What Determines Interest in an IS Career? An Application of the Theory of Reasoned Action

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Abstract:

This study posits an IS specific career choice model that provides good predictive power and elucidates the nuances of factors underlying attraction to an IS career. IS is a relatively new career option, which many students may be unaware of or may misconstrue; this suggests the need for discipline-specific understanding. In this study, we used the Theory of Reasoned Action, which is a well-developed and widely applied theoretical model, but it has only recently begun to be applied to understanding occupational intentions. We argue that the TRA is an especially useful model for developing an IS-specific model of career attraction because, unlike other theories of career choice, it specifies the effect of social environment and allows for a more nuanced understanding of the factors underlying attraction to IS. Undergraduate students in an introductory IS course at a large public university were surveyed to test the study's model, providing empirical validation of a career choice model comprising IS-career relevant beliefs and values. Overall, findings reveal that intentions significantly influence actual behavior—completion of an IS degree. IS career attitudes and social beliefs, in turn, collectively form intentions about pursuing IS careers. More specifically, attitudinal beliefs such as software/programming skill self-efficacy and technical, income, leadership, and job-variety-related work values have significant influence on favorable attitudes. The normative beliefs derived from one's referent others, i.e., family members, friends, teachers, and significant others, significantly impact IS attitudes and intentions. The research contribution and practical implications of this work are discussed.

Keywords: IS education, career choices, IS enrollments; theory of reasoned action; IS self-efficacy; IS image; IS work value congruency

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I. INTRODUCTION

Although there has been extensive research into the factors that influence college students' career choices, and particularly their interest in science and technical careers such as engineering, computer science, and math, there has been relatively little research directed toward understanding attraction to Information Systems (IS) careers. The decline in IS enrollments during the early years of this century sparked interest in IS career choice research (e.g., Looney and Akbulut, 2007; Akbulut and Looney, 2007; Firth et al., 2008; Granger et al., 2007; Koch and Kayworth, 2009; Koch et al., 2010). Because of the distinct differences between IS and related fields such as computer science, for pedagogical and counseling purposes, it is important to understand what factors lead to interest in IS careers (see Looney and Akbulut, 2007; Akbulut and Looney, 2007; Firth et al., 2008; Scott et al., 2009). Moreover, compared to other careers, Information Systems is unusual in that students hold many misperceptions about IS and lack awareness as to what an IS career entails [ITAA, 1998; Enns et al., 2006; Firth et al., 2008].

Historically, vocational psychologists and other researchers have utilized a range of theories such as expectancy theory (e.g., Brooks and Betz, 1990), personality theories (see Fouad, 1997), and social learning theory [Krumboltz et al., 1976, 1990] to understand and predict career choices. In the mid-1990s, Lent and his colleagues attempted to unify much of the existing theoretical work on career choice with Social-Cognitive Career Theory [SCCT—Lent, Brown, and Hackett, 1994]. SCCT has been used extensively to understand career choices with a variety of populations and decision contexts (see Lent, Brown, and Hackett, 2000). A few IS studies have applied this theory to examine IS career choices. For instance, 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.

But there are important factors that may influence interest in an IS career that are not fully captured by outcome-expectancy models such as SCCT. In particular, a student's social environment may also have important implications for the student's attitudes toward an IS career. Also, because many college students lack awareness of the nature of IS careers [Enns et al., 2006; Firth et al., 2008], it is crucial to understand whether misperceptions about the nature of IS careers may negatively impact attitudes. Thus, unlike most previous work on career decision making, this study uses the Theory of Reasoned Action [TRA] as a model in order to provide a more comprehensive perspective on the factors underlying student interest in IS careers. We propose, test, and refine a TRA model of attraction to IS careers that incorporates the actual behavior of interest, i.e., completion of an undergraduate IS degree. Thus the objective of this study is to posit an IS specific career choice model that provides greater predictive power and elucidates the factors underlying attraction to an IS career in a more nuanced manner.

