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CHOOSING IT AS A CAREER: EXPLORING THE ROLE OF SELF-EFFICACY AND PERCEIVED IMPORTANCE OF IT SKILLS

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CHOOSING IT AS A CAREER: EXPLORING THE ROLE OF SELF-EFFICACY AND PERCEIVED IMPORTANCE OF IT SKILLS

Research-in-Progress

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Abstract

Understanding the factors which shape students' IT career choices will allow educators to design recruitment and retention strategies to tackle the enrolment challenges. The objective of this research-in-progress is to explore the effects of two such factors, i.e., IT skills Self-efficacy (SE) and IT Skills Importance, on students' attraction to IT careers. A survey methodology was used to achieve the aforementioned objective. Undergraduate students enrolled in IT courses at two large U.S. public universities were surveyed. This study makes a contribution to the field of IT education in multiple ways. First it develops scales for two beliefs which are crucial in capturing students' attraction to IT careers. Second, it provides insights into students' perceptions regarding the importance of various IT skills. Third, it posits a preliminary model which helps in our understanding of how students' personal perceptions regarding the importance of IT skills affect SE beliefs and career intentions.

Keywords: Career choice, IT Curriculum, IT workforce, IT skills, Self-efficacy, Undergraduates, Perceived Importance of IT Skills

Introduction

The U.S. Bureau of Labor Statistics employment projections for 2006–2016 indicate that the future prospects for most IT jobs are steady, relative to other occupations. However, since the late 1990s, enrollments in IT academic programs have continued to decline sharply (Granger et al., 2007; Rogers, 2008) while the demand for IT professionals grow (Panko, 2008). To address the enrollment challenges faced by the IT programs, IT educators need to understand the factors that facilitate and impede the attraction, recruitment and retention of students. Understanding the antecedents which shape students' IT related career choices will allow educators to design recruitment and retention strategies to tackle the enrollment challenges. To this end, the objective of this work-in-progress paper is to present the results of our exploration of the effects of two critical IT related beliefs, IT Self-efficacy and IT Skills Importance, on students' attraction to IT related careers. This project is part of a larger, multi-year, National Science Foundation funded project (NSF #0733747) to explore the intersectionality of gender, race/ethnicity and socio-economic class as factors explaining the under representation of certain groups in the IT field (Kvasny et al, 2009). This understanding will help not only the particular underrepresented groups but will also enhance our overall understanding of attitudes about the IT field that might be influencing recruitment and retention. In this study, a sample of university students representing these demographics are being surveyed regarding the influence of race/ethnicity and socio-economic class on gender stereotypes about the IT field, and subsequent interest in an IT career. Phase I of this project involved an analysis of three categories of IT job skills (technical, human and business) across three genres of texts: scholarly articles, practitioner literature, and online job ads (Huang et al, 2009). The results revealed that online advertisements provided the most balance by emphasizing all three categories of skills. Phase II involved an analysis of survey responses by university students regarding gender stereotyping of these IT skills (Trauth et al., 2010). The results revealed that while masculine stereotypes are still applied to the most technical skills and feminine stereotypes to the most interpersonal skills, a new category of more gender-neutral skills (including initiative, ability to work under pressure, critical thinking and problem solving) has emerged in the minds of today's college students. Phase III is reported in this paper. Phase III primarily focuses on developing and validating IT related self-efficacy and IT skill expectations scales in a comprehensive manner. A secondary focus is on exploring the differential effects of various types of IT self-efficacy and expectations about IT skills on career intentions.

Theoretical Background

Beliefs about a behavior determine individuals' intention to engage in (or disengage from) that behavior (Ajzen & Fishbein, 1980). In this study, the effects of two beliefs, ***IT Self-efficacy*** and ***IT Skills Importance,*** on IT career intentions are explored. IT self-efficacy refers to one's beliefs about his/her ability to learn IT skills necessary to conduct IT work; whereas, IT skills importance refers to one's beliefs about the value of IT skills necessary to be successful in the IT profession.

Beliefs about IT Self-efficacy

IT self-efficacy is defined, in this study, as the individual's belief that he or she can be proficient in skills necessary to becoming an IT professional. High self-efficacy for a domain such as IT would be postulated to lead to choice (versus avoidance) of IT coursework and college majors, to facilitate performance on IT related tasks, and to lead to persistence in the face of obstacles or discouragement. Thus, as a person perceives few barriers and believes in her or his ability to undertake an endeavor, she or he will persist in IT coursework and have a higher likelihood of being successful in an IT career (Camp 1997; Stockard et al 2005). This likelihood of success reinforces the career intention. However if the barriers are viewed as significant and self-efficacy is low, there is a weaker career intention. Low self-efficacy expectations regarding a behavior (IT skills) or behavioral domain (IT careers) are postulated to lead to avoidance of those behaviors, poorer performance of those behaviors, and a tendency to "give up" when faced with discouragement or failure (Betz, 2007). Self-efficacy has been established as a crucial predictor of career intentions. Career theories, such as Social Cognitive Career Theory (SCCT) (see Lent, Brown, and Hackett, 1994) and Theory of Planned Behavior (TPB) (see Arnold et al. 2006) which have been extensively used to understand career choices with a variety of populations and decision contexts, reveal that self-efficacy is one of the major determinant of choosing a career. Akbulut and Looney (2007) have used SCCT to examine students' interest in pursuing a computing major. Looney and Akbulut (2007) applied SCCT to examine the role of effective teachers in student career choices (2007). Smith (2002) also used a version of SCCT to predict academic performance in an

