Organizational Commitment Conference/unpublished paper Journal paper	2	381	-0.480	-0.579 *	18.8	-0.793	-0.365	1.000	10.639 ***	0.012	2.798 **	0.000
	9	1,843	-0.384	-0.432 *	8.72	-0.573	-0.291	1.000	103.265 ***	0.000		
Salary Conference/unpublished paper Journal paper	2	212	-0.070	-0.080	3.53	-0.590	0.430	0.109	56.730 ***	0.000	0.449	0.117
	4	1,656	-0.135	-0.141	11.53	-0.285	0.003	0.999	34.685 ***	0.000		
Role ambiguity Conference/unpublished paper Journal paper	2	504	0.207	0.233 *	27.14	0.053	0.412	0.903	7.369 ***	0.043	0.465	0.018
	8	1,926	0.173	0.206 *	8.98	0.044	0.368	1.000	89.113 ***	0.000		
Role conflict Conference/unpublished paper Journal paper	2	504	0.405	0.453 *	39.58	0.324	0.582	1.000	5.053 *	0.107	15.802 ***	1.000
	8	1,926	0.227	0.256 *	57.89	0.191	0.322	1.000	13.819 *	0.456		
Gender Conference/unpublished paper Journal paper	2	379	-0.084	-0.099 *	100.00	-0.126	-0.071	0.218	0.133	0.824	10.483 ***	0.000
	6	2,086	-0.028	0.074	19.46	-0.029	0.177	0.949	30.827 ***	0.003		
Age Conference/unpublished paper Journal paper	3	406	0.066	0.070	83.12	-0.038	0.178	0.185	3.609	0.438	13.972 ***	1.000
	5	1,733	-0.063	-0.064 *	100.00	-0.111	-0.017	0.731	4.552	0.732		
Education Conference/unpublished paper Journal paper	2	379	-0.002	-0.007	59.35	-0.145	0.131	0.051	3.370	0.204	5.089 ***	0.000
	4	1,481	0.050	0.052	48.68	-0.024	0.129	0.417	8.217 *	0.249		
Organizational Tenure Conference/unpublished paper Journal paper	4	890	0.115	0.120 *	57.81	0.031	0.210	0.878	6.919	0.338	10.830 ***	1.000
	6	2,081	-0.160	-0.171 *	11.65	-0.299	-0.043	1.000	51.489 ***	0.000		

K = Number of studies; N = Number of observations; r = Uncorrected population correlation; ρ = Corrected population correlation;
 $V_{(art)}$ (%) = Percentage of variance in ρ accounted for by study artifacts (sampling and measurement errors); Q = Chi-square test for moderators;
Z = Z-statistic for the critical ratio (Z=1.96, p=0.05; two-tailed test) that indicates whether moderator subgroups are significantly different.
† p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 11: Summary of Moderator Analysis

Constructs	Moderators					Publication Source
	Age	Gender	Conceptualization of Turnover Intention	Operationalization of Turnover Intention	Operationalization of Predictors	
Organizational Commitment	✓			✓		✓
Salary			✓		✓	
Role Ambiguity	✓	✓				✓
Role Conflict		✓			✓	✓
Organizational Tenure	✓	✓		✓	✓	✓
Age					✓	✓
Education	✓	✓		✓		✓
Gender	✓				✓	✓

Publication Source. In examining the role of publication source as an extrinsic moderator, results (Table 10) indicate publication source influenced the effect sizes of organizational commitment, role conflict, gender, age, education and organizational tenure with turnover intent. Specifically, conference/unpublished papers reported a stronger association between turnover intent and organizational commitment ($Z=2.80$, $p<0.01$) and role conflict ($Z=15.80$, $p<0.001$).

Interestingly, the effect sizes for personal attributes and turnover intent differed for published versus unpublished papers. For age, conference/unpublished papers reported a positive association with turnover intention ($\rho=0.07$) and journal papers reported a negative association ($\rho=-0.06$; $Z=13.97$, $p<0.001$). Similarly for organization tenure, conference/unpublished papers reported a positive association with turnover intent ($\rho=0.12$) and journal papers reported a negative association ($\rho=-0.17$; $Z=13.97$, $p<0.001$).

In contrast, conference/unpublished papers reported a negative association with turnover intent for gender ($\rho=-0.10$), although journal papers reported a positive association with turnover intent ($\rho=0.07$, $Z=10.48$, $p<0.001$). Similarly for education, conference/unpublished papers reported a negative association with turnover intent ($\rho=-0.007$), although journal papers reported a positive association ($\rho=0.05$, $Z=5.09$, $p<0.001$). The above results are summarized in Table 11.

Meta-Analytic Structural Equation Modeling Results

Table 12 presents the trimmed correlation matrix, which I used to evaluate the viability of the integrated model of IT turnover intent.

Comparison of Models. To test the relative merits of the fully mediated and partially mediated models, I computed the difference in chi-square values of the two models. Given that the fully mediated model is nested within the partially mediated model, a significant chi-square difference will suggest that the partially mediated structural model fits the data better than the fully mediated model (Byrne, 1998; Kelloway, 1998).

The chi-square fit statistic for the fully mediated model ($\chi^2=271.702$, $df=27$, $p<0.001$)

was found to be significant, thereby suggesting a bad fit with the data. But this significant chi-square is to be expected because the statistic is based on a very large sample size, $N=5,732$ in this case (see Gerbing and Anderson, 1992; Kelloway, 1998). As such, I follow Gerbing and Anderson (1992)'s recommendations of assessing model fit, when using large sample sizes, using RMSEA (0.0421), SRMR (0.0242), NNFI (0.90) and CFI (0.97). These fit statistics conformed to the recommended criteria for models with good fit. Similarly, the chi-square fit statistic for the partially mediated model was also found to be significant ($\chi^2=243.480$, $df=17$, $p<0.001$). As such, I use RMSEA (0.0508), SRMR (0.0233), NNFI (0.852) and CFI (0.972) to assess model fit. The values obtained for the partially mediated model also conformed to the recommended criteria for models with good fit.

In comparing the fully mediated and partially mediated models, the results demonstrate a significant change in chi-square ($\Delta\chi^2=28.222$, $\Delta df=10$, $p<0.05$). This model comparison result favors the partially mediated model.

Fully Mediated Model. The standardized parameter estimates for paths in the fully mediated model are presented in Figure 2. Turnover intent was predicted by the more proximal variables of organizational commitment ($\beta=-0.240$, $p<0.001$) and job satisfaction ($\beta=-0.388$, $p<0.001$). Organizational commitment is predicted by job satisfaction ($\beta=0.487$, $p<0.001$), promotability ($\beta=0.230$, $p<0.001$), role ambiguity ($\beta=-0.099$, $p<0.01$), role conflict ($\beta=-0.142$, $p<0.001$), gender ($\beta=0.226$, $p<0.001$), age ($\beta=0.145$, $p<0.01$), education ($\beta=-0.292$, $p<0.05$), organizational tenure ($\beta=-0.452$, $p<0.001$) and IT tenure ($\beta=0.382$, $p<0.001$). Salary and hierarchical position did not influence organizational commitment.

Job satisfaction is predicted by promotability ($\beta=0.10$, $p<0.05$), hierarchical position ($\beta=0.168$, $p<0.05$), role ambiguity ($\beta=-0.368$, $p<0.001$), role conflict ($\beta=-0.419$, $p<0.001$), gender ($\beta=0.431$, $p<0.001$), organizational tenure ($\beta=-0.397$, $p<0.001$) and IT tenure ($\beta=0.626$, $p<0.001$). Salary, age and education did not predict job satisfaction. Finally, boundary spanning is positively related to role conflict ($\beta=0.167$, $p<0.001$).

In terms of variance explained, the model explained 31.3% of the variance in turnover intent, 36.1% for organizational commitment, 28.6% for job satisfaction, 2.8% for role conflict and less than 1% for role ambiguity.

Partially Mediated Model. Standardized parameter estimates for the partially mediated model are shown in Figure 3. Accordingly, turnover intent is predicted by job satisfaction ($\beta=-0.144$, $p<0.05$), salary ($\beta=-0.759$, $p<0.001$), promotability ($\beta=-0.850$, $p<0.001$), hierarchical position ($\beta=-0.172$, $p<0.05$), role ambiguity ($\beta=0.110$, $p<0.01$), role conflict ($\beta=0.231$, $p<0.001$), age ($\beta=0.179$, $p<0.01$), education ($\beta=0.844$, $p<0.001$) and IT tenure ($\beta=-0.704$, $p<0.001$). No significant results are obtained for organizational commitment, boundary spanning, gender and organizational tenure.

Organizational commitment is predicted by job satisfaction ($\beta=0.528$, $p<0.001$), hierarchical position ($\beta=0.171$, $p<0.01$), role ambiguity ($\beta=-0.085$, $p<0.05$) and role conflict ($\beta=-0.130$, $p<0.001$), gender ($\beta=0.129$, $p<0.05$), age ($\beta=0.096$, $p<0.05$) and organizational tenure ($\beta=-0.299$, $p<0.01$). Organizational commitment is not related to salary, promotability, boundary spanning, education and IT tenure.

Job satisfaction is predicted by salary ($\beta=-0.238$, $p<0.05$), promotability ($\beta=0.173$, $p<0.001$), hierarchical position ($\beta=0.204$, $p<0.01$), role ambiguity ($\beta=-0.379$, $p<0.001$), role conflict ($\beta=-0.414$, $p<0.001$), gender ($\beta=0.338$, $p<0.001$), organizational tenure ($\beta=-0.238$, $p<0.05$) and IT tenure ($\beta=0.445$, $p<0.001$). Boundary spanning, age and education did not affect job satisfaction.

Finally, boundary spanning is significantly related to role conflict ($\beta=0.175$, $p<0.001$) but not role ambiguity.

This model explained more variance in turnover intentions than the fully mediated model (81.8%), and accounted for 36.6% of variance in organizational commitment, 27.7% in job satisfaction, 3.1% for role conflict and less than 1% for role ambiguity.

Table 12: Meta-Analytic Correlation Values for the Predictors of Turnover Intentions¹

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Turnover Intentions	1.000													
2. Job Satisfaction	-0.525	1.000												
3. Affective Organizational Commitment	-0.454	0.581	1.000											
4. Salary	-0.134	0.220	0.248	1.000										
5. Hierarchical Position	-0.276	-0.075	0.026	0.821	1.000									
6. Promotability	-0.504	0.191	0.181	-0.036	-0.090	1.000								
7. Role Ambiguity	0.212	-0.420	-0.318	0.004	0.155	-0.144	1.000							
8. Role Conflict	0.300	-0.406	-0.321	0.052	0.204	-0.172	0.126	1.000						
9. Boundary Spanning Activities	-0.162	0.147	0.224	0.307	0.477	0.085	-0.055	0.180	1.000					
10. Organizational Tenure	-0.083	0.086	-0.015	0.113	0.251	-0.287	0.026	0.070	0.139	1.000				
11. Age	-0.038	-0.002	-0.011	0.353	0.100	0.200	-0.039	-0.099	0.143	0.440	1.000			
12. Education	0.040	0.041	-0.013	0.764	0.100	0.200	0.066	0.048	-0.033	-0.077	0.227	1.000		
13. Gender (Male; Female)	0.029	0.053	-0.040	0.344	-0.300	0.100	-0.176	-0.113	0.139	0.137	0.073	0.227	1.000	
14. IT Tenure	-0.316	0.033	-0.032	0.357	0.286	-0.343	0.022	0.075	0.138	0.700	0.100	0.100	-0.457	1.000

N=5,732

¹ Correlations greater than 0.140 are significant at p<0.05

Figure 2: Results for the Fully Mediated Structural Model of Turnover Intention

Figure 3: Results for the Partially Mediated Structural Model of Turnover Intention

DISCUSSION AND IMPLICATIONS FOR FUTURE RESEARCH

The turnover of IT professionals has long posed a practical problem for the industry. In response, an increasing number of IT studies have attempted to better understand the causes that drive IT professionals to leave their organizations, resulting in a sizable body of literature on the topic. Yet, no systematic review of the literature has been conducted, and little is known about the state-of-the-art of IT turnover research. In undertaking a qualitative and quantitative analysis of IT turnover intentions research, this study contributes to IT research by pulling together existing findings in IT literature and integrating them into a coherent theoretical model of IT turnover intention. To my knowledge, this study is the first attempt in the IT discipline at summarizing the body of knowledge on IT turnover intentions. Moreover, this review identifies areas that have been neglected, or have suffered from substantial flaws. Consequently, this study contributes to IT literature by providing important future research directions to advance the field of IT turnover.

In this section, I first summarize the findings from the qualitative and quantitative review, and discuss the insights and implications arising from them, followed by suggestions for future research.

Predictors of IT Turnover Intention

From the qualitative review of the literature (see Table 2), it appears that IT research has sampled the domain of turnover predictors. This is evidenced by the fact that the forty-eight (48) predictors identified in this review represent all major categories of antecedents reported in the management literature.

Notwithstanding this merit however, there seems to be considerable disparity in the amount of research accorded to the individual predictors. Of the forty-eight (48) predictors of IT turnover intentions for instance, only twenty-three (23) were examined in two or more independent studies. This uneven spread of attention indicates a rather disparate stream of research, and may potentially impede the field's advancement due to the lack of knowledge accumulation.

Although IT turnover intention studies have largely based their choice of predictors

and theoretical development on seminal turnover theories in the management discipline, it is interesting to note that some predictors appear to be more germane to, or elicit more interest from, the IT profession. For instance, predictors included in this review such as career satisfaction, hierarchical position and boundary spanning activities have yet to be meta-analytically reviewed in the broader management literature.

For predictors that have been similarly examined in prior meta-analyses, results from this review suggest some differences in the magnitude of effect sizes for the IT profession. For example, the correlation estimates for job satisfaction, organizational commitment, salary and perceived job alternatives with turnover intention in IT samples are found to be stronger than those reported in the meta-analysis conducted by Griffeth et al. (2000) involving general populations. This is consistent with existing findings that meta-analytic correlations tend to be stronger in homogeneous samples, rather than in heterogeneous samples (e.g. Fuller, et al., 1996; Lee, et al., 2000).

Amongst the four categories of antecedents examined, the results suggest that organization related and job related factors are most effective in predicting IT turnover intentions. In contrast, most predictors subsumed under the categories of organization factors and personal attributes do not predict turnover intentions. It could be that IT professionals are more concerned with the nature of the job itself, rather than with the extrinsic factors associated with wider organizational conditions in evaluating intentions to turnover. For personal attributes, the nonsignificant findings are in fact consistent with management research suggesting that they are weak predictors of turnover (Cohen and Hudecek, 1993; Griffeth, et al., 2000; Healy, Lehman and McDaniel, 1995). Interestingly, the nonsignificant finding for gender and turnover intention implies that female IT professionals are as likely to leave the organization as their male counterparts. This finding dispels a common myth regarding gender's effect on turnover intent (e.g. Ahuja, et al., 2002; e.g. Baroudi and Igbaria, 1995; Igbaria and Chidambaram, 1997).

Concerning variability across studies, only seven (7) of the twenty-three (23) correlations were not tempered by a potential moderator. Although I find substantial

variation for the remaining sixteen (16) predictors, I could investigate only eight (8) for the sources of variation. In general, results show that the conceptualization and operationalization of turnover intent is not a significant source of variation in the findings across studies. Apart from these two, all other moderators accounted for significant variation in the relationships of the eight predictors with turnover intent. The extrinsic factor of publication source (journal versus conference) appeared to have the most moderating impact, influencing the effect sizes for all constructs except for salary and role ambiguity. This affirms the threat posed by the file-drawer problem (Hunter and Schmidt, 1990; Rosenthal and DiMatteo, 2001).

The next important source of variation is the operationalizations of the predictors. Except for organizational commitment, role ambiguity and gender, the correlations of all other five (5) predictors were influenced by how they were measured. This suggests that researchers should devote more care and effort to the measurement of these constructs. For instance, the results imply that it is a good practice to increase the granularity of categories for variables such as education, as it has been shown that finer distinction in education levels produces stronger relationship with turnover intent.

Concerning the substantive class of moderators, I found some interesting variation in the correlation estimates depending on the mean age of study samples. For instance, although the overall gender-turnover intent correlation was not significant, results of the moderator analyses suggest that in older samples, male IT professionals were more likely to leave, whereas in younger samples, females tended to report higher turnover intentions. This result is consistent with demographic theories (e.g. Kanter, 1977) which argue that people prefer to work with similar others. This, in turn, leads to positive work experiences and lowered turnover intentions. Another recent theory put forward for these gender differences is that younger women tend to leave the workforce because of their lowered chances for promotion as well as for family reasons (Lyness and Judiesch, 2001). But, as women move up the organizational hierarchy, their turnover rates are lower compared to men (Lyness and Judiesch, 2001).

In younger samples, turnover intentions of individuals with longer organization tenure are higher than for individuals with shorter tenure, presumably because they hope to find new challenges in a different environment. In older samples, individuals with longer tenure are less likely to leave, supporting the “adjustment” and “sunk cost” theories.

Integrative Model of IT Turnover Intention

In testing an integrative model of IT turnover intention, the results provide strong support for the partially mediated model, implying that organization related, job related and personal attributes have both indirect effects via the attitudinal constructs, as well as direct effects, on turnover intention. It should be noted that the explained variation in turnover intentions in this model ($R^2=0.82$) is well above that obtained by Tett and Meyer ($R^2=0.507$, 1993). This improvement on the explained variation is attributed to including more factors such as organization related factors, job related factors and personal attributes. The meta-analytic structural equation modeling results also confirm that job satisfaction as a critical construct in explaining turnover intent, more so than organizational commitment. This is consistent with Tett and Meyer's (1993) meta-analytic path analysis where they found weak relationships between turnover and organizational commitment.

Based on the results obtained in this study, I propose a modified integrative model for future research (Figure 4). In this modified integrative model, I make two important extensions to the turnover intention model of Figure 1. For the first extension to the model, I link turnover behavior to turnover behavior. Tett and Meyer (1993) and Sager, Griffeth and Hom (1998) establish that turnover intention is an important construct in understanding the turnover phenomena. Tett and Meyer's meta-analysis of 155 turnover studies in the management discipline report that turnover intentions fully mediated the effects of job satisfaction and organizational commitment on turnover behavior. In the same vein, Sager, Griffeth and Hom (1998) tested Mobley's (1977) linkage model on a sample of sales personnel. Like Tett and Meyer, Sager et al also found that turnover intentions full mediated the distal attitudinal constructs with turnover behavior.

Future IT research could study turnover behavior as the strength of the relationship

between intentions and behavior has been found to vary across situations, depending on moderating factors such environmental context (Mobley, 1982; Steers and Mowday, 1981). By this, I do not imply that turnover intention is irrelevant. On the contrary, it is difficult to imagine an individual leaving the organization without having the intention to do so. Thus, another important avenue for future research is to better understand when turnover intention may or may not result in actual turnover behavior. For instance, the context could be an important moderator of that relationship, which I will discuss in a later paragraph.

