December 2007

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Why College Undergraduates Choose to Major in Information Technology: A Multi-Theoretical Perspective

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ABSTRACT
The proposed study plans to explore the impacts of computer self-efficacy, outcome expectations, personality, interest in computers, attitudes, subjective norm, behavioral control, social support, and perceived IT job availability on college students’ decisions to pursue information technology careers. The paper will develop a theoretical model based on social cognitive theory and the theory of planned behavior, as well as incorporating the elements of personality. The intent of this study is to extend the social cognitive theory (SCT) and theory of planned behavior (TPB) literatures by expanding their application to IT career choice issues and by including personality traits as additional factors. The latter addition also indicates a unique application of the five factor personality model, as it is rarely used in concert with self-efficacy, outcome expectations, and broad environmental factors such as job market demands. By combining multiple theories we hope to contribute to a deeper understanding of IT career choice and career choice issues in general.

Keywords
Social cognitive theory, theory of planned behavior, personality, information technology careers.

INTRODUCTION
During the past five years, a broad decline in computer and technology related enrollments has occurred at colleges across the United States (Gibson, 2005; Murphy, 2005). Although IT enrollments increased during the dot com boom of the late 1990’s, they began declining with the dot com fallout and U.S. economic recession following the terrorist attacks on 9/11 (National Bureau of Economic Research, 2003). Increasing levels of international outsourcing have also likely contributed to the dropping enrollment numbers, as prospective college students fear their future jobs might be shipped offshore (Kessler, 2004). However, with the rebounding economy, the U.S. now faces a lack of skilled IT workers. Immigration restrictions mean even fewer skilled foreign workers will have the ability to contribute to U.S. brainpower and skill in technical fields (Ante, 2004). Yet US colleges have not seen a discernable recovery of student enrollment in IT related majors. As a result of this disturbing phenomenon, America may be left with a shortage of technically skilled workers in the near future.

The issue of why students choose IT as a career is one that has received little attention in the literature. As the job market demand for IT professionals inevitably continues the cycle of rise and fall in future years, knowledge on factors contributing to student career choices will be valuable as a resource for understanding why students choose IT as a career. An increased understanding regarding this question may indicate what steps can be taken to encourage increased IT interest and enrollments when the need arises.

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There have been dozens of studies on college student career choices and career choices in general. Despite the preponderance of studies in this area, Lent, Brown, and Hackett (2000) make a call for new career choice studies that are 1) linked to social cognitive theory, 2) reflect more environmental influences, and 3) are domain specific. These three items are noticeably absent from the literature. SCT has rarely been used in a career choice capacity, even though it is well-suited to the topic (Lent et al., 2001). While certain environmental influences have been invoked, such as family influence (Berrios-Allison, 2005), social relationships (Higgins, 2001), and encouragement by others (Compeau and Higgins, 1995), there is little or no emphasis on broader factors that may have an impact, such as economic conditions (Lent et al. 2001, did include “market...
conditions,” but only as part of an index measuring “barriers” to particular career paths). There also seems to be a lack of studies that focus on specific domains – this is true for information technology, as no significant study exists regarding IT career choice.

This study will contribute to the body of research by utilizing an SCT framework that houses a TPB-based model as well as an additional environmental variable (perceived IT job availability) and personality factors. The perceived IT job availability applies specifically to the IT domain, thus expanding SCT’s use. The marriage of TPB and the five factor model within an SCT framework is a unique approach to addressing career choice issues, and one that may offer increased explanatory and predictive power than models using only one of the three. SCT has been shown to be a powerful predictor of career choice (Lent et al., 1994; Lent, 2005; Sadri and Robertson, 1993; Stajkovic and Luthans, 1998), and TPB has shown promise in its ability to predict human behavior in a wide range of settings (Armitage, 2005; Ajzen and Driver, 1992; Bagozzi et al., 2004; Beck and Ajzen, 1991; Eagly and Chaiken, 1993).

RESEARCH QUESTIONS

The chief question to be asked is why students choose or do not choose IT as a major. Therefore, the dependent variable is behavioral in nature (Figure 1). The model proposes that the answer, as suggested by SCT, lies in environmental and personal variables that interactively influence behavior (Figure 1). The interaction among these variables should help to answer questions regarding how the process takes place. Specifically, the study will investigate what, how, and why personal and environmental factors affect the choice to pursue information technology as a career. The independent variables are personal and environmental factors that may influence this behavior.