introductory IS course. Zhang (2007) used TRA to examine students' attitudes and subjective norms that shape IT career choice. These studies found that students' confidence in their ability to successfully pursue the IT major effects their interest and attitude towards IT careers. However, all of these studies on IT career choice which examine the role of self-efficacy do not capture students' confidence at IT skill level. For instance, Looney and Akbulut (2007) measure IT related self-efficacy using a six items scale which captures the students IT related confidence at a generic level by asking the students to rate items such as, I can perform well as an IS major and I can successfully utilize the tools and techniques needed in an IS major. Zhang (2007) captured students' self-efficacy by asking the student to rate their perceptions regarding IT curriculum difficulty by asking questions such as, To me IS courses are intensive, challenging, demanding. In this study we measure students' IT related self-efficacy at a much more nuance level by developing IT self-efficacy scale using a very comprehensive list of IT skills.

Beliefs about IT Skills Importance

Universities periodically update their curriculum based on the recommendations made by the IT practitioners, recruiters, and educators. This process of consulting with the stakeholders to solicit feedback regarding the importance of skills and the quality of training that the university provides ensures that education meets the needs of industry. In the IT field, for instance, several studies have examined trends in required job skills (Gallivan, Truex and Kvasny, 2004; Segars & Hendrickson, 2000; Wynekoop & Walz, 2000; Todd, McKeen & Gallupe 1995; Trauth, Farwell, & Lee 1993; Leitheiser 1992). These studies typically assess the beliefs of a particular respondent group (usually IT practitioners, consultants, users and educators) with regard to anticipated trends in the IT job market. These studies consistently report that employers are seeking an ever-increasing number and variety of skill sets from prospective employees. Trauth et al. (1993) stated the diversity inherent in IS career development as follow: "IS profession is being pulled in opposite directions. One is toward more human and business orientation. The other is toward the technical skills required to maintain a firm's technology infrastructure. The result is a knowledge explosion" (p. 300). Contemporary firms are seeking well-rounded individuals with both technical and non-technical skills.

While various stakeholder groups simply expect contemporary IT professionals to know more and be able to do more than in the recent past, scholars report differences in the way that respondent groups value the importance of IT job skills. Green (1989), for instance, found that systems analysts primarily valued their non-technical roles and skills, while users ascribed greater importance to the analysts' technical skills. Similarly, in a study of webmasters and users, Wade and Parent (2002) found that users focused on the importance of technical skills, while webmasters emphasized organizational skills as far more important to their successful job performance. Lee, Trauth and Farwell (1995) noted shifts in the composition of the IT workforce and accompanying changes in the relative importance of IT skills. Many of the low-skilled IT job positions (such as data entry operators and computer operators) were disappearing. Also, IT jobs were migrating from traditional, centralized MIS divisions out to the business units, requiring employees to have more business knowledge and stronger interpersonal / management skills for working with users. In addition to studies that examine the perceptions of stakeholder groups, scholars investigate shifts in IT skill demand and job types through content analysis of job advertisements (Gallivan, Truex & Kvasny, 2004; Todd et al., 1995; Arnett & Litecky, 1994). These studies also observe the desire to hire well-rounded employees with business knowledge, interpersonal skills and technical skills. In a study of employment prospects for recent college graduates, Wong, von Hellens and Orr (2000) used both IT job ads and surveys and interviews with stakeholders to conclude that non-technical skills were increasingly more important than technical skills. This is also evident in other related work, for instance, the high failure rate of IT projects is not attributed to the technological complexities of projects or the technical incompetency of the project teams, but to the lack of non-technical skills within the IT project management and teams (Keil et al., 1998). McGee (1996) suggested that the lack of non-technical skills will result in a failure of an IT professional promoted to a manager position.

These studies on the changing nature of job skills are useful, but fail to provide insights into the perceptions of college students. In this study we argue that students perceptions (or mis-perceptions) about the importance of IT technical and non-technical skills have a bearing on their career choices (Walstrom et al. 2008). Students gain their awareness of the importance of IT job skills from referent others including the academics who teach them, peers who socialize with them, and parents who guide them. They also gain awareness by reading newspapers and trade publications that report on the promising employment prospects for IT graduates. The extant literature has not adequately captured students' perceptions about the IT skills importance. This construct is some ways similar to SCCT's outcome expectations, TPB's work-value beliefs, and Technology Acceptance Model's perceived usefulness. However, its relationships with self-efficacy and career intentions are not yet clarified in the literature. In this work we explore the effects of this construct on IT self-efficacy and career intentions. Limited research that

has been conducted show mixed results. For instance, Medlin (2001) surveyed undergraduate IT students in upper level IT courses to determine the students' perceptions of required skills to be successful in IT professions. Their findings supported that students recognize that in addition to the technical excellence, professional skills play a key role in their success. Similarly, Woodward et al. (2008) administered a survey to university students participating in the National Science Foundation sponsored Collegiate Cyber Defense Competition. Participants were asked to rank skill sets in terms of importance to competition success. Participants identified non-technical skills as more critical to success in the competition than technical skills. Whereas, Martz and Cata (2008) who survey both IT professionals and students, found that when compared to IS professionals, students generally undervalue the non-technical skills and overvalue the technical skills.