The second extension to the model concerns the role of organizational and environmental context in turnover. Context refers to the surroundings associated with a phenomenon that help illuminate that phenomenon (Cappelli and Sherer, 1991). Context typically includes factors at a higher level of analysis than the unit of analysis of interest (Mowday and Sutton, 1993). Context is important because it constrains or provides opportunities turnover. The integrative model illustrates broadly how IT-specific contextual factors exert cross-level influence on turnover intentions. I adopt Ang and Slaughter's (2000) framework to divide the IT context into the external and the internal environment, with organizations nested within the larger environment. As such, organizational factors are relatively proximate to turnover compared to the more distal environmental factors.

Organization level factors can exert cross-level influence on turnover intentions and behaviors in two ways. First, organization level factors can moderate the relationship between turnover intentions and behavior. For example, the terms and clauses specified by the organization in the employment contract (e.g., restraint of trade) could create constraints for employees who intend to leave the firm, thus attenuating the intention-behavior relationship. Second, organization level factors can moderate the relationships between individual level antecedents and turnover intentions. The literature on person-organization fit suggests that compatibility between the person and the organization is a crucial determinant of work attitudes and turnover intentions (e.g. see review by Kristof, 1996). For example, IT professionals who have a technical career orientation are more likely to fit into IT professional firms than those with a managerial career orientation.

Figure 4: Modified Integrative Model of Turnover Intentions in IT

In addition to organizational factors, environment level factors may influence IT professionals' turnover directly. For example, technological trends may influence individuals differently. Younger IT professionals may be less affected by such changes than older professionals; IT professionals who are more committed to the profession (i.e., professional identity) may be less affected by such technological changes than individuals who are less committed, as they are likely to be more determined and motivated to update their skills.

The final extension to the integrative model is in linking turnover behavior to its consequences. For example, one consequence of turning over is a reduction in human capital. The loss of firm specific human capital may be costly to the individual in terms of career success as reduced income attainment.

Future Research on Turnover in IT

The results have several implications for future research on turnover in the IT domain. One striking implication arising from the qualitative review is the disparate stream of research on IT turnover intention. Almost half of the constructs studied in the IT domain could not be reviewed because these were "one-off" studies. The downstream effect of such a research strategy, if left unchecked, could impede the systematic accumulation of knowledge in any domain (Eden, 2002). Hence, future research may seek to examine the relationship of under researched constructs with turnover intent (see Table 2). For example, research might examine a wider range of attitudes, such as professional commitment, or even personality variables.

Second, future IT research might reexamine bivariate relationships especially in light of findings concerning the moderating effect of gender and age. Although IT studies do obtain empirical evidence of gender differences in turnover intentions (e.g. Baroudi and Igbaria, 1995; Igbaria and Chidambaram, 1997), this review failed to establish a direct relationship. Yet, I find gender differences in the effect sizes across studies on role ambiguity and role conflict. As such, future IT research might examine the mediating role of work-family conflict in explaining the gender-turnover relationship. In fact, there is evidence to suggest that gender differences exist in the way males and females approach their work

and family roles (Rothbard, 2001).

Third, all IT studies reviewed in this essay adopt March and Simon's (1958) organizational equilibrium theory of turnover. Management research has progressed beyond this classic theory to propose more contemporary theories of why individuals turnover, such as the unfolding model of turnover (Lee, Mitchell, Wise and Fireman, 1996) and the job embeddedness theory (Mitchell, Holtom, Lee, Sablinski and Erez, 2001). These two theories may offer new perspectives on the conditions in which voluntary turnover might occur. For example, future research might employ the unfolding theory to explain how certain cognitive schemata or scripts (e.g. Pazy, 1994) that are triggered under the threat of professional obsolescence may lead IT professionals towards staying with an organization.

Finally, from a theory building perspective, one of the questions raised by the results is: what are the consequences of turnover? In conducting this review, I find an extensive body of IT research examining why IT professionals leave their organizations. But turnover also has consequences (see Staw, 1980). For one, leaving one's organization is related to the loss of human and social capital that may influence subsequent career success. Another line of research may extend Moore's (2000) model of role stressors and turnover intentions. Although Moore argues that work exhaustion mediates this relationship, it is reasonable then to posit that turnover would more likely result in reduced stress.

Study Limitations

This study has some limitations that should be noted. First, the reader is cautioned that the number of studies analyzed in this study may temper the results and subsequent conclusions. Hunter and Schmidt (1990) caution that results based on small sample sizes or few studies are subject to second order sampling error. Although the number of articles in this study may seem small, other meta-analyses in niche IT domains suffer from small sample sizes as well (e.g. Dennis and Wixom, 2002; e.g. Montazemi and Wang, 1989). However, I note that the remaining substantive relationships of turnover with personal attributes, role constructs, job satisfaction and organizational commitment were estimated with a larger number of studies and sample sizes. Another limitation of this study is that all

data collected in the primary studies are self-reported and collected at the same time. As such, the data used for the meta-analysis may be influenced by common source bias. Finally, the small number of studies impedes the analysis of other moderators. The analysis of moderators indicates a significant amount of residual unexplained variance for some predictors examined in this study. Thus, other potential moderators may be influencing these relationships. To increase our understanding of the IT turnover phenomenon, more systematic accumulation and reporting of knowledge is required.

CONCLUSION

The primary contribution of this study is in presenting a qualitative and quantitative analyses of IT turnover intentions research. The IT discipline has studied the turnover phenomena for over twenty years, yet, this study represents the first attempt at summarizing this body of knowledge. Further, this study extends our collective understanding of the predictors of turnover intent by surfacing constructs, which have interested IT scholars and by examining their generalizability across studies. In addition, this study places constructs in their respective positions in a structural model of turnover intent for the IT profession, thereby, highlighting opportunities and directions for future research.

CHAPTER 3

STUDY 2 - PROTOTYPICAL CAREER PATHS IN INFORMATION TECHNOLOGY AND THEIR ECONOMIC RETURNS

INTRODUCTION

The first study in this dissertation examined the antecedents of intentions of career transitions across organizational boundaries; this study examines the career transitions across occupational boundaries and its associated consequences. Over time, an individual's career transitions become observable to researchers and managers as a career path. A career path consists of a sequence of work experiences over time (Arthur, Hall and Lawrence, 1989; Hall, 1987). Career paths, therefore, are built up by a series of observable career transitions involving lateral job transitions within an organization; upward transitions as in promotions; transitions between organizations as in turnover; and inter-occupational transitions as in leaving the occupation for another.

The study of career paths is important because of its implication for individuals and organization. For IT professionals, the study of career paths informs on issues which relate to career success (Igbaria and Wormley, 1992). For organizations, knowledge from this area of study informs on human resource practices that help organizations attract, retain and develop IT professionals for critical jobs (Ang and Slaughter, 2000).

Yet, there is little examination of career paths in IT literature (Ang and Slaughter, 2000). To my knowledge, only two studies have specifically examined the career paths of IT professionals (i.e., Kaiser, 1983; Tanniru, 1983). Ginzberg and Baroudi (1988) reviewed these earlier works and concluded that the results obtained from these prior studies were inconclusive and called for a shift of research effort towards the study of internal careers of IT professionals. Internal careers are the subjective meanings given by individuals to make sense of their careers and these meanings may change over time (Van Maanen and Schein, 1977). In contrast, external careers refer to the objective work history of individuals (Bailyn,

1989). In essence, the internal careers of individuals are exhibited through their external careers (Schein, 1971, 1978).

Following Ginzberg and Baroudi's (1988) call, the IT discipline has amassed a substantial body of knowledge on internal careers by examining attitudinal factors such as career anchors (e.g. Crepeau, Crook, Goslar and McMurtrey, 1992; Jiang, Klein and Balloun, 2001) and career satisfaction (e.g. Hsu, Chen, Jiang and Klein, 2003a; Jiang, et al., 2001). Theoretically, Bailyn (1989) considers constructs reflecting internal careers to be more proximate in explaining career related cognitions such as career satisfaction compared to the more distal external career. Internal career constructs mirror the context in which the phenomenon occurs and influences an individual's experience in that context (p. 483). Methodologically, internal careers are typically examined in cross-sectional designs and analyses. The study of external careers, however, requires longitudinal work histories that are more difficult to obtain. Moreover, the study of external careers employs additional techniques such as career sequence comparison and cluster analyses (e.g. Abbott, 1995; Abbott and Hrycak, 1990).

The IT discipline's dominant focus on internal careers rather than on the external careers of IT professionals provides an opportunity to ask whether there are prototypical career paths in IT and what their consequences are. I draw on prior literature on careers to argue that there are prototypical career paths in IT. Using longitudinal data, I analyze career transitions of individuals who have worked in IT using career sequence comparison analysis (Abbott, 1995; Abbott and Hrycak, 1990) and cluster analysis to identify prototypical career paths. Career sequence comparison offers a formal, replicable analysis of work history to succinctly compare and classify careers (Abbott, 1995; Abbott and Hrycak, 1990). Subsequently, I examine the consequences of these career paths through the lens of human capital theory (Becker, 1975). In particular, I empirically examine the returns to these career paths.

In doing so, this study makes two key contributions to career research in IT. First, this study represents the first empirical analysis of the external careers of IT professionals and complements qualitative research on IT careers paths (e.g. Kaiser, 1983; Tanniru, 1983) by focusing on individuals' transitions within and across occupations. In reconciling the internal and external perspectives on careers, theories examining the internal careers (e.g. Bailyn and Lynch, 1983; Schein, 1978) state that the internal, subjective meanings given to careers by individuals are exhibited through their external careers.

Second, this study adds to a very limited set of studies on the compensation of IT professionals by theorizing and testing the career determinants of income. This study extends IT compensation models by including career paths in addition to human capital determinants (Ang, Slaughter and Ng, 2002) in explaining the compensation of IT professionals.

In the following sections, I present the theories employed to formulate hypotheses concerning the prototypical career paths of IT professionals and the differential economic returns to these prototypical IT careers. The hypotheses are evaluated using archival data comprising career sequences of individuals and income data collected over a period covering 1979-2000. I, then, interpret the results and conclude this study with suggestions for future research.

THEORY AND HYPOTHESES DEVELOPMENT

In this section, prior research on careers provides the theoretical foundation to examine the prototypical career paths of IT professionals. Subsequently, I employ human capital theory (Becker, 1975) to argue and hypothesize the differential relationship these career paths have on the income of IT professionals.

Prototypical Career Paths in the IT Profession

The traditional view of careers is one in which a career of an individual unfolds in linear stages within an organization. To illuminate the careers of individuals, career development theories were proposed (Levinson, 1978; Super, 1957). Super's (1957) theory of career stages describes how individuals implement their self-concepts through vocational

choices. Specifically, Super argued that individuals choose an occupation that maximizes their self-expression over time. This self-expression is manifested by individuals experiencing four career stages: (1) exploration, involving a period where evaluations of fit with the occupation are made; (2) establishment, involving a period of becoming employed and finding a niche; (3) maintenance, involving a period of expertise building; and (4) disengagement, involving a period where an individual plans for retirement. Levinson (1978) suggested an alternative explanation that the careers of individuals were punctuated at certain points. Levinson argued that careers were defined by alternating periods of stability and periods of transition. In periods of stability, individuals were argued to pursue their goals, values and related activities, whereas, in periods of transition, individuals reassess their goals, values and activities of the previous period.

As traditional career theories presume that an individual's career unfolds only within the context of an organization, careers are construed as careers of advancement in which career success is measured in terms of advancement up the career ladder through increasing levels of power and authority (Zabusky and Barley, 1996). However, Hall (1976) noted in the final chapter of his seminal work on careers that individuals do not necessarily subscribe to an organizationally based career path. In fact, he observed that some individuals had transitioned across multiple organizational boundaries, appeared to be less attached to their organizations and took on the responsibility of managing their own career development. This alternative form of career, a career of achievement, is typical of careers in professional and technical occupations (Zabusky and Barley, 1996). Career success in professional and technical occupations "entails horizontal movement from the periphery to the center of an occupational community. Progress is scaled in terms of increments of skill, position in a network of practitioners and, sometimes, the setting in which one practices" (Zabusky and Barley, 1996, p. 187).

Consequently, scholars have questioned the applicability of traditional career theories to professional and technical careers (Barley and Kunda, 2001). Barley and Kunda (2001) argue that managerial work has become increasingly differentiated and that the

professional and technical occupations, in the United States, employ more people than any other occupation. Recent labor force statistics support their arguments by showing that professional and technical occupations employ twice as many people compared to the managerial and administrative occupation (Hecker, 2005). In addition, the number of individuals employed in professional and technical occupations are the largest of all occupations monitored by the Bureau of Labor Statistics (Hecker, 2005).

In place of the traditional organizationally based career, the broader management literature proposes two career paths in professional and technical occupations: a technical career path and a managerial career path. Barley and associates' (Barley, 1996; Barley and Bechky, 1994; Zabusky and Barley, 1996; Zabusky and Barley, 1997) ethnographies of technicians and scientists and Hall's (1976) seminal work on the careers of individuals within organizations provide the theoretical foundation to illuminate why individuals subscribe to either a technical or a managerial career path.

Hall's (1976) study of careers within organizations argued and found that organization commitment plays an important role in a managerial career. Individuals who are committed to their organizations tend to perceive career success in terms of the salary obtained and the position attained within an organization. The ethnographies of Zabusky and Barley (1996; 1997) concur by reporting that technicians and scientists who ascribed to a career of advancement exhibited career paths characterized by vertical mobility after entry into an organization. In contrast, individuals persist in technical career paths because such individuals love their technical work, are committed to their profession and to professional development, and ascribe to attaining expertise and reputation (Zabusky and Barley, 1996).

For example, computer programmers interviewed by Zabusky and Barley were excited about IT work and saw IT work as a calling. In addition, the ethnographers reported that individuals in a technical career path valued constant learning and saw their work as a journey towards a status of an expert. Subsequent research affirms that individuals who undertake professional development behaviors such as professional reading, being active members of a professional organization, tend to be committed to their profession (Blau,

1999; Morrow and Wirth, 1989; Wallace, 1993) and more likely to persist in their professional careers (Blau, 2000). Finally, IT professionals interviewed by Zabusky and Barley (1996) measured career success in terms of accumulated accomplishments, expertise, and the gradual acquisition of a reputation for skill. The ethnographers conclude that a career of achievement “had something to do with finding one’s self and one’s identity” (p. 198).

Similarly, IT research on career paths has traditionally advocated two distinct paths in the IT profession: one technical and the other managerial (Chesebrough and Davis, 1983). An IT professional in a technical career path holds a series of IT technical jobs for the duration of her career. In the managerial career path, an IT professional may hold a series of IT technical jobs before moving into supervisory or IT management positions later in one’s career (Kaiser, 1983).

Recent research on IT career paths suggests a third alternative career path where individuals tend to transit into and out of the IT profession. A study by Reich and Kaarst-Brown (1999) reported on IT professionals moving out of the IT profession and into line functions when the opportunity arose. The IT professionals who left IT also stated that they did not intend to come back to the IT profession. In essence, these individuals exhibit a protean or boundaryless career path by transiting across multiple occupations (Arthur and Rousseau, 1996; Hall and Mirvis, 1996).

A protean or a boundaryless career refers to a career where an individual holds a series of unrelated jobs that cross occupational boundaries seeking independence rather than dependence on traditional career arrangements provided by a profession or organization (see Arthur and Rousseau, 1996, p. 6). The measure of career success in a protean career path tends to be psychological in nature. Mirvis and Hall (1994) define psychological success as “the experience of achieving goals that are personally meaningful to the individual, rather than those set by parents, peers, an organization, or society” (p. 366). Additionally, individuals in a protean career path are argued to have fewer attachments to work (Mirvis and Hall, 1994). This argument finds support in a study of medical technologists’ intentions to leave their profession. Blau and Lunz (1999) found that

medical technologists who were male, young and less satisfied with the profession reported higher levels of intentions to leave their profession. With subjective measures of career success and fewer attachments to the work place, individuals in a protean career path tend to be driven by internal values of freedom and growth (Hall, 1976).

Therefore, I expect three prototypical career paths in the IT profession: (a) an IT technical career path; (b) an IT managerial career path; and (c) a protean career path.

Hence:

Hypothesis 1: IT professionals follow one of three career paths: (a) an IT technical career path; (b) an IT managerial career path; and (c) a protean career path.

Returns to Career Paths of IT Professionals

Although individuals may subscribe to either a technical, managerial or protean career path, the research on careers appears silent on the comparative income attained by subscribing to a career path (Arthur, Khapova and Wilderom, 2005). Researchers examining the career paths in technical and professional occupations emphasize career success in managerially oriented careers in terms of increasing levels and salary, whereas in technically oriented careers, career success is emphasized in terms of increments of skill and position in a network of practitioners (Zabusky and Barley, 1996). Unlike the objective measures of career success employed in managerial and technical careers, career success in protean careers is attitudinal in nature (Arthur, et al., 2005; Eby, Butts and Lockwood, 2003). Hence, it is not readily clear from the extant research on careers whether individuals benefit or are penalized in choosing to follow a particular career path.

Given that the extant career research is silent on a comparable measure of career success across various career paths, I draw on human capital theory in choosing a common metric for career success to evaluate their comparative value. Human capital theory (Becker, 1975) is an appropriate theory for my purpose because careers paths may be differentiated on the transferability of competencies (Sullivan, Carden and Martin, 1998). Individuals in career paths may possess knowledge and experience that are specific to a

domain, such as firm or occupation, or may possess competencies that are highly portable across domains (Sullivan, et al., 1998).

Human capital theory suggests that the income an individual receives is associated with investments in human capital (Becker, 1975; Mincer, 1970). Human capital refers to an individual's productive competencies that result from education and experience. These competencies vary in their level of specificity from general to specific. General human capital tends to increase one's productivity across domains (e.g. jobs, firms, industry and occupations). Occupation-specific human capital tends to increase one's productivity within an occupational domain and is not readily transferable outside a given occupation. Finally, firm-specific human capital tends to increase one's productivity within a specific organization and is not readily transferable to other firms.

The theory goes on to suggest differential returns according to the specificity of productive human capital (Becker, 1975). A firm's productivity is more closely tied to firm specific human capital compared to general or occupation specific human capital because firm specific human capital is more likely to be inimitable and is the basis for a firm's sustained competitive advantage (Galunic and Anderson, 2000). As such, firms tend to pay a wage premium over the market rate for individuals with firm specific human capital to reduce the likelihood of an individual with valued firm specific human capital from quitting (Cappelli and Cascio, 1991). Moreover, organizations tend to place higher value on firm-specific human capital over occupation specific or general human capital because firm specific human capital takes longer to accumulate and the potential cost of replacing firm-specific human capital, when individuals leave, is high (Doeringer and Piore, 1971; Maxwell, 1987). In fact, Cappelli and Cascio (1991) find jobs with high firm specific skills do command larger wage premiums over the market rate compared to jobs with less specific skills.

In contrast, firms compete in the open labor market for general and occupation specific human capital. Comparatively, occupation specific human capital is more limited in supply compared to general human capital (Maxwell, 1987). As such, the limited pool of

individuals with occupation specific human capital is more able to command a relatively higher salary compared to individuals with general human capital.