Based on this framework, we can address some broad issues, the two most obvious categories being 1) what, how, and why environmental factors influence the choice of IT as a career, and 2) what, how, and why personal factors influence the choice of IT as a career. TPB suggests that subjective norm (a micro-environmental variable) contributes to behavioral intention. Macro environmental factors such as the IT job market, the economy as a whole, outsourcing, and other broad factors that may influence an IT career decision are not as well researched. The question to be asked is if and how these factors affect a student’s perceptions of the likelihood of finding meaningful employment; and how they are related to computer self-efficacy and/or outcome expectations regarding the possibility of a successful IT career.

This gap in the literature indicates a need to assess broader environmental factors that may play an important role in career choice. The “environment,” as referring to larger social, cultural and economic contexts, has had relatively little emphasis in the literature, yet may offer a great deal of explanatory power concerning career decisions. Take the example of a student who may have a personality suited to an information technology career, but who chooses not to pursue IT because of a broad environmental factor such as low market demand for IT employees. If the current state of the IT job market is perceived as weak by those considering choosing IT as a career, then we would expect this perception to have a negative impact on IT enrollments. As well, the high amount of press coverage regarding international outsourcing may contribute to poor perceptions of the IT job market. While the truth is that the future of IT in the United States is improving (Frauenheim, 2005; Jacobs, 2006), perceptions are reality.

Personal factors may also influence an IT career decision, possibly by influencing an individual’s preference for activities associated with different types of careers. In fact, vocational theories posit that personality is generally the single most influential determinant of career choice (Holland, 1973; Gottfredson, 1981). In other words, the reason why an individual chooses a career may be closely related to personality. Personal interests have also been linked to behavior and to career choice in particular (Lent et al., 2001). Behavioral control (i.e., perceived difficulty) and attitudes also appear to have an effect on behavioral intentions (Ajzen and Driver, 1992; Beck and Ajzen, 1991). Therefore, we would expect personality, interest in computers, attitudes, and behavioral control to all have an influence on the choice of IT as a career. Do certain personality types prefer IT? Why does one personality type prefer IT over other careers? If so, which ones? Does higher computer self-efficacy results in more interest in computers? Does interest influence attitudes?

In essence we are trying to see whether the theory of planned behavior is useful in the arena of career choice and whether the possible moderating effects of interest in computers and perceived IT job availability might contribute significantly to the theory. The possible antecedents of personality, outcome expectations, and computer self-efficacy will also be tested for their explanatory power.

THEORETICAL BACKGROUND

Social cognitive theory (Bandura, 1986) provides a broad framework for understanding, predicting, and changing human behavior. SCT introduces the model of triadic reciprocity in which behavior, personal factors, and environment operate as
determinants of each other. Behavior refers to personal actions. Broadly speaking, every human action represents some sort of behavior. Playing tennis, typing at a keyboard, engaging in conversation, walking to class, etc. are all examples of human behavior. Behavior arises from and is the practical performance of choices made by the individual. For example, an individual’s choice to pursue a career in IT will lead to behaviors such as taking IT classes, that in turn lead to behaviors such as computer practice, relevant reading, and the like. Personal factors refer to items such as personal interests and abilities. These are hypothesized to be related to behavior, as personal interests and abilities will likely determine what types of behaviors an individual chooses to pursue. If an individual has no interest in information technology, we would not expect them to pursue a career in it. The third factor, environment, refers to external factors that may affect behavior and, to a lesser extent, personal factors. For example, an environment of constant exposure to computers may influence a person’s computer abilities and interest.

The core concept that glues Bandura’s model together is self-efficacy. Self-efficacy is personal judgment regarding one’s capability to attain a particular level and type of performance (Bandura, 1977). A person's self-efficacy develops as a result of their history of achievement in a particular area, from observations of others successes and failures, from the persuasion of others, and from one’s own physiological state (such as emotional arousal, nervousness, or anxiety) while performing a behavior. Social comparison of one's own performance to the performance of others, especially peers or siblings, also serves as a strong source of self-efficacy.