The purpose of this study is to determine how students' personal perceptions regarding the importance of IT job skills affect self-efficacy beliefs and career intentions. According to Bandura (1986) self-efficacy beliefs are correlated with motivation constructs, academic choices and achievement, and other self-beliefs. In the present study, the importance of IT skills is operationalized as a self-belief that helps to explain students' self-efficacy concept and career intentions. "The perceived importance of a task is in large part the result of outcomes expectations an individual has for a particular task and is related to self-efficacy judgments in much the same way as are outcome expectations" (Parajes, 1996 p. 560). Thus, perceived importance of IT skills and intentions to pursue an IT career should be correlated since people generally value those things they feel capable of accomplishing (Bandura, 1986). In studies of math self-efficacy among high school students, for instance, Feather (1988) and Meece, Wigfield, and Eccles (1990) found that perceived ability and importance are not only correlated; perceived ability also had a significant direct effect on the choice to pursue math-related college majors. Therefore, in this work we explore the question - *What roles do IT self-efficacy and perceived importance of IT skills play in determining the selection of IT related careers?*

Research Methods

Data Collection

A survey methodology was used to examine the posited research question. Undergraduate students enrolled in IT courses at two large U.S. public universities were surveyed to explore the effects of IT self-efficacy and IT skills importance on choosing an IT related major. Students participated in this study on a volunteer basis with the opportunity to earn bonus points. The demographic information about the participants is listed in Table 1. A total of 1,030 students completed an on-line survey. The sample is comprised of 75% male, 24% female and a small percentage of transgender. 46% of the students in the sample report to have selected an IT-related major, 42% report to have chosen a non-IT related major, and the remaining 12% indicated that they have not yet chosen an academic major. In this study we were interested in exploring the effects of IT self-efficacy and perceived importance of IT skills on career choice for the general population. Therefore, in our model we controlled for gender, major, and university attended.

Table 1. Demographic Characteristics (N=1039)	
Gender	
Male	74.85 %
Female	24.44 %
Transgender	0.07 %
Student Majors	
Computer Science & Engineering	0.01 %
Information Science & Technology / Security and Risk Analysis	41.45 %
Management Information Systems	4.79 %
Undecided	12.12 %
Non IT Major	41.94 %

Operationalization of Constructs

The items from which the behavioral intentions were adopted came from the existing literature (Taylor and Todd 1995). However, the remaining items for the study's constructs were based on an extensive review of extant literature conducted by Huang et al. (2009) who reviewed IT job skills across three genres of texts: scholarly articles, practitioner literature, and online job ads. The content from these three sources were analyzed using a two stage, grounded theory approach in which the IT job skills emerged from the data. In the first stage, three coding schemes were developed based on the articles and job advertisements. The codes fell into three standard categories: human skills, business skills, and technical skills. In the second stage, the authors synthesized and summarized the data across the three data sources to develop a comprehensive set of 60 skill items. In this study we further consolidated these 60 items into 36 broader categories (e.g., C#, COBOL, Java, .NET were consolidated into one item, namely Programming Skills). These 36 items were used to develop the scales for IT Self-Efficacy and IT Skills Importance constructs. In the next section, we discuss the measurement properties for these two constructs to confirm the validity and reliability of the scales used to measure IT self-efficacy and perceived importance of IT skills.

Analysis and Results

Measurement Model

Measurement model was assessed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA procedures were conducted by using a 'rotation' algorithm for testing which items loaded onto, or related to which factors the strongest. This method of analysis uncovered the latent factor structure of a construct. The final decision regarding the factors and the items within each factor was decided based on both statistical and theoretical support. CFA procedures were useful for testing the factor structure that was revealed to be the strongest within the EFA context.

IT Skills Self-Efficacy: For the IT self-efficacy items, on the scale of 1 (not at all confident) to 5 (totally confident), respondents were asked to specify their level of self confidence about their ability to learn and engage with each of the 36 skills items. To avoid any bias due to sequencing, these 36 items were presented to each individual in a randomized fashion. First, an exploratory factor analysis was conducted on 36 IT skills to uncover the factor structure underlying the IT self-efficacy construct. Two factors emerged from this analysis. The factor loadings and the corresponding model fit statistics are listed in Table 2. An item was said to load on a given factor if the factor loading was greater than 0.44 for that factor, and was less than 0.30 for the others. Eight of the 36 skills were removed because they loaded marginally on multiple factors, which suggested that these eight items did not fit cleanly into any one of the two factors. The model fit statistics for the two-factor model structure were very strong, thus providing strong support for our two factor model. The Comparative Fit Index (CFI) is well above the cut-off of 0.90 and the Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) were well below the required cut-off of 0.06. It has been demonstrated that the chi-square test of model fit is sensitive to sample sizes greater than 200 (Browne, 2006). Thus, even though the chi-square for this model is significant, this is likely due to our sample being much larger than 200. The EFA analysis confirms that 28 IT skills were adequately captured by the two constructs, each of which is distinct from one another. The review of the skills in each of the two factors revealed that one factor consisted of all the skills that were predominately viewed as technical skills (e.g., programming skills, integrating enterprise applications, systems implementation). We refer to this factor as IT Technical Skills Self-efficacy (IT-Tech SE). The second factor predominately consisted of non-technical skills (such as customer relationship skills, leadership skills) and therefore, referred to as IT Non Technical Skills Self-efficacy (IT-Non Tech SE). We confirmed our measurement model by conducting a confirmatory factor analysis. A measurement model describes the relationship between the factors uncovered in the EFA analysis and their respective indicator variables, i.e., IT skill items. The measurement model is said to provide a good fit to the data if each of the IT skills items were doing a good job of measuring the two factors. CFA analysis allowed us to test the fit of our measurement model. The CFA results are listed in Table 3. Comparative Fit Index (CFI) for IT Self-Efficacy model was well above the cut-off of 0.90 and the Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) were below or at the required cut-off of 0.06. The loading, as listed in Table 4, ranged from 0.49 0.76, which explains variance ranging from 24% to 58%. The CFA analysis provided strong support for our measurement model, which suggests that the IT skill items under each