II. CAREER CHOICE THEORIES AND THE IS CONTEXT

In this section, we provide an overview of the career choice theories typically used in the vocational psychology literature. This discussion provides a rationale for using the Theory of Reasoned Action as a theoretical underpinning for this study, highlighting its particular advantages for examining attraction to IS careers.

Social Cognitive Career Theory [SCCT—Lent et al., 1994] incorporates multiple career development models and theories. SCCT is most firmly based in social cognitive theory [Bandura, 1986], but includes perspectives from various other career choice models, such as social learning theory [Krumboltz at al., 1976, 1990] and the lifespan development model [Vondracek et al., 1986]. According to this theory, the selection of an academic major, referred to as choice actions, is influenced by choice goals. The choice goal variable is collectively shaped by interest, self-efficacy, and outcome expectations. The interest construct which promotes selection of career choices is characterized as patterns of likes, dislikes, and indifferences regarding career relevant activities and occupations. Interest in an academic choice is jointly developed through self-efficacy and outcome beliefs. Outcome beliefs refer to personal beliefs about the consequences of performing particular behaviors, i.e., the probable response outcome (also referred to as outcome expectations). Self-efficacy is defined as "beliefs in one's capabilities to mobilize the motivation, cognitive resources and courses of action needed to meet given situational demands" [Wood et al., 1989, p. 408].

Some recent studies on IS career choice and persistence have used SCCT as their theoretical base [Akbulut and Looney, 2007; Looney and Akbulut, 2007; Smith, 2002]. These studies provide a broad view of career choices, but

some nuances associated with career choices may be obscured. For example, Akbulut and Looney [2007] found that individual beliefs regarding capability to perform effectively as a computing major (self-efficacy) and beliefs about the likelihood that valued rewards will occur as a result of pursuing a computing major (outcome expectations) collectively triggered more interest in IS-related majors. These studies model the SE construct as beliefs that influence interest, which is characterized as patterns of likes, dislikes, and indifferences regarding career-relevant activities and occupations, and is similar to the attitude construct in TRA. However, these studies do not provide insights regarding the *nature* of the valued rewards expected from majoring in IS, nor do they delve into the *nature* of the computing abilities underlying interest in this major.

Although Lent et al. [1994] conceptualized outcome expectations as a complex and broad construct which implicitly encompasses a range of beliefs (including social norms, work values, and personal rewards), its appropriation is often left to the interpretations of the authors using this theory. Many studies use this construct at a molar level, as in Akbulut and Looney [2002], and, therefore, do not examine the differential impact of diverse beliefs (e.g., social beliefs may impact career choice differently than work value beliefs) on career choice. This approach may hold particular pitfalls for the study of attraction to IS careers; college students often are either not aware of IS careers and/or are misinformed about the nature of these careers [Enns et al., 2006; Firth et al., 2008]. Although college students may not have precise information about features of many careers, we believe that IS students may have especially inaccurate outcome expectations. If "outcome beliefs" are used as a monolithic construct (which is often the case with SCCT), we fail to capture the underlying nuances that impact the formation of those beliefs. Therefore, we need to deconstruct this variable by conceptualizing IS context-specific beliefs that are the foundation of IS career outcome expectations. To this end, we use the Theory of Reasoned Action (TRA), which provides a more granular perspective and thus a good platform for unpacking outcome beliefs and efficacy beliefs within the IS context. Moreover, using TRA, allows us to compare the predictive power of this theory with the more widely used social cognitive career theory.