Bandura (1997) claims that self-efficacy is a stronger predictor of actual behavior than a person’s actual ability. The depth of support for the idea that self-efficacy beliefs and behavior are highly correlated and that self-efficacy and attitudes are predictors of behavior prompted Graham and Weiner (1996) to conclude that, particularly in psychology and education, self-efficacy has proven to be a more consistent predictor of behavioral outcomes than have any other motivational constructs. Self-efficacy beliefs have been shown to strongly influence behavior and performance in many fields (Stajkovic and Luthans, 1998) including information technology (Igbaria and Chakrabarti, 1990; Marakas and McLean, 1998).

Within IS research, self-efficacy often takes the form of computer self-efficacy (CSE). Computer self-efficacy is the self-judged ability to accomplish and execute tasks involving computers (Compeau and Higgins, 1995). CSE appears to have an impact on attitudes towards IT careers and on actual IT use, as people with higher levels of CSE are more likely to form positive perceptions of IT (Venkatesh and Davis, 1996) and are also more likely to use IT (Compeau, Higgins and Huff, 1999).

Interests have also been known to play an integral role in predicting behavior (Diegelman and Subich, 2001; Lent et al., 2001; Lent, Hill and Hoffman, 2003). Lent and Brown’s extension of SCT, social cognitive career theory (SCCT), includes interests as an additional factor within the SCT framework, and has been successful in linking interests with career choice in numerous contexts. Consistent with general social cognitive theory, SCCT’s key cognitive person variables (e.g., self-efficacy, outcome expectations, interests, goals) are designed to capture the ways in which individuals are able to assert
agency in their own development. The theory is concerned with how these variables function along with other aspects of persons and their contexts (e.g., gender, culture, support systems, barriers) to shape the course of career development. Lent et al. (2001) found SCT to be a valuable foundation for predicting and explaining students’ choice of math and science careers.

Another theory used successfully to explain and predict human behavior is the theory of planned behavior (Ajzen, 1991). The theory of planned behavior (TPB) posits that individuals behave rationally by considering the consequences of their actions. The main premise of the theory is that behavior is directly influenced by behavioral intentions, which are in turn influenced by 1) attitudes towards the behavior, 2) the subjective norm regarding the behavior, and 3) behavioral control (see Figure 2). The attitude towards the behavior is an individual predisposition towards the behavior as a function of its expected personal consequences; the subjective norm refers to the social pressures an individual perceives regarding whether the behavior should or should not be performed; behavioral control is an individual’s perception of the difficulty of the behavior.

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Figure 2: The Theory of Planned Behavior

(http://www.istheory.yorku.ca/theoryofplannedbehavior.htm)

TPB is especially well-suited to behavioral situations requiring skills, resources, and individual will (Eagly and Chaiken, 1993), and has been used as the basis for models involving information technology and career choice issues. Most of the studies in the IT literature have focused on technology acceptance as the behavior of interest. Brown and Venkatesh (2005) used TPB as the theoretical framework for exploring technology adoption within households. In addition, TPB has been used in notable studies on music piracy (d’Astous et al., 2005), internet purchases (George, 2004) and banking (Tan and Teo, 2000), decision support system use (Workman, 2005), and gender/age influences on technology use (Morris et al., 2005).

Studies examining career related issues have used TPB as well, although none have yet addressed choice of a particular major or occupation. Giles and Rae (1999) employed TPB to investigate whether men are less willing to pursue sex-atypical careers than women and to determine what factors may explain this reluctance. They found that males are indeed much less willing than females to adopt egalitarian roles. Additionally, the findings pointed to the importance of self-efficacy in the career decision-making process. Shevlin and Millar (2006) used TPB in an attempt to predict the longitudinal growth of career exploratory behavior in teenagers, and concluded that TPB is a useful theoretical framework from which to explain career information-seeking behavior. Giles and Lamour (2000) examined the importance of self-efficacy in predicting employees’ intentions to apply for promotion, and also to confirm its place as a determinant of intention within TPB. The authors found strong support for the addition of self-efficacy to TPB’s framework.