of the two factors were adequately measuring the two Self-efficacy constructs. Furthermore, as also listed within Table 4, the reliabilities for these two self-efficacy constructs as measured by Cronbach's Alpha was well above the acceptable cut-off of 0.70.

IT Skills Importance: For this construct, on the scale of 1 (not at all important) to 5 (very important), respondents were asked to specify, for each of the 36 skills, their opinion about how important is it that someone working in an Information Technology career would need these skills to be successful. To avoid any bias due to sequencing, these 36 items were presented to each individual in a randomized fashion. An EFA and CFA analysis, similar to the IT Self-efficacy construct, was conducted to first uncover the factor structure underlying the IT Skills Importance construct, and then to validate the fit of the resulting measurement structure. Three factors emerged from this analysis. The factor loadings and the corresponding model fit statistics are listed in Table 5. Twelve of the 36 skills were removed because they loaded marginally on multiple factors. The model fit statistics for the three-factor model structure were very strong, thus providing strong support for our three-factor model. The Comparative Fit Index (CFI) is well above the cut-off of 0.90 and the Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) were well below the required cut-off of 0.06. The EFA analysis confirmed that 24 IT skills were adequately capturing three constructs, each of which is distinct from one another. The review of the skills in each of the three distinct factors revealed that one factor consisted of all the skills that are predominately viewed as technical skills (e.g., programming skills, integrating enterprise applications, systems implementation). We refer to this factor as IT Technical Skills Importance (IT-Tech Importance). The second factor predominately consisted of business and organizational skills (e.g., customer relationship skills, workplace relationship skills) and therefore, referred to as IT Business and Organization Skills Importance (IT Business Importance). The third factor predominately consists of general human skills (e.g., adaptability, critical thinking) and therefore, referred to as IT Human Skills Importance (IT Human Importance). We confirmed our measurement model by conducting a confirmatory factor analysis (CFA). The CFA results are list in Table 3. The CFI for IT Skills Importance model was above the cut-off of 0.90 and the Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) were below the required cut-off of 0.06. The loading, as listed under Table 4, ranged from 0.43 to 0.63, which explains variance ranging from 18% to 40%. The CFA analysis provided strong support for our measurement model, which suggested that the IT skill items under each of the three factors were adequately measuring the three IT Skills Importance constructs. Furthermore, as also listed under Table 4, the reliabilities for these three IT Importance constructs as measured by Cronbach's Alpha were above the acceptable cut-off of 0.70.

Table 2. EFA results for two factor solution of IT Self-Efficacy, χ^2 (664) = 1681.981, p = 0.000, CFI = 0.92, RMSEA = 0.039 (C.I.: 0.037-0.041), SRMR = 0.035.

Survey Items	Non-Tech Self-Efficacy	Technical Self-Efficacy
Communication skills (e.g., verbal, written, presentation skills)	**0.681**	-0.071
Ability to work in teams	**0.597**	-0.022
Negotiation skills	**0.483**	0.132
Leadership skills	**0.658**	-0.004
Customer relationship skills	**0.665**	-0.085
Workplace relationship skills	**0.678**	-0.084
Initiative	**0.573**	0.044
Dependability	**0.626**	-0.108
Adaptability	**0.594**	0.094
Ability to work under pressure	**0.579**	0.072
Openness to new experiences	**0.581**	0.001
Creativity	**0.437**	0.106
Critical thinking	**0.585**	0.171
Ability to engage in independent learning	**0.493**	0.138
Problem solving skills	**0.529**	0.228
Sensitivity to organizational culture and politics	**0.478**	0.121
Ethics	**0.56**	-0.084
Professionalism	**0.707**	-0.105
Domain knowledge (e.g. health care industry; telecommunications industry)	0.182	**0.563**
Integrating enterprise applications	0.004	**0.735**
Process analysis (e.g., gathering systems requirements; systems analysis)	0.123	**0.666**
Design skills (e.g. systems design; ER modeling; dimensional modeling; dat)	0.023	**0.665**
System implementation skills	0.113	**0.677**
system auditing and information assurance	-0.001	**0.709**
Programming skills (e.g., C#, XML, VB, Java)	-0.137	**0.728**
Business analytics skills (e.g., data mining, online analytics processing sys	0.149	**0.604**
Database management skills (e.g., manage SQL server, ORACLE DB)	-0.094	**0.75**
Networking skills (e.g., LAN/WAN; setting up networks; wireless networks)	0.044	**0.649**
Web development skills	-0.025	**0.689**
IT security	-0.078	**0.763**
IT architecture/infrastructure	-0.04	**0.775**
Ability to handle ambiguity	0.412	0.258
Ability to train end users and peers	0.381	0.317
Analytical ability	0.384	0.344
Business knowledge (knowledge about business functions)	0.424	0.268
Global and cultural awareness	0.387	0.174
Ability to lean and employ new technologies	0.421	0.261
Ability to understand technological trends	0.222	0.49
Project management skills	0.39	0.282

Table 5. EFA Results for three factor solution of IT Skill Importance*

Model Fit: $\chi 2$ (627) = 1258.013, p = 0.0, CFI = 0.94, RMSEA = 0.031 (C.I.: 0.029-0.034), SRMR = 0.029.