Only recently have vocational psychologists begun to use TRA to explain career choices (see Arnold et al., 2006). Although a few studies have used TRA to examine such questions as interest in the health professions [Arnold et al., 2006] and women's career choices [Vincent et al., 1998], much remains to be done in developing specialized career choice models from more generalized versions. More specialized models could provide a more nuanced and discipline-specific understanding of career choices. In the past, Trower et al. [1994/1995] used TRA to examine business students' intention to major in IS, and Zhang [2007] used TRA to model undergraduate students' intention to major in IS. In contrast to Trower et al. [1994/1995] and Zhang's [2007] TRA-based models of student interest in IS, the current study not only offers a more nuanced assessment of underlying factors, but also incorporates additional factors not included in past research. For instance this study incorporates qualitatively different types of self-efficacy, rather than just the general aptitude measure (e.g. "I find myself quite good at IS courses") used by Zhang [2007]. Also, unlike Zhang [2007], we studied students' perceptions of the degree to which an IT career would enable them to achieve particular outcomes and also the degree to which they value achieving those outcomes. Trower et al. [1994/1995] assessed the MIS-related beliefs and the corresponding outcome expectations regarding possible career in consulting, high paying jobs, job opportunities, liking the professor, and learning IS skills. In contrast, in this study we evaluate congruency between the work value valence and its instrumentality by using Schein's career orientation inventory that captures work values individuals expect to be satisfied as a result of their participation in the work role. Neither of the earlier two studies captures the effects of the image of an IS professional on choosing an IS career. Furthermore, in addition to capturing student career intentions, we also include actual career choice in our model, which to our knowledge has not been done in prior IS career choice studies.

The Theory of Reasoned Action (TRA) proposed by Ajzen and Fishbein [1975, 1980] provides a general theoretical model of behavior focused on attitudes and social beliefs. TRA has been widely used to explain individual behavior in a variety of contexts (see Powell et al., 1996; Trafimow et al., 1996) and is also familiar to many IS researchers through its application to technology adoption (e.g., Karahanna et al., 1999; Loch et al., 1996; Venkatesh et al., 2000). But more recent work on TRA suggests that it may also help in understanding vocational and career choices [Arnold et al., 2006; Van Hooft et al., 2006].

The limited research on career choice using TRA has shown mixed results. Some studies found that all the core components of TRA explain significant variance in academic and career choices [Arnold et al., 2006; Norman and Bonnett 1995; Vincent, Peplau, and Hill, 1998]. However, Giles and Rea [1999] did not find support for the positive impact of subjective norm on intentions to pursue either people or action-centered careers. Millar and Shevlin [2003], who studied career exploration behavior, found that only attitude added to the prediction of intention once past behavior was taken into account.

This study makes a contribution to the IS and career choice literatures by developing a more nuanced IS-specific career choice model that has better predictive power than the SCCT. Moreover, it helps extend the SCCT theory by

deconstructing SCCT's outcome beliefs using TRA. Furthermore, by examining actual behaviors, and not just stated intentions, this study provides an additional explanatory dimension which is often absent in TRA studies.