While SCT is concerned with the influence that personal traits, environmental factors, and behavior have on each other, TPB focuses on behavior as the sole dependent variable. Using the SCT framework, we can see that of the three independent variables used in TPB, two are personal in nature, and one is environmental. Attitudes and behavioral control are clearly personal factors, and subjective norm is an environmental factor because it deals with the support an individual receives from his or her immediate social environment. In keeping with SCT then, TPB proposes that both environmental and personal variables contribute to behavior. Therefore, it appears as if a model combining the two theories may be more useful than a model using only one of the two.

In the theoretical model (Figure 3), each construct is associated either directly or indirectly with SCT and TPB. The core TPB model of attitudes, subjective norm, and behavioral control as predictors of intention remains intact. Self-efficacy is represented by computer self-efficacy (CSE), and outcome expectations and interests are integral components of social
cognitive career theory (Lent et al., 2001); in this study, outcome expectations are expected outcomes of a career in IT, and interests are represented by “interest in computers.” These are both personal factors. Perceived IT job availability is an environmentally informed variable, while personality is a personal factor, and intention to choose IT major is a behavioral factor (the behavioral intention variable from TPB). Because personality appears to have a substantial genetic basis (Loehlin et al., 1998) it has no antecedents and instead serves as a moderating variable for the relationship between CSE and outcome expectations.

Figure 3: Theoretical Model

**Personality** is a broad and multi-faceted concept that has been defined and measured in a large variety of ways (McAdams, 1995). Only recently has there been any level of consensus regarding what basic traits comprise personality. In the past, researchers and practitioners were confronted with a wide array of personality scales, and there was little direction or logic to choices regarding measurement (John and Srivastava, 1999). After years of research and analyses, the field of psychology has come to a fairly broad consensus on an accepted taxonomy of personality traits composed of five broad dimensions. This five-factor structure shows promise as a practical and widely applicable model (Digman, 1990).

These five dimensions have been labeled in different ways, but it is generally agreed that regardless of labels, the five dimensions are fundamental to personality and applicable on a global scale (McCrea and Costa, 1997). Norman (1963) was the first scholar to formally name the five factors, and his original names are reflected in current models:

1. Extraversion or surgency (talkative, assertive, energetic)
2. Agreeableness (good-natured, cooperative, trustful)
3. Conscientiousness (orderly, responsible, dependable)
4. Emotional stability versus neuroticism (calm, not neurotic, not easily upset)
5. Culture (intellectual, polished, independent-minded)

The five-factor model has been used in many different contexts, including those relating to career issues. Barrick and Mount (1991) found correlations between personality and job performance in a number of occupational categories including...
professionals, managers, salespeople, and skilled and semi-skilled laborers. They found that conscientiousness was a significant predictor of job performance for all occupational categories, while extraversion was a predictor of performance for managers and salespeople. The other dimensions did not appear to have a significant effect on performance in any category.

Mount et al. (1991) conducted a study that explored the correlation between the five dimensions and job performance in occupations where interaction with other people played a prominent role. They found that conscientiousness, agreeableness and emotional stability were significant overall predictors of job performance. Higher levels of each resulted in greater job performance. Occupations demanding high interaction with coworkers required higher levels of agreeableness and emotional stability than in occupations where interaction with customers was the primary focus. This indicates that not only does personality have an impact upon job performance, but the impact may be moderated by occupation. Another way to state this is that an individual’s personality can affect his or her job performance depending on the type of job.

It follows then, that individuals may be inclined to choose occupations that tend to be well-suited to their particular personalities. This idea of person-job match is known as “congruence,” and is the central theme of Holland’s theory of personality style and career development (1966, 1973, 1979, 1987). Holland’s theory has been supported by hundreds of studies and is the most popular and widely used vocational theory in existence (Spokane and Cruza-Guet, 2005). Its primary premise is that vocational choice is in large part an expression of personality.

Schaub and Tokar (2005) incorporated the FFM, SCCT, and Holland’s theory in hypothesizing that personality (as measured according to the Big Five model) would relate significantly to vocational interests (as measured by Holland’s scale) that in turn lead to career choice; results revealed that personality had a significant and positive direct effect on interests in three of the six personality–interest relations tested: Openness predicted Artistic interests, Agreeableness predicted Social interests, and Extraversion predicted Enterprising interests. It therefore appears reasonable to propose that personality may have an impact upon career choice.