Survey Items	Business	Human	Technical
Negotiation skills	**0.565**	0.08	0.039
Leadership skills	**0.511**	0.176	-0.041
Customer relationship skills	**0.554**	0.142	-0.032
Workplace relationship skills	**0.481**	0.24	-0.022
Sensitivity to organizational culture and politics	**0.577**	0.017	0.192
Global and cultural awareness	**0.563**	-0.059	0.218
Initiative	0.212	**0.448**	0.108
Dependability	-0.015	**0.575**	-0.009
Adaptability	0.043	**0.551**	-0.012
Ability to work under pressure	0.139	**0.501**	-0.003
Critical thinking	0.007	**0.594**	-0.016
Ability to engage in independent learning	0.098	**0.417**	0.156
Analytical ability	0.046	**0.462**	0.213
Problem solving skills	0.017	**0.569**	0.034
Ability to lean and employ new technologies	-0.081	**0.535**	0.171
Integrating enterprise applications	0.082	0.126	**0.541**
Process analysis (e.g., gathering systems requirements; systems analysis)	0.026	0.276	**0.459**
Design skills (e.g. systems design; ER modeling; dimensional modeling; data modeling)	0.068	-0.028	**0.566**
System implementation skills	-0.033	0.185	**0.532**
system auditing and information assurance	0.059	0.174	**0.507**
Programming skills (e.g., C#, XML, VB, Java)	-0.096	-0.069	**0.669**
Business analytics skills (e.g., data mining, online analytics processing systems)	0.162	0.012	**0.559**
Database management skills	-0.113	0.025	**0.685**
Networking skills	-0.161	0.172	**0.525**
Web development skills	0.056	-0.151	**0.684**
IT security	-0.104	0.23	**0.519**
IT architecture/infrastructure	-0.108	0.249	**0.501**
Communication skills (e.g., verbal, written, presentation skills)	0.41	0.352	-0.111
Ability to work in teams	0.372	0.4	-0.113
Ability to handle ambiguity	0.324	0.24	0.104
Openness to new experiences	0.378	0.245	0.026
Creativity	0.388	0.124	0.196
Ability to train end users and peers	0.181	0.241	0.321
Business knowledge (knowledge about business functions)	0.41	-0.022	0.369
Domain knowledge (e.g. health care industry; telecom industry)	0.272	-0.029	0.472
Ethics	0.286	0.23	0.127
Professionalism	0.309	0.368	0.045
Project management skills	0.321	0.183	0.23
Ability to understand technological trends	-0.034	0.368	0.33

Table 3. CFA Results

	IT Skills Self-Efficacy	IT Skills Importance
$\chi 2$ (*df*)	10645.976 (*496*)	955.738 (*296*)
CFI	0.912	0.911
RMSEA	0.044	0.046
Upper Bound	0.047	0.05
Lower Bound	0.041	0.043
SRMR	0.063	0.048

Table 4. Factor-Specific Loadings and Reliabilities (* = Significant at p < 0.0001)

	# of Items	Cronbach's Alpha	Loading Range
IT Skills Self-Efficacy			
IT Non Technical Self-Efficacy	18	0.91	.49-.66*
IT Technical Self-Efficacy	13	0.92	.62-.76*
IT Skills Importance			
Business Skill Importance	6	0.77	.43-.63*
Human Skills Importance	9	0.81	.52-.61*
Technical Skills Importance	12	0.87	.50-.61*

Behavioral Intentions about Pursuing an IT Career: This construct was measured by asking students the likelihood of their majoring in MIS. On the scale of 1 to 5 respondents specified the likelihood of the following two items: "*Assuming I satisfy the requirements, I intend to take an IT related major*," and "*I intend to pursue my career in the field of Information Technology.*" The reliability for these two items as measured by Cronbach's Alpha was .94 which is above the acceptable cut-off of 0.70.

Table 6. Descriptive Statistics		
Variables	**Mean (n=1039)**	**SD**
Behavioral Intentions	3.29	1.42
IT Non-Tech Self-Efficacy	4.00	0.61
IT Tech Self-Efficacy	3.15	0.82
Business Importance	3.59	0.70
Human Importance	4.15	0.55
Tech Importance	3.90	0.62