III. THEORETICAL MODEL AND HYPOTHESES

The Theory of Reasoned Action (TRA) suggests that pursuing an IS career (a behavior) is best predicted by intentions. Intentions are collectively shaped by a person's attitude and perceived subjective norms concerning IS careers. Subjective norms are defined as a person's perceptions of significant others' evaluations of IS as a career choice; the inclusion of an individual's social environment is an important, novel contribution to understanding student attraction to IS. An individual's attitude toward an IS career is formed by behavioral beliefs about the consequences of pursuing an IS career and evaluation of those consequences. Therefore, in this model an individual's intentions to pursue an IS career are determined by two main components: personal interests (negative or positive attitude toward IS) and social influence (perceived social pressures regarding an IS career). Figure 1 illustrates the posited research model for this study.
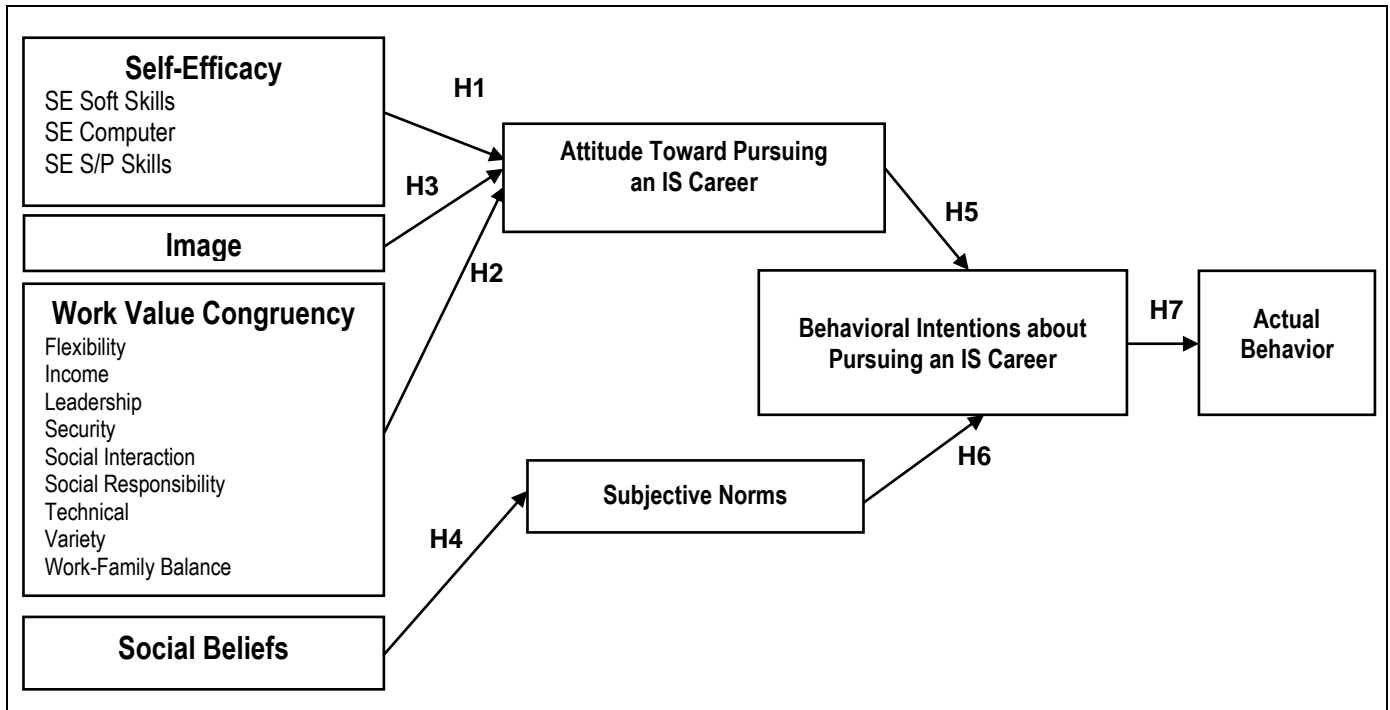

Figure 1. Proposed Research Model

Beliefs Regarding IS-Related Self-Efficacy

The self-efficacy beliefs build confidence in one's ability to organize and execute a given course of action to solve a problem or accomplish a task. Research in social psychology has shown that behavior and behavior change are mediated mainly by expectations that one can successfully perform a behavior, i.e. self-efficacy [Bandura, 1977]. Self-efficacy expectations determine whether or not a behavior will be initiated, how much effort will be expended, and how long effort will be sustained in the face of challenges and obstacles. *Self-efficacy,* here, refers to an individual's personal beliefs about his/her ability to successfully perform in a chosen career. Self-efficacy affects choice directly and indirectly via interest and outcome beliefs. Efficacy beliefs are a central mechanism of personal agency and integral to the career decision-making process [Lent et al., 1994].