The nature of IT jobs requires incumbents to possess occupation-specific human capital in the form of technical competencies, e.g. systems analysis, design, software engineering, and network management (Lee, Trauth and Farwell, 1995; Todd, McKeen and Gallupe, 1995). Such competencies are typically acquired through formal education and refined with tenure in IT. At the same time, IT professionals require firm-specific human capital in the form of business and managerial competencies to solve problems in an organization (Leitheiser, 1992; Taggart and Silbey, 1979).

IT professionals in a technical career path typically undertake IT jobs that are complex requiring advanced education and experience in information technology (Meares and Sargent, 1999). To be productive, IT professionals require a greater extent of technical competencies and less of firm-specific competencies to work effectively (Ives and Olson, 1981). Moreover, income attainment in an occupationally driven career path is more closely tied to an individual's productivity on the job rather than to position or seniority (Althausen, 1989; Eliason, 1995). However, returns to technical human capital may decline over time as technical competencies erode rapidly unless one continues working in a technical domain (Fossum and Arvey, 1990; Glass, 2000). This suggests that as long as an individual remains in a technical career path, income should increase along one's career.

Individuals in an IT managerial career path tend to require more firm-specific competencies to be effective in the context of a particular organization. Taggart and Silbey's (1979) analysis of critical work incidents experienced by an IT manager reported that more than 65% of the critical incidents encountered over a six month period consisted of resolving personnel or administrative issues. Such firm-specific competencies are typically acquired on the job and are more durable compared to technical competencies (Dubin, 1971; Pazy, 1994). Hence,

Hypothesis 2: Income of individuals in an IT managerial career path is higher than the income of individuals in IT technical or protean career paths.

Income attainment for individuals who repeatedly cross occupational boundaries tend to be derived mainly from individuals' stock of general human capital (Althauser and Kalleberg, 1981). However, general human capital is not likely to enhance an organization's unique capabilities compared to firm specific human capital (Galunic and Anderson, 2000). Moreover, firms may obtain general human capital cheaply from the open labor market and the potential cost to the firm of replacing general competencies when individuals leave is low (Doeringer and Piore, 1971; Maxwell, 1987). As such, firms tend to place a lower value and provide less rewards for investments in general human capital compared to firm specific human capital (Galunic and Anderson, 2000; Maxwell, 1987).

From the individual's perspective, individuals subscribing to a protean career path have fewer opportunities and less incentive to invest in occupation specific or firm-specific human capital. Without these forms of human capital, their productivity levels are likely not comparable to those in the other two career paths. As such, individuals in the protean career path are more likely to earn lower wages compared to individuals in technical or managerial career paths. Hence,

Hypothesis 3: Income of individuals in the protean career path is lower than the income of individuals in IT technical or IT managerial career paths.

In summary, this section proposes why I expect to find three career paths in the IT profession. Subsequently, I employ human capital theory as a theoretical lens to argue for differential returns to these career paths. In the next section, I present the methods used to answer the research questions posed in this study and the hypotheses developed in this section.

METHOD

This section begins with a description of the longitudinal data used and follows with a description of the measures. I conclude this section with the data analysis approach employed to arrive at the results.

Data

I test the hypotheses developed in the previous section using data drawn from the National Longitudinal Survey of Youth (NLSY) dataset. The NLSY dataset surveyed 12,686 individuals who were 14-22 years old as of January 1, 1979. The interviews conducted covers a period from 1979 to 2000. The sample used in this study comprises of respondents in the civilian labor force who have attained at least a bachelor's degree and have worked in the IT profession for at least one continuous year. I follow the Bureau of Labor Statistics' definition of a permanent job by applying the "one continuous year" criterion to ensure the selection of those individuals who have regarded IT jobs as a permanent job and not just as a temporary job (Polivka, 1996).

IT jobs were identified by a 3-digit occupation classification code developed by the U.S. Census Bureau for the 1970 Census of Population (U.S. Census Bureau, 1971). A full-time job is identified as a job in which a respondent worked for more than 20 hours a week (Parent, 2000).

Following the criteria above, I identified 351 individuals (3%), out of the 12,686 individuals included in the NLSY, who have worked in an IT job for at least one year at any point in their work history.

Coding Career Paths

The NLSY dataset contains respondents' work histories covering a period from 1979 to 2000. Using work history data, I coded each respondent's occupation in each period. To develop the career paths of the respondents, I follow Abbott's (Abbott, 1995; Abbott and Hrycak, 1990) approach to coding career sequences by expressing each individual's career path as a sequence of occupations. I begin a career sequence with an individual's first job after receiving a bachelor's degree because jobs held before attaining the degree are part-

time, or internships or short employment stints (Polivka, 1996). To analyze the career history of each individual, I expressed each individual's career using one calendar year as the basic time interval. Individuals who switched jobs within a given calendar year were coded for their dominant occupation in that year.

I relied on the 1970 3-digit occupation classification (U.S. Census Bureau, 1971) in the NLSY dataset to code each job undertaken by each individual. IT jobs include computer programmers, computer systems analysts, computer specialists, data processing machine repair personnel and data processing operators. A job was coded "I" if it corresponded to an IT job. Otherwise, it was coded "M" if its 3-digit occupation classification code corresponded to a managerial job or coded "N" for all other non-IT, non-managerial jobs or coded "U" when the individual was unemployed.

Career Sequence Comparison Analysis

I use sequence comparison analysis (Abbott, 1995; Abbott and Hrycak, 1990) with ClustalG (Wilson, 2002) to examine the career sequences of IT professionals. I use sequence comparison analysis because it is able to analyze longitudinal data and identifies patterns in temporal sequences of career histories (Abbott, 1995; Abbott and Hrycak, 1990).

In conducting a sequence comparison analysis, I input into ClustalG the sequences of occupations undertaken by respondents. The output obtained from career sequence comparison analysis is a matrix of similarity scores for each career sequence with the next. Similarity scores are calculated by the number and cost of substitutions, insertions and deletions required to transform one sequence into another (Wilson, Harvey and Thompson, 1999). For the cost of substituting occupations, I use the default identity matrix that does not allow for variation in substitution costs because the matching algorithm appears to be insensitive to the weight matrices. Insertion and deletion costs were set to equivalent high penalty values (i.e. 10) for introducing and extending gaps into sequences as there is no theoretical reason to introduce gaps into individuals' career sequences (see Abbott, 1995; Abbott and Hrycak, 1990). Subsequently, the resulting similarity matrix is converted into a Euclidean distance matrix by subtracting each similarity score by the maximum score

occurring in the matrix. The cluster analysis program uses the distance matrix to empirically group the career sequences into natural clusters (Hair, Anderson, Tatham and Black, 1995).

Cluster Analysis

I use cluster analysis to group the career sequences into “natural clusters” (Aldenderfer and Blashfield, 1984) with the goal of identifying prototypical career paths in the IT profession. Cluster analysis is an exploratory technique that is well suited for surfacing meaningful patterns in categorical data as well as continuous data. Specifically, I use a two-step cluster analysis to analyze the Euclidean distance matrix to determine the number of viable clusters in the data. The two-step cluster adopts a hierarchical agglomerative algorithm that first develops a modified cluster feature (CF) tree based on the distance scores from the Euclidean distance matrix. In the second step, the clustering algorithm takes the sub-clusters developed from the CF tree and calculates the optimal number of clusters by comparing model fit statistics across different clustering solutions.

I did not limit the clustering algorithm to produce a certain number of clusters but allowed the algorithm to determine up to a maximum of 15 clusters (the default in SPSS). The clustering algorithm calculates the optimal number of clusters by comparing model fit statistics [i.e. Akaike's Information Criterion (AIC, Akaike, 1974); and Schwarz's Bayesian Criterion (SBC, Schwarz, 1978)] across different clustering solutions. These model fit statistics are based on maximum likelihood measures compared with a null cluster solution (Bozdogan and Sclove, 1987).

I subsequently validated the resulting cluster solution using criterion variables to establish predictive validity (Aldenderfer and Blashfield, 1984; Hair, et al., 1995). To do so, I use actual tenure in IT technical jobs, in managerial jobs and in other non-IT, non-managerial jobs as criterion measures. These tenure variables were chosen because they have strong theoretical relationships with the clusters (see Althauser, 1989; Ang, et al., 2002; Slaughter and Ang, 2004) and that these variables were not used to form the clusters (Aldenderfer and Blashfield, 1984; Hair, et al., 1995).

Measures

Dependent Variable. The dependent variable is average real income. To arrive at a measure of real income, I first obtained the reported total annual income of individuals in the NLSY dataset for each year. The reported total annual income includes income from wages, salary and tips for an individual in a given year. Subsequently, I compute real income using a CPI deflator with 1982-1984 as the base year (Bureau of Labor Statistics, 2004a). An individual's average real income is obtained by averaging one's annual real income for their entire career.

Independent Variables. The independent variables are the career paths of IT professionals. I use the dummy coding approach advocated by Cohen and Cohen (1983) to create two dichotomous, dummy variables to represent IT managerial career path (1=IT managerial; 0=others); and Protean career path (1=Protean; 0=others).

Controls. Prior research on the compensation of IT professionals (e.g. Ang, et al., 2002; Slaughter and Ang, 2004) has shown that human capital predictors provide an explanation of why income varies from one IT professional to the next. Hence, I include education, a dichotomous variable, to measure whether an individual attained a bachelor's degree or a postgraduate degree. The other human capital variable is accumulated work experience, measured as a continuous variable. I also include the squared term of work experience to model the nonlinear relationship between work experience and income (see Mincer, 1970; Sturman, 2003). Finally, I use the number of career transitions as a proxy for organization specific and occupation specific human capital.

In addition to human capital, the gravitational hypothesis suggests that individuals incline towards jobs based on their ability and job complexity (Wilk and Sackett, 1996) which in turn effects their career outcomes. To account for this alternative explanation, I include a measure of cognitive ability using the percentile score of the Armed Forces Qualifying Test (AFQT), which was administered to the NLSY sample in 1980. The AFQT percentile score is a composite of four quantitative and verbal tests: mathematical knowledge, arithmetic reasoning, paragraph comprehension and work knowledge.

Prior research has also suggested that gender and race are important predictors of income because of the representational issues of males and whites in the various labor segments (Brett and Stroh, 1997; Dreher and Cox, 2000). As such I include two demographic controls, first, a dichotomous variable to indicate gender (0=female; 1=male), and second, a dichotomous to indicate an individual's race (0=non-white; 1=white).

Data Analysis

I examined the data for missing values, outliers and for violations of assumptions of multivariate analysis (i.e. normality, homoscedasticity, independence or errors and multicollinearity). I found that out of the 351 individuals in the dataset, thirteen (13) were not administered the AFQT in 1980 and were subsequently removed from the dataset. Using Boxplots and the Mahalanobis D^2 methods to identify outliers, I identified and removed another four (4) individuals for whom one or more measures contained extreme values. Hence, the final working sample for regression analysis includes 338 individuals.

I assessed normality of distribution of ratio measures using the Kolmogorov-Smirnov Z statistic which indicates a non-normal distribution for all constructs ($Z = 0.06$ to $Z = 0.48$, $df=338$, $p<0.01$). I assessed homoscedasticity using the Levene test, which indicated that the data is homoscedastic across groups for all constructs ($F_{2,335}=0.47$ to 1.77 , $p>0.1$). Residual plots also indicated independence of error terms. To confirm that the errors are homoscedastic, I performed a model specification test (White, 1980) with the null hypothesis that errors are homoscedastic. The model specification test (White, 1980) confirmed that the errors are independent and that their variances are not constant ($\chi^2=45.26$, $df=38$, $p>0.10$). Although the data meets the assumptions of normality of residuals and that the data is homoscedastic, I ran two sets of analysis: one with and another without White's (1980) corrections for between subject heterogeneity. The two sets of results obtained were identical.

To assess multicollinearity, I checked the variance inflation factors and condition indices of variables in the model and found them to be below the values of 2 and 7

respectively. These values are below the suggested threshold values of 10 and 15 respectively (see Hair, et al., 1995).

Nonetheless, I use the natural logarithm of average real income for the dependent variable and grand mean centered all independent variables. With grand mean centering, the intercept represents expected value of real income for an individual with average levels of human capital variables.

I use hierarchical regression analysis with PROC REG (SAS Institute, 2003) to obtain the results in three steps. In Step 1, I estimate the effects of demographic controls: gender and race. In Step 2, I include the effects of human capital: education, work experience, squared term of work experience and career transitions. Step 3 estimates the full model by including the effects of career path

RESULTS

In this section, I present the results obtained using the methods described in the previous section. I first report on the results concerning the prototypical career paths in the IT profession. I then report on the results concerning the returns to these career paths.

Prototypical Career Paths in the IT Profession

To establish the number of naturally occurring career paths in the sample, I used a two-step cluster analysis. The two-step cluster analysis yielded between two to six cluster solutions. The model fit statistics from cluster analysis indicates a three-cluster solution fit the data better than the other cluster solutions. I labeled these three clusters using terms found in prior research (e.g. Hall and Mirvis, 1996; Igbaria, et al., 1991; Kaiser, 1983) and on the dominant occupation within each career path as: (1) IT technical careers; (2) IT managerial careers; and (3) Protean careers.

The IT technical career path is characterized by a sequence of jobs within IT. Individuals in the IT technical career path were in IT jobs, on average, for 74% of their careers; in managerial jobs, on average, for 2% of their career and in other non-IT, non-managerial jobs, on average, for 24% of their careers.

The IT managerial career path is characterized by a sequence of jobs that transited

from an IT job into a managerial job. Individuals in the IT managerial career path were in IT jobs, on average, for 46% of their careers and in managerial jobs, on average, for 40% of their careers. Individuals in this career path were in other non-IT, non-managerial jobs, on average, for 14% of their careers.

Finally, a protean career is characterized by a sequence of jobs in non-IT occupations. Individuals in this career path were in IT jobs, on average, for 22% of their careers and in managerial jobs, on average, for 9% of their careers. Individuals in the Protean career path were in other non-IT, non-managerial jobs, on average, for 69% of their careers.

Table 13 presents the sample characteristics. The demographics of the IT professionals do not differ across the three clusters except for gender. There are more males in technical (Male = 64.8%) and managerial (Male = 64.9%) jobs as compared to protean (Male = 40.9%) jobs ($\chi^2 = 19.79$, $df = 2$, $p < 0.001$).

The resulting cluster solution was validated using IT technical experience, managerial experience and experience in other occupations as criterion measures. The results of the validation are presented in Table 14. The results show that individuals in IT technical career path have significantly more IT technical experience ($F_{2,348} = 184.89$, $p < 0.001$), individuals in an IT managerial career path have significantly more managerial experience ($F_{2,348} = 137.62$, $p < 0.001$) and, individuals in a protean career path possess significantly more experience in other occupations ($F_{2,348} = 232.02$, $p < 0.001$).

Table 13: Sample Characteristics

	Full Sample		IT Technical Career	IT Managerial Career	Protean Career	χ^2
	N=351		N=128	N=74	N=149	
Gender						19.79 ***
Female	159	45.3%	45	26	88	59.1%
Male	192	54.7%	83	48	61	40.9%
Race						4.30
Non-White	101	28.8%	36	15	50	33.6%
White	250	71.2%	92	59	99	66.4%
Education						
Bachelors Degree	271	77.2%	107	55	109	73.2%
Postgraduate Degree	80	22.8%	21	19	40	26.8%

Table 14: Results of Cluster Validation

	Full Sample		IT Technical Career	IT Managerial Career	Protean Career	F
	N=351		N=128	N=74	N=149	
IT Technical Experience						184.89 ***
Mean (Years)	6.95		11.14		6.65	3.50
SD	4.72		3.86		3.47	2.61
Managerial Experience						137.62 ***
Mean (Years)	1.93		0.30		5.78	1.40
SD	3.09		1.06		3.29	2.51
Other Occupational Experience						232.02 ***
Mean (Years)	6.42		3.63		2.00	11.01
SD	5.28		3.41		2.64	3.85

* p<0.05; ** p<0.01; *** p<0.001

Returns to Career Paths of IT Professionals

In this section, I present the results from the regression analysis and hypothesis testing. Recall that Hypotheses 2 states that the income of individuals in managerial careers is higher than the income of individuals in IT technical or protean careers. Hypothesis 3 states that the income of individuals in protean careers is lower than the income of individuals in IT technical or IT managerial careers. To test these hypotheses, I used hierarchical regression analysis. Specifically, for steps 1 through 3, I entered demographic controls, human capital controls and career path, respectively. Table 15 presents information on means, standard deviations and correlations for variables in the model.

In support of Hypothesis 2 and 3, the change in the multiple squared correlation coefficient associated with the addition of career paths is statistically significant ($\Delta R^2 = 0.033$, $F_{2,328} = 9.862$, $p < 0.001$). Table 16 presents the results of the hierarchical regression analysis. Of the demographic controls, results indicate that income of males is higher than the income for females ($\beta = 0.107$, $p < 0.001$). Individuals with higher cognitive ability command higher incomes ($\beta = 0.110$, $p < 0.001$).

The results for returns to work experience is non-linear as shown by the positive sign for the regression coefficient of work experience ($\beta = 0.698$, $p < 0.001$) and a negative sign for the regression coefficient of the squared term of the work experience ($\beta = -0.551$, $p < 0.01$). Finally, career transitions is found to depress income ($\beta = -0.114$, $p < 0.001$) suggesting that individuals with more career transitions command less income.

For career path variables, results indicate that incomes of individuals in the IT managerial career path are significantly more than the incomes of other career paths ($\beta = 0.048$, $p < 0.05$). As expected, incomes of individuals in the protean career path are significantly lower than the incomes of individuals in IT technical and IT managerial career paths ($\beta = -0.072$, $p < 0.01$).