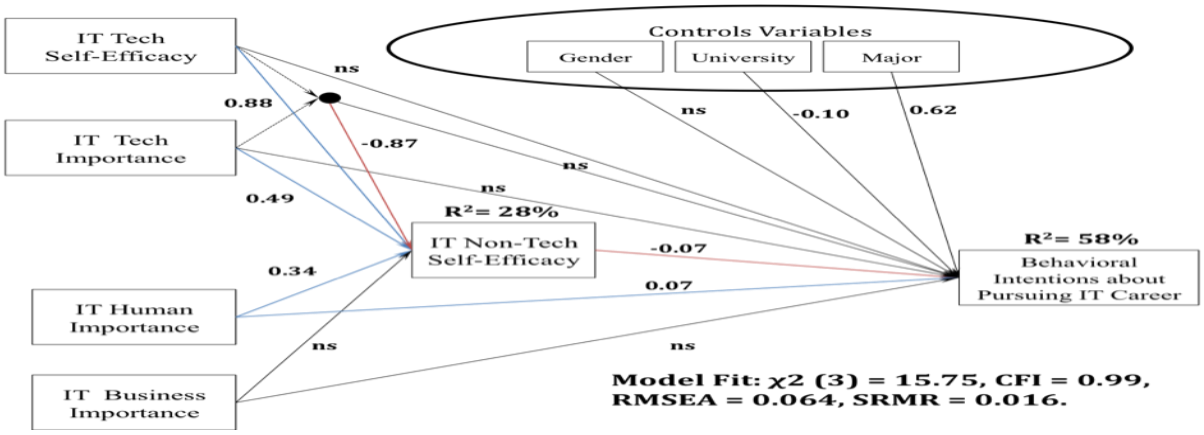

Figure 1. Preliminary Research Results

Structural Model

The descriptive statistics for all the constructs are listed in Table 6. As argued in the Theory section, we do not posit an *a priori* theoretical model because of the lack of theoretical underpinning regarding the intersectionality of IT Skills Self-efficacy and Perceived Importance of IT skills on students Intentions about pursuing an IT career. Therefore, the assessment and estimation of the structural model was based on comparing various permutations and combinations of the relationship among the Self-efficacy, IT Importance, and Intentions constructs. After testing various versions of the intersectonality among the Self-efficacy, IT Importance and Intention constructs, the model illustrated in Figure 1 was selected. This model represents a type of path analysis, or covariance structure model. All analyses were conducted using Mplus version 5.21 (Muthén & Muthén, 1998-2006). This type of modeling is achieved by simultaneously estimating multiple regression paths, and allows one to relax many of the assumptions associated with traditional regression techniques (i.e., homogeneity of variance, independance of exogenous predictors, etc.). Moreover, this type of modeling gives multiple fit statistics, which can assist in deciding between competing models. The selection was based on the variance explained (i.e., R-square) and other model fit statistics discussed below. The structural model posited in Figure 1 accounted for 28% variance in Non-Tech IT Self-efficacy and 58% variance in Intentions about pursuing an IT career. The fit statistics for the preliminary model was very strong. The CFI was well above the 0.90 cut-off and RMSEA and SRMR were below the 0.06 cut-off. We also ran this model without the interaction term, i.e., the moderation effects of IT Tech Importance on the relationship between IT Tech Self-efficacy and IT Non-Tech Self-efficacy. All the relationships remained unchanged except the relationship between IT Tech Self-efficacy and IT career Intentions was significant, which shows that IT Non-Tech Self-efficacy mediated the relationships between IT Tech Self-efficacy and IT Tech Importance and career intentions. The preliminary results showed that IT Non-Tech Self-efficacy negatively predicted an individual's intentions to pursue IT careers (β = -0.07, p = 0.015). IT Human Importance had a positive effect on intentions (β = 0.07, p = 0.020) and on IT Non-Tech Self-efficacy (β = 0.34, p < .001). IT Business and Organization Importance did not significantly predict IT Non-Tech Self-efficacy (β = 0.01, p = 0.860) or IT Career Intentions (β = 0.03, p = 0.268). The most interesting result revealed in this study was that although IT Tech Self-efficacy (β = 0.88, p < .001) and IT Tech Importance (β = 0.49, p = 0.001) had an independent, positive effect on IT Non-Tech Self-efficacy, their interaction had a strong negative effect on IT Non-Tech Self-efficacy (β = -0.87, p = 0.002). Neither IT Tech Self-efficacy (β = -0.11, p = 0.522) nor IT Tech Importance (β = -0.14, p = 0.142) had direct effects on IT career intentions.

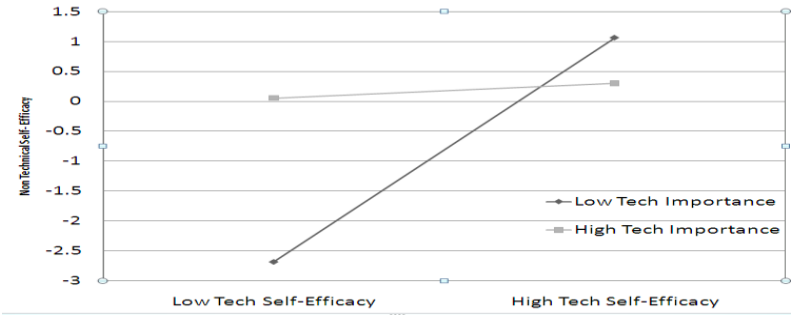

Figure 2. Interaction Effects of IT Importance and IT Tech Self-Efficacy on IT Non Tech Self-Efficacy