IS 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 IS professional. Self-efficacy has been shown to shape attitudinal variables [Guskey, 1988; Busch, 1995]. We argue that individuals' attitude toward majoring in IS will be influenced, in part, by efficacy beliefs, i.e., a student with low self-efficacy could rationalize his or her avoidance to choose an IS-related career by evaluating it in an unfavorable light. In other words, an individual with a strong IS-related self-efficacy perceives few barriers and believes in her or his ability to undertake an endeavor; she or he will persist in IS coursework and have a higher likelihood of being successful in an IS career [Camp, 1997; Stockard et al., 2005]. This likelihood of success (or lack thereof) reinforces their attitude toward an IS major. So, we argue that a high self-efficacy corresponding to the skills required for a domain such as IS will lead to more positive attitudes toward IS majors. An individual's efficacy expectations are the major determinant of goal setting, activity choice, willingness to expend effort, and persistence (see Bandura, 1997). These beliefs have been found to be predictive of academic and career-related choice and

performance [Hackett and Lent, 1992; Multon, Brown, and Lent, 1991; Sadri and Robertson, 1993]. Previous research with IS students [Akbulut and Looney, 2007; Smith, 2002] has also shown the importance of general computer self-efficacy on interest toward IS. Lower IS self-efficacy has been viewed as one of the primary barriers to entry into IS-related careers [Akbulut and Looney, 2007; Dickhaeuser et al., 2002; Smith, 2002]. Therefore, higher self-efficacy in IS-related abilities should lead to more positive IS-related attitudes.

In this study, unlike previous research, we explicitly compare three types of self-efficacy that are important to IS but are conceptually distinct: (1) computer self-efficacy, (2) IS software/programming self-efficacy (technical), and (3) IS soft-skills self-efficacy (nontechnical). *Computer self-efficacy* is defined as the beliefs regarding one's capability to use a computer. *Software/programming self-efficacy* is defined as the beliefs regarding one's capability to use various software applications and programming languages. *IS soft skills self-efficacy* is defined as the beliefs regarding one's capability to analyze and solve business-related problems, communicate effectively, and conduct teamwork. It is well understood by IS researchers that both software/programming and soft skills such as communication and teamwork are necessary for individuals to succeed in IS [Bailey et al., 2001; Basselier et al., 2001., 2003; Gallivan, et al. 2004; Green, 1989; Information Technology Association of America (ITAA) 2000; Lee et al., 1995; Litecky et al., 2004; Luftman and Kempaiah, 2007, 2008; Todd et al., 1995; Vitello, 1997]. However, it is not clear that students understand the importance of soft skills to IS career success. We expect that most students, even after exposure to an IS course, will tend to associate IS careers primarily with computers and programming, and thus that their self-efficacy in these components will be predictive of their interest in an IS career, whereas soft skills self-efficacy will not.

> H1: IS software/programming skill self-efficacy and computer self-efficacy are positively associated with attitudes toward IS, whereas soft skills self-efficacy is not associated with attitudes toward IS.

Work Value Congruence

In this study, work value congruence is defined as a function of the congruence between an individual's work values and their instrumentality, i.e., a student's perceptions that a career in IS will enable him/her to satisfy those values. This component incorporates the motivational aspects of career decision making. Attraction to an occupation, or valued-related valence, is determined in large part by an individual's perception of the instrumentality of the occupation for attaining outcomes valued by that individual [Brooks et al., 1990; Wanous et al., 1983]. ,For example, an individual might be attracted to IS because she/he sees it as leading to a high income, which she/he values, but also dissuaded if she/he values social interaction and perceives that an IS career might lead to an isolated work life.

In IS, technology acceptance research has examined the role of values in explaining IT usage (e.g., Karahanna et al., 2006). However, even though work values have been identified as critical variables in occupational decision making (e.g., Brown, 2002; Crepeau et al., 1992; Fouad, 1995; Igbaria et al., 1993; Super and Sverko, 1995) to our knowledge, IS researchers have not taken a values-based approach to examining attraction to IS as a career. Work values are standards and preferences that guide an individual's career-related decision-making processes. Individuals' self evaluation of the degree to which certain careers favorably fulfill their values plays a major role in the formation of career-related goals [Brown, 2002].