Table 15: Descriptive Statistics and Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. ln(Real Income)	9.827	0.512	1.000									
2. Gender ¹	0.541	0.499	0.347 ***	1.000								
3. Race ²	0.716	0.452	0.154 **	0.052	1.000							
4. Cognitive Ability	0.000	1.000	0.355 ***	0.276 ***	0.403 ***	1.000						
5. Education ³	0.225	0.418	0.062	-0.016	0.103	0.169 **	1.000					
6. Work Experience	16.807	2.772	0.425 ***	0.078	0.115 *	0.104	-0.068	1.000				
7. Work Experience (Sq)	290.125	89.022	0.407 ***	0.083	0.111 *	0.105	-0.080	0.990 ***	1.000			
8. Career Transitions	5.278	2.682	-0.381 ***	-0.100	-0.175 ***	-0.146 **	0.008	-0.228 ***	-0.244 ***	1.000		
9. IT Technical Career	0.364	0.482	0.149 **	0.141 *	0.013	0.059	-0.128 *	0.104	0.095	-0.085	1.000	
10.IT Managerial Career	0.210	0.408	0.285 ***	0.110 *	0.083	0.100	0.018	0.154 **	0.169 **	-0.271 ***	-0.390 ***	1.000
11.Protean Career	0.426	0.495	-0.379 ***	-0.228 ***	-0.081	-0.140 *	0.109 *	-0.228 ***	-0.232 ***	0.306 ***	-0.652 ***	-0.444 ***

N=338; ¹ Gender: Female=0, Male=1; ² Race: Non-white=0, White=1; ³ Education: Bachelors degree=0, Postgraduate degree=1; * p<0.05; ** p<0.01; *** p<0.001

Table 16: Regression Results of the Effects of Career Paths on Real Income^a

Variable	Step 1	Step 2	Step 3
Gender ¹	0.174 ***	0.123 ***	0.107 ***
Race ²	0.070 **	-0.022	-0.023
Cognitive Ability		0.116	0.110 ***
Education ³		0.022	0.028
Work Experience		0.686 ***	0.698 ***
Work Experience (Squared)		-0.524 ***	-0.551 ***
Career Transitions		-0.142	-0.114 ***
IT Managerial Career			0.048 *
Protean Career			-0.072 **
R ²	0.139	0.418	0.451
Adjusted R ²	0.134	0.405	0.436
F	27.044 ***	33.822 ***	29.911 ***
df	2,335	7,330	9,328
ΔR ²		0.279	0.033
ΔAdjusted R ²		0.271	0.031
F for ΔR ²		31.594 ***	9.862 ***
df		5,330	2,328

^a Beta coefficients are reported for all models (n=338); ¹ Gender: Female=0, Male=1;

² Race: Non-white=0, White=1; ³ Education: Bachelors=0, Postgraduate=1; * p<0.05; ** p<0.01; *** p<0.001

To summarize and to give an intuitive view of the results, I graphed the income-work experience profiles for IT professionals in the respective career paths (Figure 5). As the graph illustrates, income increases with work experience at a decreasing rate for all career paths. IT professionals in the IT managerial career path start with higher incomes and continue to command a higher income throughout their work experience. Individuals in an IT technical career path receive incomes are higher than individuals in the protean career path throughout their work experience. Individuals in the protean career path receive the lowest income compared to the other two career paths throughout their work experience.

To explore the income-work experience profile further, I conducted a post-hoc analysis for gender, cognitive ability and work history. Recall that there are significantly more females in the protean career path (59.1%) than in the IT technical (35.2%) or IT managerial (35.1%) career paths ($\chi^2 = 19.79$, $df = 2$, $p < 0.001$). I propose that such an income-experience profile may be evidence of the income inequality faced by women in the IT work force. The extant management research corroborates this finding by reporting that women are consistently paid less than their male counterparts (Brett and Stroh, 1997; Dreher and Cox, 2000)

Yet, an additional reason may be that the income-work experience profile is evidence of the gravitational hypothesis. The hypothesis states that individuals seeking person-job fit would incline towards jobs that fit their cognitive ability (Cable and Judge, 1996; Wilk and Sackett, 1996). However, the results do not support this assertion because I find no significant difference in cognitive ability across the career paths ($F_{2,331} = 0.780$, $p > 0.1$).

Finally, I explored the work history of individuals in the protean career path by examining qualitative differences in the types of jobs held. Individuals in the protean career path spent significantly more time in non professional jobs as clerical or unskilled workers, laborers, craftsman, equipment operators, transport workers and service workers ($F_{2,331} = 26.283$, $p < 0.001$). Individuals in the protean career path were in non-professional occupations, on average, for about 11 years of their careers. This contrasts with the average of about 3.5 years in IT technical jobs and about 1.4 years in IT managerial jobs.

Figure 5: Predicted Work Experience - Income Profile

DISCUSSION

Although the IT discipline has accumulated research on the internal careers of IT professionals, there has not been a systematic investigation of external careers, i.e., the observable career paths, in the IT profession. In addressing this gap, my research objectives in this study are two-fold: (1) to identify the prototypical careers of IT professionals, and (2) to examine the consequences of these career paths on income. The results of this study of IT professionals' careers raise several important practical and research implications. In this section, I first discuss the results for the two research objectives. I, then, conclude with the implications for future research and for practice.

Prototypical Career Paths in the IT Profession

The results support the hypothesis concerning the prototypical career paths. In the IT profession, I find three prototypical career paths in the IT profession. One, an IT technical career path in which individuals hold a series of jobs that are predominantly in the IT profession. Two, I find an IT managerial career path where individuals transit from an IT job into a managerial one at some later point in their career. Finally, I find a protean career path in which individuals hold jobs in various non-IT occupations. As IT research begins to accumulate evidence concerning the three prototypical careers paths in the IT profession, one could also begin to ask how these career paths of IT professionals are formed.

A possible explanation is that IT experience may influence the formation of career paths by acting as a barrier. As one accumulates occupational competencies, the individual becomes further entrenched in the profession as professional experience translates into expertise (Barley and Bechky, 1994). In turn, the accumulation of expertise acts as a barrier to moving out of the profession (Vardi and Hammer, 1977). This finding is corroborated by studies on technology professionals which reveal that professionals become entrenched in their careers over time and do not readily leave their careers for other occupations (Barley and Bechky, 1994; Page, Stephens and Angela, 1992; Vardi and Hammer, 1977).

I find that individuals in the IT technical and IT managerial career paths have significantly more IT professional experience compared to those in the protean career path.

This accumulated professional experience allows individuals in the IT technical and IT managerial career paths to accumulate occupational-specific competencies (Quinones, Ford and Teachout, 1995; Tesluk and Jacobs, 1998). Further, an IT professional is not likely to maximize returns to IT expertise by moving out after long tenure in the IT profession. An additional barrier is established by managerial experience. Further examination of the professionals following the IT managerial career path shows that individuals in this career path do not transit to IT technical or non-IT jobs once they become IT managers.

However, such barriers to exit may not exist for individuals in the protean career path, as there is significantly less investment in IT competencies or managerial competencies. For individuals in a protean career path, they readily transit across occupational boundaries because they accumulate more general competencies in favor of specific competencies (Tolbert, 1996). The results show that these individuals have, on average, 3.5 years of experience in IT jobs but have 11 years of experience in other occupations (Table 14). The significantly more years spent in non-IT jobs may provide these individuals with such general competencies (Page, et al., 1992).

Another explanation of how career paths are formed can be drawn from career anchor theory. Career anchors refer to an individual's self-perceived abilities and values that influence career decisions (Schein, 1978) and result observable career paths (Schein, 1990). In essence, career anchors are values held by individuals about themselves that influence their career decisions. Traditionally, IT career research examining career anchors of IT professionals established that the two most salient career anchors of IT professionals were the abilities career anchors of technical competence and managerial competence (e.g. Crepeau, et al., 1992; e.g. Igbaria, et al., 1991). Following the arguments of career anchor theory, the career path of IT professionals with a salient technical competence anchor may be characterized by jobs within the IT profession. Similarly, the career of IT professionals with salient managerial competence anchor may be characterized by a transition into management and see their early experiences in IT technical jobs as a stepping stone (Ginzberg and Baroudi, 1988). More recently, IT studies find career anchors, other than

technical and managerial, as the salient career anchors of IT professionals (Hsu, et al., 2003b). A finding that IT professionals' career decision may be driven by personal values rather than by their perceived abilities does suggest that they may pursue alternative career paths. Future research might examine if this is indeed true.

Returns to Career Paths of IT Professionals

Regarding the returns to career paths, I hypothesized that the incomes of individuals in the IT managerial career path are higher than the incomes of individuals in the IT technical and protean career paths. In turn, I hypothesized that the incomes of individuals in the protean career path are less than the incomes of individuals in the IT technical and IT managerial career paths. The results support these hypotheses indicating that individuals in the IT managerial careers are the highest paid and those in the protean careers are paid less than their counterparts in the IT technical or IT managerial career paths.

These results are corroborated by prior literature in economics and management. Income premiums are likely to be associated with individuals in supervisory or managerial positions in an effort by organizations to attract and retain such individuals (Doeringer and Piore, 1971). As these incumbents possess competencies valued by firms and that the cost of replacing such competencies are high, organizations are more likely to offer higher incomes to managers.

Implications for Future Research

The results obtained in this study have three implications for future research. First, future research should empirically establish the relationship between career anchors and career paths. Although there is qualitative data suggesting the relationship (e.g. Schein, 1975; Schein, 1978), there is no study in IT or management, to my knowledge, that has empirically shown that a salient career anchor of an individual results in a particular career path as suggested by the theory. The important contribution of this line of research is in adding to our understanding of the mechanisms by which individuals' subjective careers influence their observable, objective careers.

Second, future research may empirically test the proposition that the income growth

over time differs across career paths. Income growth may be higher in IT managerial careers than the other two career paths because of the increasing level of firm-specificity associated with increasing levels of work experience. I would expect that income growth in IT technical careers to be higher than protean careers because of the knowledge and skills gained in applying technology to business situations. Recent thinking on work experiences argues that work experience is a good proxy for knowledge and skills about subjective and objective aspects of work (see Quinones, et al., 1995 for a review of work experience; see Tesluk and Jacobs, 1998).

Third, future research might adopt longitudinal research methods to study careers. Such longitudinal research designs can help the field come to an understanding of career transitions such as answering why individuals switch occupations in mid or even late career. Although career anchors are thought to be stable over a person's career (Schein, 1978; Schein, 1990), career anchor theory may be extended by examining the moderating role of person-work environment fit to explain intra-occupational transitions as seen in the protean career path.

Implications for Practice

I identify two implications for IT professionals following from the results reported here. One, the three prototypical career paths in the IT profession suggest that IT professionals may have careers that are not constrained to the dual career concept as suggested by Chesebrough and Davis (1983) and Ginzberg and Baroudi (1988). IT professionals and human resource managers, in planning IT professionals' careers, might consider moving IT professionals valued by the organization into line functions. As such, a boundaryless career might be a viable alternative to the dual career track. This implication is especially important for organizations to attract, retain and develop valued individuals for critical jobs.

Following from above, IT professionals might consider moving into IT management when opportunity arises. For the practitioner, this study answers the question of which career pays better. This question becomes especially salient in light of recent IT outsourcing trends. As IT technical jobs (e.g. programming, IT operations, network administration) move

offshore, the career alternatives available are either IT management or a protean career. Between the two alternatives, IT managerial careers command higher incomes compared to protean career.

CONCLUSION

This study extends a long-standing stream of research by examining the careers paths of IT professionals and consequences associated with their career choices. In doing so, this study contributes to IT careers research in two key ways. First, to the best of my knowledge, this study represents the first empirical analysis of career paths of IT professionals. This study complements qualitative research on IT careers paths by focusing on individuals across occupational boundaries. Second, this study adds to a very limited set of studies on compensation of IT professionals by theorizing and testing career determinants of income. This study extends IT compensation models by including career paths in addition to human capital determinants in explaining the compensation of IT professionals.

CHAPTER 4

STUDY 3 - EXAMINING THE ROLE OF HUMAN CAPITAL AND GENDER IN PREDICTING IT PROFESSIONALS' EXIT FROM ORGANIZATION AND OCCUPATION

INTRODUCTION

Study 2 examined the career transitions of IT professionals across occupational boundaries to ascertain whether there are prototypical careers in IT and what their associated consequences were. In this study, I examine why IT professionals leave the IT profession, in addition to examining why IT professionals leave their organizations.

As mentioned, IT researchers have been interested in the career transitions of IT professionals for over 20 years (e.g. Gallivan, 2004; e.g. Ginzberg and Baroudi, 1988) and the topic's enduring interest may originate from challenges posed by a tumultuous IT labor market experienced by organizations and IT professionals in the United States since the 1970s. A major challenge for organizations between 1970 and 1990 was a severe imbalance in the demand and supply of IT professionals. The chronic shortage of IT professionals led to turnover as a pervasive phenomenon in this period (U.S. Department of Commerce, 1998). During this period, a key issue with IT managers was attracting, retaining and developing IT professionals for critical IT jobs within the organization (Brancheau, et al., 1996; Brancheau and Wetherbe, 1987; Dickson, et al., 1984).

The chronic shortage of IT professionals abated with the outsourcing and offshoring trend in the United States in the 1990s. The outsourcing and offshoring of IT functions meant that career opportunities were curtailed within user organizations (Morello, 2003). The major challenge for IT professionals, then, is in deciding whether to remain in IT by moving to the outsourcing vendor organization, or to leave the IT profession by moving to line functions in their current organization (Morello, 2003; Slaughter and Ang, 1996). Moreover, IT literature is silent on the transferability of IT professionals' skills and

experiences to other occupations. In essence, we are unclear what the consequences are for IT professionals' career success should they choose either career options.

Over the next decade, we can expect the context within which IT professionals' careers develop to remain as tumultuous as the last decade. Analysts foresee the outsourcing trend reversing as organizations begin to insource part of their IT functions (Dreyfuss and Scardino, 2005). Insourcing may, again, open new career opportunities for IT professionals within user organizations (Morello and Lavalette, 2003) and within IT services organizations (Dreyfuss and Scardino, 2005). In fact, analysts expect the IT profession to be one of the top three fastest growing occupations (Berman, 2004) with the number of IT positions in the United States increasing from about 1.2 million in 2002 to about 1.8 million by 2014 (Hecker, 2005).

Yet, in examining the career transitions of IT professionals, IT researchers appear to have accumulated an extensive body of knowledge on why IT professionals leave their employers by turning over. A review of the IT turnover literature in Study 1 reveals that IT professionals leave their employers due to career, organization, job and personal related factors. Implicit in all IT studies is the assumption that IT professionals turnover to a similar IT job in another organization. Management research, too, appears to hold this same implicit assumption (Kirschenbaum and Weisberg, 2002). In challenging this assumption, Kirschenbaum and Weisberg (2002) argue and show that individuals may not necessarily turnover to a similar job in another organization. In turning over, individuals may leave their profession as well.

In the IT discipline, there is very limited work that examines why IT professionals leave the IT profession. Reich and Kaarst-Brown (1999)'s case study of former IT professionals in an insurance organization examined the factors that facilitated the permanent movement of IT professionals into non-IT jobs within the organization. From their results, Reich and Kaarst-Brown conclude that IT professionals who moved to non-IT jobs made the career transition without deliberate preparation and without formal transition programs that might reduce the risk of such transitions. These former IT professionals'

career transitions were also facilitated by good IT-line relationships. In a similar vein, Lee et al.'s (1997) research-in-progress examined the factors that might push an IT professional to leave the profession. Their preliminary analysis finds that IT professionals who intended to leave the IT profession experienced significantly higher role stress compared to IT professionals who intended to turnover.

The current state of IT literature examining the career transitions of IT professionals provides an opportunity to extend this body of research. I do so by examining two forms of careers transitions: (a) turnover, defined as voluntarily leaving one's IT job with an employer for an IT job with another employer; and (b) turnaway, defined as voluntarily leaving one's IT job for a non-IT job. Accordingly, the research questions I seek to answer in this study are: (a) why IT professionals turnover, and (b) why IT professionals turnaway. By conceptualizing turnover and turnaway as mutually exclusive behaviors, I am able to directly compare the effects of predictors on turnover and turnaway by conducting a competing risks analysis (Allison, 1984).

As such, this study contributes to IT and to management research in four ways. First, this study adds to the turnover research streams in IT and management by refining the traditional definition of turnover to refer to voluntarily leaving one job with an employer for a similar job with another employer. By doing so, I am able to conceptualize an additional form of career transition, i.e. turnaway. Second, this study adds to IT research on career transitions by examining actual turnover behaviors instead of turnover intentions. From Study 1, I find only two studies in the IT domain that has examined turnover behavior (i.e. Bartol, 1983; Josefek and Kauffman, 2003). Third, this study extends IT research on career transitions by examining why IT professionals turnaway. To date, only one study that has attempted to explain why IT professionals intend to change occupation. In this study, I examine actual turnaway behavior rather than intention.

Finally, this study adds to IT and management research by developing and testing a temporal model of turnover and turnaway using survival analysis. Indeed, I know of no research in the IT discipline that develops and tests a temporal model of turnover or

turnaway using survival analysis. Survival analysis allows us to examine not only *why* IT professionals turnover and turnaway, but also *when* they do so. Management scholars have noted that examining “*when*” such career transitions occur is important and relevant as understanding the “*why*” (Mobley, 1982; Peters and Sheridan, 1988). Time is an important factor in survival models because time may strengthen and weaken causal relationships (Kelly and McGrath, 1988).

With survival analysis, this study goes beyond modeling turnover and turnaway as simple dichotomous variables to explicitly model the duration for which individuals stay with an organization and with the IT profession. As such, turnover and turnaway are operationalized as time dependent variables that change states based on the duration since individuals joined the labor force. Although management research has a long-standing and extensive body of work examining turnover behavior over time (e.g. Dickter, Roznowski and Harrison, 1996; Porter, et al., 1976; e.g. Trevor, 2001), this study adds to management research as it is silent on the dynamics of occupation changes over time.

Finally, survival analysis is preferred over other time-series approaches because turnover and turnaway events are not well distributed over time. In fact, there are more occurrences of staying (typically coded as 0 in such datasets) than there are of turnover or turnaway. Such zero inflated distribution of events are known to inflate correlations and parameter estimates in other time series approaches, thus leading to incorrect conclusions about the data (Wang, 2001).

THEORY AND HYPOTHESES DEVELOPMENT

In this section, I draw on human capital theory and on gender related literature to formulate a set of hypotheses concerning why IT professionals turnover and turnaway. In essence, I hypothesize that human capital and gender have differential effects on turnover and turnaway by acting as enablers of and as inhibitors of career transitions.

The IT discipline’s research on career transitions is primarily based on March and Simon (1958)’s inducement-contribution theory. According to the inducement-contribution theory, turnover occurs when individuals perceive their contributions to the organization

exceed the inducements they receive from the organization (March and Simon, 1958). Of the twenty-four (24) studies reviewed in Study 1, twenty-two (22) employed March and Simon's theory as its theoretical foundation. Only two IT studies (i.e. Igbaria and Chidambaram, 1997; Josefek and Kauffman, 2003) indicate using human capital theory but these studies do not follow closely Becker's formulation of human capital.

This study adds to our collective understanding of the career transitions of IT professionals by remaining close to Becker's (1975) formulation of human capital and that refined by subsequent research (Althauser and Kalleberg, 1981; Maxwell, 1987; Stolzenberg, 1975). In Becker's (1975) original formulation, human capital refers to an individual's productive competencies that result from training and experience that vary in specificity from the general to the specific. Becker's (1975) identified two forms of human capital: general and specific human capital. General human capital refers to competencies that result from general training and experience. General human capital may be productively utilized in all domains (e.g. jobs, firms, industry and occupations). For example, formal general education and work experience develops competencies in individuals that may be productively utilized in all other organizations and occupations.

In contrast, specific human capital refers to competencies that result from training and experience within a given domain (Becker, 1975). Firm specific human capital refers to competencies that result from firm specific training and experience. Firm specific human capital may be productively utilized only in a specific firm and is not readily transferable to other firms (Becker, 1975). Returns to firm specific human capital tend to be maximized within the firm investing in such capital (Becker, 1975). This is because firm specific human capital is more closely tied to the productivity of the firm providing it than to other firms (Becker, 1975).