Discussion and Work In Progress

Overall, the results suggested that the IT Non Tech SE and importance placed on IT Human skills directly, and IT Tech SE and IT Tech Importance indirectly plays a role in choosing an IT career. Unfortunately, IT Business and Organization Importance do not significantly affect IT career intentions. The finding that college students who have high confidence in their Non Tech SE are less likely to choose IT as a career is troublesome. Given the importance of non-technical skills for success in many IT jobs and the relatively high SE score for Non Tech skills (mean = 4.0) in our sample, IT educators need to find ways of recruiting these individuals. The finding that Business and Organization skills do not have any significant effect on pursuing IT careers also help provide some insight into the negative association between Non Tech SE and intentions to pursue IT careers. It seems the students do not perceive that Business and Organizational skill such as leadership, customers and relationships skills are critical to succeed in IT careers. Perhaps individuals who believe they are good at Business and Organizational skills may be attracted to other majors (such as other marketing, communications, management) that often highlight the importance of these skills. These findings highlight an area of opportunity for developing interventions and strategies that can help to attract students who have good Non Tech skills. The findings that Non Tech SE fully mediates the effects of IT Tech SE and IT Tech Importance on career intentions are intriguing (see Figure 2). A deeper look at this result reveals that generally (with the exception of individuals who have very high Tech SE) college students who perceive IT Tech skills to be very important for IT profession are less likely to engage in IT careers. More specifically, on the one hand, the individuals who place high importance on IT Tech skills often are discouraged from pursuing IT careers because these individuals often have high Non Tech SE. On the other hand, the individuals who place low importance on IT Tech skills and have low Tech SE are attracted to IT careers (as a result of low Non Tech SE). In order to attract student who have high Non Tech SE, IT educators need to create realistic expectations about the importance of IT Tech skills requirements in the IT profession. Unrealistic expectations about IT Tech skill requirements not only creates IT enrollment challenges, but also creates barriers to meeting the industry needs for well-rounded individuals with both technical and non-technical skills. Courses that impart IT skills can provide additional supports such as teaching assistants and study groups to help build both the realistic expectations and confidence of students regarding Tech and Non Tech skills. This study was conducted at two universities. Although this kind of sampling occurrence is common in this type of research, it limits the generalizability of these findings. Although, we control for some of the demographic variables, other variables such as ethnicity, class, IT related experience, types of courses could also impact student's career choices. This research in progress, in its current form, makes a contribution to the field of IT education in multiple ways. First it develops comprehensive and robust scales for IT SE and IT Skills Importance which are crucial in shaping college students' attraction to IT careers. Second, it provides insights into college students' perceptions regarding the importance of various IT skills which is often not fully captured in the IT skills literature. Third, it posits a model which helps in our understanding of how students' personal perceptions regarding the importance of IT skills affect SE beliefs and career intentions. More specifically, this study highlights the critical role of IT Non Tech SE in attracting students into IT related majors. In this study we controlled for gender and major. We are currently in the process of collecting data from ten additional universities to increase the sample size which will allow us to examine the moderating effects of gender and major (e.g, MIS vs. IST majors) which could provide a more nuanced understanding of the effects of IT SE and Skills Importance beliefs on IT careers selection. Research will involve: 1) the analysis of gender stereotypes by gender, major and race/ethnicity within gender; and 2) analysis of career choices by gender, major and race/ethnicity within gender.

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References

Ajzen, I., and Fishbein, M. 1980. *Understanding Attitudes and Predicting Social Behavior*, Englewood Cliffs, NJ Prentice-Hall.

Akbulut, A. Y., and Looney, C. A. 2007. "Their Aspirations are Our Possibilities: Inspiring Students to Pursue Computing Degrees," *Communications of the ACM* (19), pp.781-805.

Arnett, K. and Litecky, C. 1994. "Career Path Development for the Most Wanted Skills in the MIS Job Market," *Journal of Systems Management* (45:2), pp. 6-10.

Arnold, J., Loann-Clarke, J., Coombs, C., Wilkinson, A., Park, J., and Preston, D. 2006. "How Well Can the Theory of Planned Behavior Account for Occupational Intentions?" *Journal of Vocational Behavior* (69), pp. 374-390.

Bandura, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NY: Prentice Hall.

Betz, N. 2007. Career Self-Efficacy: Exemplary Recent Research and Emerging Directions. *Journal of Career Assessment,* (15:4), pp. 403-422.

Brown, T. A. 2005. *Confirmatory Factor Analysis for Applied Researchers*, NewYork, NY: Guilford.

Camp, T. 1997. "The Incredible Shrinking Pipeline," *Communications of the ACM*, (40:10), pp. 103-110.

Feather, N.T. 1988. "Values, Valences, and Course Enrollment: Testing the Role of Personal Values Within an Expectancy-Valence Framework", *Journal of Educational Psychology* (80), pp. 381-391.

Gallivan, M., Truex, D. and Kvasny, L. 2004. "Changing Patterns in IT Skill Sets 1988-2003: A Content Analysis of Classified Advertising", *Database for Advances in Information Systems* (35:3), pp. 64-87.

Granger, M., Dick, G., Jacobson, C. and Slyke, C. 2007. "Information Systems Enrollments: Challenges and Strategies," *Journal of Information Systems Education* (18:3), pp. 303-311.

Green, G.I. 1989. "Perceived Importance of Systems Analysts' Job Skills, Roles and Non-salary Incentives," *MIS Quarterly* (13:2), pp. 115-133.

Huang, H., Kvasny, L., Joshi, K.D., Trauth, E.M. and Mahar, J. 2009. "Synthesizing IT Job Skills Identified in Academic Studies, Practitioner Publications and Job Ads," Proceedings of the ACM SIGMIS Computer Personnel Research Conference (Limerick, Ireland, May 28-30).