EXPECTED CONTRIBUTIONS

Although the theory of planned behavior has been successfully used in a wide variety of settings to explain human behavior, it has not yet been used in conjunction with career. This study will test the central components of the TPB model: attitudes, subjective norm, behavioral control, and behavioral intention; and will do so in a new field. Another key issue to be explored is the role that interest in computers and perceived IT job availability may play as moderating factors for the primary TPB relationships. There is the possibility of a significant contribution to the growing amount of literature supporting TPB.

The study will also contribute to the further development of social cognitive theory and TPB by adding personality traits as a possibly important additional factor. Although SCT has been used in career choice studies (SCCT), it has yet to be used to look at IT career choices. The combination of both theories along with personality may contribute to a fuller understanding of IT career choice and career choice issues in general.

While SCT and SCCT emphasize personality characteristics as an influential trait in career choices (by means of “personal factors”), they additionally emphasize the role of the environment. Although theoretically related (SCT claims a reciprocal relationship between environment and personal factors), environment and personality are not overlapping ideas, suggesting a model combining the two may create stronger predictive and explanatory possibilities.

It is also important to realize that SCT’s “personal factors” differ from the FFM’s definition of personality by emphasizing the importance of self-efficacy. Holland’s proposal that different personality types are more adept and/or interested in certain careers suggests that they are more likely to have higher degrees of self-efficacy regarding tasks that are considered a part of particular careers. This conceptualization views personality as preceding personal factors such as self-efficacy in a causal chain. In other words, personality would appear to influence self-efficacy. SCCT, which specifically adapts SCT to career issues, views self-efficacy as being influenced by four main factors: 1) personal performance accomplishments, 2) vicarious learning, 3) social persuasion, and 4) physiological and affective states (Lent, 2005). The inclusion of personality factors is noticeably absent, even though it appears theoretically feasible, if not probable, to expect self-efficacy and personality traits to be interrelated. This relationship between two key ideas of each theory suggests that a combined model may produce a fuller understanding of how they are related and how and why each contributes to career choice.

Correlating differing levels of each of the personality types to the other model relationships may also yield interesting insights into the relationship between personality and other factors such as self-efficacy and outcome expectations. Personalty and self-efficacy are both widely used theoretical concepts, yet the relationship between the two has not been well explored despite the appearance of a possible relationship. A significant correlation between the two would increase our understanding of how computer self-efficacy is attained in the first place. If personality itself is seen to influence the relationship between computer self-efficacy and self-evaluating outcomes expectations, which in turn influences decision to
pursue IT as a major, then the implication is that personality may play a role in IT career choice. More important than bolstering the proposition that personality may affect career choice, the analysis of study results may help to explain the intermediary mechanisms by which this takes place.

Data analysis may also shed some light on the importance or insignificance of self-efficacy’s influence upon behavioral control and interest in computers. Additionally, the links between outcome expectations and attitudes will be explored, as well as any moderating effect that interest in computers and perceived IT job availability may have on the model. Discovering the relationships between these sets of factors will increase our understanding of the causal path leading up to career choice.

Finally, as the job market demand for IT professionals inevitably continues to rise and fall in future years, information on factors contributing to student career choices will be valuable as a resource for understanding why students choose IT as a career and what steps can be taken to encourage increased IT interest and enrollments when the need arises. Data collected in this survey may also aid in addressing additional issues such as the ways in which IT choices are influenced vs. other business majors, and whether a continued turnaround in the IT job market will increase interest in IT careers.

CONCLUSION

This study will explore the impacts of computer self-efficacy, outcome expectations, personality, interest in computers, attitudes, subjective norm, behavioral control, social support, and perceived IT job availability on college students’ decisions to pursue information technology careers. The study model is based on social cognitive theory and the theory of planned behavior, and will examine the moderating effects of other environmental and personal variables in order to provide an understanding of the factors that affect students’ choices. SCT and TPB will be extended by the study. Finally, once the causes and mechanisms of IT choice are better known, it will be possible to address current enrollment issues.

REFERENCES