Becker's original formulation of specific human capital is further refined by subsequent research to include occupation specific human capital (Althauser and Kalleberg, 1981; Maxwell, 1987; Stolzenberg, 1975). Occupation specific human capital refers to competencies resulting from training and experience within an occupational domain

(Maxwell, 1987). Although occupation specific human capital is specific to an occupational domain, it is readily transferable across organizations that utilize similar jobs in that occupational domain (McDuff and Mueller, 2000). Firms may acquire occupation specific human capital by competing for occupational expertise in an open labor market (Hachen, 1990). As such, returns to occupation specific human capital are more likely maximized when individuals practice their occupations (Keane and Wolpin, 1997). For example, training and experience in programming skills is specific to and more valued in IT than in other occupations. Individuals with programming skills are more likely to obtain higher returns to their programming skills when utilized in jobs within the IT profession as compared to when utilized in jobs in other professions.

In the following sections, I relate these various forms of human capital to the career transitions of IT professionals.

Role of General Human Capital. The nature of IT jobs requires incumbents to possess general human capital such as intellectual skills and advanced education to quickly grasp and resolve the myriad issues concerning the application of technology to a particular context (Lee, et al., 1995). Yet, the IT literature examining the role of general human capital in explaining career transitions is limited to examining the effects of education on turnover intentions. Within the available set of studies, IT research finds a positive relationship between education and turnover intentions indicating that individuals with higher levels of education hold stronger intentions to turnover (Igbaria and Greenhaus, 1992; Igbaria and Siegel, 1992). However, the IT discipline is silent on the role of general human capital in explaining the turnaway of IT professionals.

Human capital theory (Becker, 1975) suggests that general human capital may be transferable to and be productively utilized across organizations and occupations. Accordingly, an individual with higher levels of general human capital may move easily across organizations and occupations. The rationale is that prospective employers tend to rely on the level of general human capital held as an indicator of that individual's productivity, in the absence of other indicators of productivity (Spence, 1973). Therefore, individuals with

higher levels of general human capital are perceived to be more productive, and likely to be presented with more jobs alternatives compared to individuals with lower levels of general human capital (Moen, 1999).

Recent research by Trevor (2001) and Benson et al. (2004) confirm the relationship between general human capital and turnover. Using a sample drawn from the National Longitudinal Survey of Youth, Trevor (2001) found that an increase of one standard deviation in cognitive ability increases the probability of turnover by 1% and each additional high school grade attained increased the probability of turnover by 8%. Similarly, Benson et al. (2004), examining the tuition reimbursements and voluntary turnover of employees in a large high technology manufacturing company, find that earning a bachelor's degree increased the probability of employees turning over by 37%.

Individuals may also seek out jobs that are commensurate with their levels of general human capital. Applying using social cognitive theory to the careers of individuals, researchers find that individuals with higher levels of cognitive ability or higher educational levels have wider vocational interests because these individuals perceive themselves to be as efficacious in other jobs (Johnson and Stokes, 2002). Johnson and Stokes' (2002) study of antecedents and consequences of vocational interest tracked the careers of graduates from a large southeastern university over a twenty-three period. They found that graduates with higher levels of cognitive ability reported having significantly wider vocational interests, and in turn, found that individuals with wider vocational interests exhibited a work history characterized by jobs held in multiple organizations and occupations. In moving, these individuals tended to seek jobs that fit their cognitive ability and educational levels (Wilk, Desmarais and Sackett, 1995; Wilk and Sackett, 1996).

Based on the arguments above, it is reasonable to expect that the theory and empirical relationship between general human capital and career transitions of IT professionals to be consistent with the broader management literature. As such, I propose that IT professionals with higher levels of general human capital are more likely to turnover and turnaway because general human capital eases the movement towards alternative jobs

by acting as a signal of one's productivity. Hence:

Hypothesis 1a: IT professionals with higher levels of general human capital will be at a higher risk of turnover compared to IT professionals with lower levels of general human capital.

Hypothesis 1b: IT professionals with higher levels of general human capital will be at a higher risk of turnaway compared to IT professionals with lower levels of general human capital.

Role of IT-Specific Human Capital. In the IT context, I refer to occupation specific human capital as IT specific human capital. IT professionals obtain relevant IT specific human capital primarily from formal education in IT and from work experience in IT related jobs. In relating IT specific human capital to career transitions, IT studies are limited to examining the role played by IT experience in explaining turnover intentions. All three studies in the IT discipline (Igbaria and Chidambaram, 1997; Igbaria and Greenhaus, 1992; Igbaria and Siegel, 1992) indicate that IT experience tends to reduce the turnover intentions of IT professionals. However, IT research is largely silent on the role of IT specific education in explaining career transitions. Even with the pervasiveness and widespread importance of information technology in other professions, IT professionals are not likely to utilize all of their IT competencies in these other professions. Reich and Kaarst-Brown (1999)'s interviews with former IT professionals report that IT knowledge and skills were not readily transferable nor fully utilized in non-IT line jobs.

Following the logic of human capital (Becker, 1975) and signal (Spence, 1973) theories, I propose that IT specific human capital enables IT professionals to turnover but inhibits them from turning away. IT professionals are more likely to turnover because IT specific human capital eases the movement towards alternative IT jobs by acting as a signal of one's productivity. Labor economists argue that prospective employers tend to perceive individuals with higher levels of occupation specific human capital to be more productive in their professions, and thus, more valuable to organizations than those with lesser levels of occupation specific human capital (Maxwell, 1987).

Accordingly, firms may pay a premium over the market rate for individuals with high levels of occupation specific human capital to entice such individuals to join the prospective firm (Maxwell, 1987; Parent, 2000; Weinberg, 2001). Studies on the returns to individuals' occupation specific human capital by Parent (2000) and Weinberg (2001) argue that firms tend to compete in the open labor market for occupational expertise. Firms' competitive bids for individuals with high levels of occupational expertise tend to translate into higher wages (Parent, 2000). In addition, individuals tend to maximize returns to their occupation specific human capital by moving between jobs in their chosen occupation (Keane and Wolpin, 1997). Arguing that sunk investments in occupation specific human capital make leaving the occupation more costly for individuals with high levels of occupation specific human capital, Weinberg's (2001) study goes on to show that such investments in occupation specific human capital tend to reduce the probability that individuals leave the occupation.

Arguing along similar lines, management research posits that individuals who invest in professional activities tend to be more committed to the profession and in turn, are less likely to leave (Blau, 2000). Blau's (Blau, 1999; Blau, 2000; Blau and Lunz, 1998) multi year studies of medical technologists shows that medical technologists who invest in developing their professional skills were more committed to their profession and held significantly lower intentions to leave their profession . Hence:

Hypothesis 2a: IT professionals with higher levels of IT specific human capital will be at higher risk of turnover compared to IT professionals with lower levels of IT specific human capital.

Hypothesis 2b: IT professionals with higher levels of IT specific human capital will be at a lower risk of turnaway compared to IT professionals with lower levels of IT specific human capital.

Role of Firm-Specific Human Capital. IT research on the knowledge and skills required of IT professionals are in consensus that firm specific competencies are as important as technical skills. Taggart and Silbey's (1979) analysis of critical work incidents experienced by an IT manager report that more than 65% of critical incidents encountered

over a six month period involved resolving organization related issues. Subsequent IT skills requirements surveys (Cheney and Lyons, 1980; Lee, et al., 1995; Todd, et al., 1995; Trauth, Farwell and Lee, 1993) go on to identify specific business and management skills IT professionals require to undertake IT work. The long list of business and management skills identified were recently categorized by Bassellier and Benbasat (2004) into the broad categories of organization specific knowledge, interpersonal skills and management knowledge. Specifically, Bassellier and Benbasat show that organizations may provide IT professionals with firm specific training and experience by immersing them in functional units to understand “their objectives and problems and the language they speak” (p. 679). Additionally, firms may develop IT professionals’ competencies in IT-business integration to understand a firm’s issues and to enable IT professionals to appreciate how IT supports business processes (Bassellier and Benbasat, 2004, p 680).

Despite the available research on firm specific human capital, IT research examining career transitions has focused solely on the role of firm specific experience in explaining turnover of IT professionals, consistently finding a negative relationship between firm specific experience and turnover intent (Igbaria and Chidambaram, 1997; Igbaria and Greenhaus, 1992). IT research, however, is silent on the role played by firm specific training in the career transitions of IT professionals.

Nonetheless, I draw on the broader management literature to argue that IT professionals with higher levels of firm specific human capital are less likely to turnover because firm specific human capital restricts the ease of movement to alternative IT jobs. In examining the effect of on-the-job training and the mobility of individuals, Loewenstein and Spletzer (1997) theorized that individuals were less likely to turnover because of the costly nature of such a career transition. Loewenstein and Spletzer go on to show that an individual tends to maximize returns to firm specific human capital in the form of higher wages by remaining within the firm rather than by quitting. Using a sample drawn from the National Longitudinal Survey of Youth, Loewenstein and Spletzer report that firm specific training tends to reduce the probability of turnover by 15%. Similarly, Benson et al.’s (2004)

study of individuals in a high technology manufacturing organization report that an increase of one standard deviation in firm specific experience ($SD=9.64$ years) decreases the probability of turnover by 28%.

Following a similar line of reasoning, IT professionals accumulating firm specific human capital are unlikely to turnaway because IT professionals maximize returns to firm specific human capital by staying with their current employer. Accumulating training and experience within a particular organization tends to facilitate the understanding of the organization's business, its strategy and culture (Bassellier and Benbasat, 2004; Reich and Benbasat, 2000).

Studies in the broader management literature, however, tend to find that firm specific human capital is not related to occupational exit (Carson and Bedeian, 1994; Hackett, Lapierre and Hausdorf, 2001; Lee, et al., 2000; McDuff and Mueller, 2000; Thompson and Van de Ven, 2002). Yet, Barley's (Barley, 1996; Zabusky and Barley, 1996) ethnographic studies on technicians, including computer programmers and IT technicians, argued that acquiring organization specific contextual knowledge is critical to performance of a professional. The IT professionals studied by Barley tended to play the role of a broker between the users and the IT infrastructure, in effect, adapting "technological feasibilities into local realities" (Barley, 1996, p. 423). Zabusky and Barley (1996) go on to argue and show that professionals tend to hold this brokering role as part of their professional identities. It is by applying technology to a specific context that provides a professional with a sense of achievement, which in turn, reinforces one's professional identity. Leaving the occupation may result in a diminished professional identity. Hence:

Hypothesis 3a: IT professionals with higher levels of firm specific human capital will be at a lower risk of turnover compared to IT professionals with lower levels of firm specific human capital.

Hypothesis 3b: IT professionals with higher levels of firm specific human capital will be at a lower risk of turnaway compared to IT professionals with lower levels of IT specific human capital.

Role of Gender. In addition to human capital, this study investigates the role that gender plays in career transitions. There is limited research in IT and management that investigates gender effects on career transitions as defined in this study. Nonetheless, the available research tends to stereotype women as quitters (Ahuja, 2002; Stroh, Brett and Reilly, 1996). Yet, of the eight (8) IT turnover studies examining gender's effect on career transitions that were reviewed in Study 1, only one finds a weak relationship indicating that women were more likely to turnover compared to men (Igbaria and Chidambaram, 1997). A reason why IT studies tend not to find a significant gender effect may be due to operationalizing turnover intent as the dependent variable rather than turnover behavior. Weisberg and Kirschenbaum (1993)'s study of textile workers find no gender differences in turnover intentions but do so for turnover behavior. The researchers reason that women may harbor intentions to turnover but are unable to do so as women have less alternative jobs available to them.

Management and IT literature argue that women lack the informal networks required to obtain alternative jobs (Ahuja, 2002; Dreher and Cox, 2000). Without these informal social networks, "inside information" about job openings and prospects of securing these jobs may be reduced (Brett and Stroh, 1997). In an analysis of social networks in advertising, women were found to use their informal networks for social support rather than for instrumental reasons such as obtaining a job (Ibarra, 1992). Yet, when women do use their informal networks for seeking out alternative job opportunities, women tend to find these networks dominated by men (Ibarra, 1992). Similarly, gender studies in IT find that women IT professionals' social networks are dominated by males (Hartmann, Kraut and Tilly, 1986; Margolis and Fisher, 2002). Hartmann et al. (1986) and Margolis and Fisher (2002) warn female IT professionals that their lack of demographically similar informal networks may result in women being less aware of job alternatives and experiencing reduced prospects of securing other IT jobs.

In contrast, males appear to benefit from turning over compared to females. Research indicates that males benefit from turnover as males receive higher compensation

following an external labor market strategy compared to females (Brett and Stroh, 1997). According to Brett and Stroh (1997), women are discriminated in the external labor market relative to males because men tend to broker the external labor market. As men tend to possess the informal networks and have more bargaining power in the external labor market, men tend to benefit from turning over by negotiating for higher compensation premiums compared to females.

In addition, women IT professionals are more likely to turnaway compared to their male counterparts because women IT professionals are more likely to experience dissatisfaction with the IT profession (Hartmann, et al., 1986; Margolis and Fisher, 2002). IT research has identified two main reasons why female IT professionals are dissatisfied with the IT profession. First, women IT professionals may become dissatisfied with IT as a career when they perceive a glass ceiling in terms of restricted career advancement opportunities (Baroudi and Igbaria, 1995; Gallivan, 2004). Management research (Lyness and Judiesch, 1999; Maume, 2004; Stroh, et al., 1996) corroborates the results of IT research by finding that women who experience an artificial barrier to advancement tend to become dissatisfied. In turn, these women are more likely to act on their dissatisfaction by leaving their jobs.

Second, the nature of IT work is such that IT professionals are often required to work late and to constantly upgrade their technical skills (Ang and Slaughter, 2000). The demands of IT work on IT professionals, especially women, may at times be incompatible with the demands of their family (Ahuja, 2002). When work demands become incompatible with demands of the family, management research indicates that the conflict arising from these competing demands may degrade the quality of both work and family life for women more than for men (Byron, 2005; Gutek, Searle and Klepa, 1991).

In the IT context, IT researchers find that work-family conflict results in women IT professionals experiencing higher levels of work stress compared to their male counterparts (Ahuja, et al., 2002; Trauth, 2002). In turn, high levels of work stress have been shown to lead women IT professionals to experience higher levels of work exhaustion (Moore, 1998;

Moore, 2000). Management research goes on to show that women, more than men, tend to alleviate work family conflict by leaving such careers for less stressful ones (Byron, 2005; Ng, Eby, Sorensen and Feldman, 2005). This line of reasoning may explain the 11.6% decline in the proportion of women in the IT profession from 44% in 1996 to 32.4% in 2005. The proportion of women declined despite the increasing number of IT jobs created within the same period (Information Technology Association of America, 2005). Hence:

Hypothesis 4a: Female IT professionals will be at a lower risk of turnover compared to male IT professionals.

Hypothesis 4b: Female IT professionals will be at a higher risk of turnaway compared to male IT professionals.

METHOD

In this section, I provide a description of the sample used in this study, report on the measures and describe the data analysis approach to test the above hypotheses.

Sample

I analyze work history data of individuals drawn from the National Longitudinal Survey of Youth (NLSY) dataset (Bureau of Labor Statistics, 2004b). Although the NLSY dataset in Study 2 contained data from 1979 to 2000, the current dataset includes an additional wave of data collected in year 2002. However, due to attrition, 61% of respondents (7,724 out of 12,686 individuals) were retained as of 2002. Interviews with these individuals were conducted periodically between 1979 and 2002. During these periodic interviews, detailed data is collected on a broad range of topics including demographics, educational background, work history, job duration, occupation and labor market experiences. As such, this dataset is ideal for empirical analysis as it tracks individuals across multiple jobs, organizations and occupations. Consequently, the NLSY dataset is suited to examining why IT professionals turnover and turnaway.

The sample used in this study includes individuals who have attained at least a bachelor's degree, and worked in the IT profession as a permanent job. IT jobs in the NLSY dataset are identified by their Standard Occupation Classification code (U.S. Census

Bureau, 1971, 2000). The criterion of a bachelor's degree follows the U.S. Department of Labor's educational requirement for information technology positions as reported in O*Net (U.S. Department of Labor, 2005). I adopt the Bureau of Labor Statistics' (BLS) definition of a permanent job by applying a "one continuous year in an occupation" criterion to ensure the selection of individuals who have regarded IT jobs as a permanent job and not just as a temporary job (Polivka, 1996). Applying these criteria, the final sample comprises 359 individuals (3%), out of the 12,686 individuals included in the NLSY.

Measures

Dependent variables. The NLSY survey contains information about all jobs, the occupation of these jobs and information about employers from 1979 to 2002 for each individual in the dataset. Using this information provided by individuals in each year, I created two dependent variables: *turnover*, and *turnaway*. I coded *turnover* as "1" if the respondent reported voluntarily leaving an organization for another IT job, otherwise, it was coded as "0." Similarly, I coded *turnaway* as "1" if the individual reported leaving the IT profession voluntarily; otherwise, it was coded as "0."

General human capital. General human capital measures are cognitive ability and education. Cognitive ability (Cog) is measured using the percentile score of the Armed Forces Qualifying Test (AFQT), which was administered to the NLSY sample in 1980. The AFQT percentile score is a composite of four quantitative and verbal tests: mathematical knowledge, arithmetic reasoning, paragraph comprehension and work knowledge. Education (Edu) measured as a dichotomous variable to represent whether an individual attained a bachelor's degree or a postgraduate degree at any point time from 1979 to 2002.

IT specific human capital. The variables measuring IT specific human capital are IT specific education and IT experience. IT specific education (ITSE) is a dichotomous variable coded with "1" if IT was the respondent's major field of study in college. Otherwise, IT specific education is coded as "0." IT experience (ITSExp) is measured by creating a variable from information on start and end dates of IT jobs held by each respondent.

Firm specific human capital. The firm specific human capital variables are firm

specific training and firm experience. Firm specific training (FST) represents the accumulated number of firm specific training events a respondent received with a particular employer in a year. It is a continuous variable constructed from respondents' answers to whether they had received training in their job with a specific employer during the course of a year and, if so, what kind of training it was. Training events such as seminars conducted outside an organization or training at a vocational institute were not included in this count. Firm specific experience (FSExp) is measured by a total tenure variable created by NLSY from start and end dates of a job with a particular employer.

Gender. I noted each respondent's gender, with females coded as "0" and males coded as "1."

Controls. To account for alternative explanations, I include a set of control variables. Single people are argued to have more energy to focus on their careers compared to married people (Blau and Lunz, 1998). As such, I noted each respondent's marital status (MS) in each period from 1979-2002. I coded marital status as "1" if the respondent reported being married; otherwise, I coded marital status as "0."

I include job satisfaction (JS) to account for the desire to leave a job (see March and Simon, 1958). The NLSY respondents rated on a four-point scale, from "like it very much" to "dislike it very much," how they felt about their job. This one item provides a general or 'global' indication of a respondent's satisfaction with his or her job. Although the use of single item measures are assumed to have low reliabilities, Wanous, Reichers and Hudy (1997) found substantial convergent validity with single item measures of job satisfaction. In fact, Wanous et al. report a conservative minimum reliability of 0.69 but conclude that reliabilities may be as high as 0.82 for a single item job satisfaction measure. Moreover, prior research (in particular, Ganzach, 1998) using the NLSY dataset find this single item measure producing similar results as those from multiple item measures.