Keil, M., Cule, P.E., Lyytinen, K. and Schmidt, R.C. 1998. "A Framework for Identifying Software Project Risks," *Communications of the ACM* (41), pp. 76-83.

Kvasny, L., Trauth, E.M. and Morgan, A. 2009. "Power Relations in IT Education and Work: The Intersectionality of Gender, Race and Class, *Journal of Information, Communication and Ethics in Society* (7:2/3), pp. 96-118.

Lee, D., Trauth, E.M., and Farwell, D.W. 1995. "Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation," *MIS Quarterl*y (19:3), pp. 313-332.

Leitheiser, R.L. 1992. "MIS Skills for the 1990s: A Survey of MIS Managers' Perceptions," *Journal of Management Information Systems* (9:1), pp. 69-91.

Lent, R.W., Brown, S.D., and Hackett, G. 1994. "Toward a unifying social cognitive theory of career and academic interest, choice, and performance." *Journal of Vocational Behavior* (45), pp. 79-122.

Looney, C. and Akbulut, A.Y. 2007. "Combating the IS Enrollment Crisis: The Role Of Effective Teachers in Introductory Is Courses," *Communications of the Association for Information Systems* (19), pp. 781-805.

Martz, B. and Cata, T. 2008. "Students' Perception of IS Academic Programs, IS Careers, and Outsourcing," *Journal of Education for Business* (82:2), pp. 118-125.

McGee, M.K. 1996. "People Skills Can Pay Off," *Information Week* (561), p. 62.

Medlin, B.D., Dave D.S., and Vannoy, S.A. 2001. "Students' Views of the Importance of Technical and Non-technical Skills for Successful IT Professionals," *The Journal of Computer Information Systems* (42:1), pp. 65-69.

Meece, J.L., Wigfield, A., and Eccles, J.S. 1990. "Predictors of Math Anxiety and its Influence on Young Adolescents' Course Enrollment and Performance in Mathematics", *Journal of Educational Psychology* (82), pp. 60-70.

Muthén, L. K., and Muthén, B. O. (1998-2006). *Mplus user's guide.* Los Angeles: Muthén & Muthén.

Panko, R. 2008. "IT employment prospects: beyond the dotcom bubble," *European Journal of Information Systems* (17:3), pp. 182-197.

Parajes, F. 1996. "Self-Efficacy Beliefs in Academic Settings", Review of Educational Research (66:4), pp.543-578.

Rogers, C. 2005. "State short of tech workers Scarcity stunts efforts to diversify slumping economy," The Detroit News, retrieved on 8/30/2008: http://www.detnews.com/apps/pbcs.dll/article?AID=/20080818/BIZ04/808180350, August 18.

Segars, A.H. and Hendrickson, A.R 2000. "Value, Knowledge, and the Human Equation: Evolution of the Information Technology Function in Modern Organizations," *Journal of Labor Research* (21:3), pp. 431-445.

Smith S. M. 2002. "The Role of Social Cognitive Career Theory in Information Technology based Academic Performance," *Information Technology, Learning, and Performance Journal* (20:2), pp 1-15.

Stockard, R., Myungsook, K. and Akbari, A. 2005. "Computer Science Higher Education Pipeline," *Journal of Computing Sciences in Colleges* (20:3), pp. 102-113.

Taylor, S., and Todd, P. A. 1995. "Understanding Information Technology Usage: A Test of Competing Models," *Information Systems Research* (6:2), pp. 144-176.

Todd, P.A., McKeen, J.D., and Gallupe, R.B. 1995. "The Evolution of IS Job Skills: A Content Analysis of IS Job Ads," *MIS Quarterly*, (19:1), pp. 1-37.

Trauth, E.M., Farwell, D.W., and Lee, D. 1993. "The IS Expectation Gap: Industry Expectations versus Academic Preparation," *MIS Quarterly* (17:3), pp. 293-307.

Trauth, E.M., Joshi, K.D., Kvasny, L., Chong, J., Kulturel, S. and Mahar, J. 2010. "Millennials and Masculinity: A Shifting Tide of Gender Typing of ICT?" *Proceedings of the 16th Americas Conference on Information Systems* (Lima, Peru, August 12-15).

Wade, M. and Parent, M. 2002. "Relationships Between Job Skills And Performance: A Study Of Webmasters," *Journal of Management Information Systems* (18:3), pp.71-98.

Walstrom, K.A, Schambach, T.P., Jones, K.T, and Crampton, W.J. 2008. "Why Are Students Not Majoring in Information Systems?," *Journal of Information Systems Education* (19:1), pp. 313-319.

Wong, S., von Hellens, L. and Orr, J. 2000. "Nontechnical Skills and Personal Attributes: The Soft Skills Matter Most," 6th Australasian Women in Computing workshop, July 21-22, pp. 27-33, pp. 27-33, available online at http://www2.sqi.gu.edu.au/wic2000/docs/Wongetal.pdf.

Woodward, B.S., Ashby, S., Litteken, A., and Zamora, S. 2008. "Student Perceptions of Information Technology Preparedness and Important Job Skills," *Information Systems Education Journal* (6:38), pp. 1-10.

Wynekoop, J.L. and Walz, D.B., 2000. "Investigating Traits of Top Performing Software Developers," *Information Technology & People* (13:3), pp. 186-202.

Zhang, W. 2007. "Why IS: Understanding Undergraduate Students' Intentions to Choose an Information Systems Major," *Journal of Information Systems Education* (18:4), pp. 447-458.