This construct captures the *congruency* between the work value valence (also referred to as outcome valence or a person's preference for certain values) and its instrumentality (a person's perception of the likelihood that a given occupation will bring specific outcomes). *Work values* are the values that individuals expect to be satisfied as a result of their participation in the work role. Certain values directly access task-related outcome valences (e.g. technical orientation, ability to exhibit leadership skills) whereas others are lifestyle-related (e.g., work-family balance]. In this study, the work values posited in Schein's [1985] career orientation inventory (which includes task and lifestyle-related values) are used to access outcome valence. These values include the most common ones used in vocational psychology. The Schein [1985] model has also been used to study the satisfaction of IS professionals (e.g., Igbaria et al., 1993). An individual will attribute higher personal significance to an occupation which provides greater congruency among their value-related valences and its corresponding instrumentality.

> H2: Greater congruency between individual work values and perceptions of the extent to which IS careers will fulfill those values is positively associated with attitudes toward IS.

Image of IS Professionals

The stereotype of IT professionals, in general, as "geeky" or asocial has often been cited as a factor suppressing student interest in IT careers and may be an especially strong deterrent for women and minorities [AAUW, 2000; Beyer et al., 2004; Craig et al., 1998; ITAA, 1998; Jepson et al., 2002; Margolis et al., 2003; Margolis et al., 1998]. The image of computing culture as very boring programming-oriented work where people sit in front of the computer all day long also makes the profession unattractive to business students [Margolis et al., 2003, 1998; Panteli et al.,

1999]. Therefore, the image of the IT profession as a boring profession coupled with the image of an IT professional as a "techie guy who cannot make friends" is believed to be behind the negative attitude many students have toward IT careers [ITAA, 1998, 2000].

IS careers, despite having greater variety and more of a "people" component, are often perceived to be similar to other IT fields such as computer science and computer engineering. Business majors may have a very flawed idea about what IS careers are really like [Cale, Mawhinney, and Callaghan, 1991; Rettenmayer, Berry, and Ellis, 2007], and this misconception could contribute to shaping their less-positive attitude toward IS careers. Therefore, we posit that the inaccurate negative stereotypes associated with the IT careers may also underlie negative attitudes toward IS careers.

> *H3: A negative image of IS professionals is negatively associated with attitudes toward IS careers.*

Social Beliefs Regarding IS Careers

One of the most important contributions a TRA perspective can offer is its inclusion of an individual's social environment as a factor in career decision making. Individuals are influenced by the beliefs of people who are important to them. Social beliefs are beliefs that an individual attributes to relevant others (salient referents) about preferred behavior; they play a critical role in determining behaviors in a wide variety of domains, including technology adoption (e.g., Venkatesh et al., 2000).

Arnold et al. [2006], in a recent TRA-based study of attraction to health careers, found that beliefs about significant others' attitudes had strong impacts on attitudes, particularly for married or cohabiting respondents. Moreover, individuals often do not have well-informed outcome beliefs about IS careers (e.g., beliefs about IS-related abilities and the nature of job opportunities), and, therefore, their views about IS may be especially influenced by the people who are important to them.

> *H4: Referent others' [perceived] beliefs are positively associated with subjective norms regarding IS careers.*

Attitude, Subjective Norms, and Intentions

Attitude in this study refers to an individual's feelings about choosing an IS-related career. In general, a more positive attitude to IS will be associated with a greater intention to pursue IS; note, however, that this correlation is not expected to be perfect. There are, of course, many factors associated with educational and occupational choices, as well as competing fields of studies and occupations that students may also be attracted to (differential attraction is not addressed in this study).

> *H5: Attitudes toward IS are positively associated with intent to pursue IS as a career.*

Subjective norms reflect the perception of social pressure to perform or not perform a certain behavior. If referent others view the performing of a behavior as positive (choosing an IS career) and the individual is motivated to meet the expectations of relevant others (motivation to comply), that individual will have greater motivation for choosing an IS career. If relevant others have negative attitudes about choosing an IS career and the individual wants to meet their expectations, then the individual will have greater motivation for not selecting an IS career.