To account for ease of movement, I include the unemployment rate (UR) for each job held by an individual using a variable created by NLSY. The NLSY unemployment rate data is constructed from local and state unemployment rates published in the May issue of

Employment and Earnings for the month of March of each survey year (Bureau of Labor Statistics, 2004b). I also noted the industry (Ind) using a two-digit Standard Industrial Classification code reported in the NLSY for each job held by the individual.

Finally, the squared term of IT and firm specific experience are included to model the nonlinear relationship between the experience variables and the dependent variables. Human capital theorists argue that returns to experience diminishes over time due to the deterioration of individuals' job performance as they age (Jackofsky, 1984). Consistent with prior research (e.g. Bloom and Michel, 2002; Healy, et al., 1995; McEvoy and Cascio, 1989; Thomson, Griffiths and Davison, 2000), I include the squared terms of IT and firm specific experience to model the nonlinear effects of experience on turnover and turnaway.

Data Analysis

I use event history analysis rather than regression analysis for three conceptual and statistical reasons. First, event history analysis explicitly takes into account the role of time in addition to the roles of various covariates in predicting the occurrences of events (Morita, Lee and Mowday, 1989; Peters and Sheridan, 1988). Second, event history analysis allows me to incorporate time to gauge the increasing or decreasing effects of a predictor over the intervening period (Allison, 1984). This is possible by including time invariant as well as time varying predictors (Allison, 1984). Finally, event history analysis is able to effectively handle censored data which traditional regression analysis does not (Peters and Sheridan, 1988).

Within event history analysis, one has a choice between discrete-time and continuous-time approaches (Allison, 1984). I chose to use a discrete time approach following Allison's (Allison, 1984) recommendations because all predictors were measured at regular time intervals. Continuous time approach is suited for data collected in analog form or as continual records.

Within the discrete-time approach, one has a choice between nonparametric, semiparametric and parametric models of event history analysis (Allison, 1984). I chose to use a semiparametric model to analyze the turnover and turnaway of IT professionals. The semiparametric model, also known as a proportional hazards rate model or a Cox regression

(Cox, 1972), does not require the analyst to make strong assumptions about the shape or distribution of the underlying baseline hazard of turnover and turnaway over time (Allison, 1984; Hosmer and Lemeshow, 1999; Singer and Willett, 2003). Another advantage of semiparametric models is that it allows the analyst to include predictors in a standard regression form. The model, however, does assume that the hazard function at different levels of covariates are proportional to some unknown baseline hazard function (Hosmer and Lemeshow, 1999).

Like semiparametric models, nonparametric models do not assume that the event of interest is distributed in any particular form over time. Unlike semiparametric models, nonparametric models do not have the standard regression form in which I can analyze the effects of predictors.

Although parametric models, such as the Weibull, Gompertz and log normal models, do model predictors in a standard regression form, parametric models require the analyst to make "strong assumptions about the shape of turnover risk over time" (Harrison, Virick and William, 1996, p. 336). The analyst is also required to justify the shape of the hazard function over time. Parametric models are preferred when there is strong prior evidence about the distribution of the hazard function (Hosmer and Lemeshow, 1999). However, management and IT literature provide no evidence to argue that the hazard function of turnover or turnaway is of a particular form, e.g. always increasing with time or always decreasing. When information about the shape of the hazard function is unavailable, Allison (1995) recommends that Cox proportional hazards model be the default model.

The data used for subsequent analysis consists of multiple events per individual. To analyze such data, I first reconfigured the data into spells or person-period format. Each spell or person-period observation consists of covariates that are constant over time, e.g. gender and race, and covariates that vary with time, e.g. IT experience, firm specific experience and turnover. Given that I tracked individuals in the labor force only after the attainment of their degree, the data is left truncated as individuals have varying times of entry into the risk set. The final dataset contained 5,860 spells for 359 individuals.

Additionally, spells are bounded by events, defined as qualitative change situated in time (Allison, 1984). The events of interest are turnover and turnaway. However, as the available data in NLSY ends with data collected in year 2002, it is not known when the next transition will occur. As such, the data is considered to be right censored because observations are terminated (i.e. in year 2002) before the next transition event occurs. Censoring of data in survival analysis also allows us to account for involuntary transitions, such as lay-offs, by treating these transitions as censored data. This approach allows us to include their data for analysis.

I tested the models of turnover and turnaway for violations of the proportionality assumptions using the approach recommended by Allison (1984) and by Hosmer and Lemeshow (1999). I first checked for violations of the proportionality assumption by visually comparing the graphed estimates of the hazard functions for each level of dichotomous variables used to predict turnover and turnaway. I find that the hazard functions were non-overlapping for each level of the dichotomous variables examined indicating that the assumptions of proportionality were met for these variables. For continuous variables, I plotted the Schoenfeld residuals to ascertain a zero slope, which indicates adherence to proportionality assumptions. All continuous variables, except the experience variables, adhered to proportionality assumptions. The tests indicate that the hazard function changes with each level of IT and firm experience.

Following recommendations by Allison (1984) and Hosmer and Lemeshow (1999) on procedures to resolve departures from the proportionality assumption, I grand mean centered the experience variables and interacted them with the natural log of time. Interacting the experience variables with the natural log of time is consistent with human capital theory suggesting a non-linear, diminishing effect of experience over time (Jackofsky, 1984). I again tested this revised model to confirm that it was correctly specified and that it met the assumptions of proportionality. In doing so, I first conducted the link function test (Hosmer and Lemeshow, 1999) in STATA 9.0 (Cleves, Gould and Gutierrez, 2004; STATA Corporation, 2005) to ascertain that the model is correctly specified. The link function test is

used to verify that the coefficient of the squared linear predictor is non-significant. The link test produced a non-significant chi-square for both the turnover ($p < 0.1$) and turnaway ($p < 0.1$) models, thereby, confirming that the models were correctly specified.

In addition, multiple career transition events per person threatened to violate the assumption of independent observations (Allison, 1984). The non-independence of spells may bias the standard errors and the estimated coefficients (Hosmer and Lemeshow, 1999). To account for multiple observations, I follow Hosmer and Lemeshow (1999)'s recommendation of correcting the dependence of spells for using a robust variance estimator advocated by Lin and Wei (1989). The robust variance estimator accounts for multiple spells by computing standard errors from cumulating residuals within individuals (Hosmer and Lemeshow, 1999).

In this study, I am able to model type specific hazard functions because I have conceptualized and operationalized turnover and turnaway as mutually exclusive events in that the occurrence of one event (either turnover or turnaway) removes the individual from risk of the other event (Allison, 1984). Subsequently, I conducted a competing risk analysis using the approach recommended by Allison (1984; 1995) to compare the effects of predictors on turnover and turnaway. I test for significantly differing effects by computing a Wald chi-square with 1 degree of freedom using the estimated coefficients and their standard errors (Lagakos, 1978). A significant Wald chi-square indicates that the predictor has significantly different effects on turnover and turnaway.

For both turnover and turnaway, Model 1 estimates the effects of the control variables. In Model 2, I estimate the effect of general human capital by including cognitive ability and education. In Models 3 and 4, I estimate the effects of IT specific human capital and firm specific human capital respectively. The final model, Model 5, estimates the full model by including gender:

$$\begin{aligned} h(t;x) = & h_0(t) \exp[\beta_1(X_{MS}) + \beta_2(X_{JS}) + \beta_3(X_{UR}) + \beta_4(X_{Ind}) + \beta_5(X_{Cog}) + \beta_6(X_{Edu}) \\ & + \beta_7(X_{ITSE}) + \beta_8(X_{ITSExp}) * \ln(t) + \beta_9(X_{ITSExpSq}) * \ln(t) + \beta_{10}(X_{FST}) \\ & + \beta_{11}(X_{FSExp}) * \ln(t) + \beta_{12}(X_{FSExpSq}) * \ln(t) + \beta_{13}(X_{Gender})] \end{aligned}$$

where $h(t;x)$ represents the hazard function, i.e. conditional probability of turnover and the conditional probability of turnaway at time t since entering the labor force with predictors X ; $h_0(t)$ represents the baseline hazard function for individuals; β represents the estimated regression coefficients ; and X represents the explanatory variables.

RESULTS

The sample characteristics are presented in Table 17. The sample is gender balanced ($\chi^2 = 3.41$, $p>0.05$) but is predominantly Caucasian ($\chi^2 = 117.06$, $p<0.001$). Only 22% of the sample possess a postgraduate degree ($\chi^2 = 105.92$, $p<0.001$). I also find that there are significantly more non-IT majors than IT majors in the sample ($\chi^2 = 6.15$, $p<0.05$). The means, standard deviations and correlations are presented in Table 18.

Turnover

The average number of turnover events for individuals in the sample is 1.56 turnover events. The Kaplan-Meier estimate of the survival function, which may be interpreted as the probability of staying in an organization until time t_{i+1} , indicates that the survival rates of IT professionals remaining in an organization beyond the first year in the labor force is 0.90 ($\hat{S}(t)=0.87$). By year 8 in the labor force, more than half of the IT professionals in the sample had turned over at least once ($\hat{S}(t)=0.47$).

The baseline cumulative hazard function, which may be interpreted as the cumulative probability of turnover controlling for the covariates, indicates that IT professionals are likely to turnover between 4 ($h_0(t)=0.35$) and 5 ($h_0(t)=0.46$) years after entering the labor force. The flattening of the baseline cumulative hazard in year 19 may be attributed to the small number of turnover events in that time period.

Recall that the hazard rate ($h(t;x)$) is the probability of turnover conditional upon years since entering the labor force. Table 19 presents the results, as raw coefficients and as exponentiated coefficients, for the proportional hazards model testing Hypotheses 1 to 4. The raw coefficients (β) are interpreted as odds ratios and subtracting 1 from the exponentiated coefficients (i.e. $\exp^\beta$) presents the results as a percentage change in the hazard rate of turnover given a unit change in the covariate. Exponentiated coefficients

($\exp^{\beta}$) greater than 1 indicate a positive relationship with turnover and exponentiated coefficients less than 1 indicate a negative relationship.

Model 1 (Table 19) presents the results for the control variables indicating that a 1-unit increase in job satisfaction significantly reduces the probability of turnover by 18% ($\beta = -0.203$; $\exp^{\beta} = 0.816$; $p < 0.01$). The remaining control variables did not predict turnover.

Model 2 provides limited support for Hypothesis 1a, which posits that IT professionals with higher levels of general human capital will be at higher risk of turnover compared to IT professionals with lower levels of general human capital. Cognitive ability is significantly related to the probability of turnover such that a 1 percentile increase in cognitive ability increases the probability of turnover by about 1% ($\beta = 0.007$; $\exp^{\beta} = 1.007$; $p < 0.01$). Although in the hypothesized direction, I find that education is not a significant predictor of turnover.

Hypothesis 2a posits that IT professionals with higher levels of IT specific human capital will be at higher risk of turnover compared to IT professionals with lower levels of IT specific human capital. The results of Model 3 provide support for Hypothesis 2a. Specifically, I find IT specific education increases the probability of turnover by 42% ($\beta = 0.349$; $\exp^{\beta} = 1.418$; $p < 0.01$). I also find that a year's increase in IT experience increases the probability of turnover by 10% ($\beta = 0.091$; $\exp^{\beta} = 1.095$; $p < 0.001$).

In exploring the nonlinear relationship between IT specific experience and turnover, I find that the squared term of IT experience is significant and negatively related to the probability of turnover ($\beta = -0.006$; $\exp^{\beta} = 0.994$; $p < 0.001$). I graphed the effects of IT experience following the approach recommended by Cohen and associates (Cohen, Cohen, West and Aiken, 2003). With all other covariates held at their means, I obtain a curvilinear, inverted U-shaped relationship between IT experience and the probability of turnover. The probability of turnover peaks when IT professionals have 11 years of IT experience ($h(t;x) = 1.10$). Thereafter, the probability of IT professionals turning over reduces with each year of IT experience accumulated.

Table 17: Sample Characteristics

	N	%	χ^2
Gender			3.41
Female	162	45.13	
Male	197	54.87	
Race			117.06 ***
Non-Caucasian	77	21.45	
Caucasian	282	78.55	
Education			105.92 ***
Bachelors	277	77.16	
Postgraduate	82	22.84	
Field of Study			6.15 *
Non-IT Major	203	56.55	
IT Major	156	43.45	

N=359. * p<0.05; ** p<0.01; *** p<0.001

Table 18: Means, Standard Deviation and Correlations^a

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Turnover	0.10	0.29	1.000													
2 Turnaway	0.02	0.15	-0.051 ***	1.000												
3 Cognitive Ability	72.42	24.27	0.053 ***	-0.026 *	1.000											
4 Education	0.12	0.32	0.014	0.005	0.155 ***	1.000										
5 IT Education	0.43	0.50	0.087 ***	-0.045 ***	0.012	-0.103 ***	1.000									
6 IT Experience	5.24	5.37	0.150 ***	0.008	0.149 ***	0.115 ***	0.202 ***	1.000								
7 IT Experience Squared	56.24	94.98	0.091 ***	-0.022	0.138 ***	0.081 ***	0.184 ***	0.930 ***	1.000							
8 Firm Specific Training	0.43	0.89	-0.111 ***	-0.049 ***	0.080 ***	0.065 ***	0.038 *	0.285 ***	0.253 ***	1.000						
9 Firm Specific Experience	3.79	4.02	-0.049 ***	-0.032 *	0.072 ***	0.110 ***	0.011	0.445 ***	0.416 ***	0.393 ***	1.000					
10 Firm Specific Experience Squared	30.51	60.07	-0.047 ***	-0.037 **	0.206 ***	0.059 ***	0.093 ***	0.408 ***	0.419 ***	0.344 ***	0.001	0.932 ***	1.000			
11 Gender	0.54	0.50	0.080 ***	-0.030 *	0.059 ***	0.004	0.166 ***	0.138 ***	0.123 ***	0.044 ***	0.001	-0.005	1.000			
12 Marital Status	0.47	0.50	0.016	-0.020	0.090 ***	0.091 ***	0.016	0.322 ***	0.266 ***	0.176 ***	0.234 ***	0.174 ***	0.053 ***	1.000		
13 Job Satisfaction	3.32	0.74	-0.051 ***	-0.029 *	-0.010	0.072 ***	-0.012	0.062 ***	0.050 ***	0.040 **	0.037 **	0.036 **	0.047 ***	0.062 ***	1.000	
14 Unemployment Rate	2.62	0.96	-0.021	-0.010	-0.005	-0.077 ***	0.038 **	-0.178 ***	-0.143 ***	-0.110 ***	-0.151 ***	-0.139 ***	-0.005	-0.119 ***	-0.011	1.000
15 Industry	63.88	23.00	0.005	0.004	-0.080 ***	0.039 **	-0.095 ***	-0.090 ***	-0.070 ***	-0.038 **	-0.047 **	-0.034 **	-0.124 ***	-0.065 ***	0.008	0.014

^aThese correlations are derived from 5,860 person-period observations for n=359 individuals.

Education: Bachelors=0, Postgraduate=1; IT Education: Non-IT Major=0, IT Major=1; Gender: Female=0, Male=1; Marital Status: Not married=0, Married, Spouse present=1.

* p<0.05; ** p<0.01; *** p<0.001

Table 19: Results of Proportional Hazards Regression Analysis for Turnover

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β	$\exp(\beta)$	β	$\exp(\beta)$	β	$\exp(\beta)$	β	$\exp(\beta)$	β	$\exp(\beta)$
Marital Status	0.092	1.096	0.063	1.065	-0.096	0.909	0.024	1.024	0.014	1.014
Job Satisfaction	-0.203 **	0.816	-0.205 **	0.815	-0.222 ***	0.801	-0.226 ***	0.798	-0.240 ***	0.787
Unemployment Rate	-0.065	0.937	-0.062	0.940	-0.036	0.964	-0.066	0.937	-0.066	0.936
Industry	0.001	1.001	0.001	1.001	0.004 *	1.004	0.003	1.003	0.004 *	1.004
Cognitive Ability			0.007 **	1.007	0.004	1.004	0.005 *	1.005	0.004 *	1.004
Education			0.068	1.070	0.125	1.133	0.048	1.049	0.058	1.059
IT Education					0.349 **	1.418	0.385 ***	1.470	0.346 **	1.414
IT Experience					0.091 ***	1.095	0.106 ***	1.112	0.104 ***	1.109
IT Experience Squared					-0.006 ***	0.994	-0.006 ***	0.994	-0.006 ***	0.994
Firm Specific Training							-0.984 ***	0.374	-0.974 ***	0.377
Firm Specific Experience							-0.039 ***	0.962	-0.039 ***	0.961
Firm Specific Experience Squared							0.002 *	1.002	0.002 *	1.002
Gender									0.322 **	1.380
Log Likelihood	-3196.37		-3188.10		-3080.66		-2977.94		-2971.83	
Log Likelihood Chi-sq	10.72 *		16.52 *		200.85 ***		481.71 ***		490.95 ***	
df	4		6		9		12		13	
Change in chi-sq			5.8		190.13 ***		470.99 ***		480.23 ***	
Change in df			2		5		8		9	

Marital Status: Not married=0, Married Spouse Present=1; Education: Bachelors=0, Postgraduate=1; IT Education: Non-IT Major=0, IT Major=1; Gender: Female=0, Male=1; † p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Hypothesis 3a posits that IT professionals with higher levels of firm specific human capital will be at lower risk of turnover compared to IT professionals with lower levels of firm specific human capital. The results of Model 4 provide support for Hypothesis 3a. Specifically, firm specific training reduces the probability of turnover by 63% ($\beta=-0.984$; $\exp^{\beta}=0.374$; $p<0.001$) and a year's increase in firm specific experience reduces the probability of turnover by 4% ($\beta=-0.039$; $\exp^{\beta}=0.962$; $p<0.001$).

Finally, Hypothesis 4a posits that male IT professionals will be at a higher risk of turnover compared to female IT professionals. In Model 5, I find that the probability of turning over is increased by 38% for male IT professionals ($\beta=0.322$; $\exp^{\beta}=1.380$; $p<0.01$).

Turnaway

In the sample, 142 out of 359 (39.55%) individuals turned away from the IT profession during the study period and did not return to the IT profession. The Kaplan-Meier estimate of the survival function, which may be interpreted as the probability of staying in the IT profession until time t_{i+1} , indicates that the survival rates of an IT professional remaining in the profession beyond the year in the labor force is 1.00 ($\hat{S}(t)=1.00$). The probability of survival drops gradually but the probability stays above 0.5 up until the end of the study period (min $\hat{S}(t)=0.62$ at time 20) indicating that three quarter of IT professionals in the sample remained in the IT profession.

The baseline cumulative hazard function for turnaway indicates that IT professionals are likely to turnaway between years 3 ($h_0(t)=0.37$) and 4 ($h_0(t)=0.59$) since entering the labor force. The flattening of the baseline cumulative hazard at time 19 may be attributed to the small number of individuals with turnaway events in that time period (see Allison, 1995)

Recall that the hazard rate ($h(t;x)$) is the likelihood of turnaway conditional upon time since degree. Table 20 presents the results for hypotheses concerning the turnaway of IT professionals. Model 1 (Table 20) presents the results for the control variables demonstrating that a 1-unit change in job satisfaction significantly reduces the probability of turnaway by 19% ($\beta=-0.212$; $\exp^{\beta}=0.809$; $p<0.01$). Marital status and unemployment rate are not significantly related to the probability of turnaway.

Model 2 does not provide support for Hypothesis 1b, which posits that IT professionals with higher levels of general human capital will be at a higher risk of turnaway compared to IT professionals with lower levels of general human capital. Contrary to my hypothesis, I find that cognitive ability is negatively related to the probability of turnaway such that a 1 percentile increase in cognitive ability reduces the probability of turnaway by about 1% ($\beta=-0.006$; $\exp^{\beta}=0.994$; $p<0.01$). Although in the posited direction, education is not significantly related to the probability of turnaway.

Model 3 provides limited support for Hypothesis 2b, which posits that IT professionals with higher levels of IT specific human capital will be at a lower risk of turnaway compared to IT professionals with lower levels of IT specific human capital. I find that IT education reduces the probability of turnaway by 53% ($\beta=-0.760$; $\exp^{\beta}=0.468$; $p<0.001$) and a year's increase in IT experience increases the probability of turnaway by about 9% ($\beta=0.083$; $\exp^{\beta}=1.087$; $p<0.001$).

In exploring the nonlinear nature of IT specific experience with the probability of turnaway, I find that the effect of IT specific experience decreases with each year as evidenced by the significantly negative relationship between the squared term of IT experience and the probability of turnaway ($\beta=-0.014$; $\exp^{\beta}=0.987$; $p<0.001$). I graphed the effects of IT experience on the probability of turnaway. When all other covariates are held at their means, I obtain a curvilinear, inverted U-shaped relationship between IT experience and the probability of turnaway. The probability of turnaway peaks when IT professionals have 6 years of IT experience ($h(t;x)=0.12$). Thereafter, the probability of IT professionals turning away reduces with each year of IT experience accumulated.

Model 4 provides limited support for Hypothesis 3b, which posits that IT professionals with higher levels of firm specific human capital are at a lower risk of turnaway compared to IT professionals with lower levels of IT specific human capital. I find that a unit increase in firm specific training reduces the probability of turnaway by 49% ($\beta=-0.675$; $\exp^{\beta}=0.509$; $p<0.001$). However, firm specific experience is unrelated to the probability of turnaway.

Finally, Model 5 provides support for Hypotheses 4b relating gender to the probability of turnaway. Specifically, the probability of turnaway is reduced by 34% for male IT professionals ($\beta=-0.409$; $\exp^{\beta}=0.665$; $p<0.01$).

Table 20: Results of Proportional Hazards Regression Analysis for Turnaway

	Model 1		Model 2		Model 3		Model 4		Model 5	
	β	exp(β)	β	exp(β)	β	exp(β)	β	exp(β)	β	exp(β)
Marital Status	-0.276	0.759	-0.247	0.781	-0.369 *	0.691	-0.295 *	0.744	-0.280 *	0.756
Job Satisfaction	-0.212 *	0.809	-0.217 *	0.805	-0.237 *	0.789	-0.229 *	0.796	-0.207 *	0.813
Unemployment Rate	-0.097	0.908	-0.093	0.911	-0.046	0.955	-0.057	0.945	-0.058	0.944
Industry	0.001	1.001	0.001	1.001	0.001	1.001	0.001	1.001	0.000	1.000
Cognitive Ability			-0.006 **	0.994	-0.008 **	0.992	-0.007 **	0.993	-0.006 *	0.994
Education			0.271	1.311	0.104	1.110	0.070	1.073	0.077	1.080
IT Education					-0.760 ***	0.468	-0.733 ***	0.480	-0.692 ***	0.500
IT Experience					0.083 ***	1.087	0.092 ***	1.096	0.096 ***	1.101
IT Experience Squared					-0.014 ***	0.987	-0.014 ***	0.986	-0.014 ***	0.986
Firm Specific Training							-0.675 ***	0.509	-0.670 ***	0.512
Firm Specific Experience							-0.027	0.974	-0.028 *	0.973
Firm Specific Experience Squared							0.001	1.001	0.001	1.001
Gender									-0.409 **	0.665
<hr/>										
Log Likelihood	-813.65		-811.56		-780.93		-769.06		-766.39	
Log Likelihood Chi-sq	8.74		17.93 **		64.86 ***		91.35 ***		95.48 ***	
df	4		6		9		12		13	
Change in Chi-sq			9.19 *		56.12 ***		82.61 ***		86.74 ***	
Change in df			2		5		8		9	

Marital Status: Not married=0, Married Spouse Present=1; Education: Bachelors=0, Postgraduate=1; IT Education: Non-IT Major=0, IT Major=1; Gender: Female=0, Male=1; † p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Comparing the Effects of Predictors on Turnover and Turnaway

Following the competing risks approach (Allison, 1984), I find that the effects of cognitive ability, IT education, squared term of IT experience and gender significantly differed for turnover and turnaway (Table 21). The results of the competing risk analysis provide support for my assertion that human capital predictors act as inhibitors and enhancers of career transitions. Specifically, cognitive ability significantly differed across career transitions by increasing the probability of turnover but reducing the probability of turnaway ($\chi^2=8.577$, $df=1$, $p<0.01$). Similarly, IT education also significantly differed across career transitions. IT education increases the probability of turnover but reduces the probability of turnaway ($\chi^2=27.943$, $df=1$, $p<0.001$). For the squared term of IT experience, the effect of the squared term of IT experience over time is twice as strong in turnaway as in turnover ($\chi^2=4.174$, $df=1$, $p<0.05$). Finally, the results report significantly different gender effects in that males are more likely to turnover but are less likely to turnaway ($\chi^2=14.799$, $df=1$, $p<0.001$).

Table 21: Comparing the Effects of Predictors on Turnover and Turnaway

	Turnover: Model 5		Turnaway: Model 5		Wald χ^2
	β	se	β	se	
Marital Status	0.014	0.119	-0.280	0.165 *	2.084
Job Satisfaction	-0.240	0.064 ***	-0.207	0.107 *	0.070
Unemployment Rate	-0.066	0.048	-0.058	0.086	0.007
Industry	0.004	0.002 *	0.000	0.003	0.927
Cognitive Ability	0.004	0.002 *	-0.006	0.003 *	8.577 **
Education	0.058	0.175	0.077	0.245	0.004
IT Education	0.346	0.112 **	-0.692	0.161 ***	27.943 ***
IT Experience	0.104	0.008 ***	0.096	0.013 ***	0.287
IT Experience Squared	-0.006	0.001 ***	-0.014	0.004 ***	4.174 *
Firm Specific Training	-0.974	0.096 ***	-0.670	0.206 ***	1.781
Firm Specific Experience	-0.039	0.008 ***	-0.028	0.017 *	0.359
Firm Specific Experience Squared	0.002	0.001 *	0.001	0.002	0.136
Gender	0.322	0.121 **	-0.409	0.146 **	14.799 ***

Marital Status: Not married=0, Married Spouse Present=1; Education: Bachelors=0, Postgraduate=1;

IT Education: Non-IT Major=0, IT Major=1; Gender: Female=0, Male=1;

† $p<0.1$; * $p<0.05$; ** $p<0.01$; *** $p<0.001$

DISCUSSION

This study builds on and extends the broader research stream examining career transitions of IT professionals. I undertook this study with the following two objectives: (a) to examine why IT professionals turnover; and (b) to extend the career transitions research stream by examining why IT professionals turnaway. In this study, I refined the conceptualization of career transitions to refer to turnover, defined as a career transition in which an IT professional leaves an IT job in one organization for another IT job in another organization. In addition to examining the predictors of turnover, I also examine the predictors of turnaway, i.e., a career transition in which an IT professional leaves the IT profession.

This study drew on human capital and gender literature to develop four sets of hypotheses linking human capital and gender predictors to turnover and turnaway. Subsequently, I tested these hypotheses with a predictive model on a longitudinal dataset. In the following sections, I discuss the results obtained in this study and highlight the implications of the findings for research and the practice of IT.

Turnover

I obtained results that were consistent with my hypotheses and obtained some interesting results. IT professionals, on average, experience 1.56 turnover events in their careers. In answering when IT professionals turnover, they are more likely to turnover between years five (5) and six (6) of entering the labor force, controlling for covariates.

As expected, the risk of turnover is reduced by job satisfaction and firm specific human capital (see Model 5 in Table 19). The empirical results for job satisfaction and firm specific human capital are consistent with management literature (e.g. Galunic and Anderson, 2000; Griffeth, et al., 2000; Trevor, 2001) and with IT studies that also report a negative relationship between firm specific experience turnover (e.g. Josefek and Kauffman, 2003; Moore, 2000). Although studies in the IT discipline focused on the role of firm specific experience in explaining turnover, IT research is silent on the role of firm specific training.

This study adds to IT research by indicating that firm specific training is likely to reduce turnover.

As expected, turnover is facilitated by cognitive ability, IT specific human capital and by gender. The finding that cognitive ability contributes to the risk of turnover is consistent with prior management literature (e.g. Dickter, et al., 1996; e.g. Trevor, 2001). Although there is an extensive body of literature on firm specific human capital and turnover (e.g. Dess and Shaw, 2001; Trevor, 2001), there is a dearth of research in management and in IT examining the role of occupation specific human capital in predicting turnover. As such, this study adds to research by establishing that occupational specific human capital enables individuals to secure similar jobs across organizational boundaries.

Additionally, this study finds support for an inverted, U-shaped relationship between IT experience and turnover. The diminishing effect of IT experience over time may be due to professional obsolescence. Sturman (2003) argued and showed that the diminishing effect of increasing years of job experience on job performance may be attributed to aging effects. In the IT profession, the aging effects of IT experience may result from IT professional obsolescence. The relatively short half-life of IT specific human capital and the rapidly changing composition of core IT skills suggests that IT professionals with long tenure in IT are likely to be professionally obsolete (Ang and Slaughter, 2000; Dubin, 1990).

Threatened by professional obsolescence, individuals cope by ignoring new technologies and narrowing their professional referent group to those with similar competencies (Pazy, 1994). These maladaptive behaviors reduce the need for updating (Schambach, 1994) and, consequently, narrow the IT job alternatives. Consequently, I would expect an inverted U-shaped curvilinear relationship between IT experience and the probability of turnover where the probability of turnover initially increases due to accumulation of human capital and then reduces after a point due to professional obsolescence. This finding is corroborated by prior IT research (e.g. Igbaria and Chidambaram, 1997), that consistently reports a negative relationship between IT experience and turnover. The sample of individuals analyzed in these prior IT studies are

typically more senior IT professionals with more than 10 years of IT experience. Consistent with the results in this paper, IT professionals with IT specific experience beyond 10 years face a declining probability of turning over.

As for gender's effect on turnover, males are more likely to turnover compared to females. This finding is consistent with arguments suggesting that female IT professionals lack the resources to find and obtain alternative jobs (Ahuja, 2002; Hartmann, et al., 1986; Margolis and Fisher, 2002).

Finally, I did not find support for the effect of education on the risk of turnover. Although in the hypothesized direction, I find that education level (i.e. bachelors versus postgraduate) does not significantly increase the risk of turnover. But, the type of postgraduate education rather than level may significantly contribute to the risk of turnover. Human capital theory suggests that a postgraduate degree, such as an MBA, provides an individual with human capital that is more closely tied to the firm than to an occupation. In addition, an MBA may serve as a signal to one's employer that the individual with an MBA is seeking to advance to a managerial position within the firm. Prior research does suggest that individuals with MBAs are less likely to turnover (Dougherty, Dreher and Whitely, 1993; Lyness and Judiesch, 2001).

This dataset is limited as I am unable to ascertain the type of postgraduate degree attained by individuals. As such, future research might examine the effects of general versus specific types of postgraduate degrees in IT professionals' turnover behaviors.

Turnaway

IT professionals who turned away are likely to do so between three (3) to four (4) years of entering the labor force. In contrast to turnover, turnaway appears to be a one-time event in the careers of IT professionals where IT professionals who left the profession did not return in the course of their career to date.

As with turnover, I obtained results, which were expected and obtained results that were contrary to my expectations. As expected, turnaway is inhibited by IT specific human capital and firm specific human capital. IT specific human capital and firm specific human

capital are important resources for IT professionals to perform their jobs as these are closely tied to IT professionals' productivity.

Moreover, there is a curvilinear, inverted U-shaped relationship between IT experience and turnaway such that the probability of turnaway peaks at six (6) years after IT professionals enter the labor force. Beyond the sixth year, IT professionals tend to persist with their IT careers. Management literature may provide a rationale for this finding. New entrants into a profession will most likely focus on technical mastery and learning the norms, rules and values about the organization and profession (Blau, 1999). As new professionals accumulate experience in a profession, they would also accumulate information about the nature of work in the profession. With increasing amounts of information about the nature of work in a profession, individuals might reasonably assess their congruence with their profession (Wilk and Sackett, 1996). Professionals in the early stage of their careers have relatively low investments in occupation specific human capital and may incur less cost when turning away compared to those with higher levels of IT experience.

To encourage professionals to persist with their career choices, management literature suggests an apprenticeship approach with a socialization period and a slow increase in the challenge posed by assignments (Blau, 1999). It is argued that this "slow burn" approach is likely to result in a crisis-free mid-career stage for professional employees (Blau, 1999). Individuals who persist on and continue to accumulate professional experience are more likely to remain within the profession because the cost of turning away is even higher. This argument is consistent with Becker's (1960) side-bet notion where commitment is calculative and is rooted in extrinsic inducements (Meyer, et al., 2002).

In addition to human capital, I find that women IT professionals are more likely to leave the IT profession compared to their male counterparts. Taking this finding together with the significant gender effect where male IT professionals are more likely to turnover suggests that women IT professionals may be moving into line functions within their organizations or in other organizations. The transition into line jobs might explain the job

destination of women when they leave the IT profession. As such, future research could examine whether organizations do indeed “seed the line” with female IT professionals.

Contrary to prior research (e.g. Johnson and Stokes, 2002; Wilk, et al., 1995; Wilk and Sackett, 1996), this study finds that cognitive ability reduces the probability of IT professionals turning away. In reconciling theory with the results found here, I propose that the results indicate a possible boundary condition to the gravitational hypothesis of career transitions (Wilk, et al., 1995; Wilk and Sackett, 1996). The gravitational hypothesis posits that individuals will incline towards jobs with cognitive complexity commensurate with their levels of cognitive ability. Although individuals with higher levels of cognitive ability have wider vocational interests, which results in more career options, the inclination towards occupations with cognitive complexity commensurate with their levels of cognitive ability eliminates career options. As such, individuals high in cognitive ability would have few occupational choices commensurate with their cognitive ability, without first leaving the workforce and enrolling in formal education.

The results do suggest that individuals with high cognitive ability are unlikely to turnaway because they are limited in their occupational choices of jobs with cognitive complexities matching their cognitive ability. Individuals in my sample were, on average, at 72 percentile of cognitive ability. Leaving the workforce is a costly option for individuals who are intent on following their vocational interest. In fact, the more frequent occupations to which IT professionals moved into were clerical (n=43), sales (n=16), media and public relations (n=10), production operations (n=7), college teaching (n=6) and non-college teaching (n=6). The career transition into these professions does not require individuals to leave the workforce to reskill.

With limited choices, IT professionals with high cognitive ability might choose to remain in IT where the returns to their general human capital are maximized. An interesting research would be to examine the relationship between cognitive ability and the occupational choices of individuals. This line of research would benefit the IT discipline as it would have implications for IT career planning and would help IT professionals transit into other

occupations. Current research suggests that IT professionals do not plan such career transitions (Reich and Kaarst-Brown, 1999).

Finally, I find that education is positively but not significantly related to the risk of turnaway. Future research could examine the role played by the type of postgraduate degree in estimating the risk of turnaway. Human capital theory suggests that specialized postgraduate degrees, such as a Masters of Science in IT, would serve as a barrier to turnaway as it signals an individual's investment in IT expertise, level of IT competencies, and of interest in IT as a profession.

Comparing the Effects of Predictors on Turnover and Turnaway

The competing risks analysis showed differences in the effects of predictors when the conceptualization and operationalization of turnover is enriched by delineating turnaway. Specifically, the competing risks analysis highlighted significant differences in the effects of cognitive ability, IT education, IT experience and gender on turnover and turnaway (Table 21). Cognitive ability and IT education appear as enablers of turnover and inhibitors of turnaway. Given that IT specific education increases the probability of turnover by 42% but reduces the probability of turnaway by 53%, this study establishes IT specific education as an important factor in the career persistence of IT professionals. Additionally, the effect of IT experience over time is stronger in keeping IT professionals within the profession compared to retaining IT professionals within an organization. Finally, the competing risk analysis confirms the different role gender plays in turnover and turnaway. Contrary to prior IT research, women IT professionals should not be stereotyped as "quitters" given that women are less likely to turnover and are as likely as men to leave the IT profession.

A major implication for future research would be to begin reanalyzing much of what we know about the turnover of professionals to tease out differences due to turnover, i.e. leaving a job with an employer for a similar job with another employer, from those due to turnaway, i.e. leaving the profession.

Implications for Research

The findings reported in this study and discussed above have several implications for research. One, this study has enriched the definition of turnover to examine career transitions to similar jobs with another employer and has started a research program that examines why and when IT professionals experience such career transitions. As mentioned above, one major implication would be to reexamine prior results on the turnover of professionals to compare their effects with turnaway.

Two, future research might go beyond human capital variables to examine the role of attitudes and context over time. For example, predictors such as organizational commitment (e.g. Allen and Meyer, 1990; Allen and Meyer, 1996) show differential effects on career mobility. Research suggests that continuance commitment is lower prior to internal career transitions compared to those who did not move but that affective commitment increases after internal career transitions (Kondratuk, Hausdorf, Korabik and Rosin, 2004). The role of social context (e.g. Higgins, 2001), organization context (e.g. Bloom and Michel, 2002) and job context (e.g. Blau, 2000) on career transitions of IT professionals remains a largely unexplored area. For example, the dynamic technological landscape coupled with the stresses of the job might explain why IT professionals leave employer and profession. In examining the role played by these constructs in career transitions, IT research might explore their differential effects over time.

Three, future research might build on this study to examine why and when other forms of career transitions occur. IT professionals, in the course of their work life, experience a spectrum of career transitions. Besides turnover and turnaway, future research could examine why individuals turn into the IT profession or examine the antecedents of promotions in IT. For example, tournament theory (Rosenbaum, 1979) would suggest that individuals who have lost in prior rounds of career advancement in other occupations might turn into IT. Given that competencies in the IT profession have a half-life of about 2 to 3 years (Ang and Slaughter, 2000; Dubin, 1990), individuals who turn into IT may have similar career prospects vis-à-vis other experienced IT professionals.

Four, the results strongly suggest that future research delineate the effects of various forms of human capital and theoretically account for these when developing theory about IT professionals career related behaviors. It is not enough to include IT tenure or firm specific experience (e.g. Igbaria and Greenhaus, 1992; Josefek and Kauffman, 2003). This study finds that the components of human capital variables relate differently with turnover and turnaway. As such, future research might find it relevant to include both training and experiences across the various levels of specificity in their models. Finally, this study contributes to IT research by modeling the temporal dimension of career transitions. Future research might also model the effects of time. By doing so, future research will contribute to IT research by going beyond estimating the relative influences of various antecedents to estimating the conditional probability of risk of career transitions.

Implications for Practice

The predictive model developed and tested here provides IT professionals and managers with information to manage career transitions. Given that IT professionals will most likely turnaway within 4 years and turnover within 6 years of entering the labor force, managers who want to retain their valued IT professionals might develop career transition programs to facilitate the movement of IT professionals into non-IT functions within 4 years. Subsequently, managers might focus on retaining valued individuals by developing IT professionals' firm specific competencies to keep them within firm and within profession (see Munasinghe and O'Flaherty, 2005).

For IT professionals who view IT as a career of advancement, the results from this study suggest that such IT professionals invest time and effort in developing their firm specific human capital. Such capital might be developed by attending firm specific training provided by one's employer, via strong relationships with friends and mentors in business areas, developing strong attachments to the organization and exhibiting organization citizenship behaviors (Paré, et al., 2000; Reich and Kaarst-Brown, 1999). For IT professionals who view their career as one of achievement, the results suggest developing both business and IT technical competencies to remain marketable in the profession.

CONCLUSION

In summary, this study extends IT research by examining “*why*” and “*when*” IT professionals turnover and turnaway. Using longitudinal data, I find that general and IT specific human capital increases the risk of turnover for IT professionals. Firm specific human capital, however, reduces this risk. Similarly, components of general human capital and IT specific human capital behave in different ways in predicting turnaway. In conclusion, this study makes four important contributions to research in IT and management. First, this study adds to a limited set of studies that define turnover as movement to a similar job with another employer. Second, this study adds to IT research on career transitions by examining actual turnover behaviors instead of turnover intentions. Third, this study extends IT research on career transitions by examining why IT professionals turnaway. Finally, this study adds to IT and broader management research by developing and testing temporal models of turnover and turnaway using survival analysis.

CHAPTER 5

SUMMARY AND CONCLUSION

With these three studies, I have started a research program to understand why IT professionals leave their organization and occupation. Specifically, the three studies in this dissertation examine the antecedents and consequences of career transitions of IT professionals. The career transitions of interest in this dissertation are turnover and turnaway. The traditional definition of turnover, i.e. voluntarily leaving an organization is broad and may include individuals leaving the profession as well. Therefore, I enrich the definition of turnover, in the final study, to refer to leaving an IT job with one employer for an IT job with another employer. I am, then, able to extend IT research by examining turnaway as distinct from turnover.

In the following sections of this chapter, I provide a summary of the three studies detailed in the previous chapters; summarize the contributions of this thesis to both research and practice; and conclude with suggestions for future research.

SUMMARY OF STUDIES AND KEY FINDINGS

Study 1

In the first study, I focused on the antecedents of turnover intent. The research question I sought to answer was why IT professionals intend to leave organizations. In answering this research question, I conducted a qualitative and a quantitative review of IT turnover intentions literature. I, then, proposed and tested an integrative model of turnover intentions for IT professionals.

There are several key findings from the qualitative and quantitative review of IT turnover intentions literature. One, the qualitative review highlighted a predominance of IT studies examining the turnover intentions of IT professionals rather than actual turnover behaviors. Two, while the IT discipline has examined a wide variety of antecedents to turnover intentions, many of these antecedents are only examined in “one-off” studies. However, there are idiosyncratic predictors of turnover intent that have held the attention of

IT scholars. These predictors include tenure in the profession, hierarchical level and boundary spanning activities of IT professionals. Three, IT research is generally silent about other forms of career transitions and their associated consequences.

Four, the quantitative analysis established the population correlations of 23 predictors of turnover intentions. In doing so, I find that conceptualization and operationalization of constructs accounted for the variation in reported correlations in prior IT turnover intention studies. This finding suggests that researchers should be mindful that modifications to previously validated scales influence the results.

Five and finally, I find support for a partially mediated model of turnover intentions for IT professionals. The integrative model of turnover intention consists of work attitudes (e.g. job satisfaction and organization commitment) partially mediating the more distal organization, job and personal factors.

Study 2

The second study builds on the first by examining the career transitions of IT professionals across occupational boundaries and its associated consequence. Specifically, the second study examines whether there are prototypical career paths in IT; and what the consequences are of following these career paths. Career paths, in the second study, are the culmination of occupational transitions over IT professionals' work histories.

In this study, I find that three career paths characterize the IT profession: IT technical, IT managerial, and protean. Further, I find differential returns to career paths where IT professionals following an IT managerial career path are paid the most and IT professionals in the protean career path are paid the least.

Study 3

The third and final study in this dissertation examined both types of career transitions: turnover and turnaway. In this study, I examine the actual turnover behaviors of IT professionals, rather than turnover intentions, in response to the dearth of studies in IT. In this study, I also examine turnaway behaviors in response to the scarcity of IT studies examining other forms of career transitions. The research question driving the third study in

this dissertation is: why IT professionals leave organization and occupation?

One key finding in this final study is the role played by human capital and gender predictors of turnaway. To reiterate, cognitive ability, IT education and firm specific training reduces the probability of turnaway but IT experience increases the probability of turnaway. Another significant finding in this study is the significant differences in the way cognitive ability and IT education influences both types of career transitions. Cognitive ability and IT education, both, increase the risk of turnover but reduce the risk of turnaway.

It should be cautioned that the results reported in the studies above are not generalizable to all professions. In fact, the phenomenon of a dual career path arises typically in the context of a technical or professional occupation (Hall, 1987). In such a professional context, Zabusky and Barley (1996)'s ethnographies show that technical professionals have a choice of pursuing a technical career path consisting of a sequence of similar job but spanning multiple organizations or individuals may choose to remain with an employer and move up the career ladder. Strong evidence for a dual track career path has also been found and studied in engineering (Katz, Tushman and Allen, 1995), law (Wallace, 1995) and medical technology (Blau, 1999). Accordingly, individuals may experience turnaway as a career transition in a professional context.

Yet, there are four reasons why the results reported in this thesis are unique to career transitions in the IT profession. First, the IT profession differs from other professions due to the low barriers to entry and exit (Ang and Slaughter, 2000; Ang and Slaughter, 2004). Unlike in the engineering and legal professions where accreditation is necessary before an individual may practice in the profession, the IT profession requires no accreditation for the practice of IT. In relation to the career transitions of IT professionals, the lack of accreditation implies that individuals may easily enter and exit the IT profession with relatively little cost incurred. As such, the porous nature of the IT profession allows individuals to subscribe to a protean career path as an alternative to the technical and managerial career paths.

Second, the IT profession is different from other professions because of the rapid rate of technological change affecting the human capital of individuals within the profession. The rapidly changing technology landscape results in a relatively short half-life of IT human capital, estimated at about 2 to 3 years (Dubin, 1990). The rapidly changing composition of core IT skills suggests that IT professionals with long tenure in the profession are likely to be professionally obsolete (Ang and Slaughter, 2000; Dubin, 1990). In relation to career transitions, the short half-life of IT human capital implies that individuals might frequently turnover to IT jobs that involve the implementation of the latest technology to remain current in the IT profession. IT professionals in these types of jobs may learn the latest technology and experience implementing such technologies in organizations, hence prolonging their value in the IT profession.

Third, the rapid rate of technological change coupled with the low barriers of entry implies that individuals may enter the IT profession and potentially be at the same level of human capital as experienced IT professionals. Although both the experienced and the prospective IT professional would have to equip themselves with the knowledge and experience of the new technology, both these individuals would have similar career prospects within the IT profession thereafter. Moreover, the rate of technological change and the low barriers of exit also suggest that individuals may leave the IT profession with relatively little cost incurred. Individuals' prior investments in IT specific human capital would lose their value in the IT profession over time as new technologies are introduced.

Finally, the IT profession is experiencing a demand-supply imbalance. The falling enrollments in information technology and computer science programs over the last five years suggest an impending labor shortage of IT professionals in the US workforce (Gallivan, McLean, Moore and Roldan, 2001). Despite the number of IT jobs being offshored, the US economy still requires up to 1.8 million IT professionals by 2012 (Hecker, 2005). In addition, IT professionals turning away from the IT profession may exacerbate the turnover of IT professionals. Therefore, the impending IT labor shortage may bring back the levels of turnover rates not experienced by the IT profession since the 1990s.

CONTRIBUTIONS TO RESEARCH

The three studies in this dissertation illuminate different aspects of the broader research of why IT professionals leave organization and occupation. In answering this research question, the three studies presented here draw on disparate theoretical lenses and methodologies. By bringing together disparate lines of research from IT and the broader management literature, this dissertation builds on and extends research concerning the career transitions of individuals in technical and professional occupations. Taken together, these three studies contribute to IT and the extant management literature by adding to our collective understanding of the career transition phenomena.

Contributions to Theory

This dissertation contributes to theory by extending current theories of turnover and of occupational exit. One, this dissertation adds to careers research by explicating factors that are important within an occupation such as IT. Unlike the broader management literature, the role of constructs such as boundary spanning activities and occupational tenure has not been examined in management turnover research (e.g. see Griffeth, et al., 2000). Investigating career transitions within the context of the IT profession highlights factors of career transitions which are important to the IT profession in addition to controlling for contextual factors that interact with individual factors (Ang and Slaughter, 2000). Much of the available management literature on career transitions ignores occupational context that might bias the variance explained by individual factors (see Arthur and Rousseau, 1996). Individuals in a profession have attachments to their occupations as well as to their organizations (Blau, 2000). The tension between these attachments changes the nature of employee-employer obligations (Rousseau and Arthur, 1996; Rousseau and Wade-Benzoni, 1995), and consequently, influences their career transitions (Blau, 2000).

At a macro level, technological trends in IT create new competencies while destroying those currently held by IT professionals (Ang and Slaughter, 2000). Contrary to human capital predictions, the IT context is idiosyncratic in that a long career in IT may not necessarily lead to success because of the devaluing effects of professional obsolescence

(see Dubin, 1971; Pazy, 1994).

Two, this dissertation informs IT and management research on career transitions by theorizing and testing the influence of career transitions across organizational and occupational boundaries on career outcomes (Sullivan, 1999). Much current research focuses on the antecedents of career transitions (Sullivan, 1999) and relatively little has been written about the consequences of career transitions (e.g. Marler, et al., 2002; Stroh and Reilly, 1997). Study 2 of this dissertation extends current theories explaining career transitions to include their associated consequences.

Three, this dissertation extends theory on career transitions by enriching the definition of turnover by considering the destination of individuals' turnover behavior. As a result, this dissertation theorizes and shows that a set of factors can have differing effects when turnover behavior is modeled as distinct from turnaway behavior.

Contributions to Methods

The studies in this thesis also make methodological contributions to IT research. One, studies 2 and 3 contribute to IT research methods on career transitions by examining actual career transition behaviors instead of intentions. Prior turnover research in the IT discipline has almost always examined intentions (e.g. Guimaraes and Igbaria, 1992; Igbaria and Greenhaus, 1992; Lee, et al., 1997; Moore, 2000) rather than actual behaviors (e.g. Bartol, 1983; Josefek and Kauffman, 2003). Although intentions and behaviors are closely related (Parasuraman, 1982), management scholars still call for studies which examine actual behaviors (Peters and Sheridan, 1988) as quit intentions do not necessarily lead to quit behaviors (Mitchell and Lee, 2001).

Two, this study adds to IT and the broader management research methods by developing and testing temporal models of turnover and turnaway using survival analysis. This approach adds to a growing body of work that examines why professionals undertake career transitions, and when they do so (Singer and Willett, 1991). Management scholars have long noted that investigating when career transitions occur is as important and relevant as understanding the "why" (Mobley, 1982; Peters and Sheridan, 1988).

CONTRIBUTIONS TO PRACTICE

The results obtained from the set of studies in this dissertation have important implications for the career decisions of IT professionals and for the management of IT professionals.

For IT Professionals

The three prototypical career paths in the IT profession suggest that IT professionals may have careers that are not constrained to the dual career concept as suggested by Ginzberg and Baroudi (1988). An option that IT professionals might consider is moving out of IT technical jobs and into a job that requires the incumbent to possess firm specific human capital. This career transition might involve moving into an IT managerial track or moving into line functions (e.g. Reich and Kaarst-Brown, 1999), both of which maximizes returns to their firm specific competencies. Clearly, this study answers the question of which career path pays better. As IT technical jobs (e.g. programming, IT operations, network administration) continue to move offshore, the career alternatives available to IT professionals are either IT management or a protean career. Between the two alternatives, IT managerial careers command higher incomes compared to protean career.

Whether IT professionals choose to move into management or into line functions or to remain in IT, the results from this study suggest that such IT professionals invest time and effort in developing their firm specific human capital. Such capital might be developed by attending firm specific training provided by one's employer, via strong relationships with friends and mentors in business areas and developing strong attachments to the organization (Paré, et al., 2000; Reich and Kaarst-Brown, 1999). In addition, IT professionals who view their career as one of achievement (Zabusky and Barley, 1996) should consider developing both business and IT technical competencies to remain marketable in the profession.

Finally, for new IT professionals who are unsure of their calling, this dissertation provides information on the most likely time to leave the IT profession. On average, I find

that IT professionals will most likely turn away within 4 years of obtaining a degree. Leaving after this time might incur higher than average costs in terms of career success.

For the Management of IT Professionals

The three prototypical career paths in the IT profession suggest that IT professionals may have careers that are not constrained to the dual career concept as suggested by Ginzberg and Baroudi (1988). As such, human resource managers, in planning IT professionals' careers, might consider moving IT professionals valued by the organization into functions that are more embedded in the organization (e.g. Reich and Kaarst-Brown, 1999). This is especially important in light of Study 3 where I find that firm specific competencies are important for retaining and developing IT professionals.

Besides, the predictive model developed and tested in Study 3 provides managers with information to manage inter- and intra-organization career transitions. Given that IT professionals will most likely turn away within 4 years of obtaining a degree and turnover within 6 years of obtaining a degree, managers who want to retain their valued IT professionals might move IT professionals into non-IT functions within this timeframe. Subsequently, managers might focus on retaining valued individuals by developing IT professionals' firm specific competencies (see Munasinghe and O'Flaherty, 2005).

FUTURE RESEARCH DIRECTIONS

Besides contributing to management and IT research, this dissertation also points to many opportunities for research. The discussion section of each study identifies a number of future research opportunities. Nonetheless, in the following paragraphs, I highlight major research opportunities that may significantly contribute to our collective understanding of how, why and when IT professionals undertake career transitions.

One striking finding from the qualitative review in the first study is the disparate stream of research on IT turnover intentions. The many "one-off" studies in IT provide research opportunities to examine the relationship of under-researched constructs with turnover intent and turnover behavior (see Table 2).

From the second study, future research could significantly contribute to IT and management research by empirically establishing the relationship between career anchors and career paths. Although there is qualitative data suggesting the relationship (Schein, 1975; Schein, 1978), there is no study in IT or management, to my knowledge, that has empirically shown that the salient career anchor of an individual results in a particular career path as suggested by the theory. The important contribution of this line of research is in adding to our understanding of how individuals' subjective careers influence their observable, objective careers (Ginzberg and Baroudi, 1988; Gunz, 1989).

Yet another research opportunity identified from my study of career paths is that future research may empirically test the proposition that the income growth over time differs across career paths. Income growth in IT managerial careers may be higher than in the other two career paths because of the increasing levels of firm-specificity accumulated over time (see Slaughter and Ang, 2004). I would expect that income growth in IT technical careers to be higher than protean careers because of the knowledge and skills gained in applying technology to business situations.

From my study of turnover and turnaway, I find that IT experience acts as a signal of one's professional expertise in the early years of an IT professional's career but its effect on turnover subsequently declines in the later years. In explaining this result, I drew from prior research that shows the turnover rates of technically oriented IT jobs are higher than those of more managerially oriented IT positions (Ang and Slaughter, 2004). Future research might extend IT turnover models by exploring the probability of turnover across job types.

Finally, future research may go on to examine why and when other forms of career transitions occur. IT professionals, in the course of their work, experience a spectrum of career transitions. Besides turnover and turnaway, future research could examine why individuals turn into the IT profession (see Moore, Yager, Sumner and Crow, 2001) or examine the antecedents of promotions in IT. As far as I am aware, there are no studies in the IT domain that has examined these types of career transitions.

CONCLUSION

A continuing source of challenge for managing IT professionals is the high rate of career transitions in the IT industry. Turnover statistics for the last three decades ranged from 15% in the 1970s to 33% in the 1990s (e.g. Hayes, 1998). It is also predicted that up to 15% of the incumbent IT professionals or about 180,000 IT professionals will dropout of the profession within the next four years (Morello, 2005). This high rate of turnover and turnaway raises serious concerns amongst IT practitioners and scholars alike over how to attract the best IT talent and to entice these IT professionals to stay. In seeking a solution to attracting and retaining IT professionals, research in the IT discipline has provided partial answers to the big research question. Prior research has typically focused on the role work attitudes play in the intentions of IT professionals to turnover. Yet, work attitudes play a relatively small role in keeping an individual within an organization (Griffeth, et al., 2000) or within the profession (Lee, et al., 2000). IT research should go beyond examining intentions to examining their actual career transition behaviors.

In addition, IT research has largely ignored the nuances of career transitions. With the outsourcing and offshoring of IT functions in the last decade, IT professionals in the US face reduced career opportunities. As a result, IT professionals have to decide whether to remain in IT by moving to the outsourcing vendor organization, or to leave the IT profession by moving to line functions in their current organization (Morello, 2003). Over the next decade, we can expect the context within which IT careers develop to remain as volatile as in the last decade. Analysts foresee the outsourcing trend reversing as organizations begin to insource their IT functions (Dreyfuss and Scardino, 2005). Insourcing may open new career opportunities for IT professionals within user organizations (Morello and Lavalette, 2003) and within IT services organizations (Dreyfuss and Scardino, 2005). In fact, analysts expect the IT profession to be one of the top 3 fastest growing occupations (Berman, 2004) with the number of IT positions increasing from about 1.2 million in 2002 to about 1.8 million by 2014 (Hecker, 2005).

As such, the study of career transitions is important because of its implication for IT

professionals, organizations and researchers. IT professionals will continue to have to decide whether to leave their organization or profession. The study of career transitions informs on the implications of their professional development, career decisions and its associated impacts on career success. For organizations, knowledge from this area of study informs on human resource practices that help organizations attract, retain and develop IT professionals for critical jobs. For research, the study of career transitions addresses our collective understanding of the career transition phenomenon by seeking factors that may be similar to other occupations and those that may be unique to IT. Finally, this thesis extends prior research by examining constructs that have interested IT scholars and by examining refinements to these constructs.

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A Very Long Story

One lunchtime

"How many times must a man look up before he can see the sky?" rasped Dylan at Budokan.

"42," replied Adams as he lay on the grass in front of a bulldozer.

Waters and Gilmour shook their heads in despair, but continued to enquire, "And did you exchange a walk on part in the war for a lead role in a cage?"

..... a few minutes later all was destroyed to make way for a bypass.