> *H6: Subjective norms are positively associated with intent to pursue IS as a career.*

According to TRA, the most important determinant of a person's behavior is behavioral intent. Therefore, individuals who indicate stronger intentions to select IS careers will be more likely to graduate with an IS degree.

> *H7: Intention of pursuing IS as a career is positively associated with actual behavior of graduating with an IS degree.*

IV. METHOD

Data Collection

Undergraduate students from an introductory IS course at a large public university were surveyed to test the study's model. For most students, this course was their first introduction to the IS field. Students participated on a volunteer basis with the opportunity to earn a lottery prize by random selection from all participating students. This is a required course for all students who intend to certify in any business major. Thus students enrolled in this course had not necessarily crystallized their decision about an academic major within business. Subjects completed a confidential online questionnaire at the end of the semester. The data was collected in early 2000, and the actual behavior (i.e., graduating major) was collected during the fifth year. Most of the participating students were freshmen and sophomores; therefore, a lag of five years was necessary to collect the actual behavior information.

The introductory IS course comprises both lectures (which provide an overview of the role of IS within business organizations and the nature and scope of IS careers) and lab sessions (where students are introduced to tools such as Spreadsheet and Database). The course content, hands-on experience with simple IT tools, and exposure to IS professionals as guest speakers all collectively provide students with a more accurate picture of IS careers.

Sample

Over a period of two consecutive semesters, a total of 508 students completed an online questionnaire. From university records we determined the actual degree earned by each student. From this sample, sixty-five students completed degrees in IS and the remaining 443 completed degrees in other majors (or did not graduate?). All the classes were taught by the same instructor (who was not one of the authors).

Measures

Most of the scales, except the image and IS soft-skills self-efficacy scales, were adapted from the existing literature. The survey was pilot-tested, and required modifications were made. All the scales used a 7-point Likert scale (see Appendix A). The beliefs scores for self-efficacy, image, and referent others were determined by combining belief items with the evaluative component using the expectancy-value approach suggest in TRA (see Davis et al., 1989; Fishbein et al., 1975; Taylor et al., 1995). Moreover, a bipolar scoring system was used to transform these responses to a scale of -3 to 3 [Ajzen and Fishbein, 1980, p. 71], which is essential for an expectancy-value approach [Sparks et al., 1991].

Self-Efficacy

Self-efficacy is a multiplicative function of a person's beliefs regarding their skills and their evaluation of the importance of those skills for IS careers. Therefore, individuals evaluated their own self-efficacy for the various skill sets and also indicated how important they felt each skill is for a successful career in IS. The computer and software/programming skill items were adapted from available computer and technology scales [Taylor et al., 1995]. New items were developed to assess self-efficacy specific to IS soft skills, namely students' confidence in their communication, managerial, and analytical abilities. The two software/programming skill self-efficacy items adapted for this study measure the skills associated with programming and software usage. The evaluations efficacy beliefs were transformed from a scale of 1 to 7 to a scale of -3 to 3 with a response of 4 scaled to zero. Therefore, the actual self-efficacy score ranges from -21 to +21, where a score of -21 implies low self-efficacy with a very high importance placed on its value to IS careers and a score of 21 implies high self-efficacy with a very high importance placed on its value.

Work Value Congruence

Congruence is assessed by the absolute difference between an individual's valued work outcomes and his perceptions of the degree to which those values are likely to be met by a career in IS (i.e., instrumentality). A high degree of congruence is indicated by a congruency value close to or equal to zero. Individual work values were assessed using a modified version of Schein's career orientation inventory [Schein, 1985], which has been extensively used to study the work values of IS professionals [Crepeau et al., 1992; Igbaria et al., 1993], but not with students. But many of its items and constructs overlap with those that have been used to study college student work values (see Konrad, 2004). The work values assessed include technological focus, leadership, high income, variety, security, flexibility, social responsibility, social interaction, and work-family balance. An individual's perceptions regarding the degree to which the work values are likely to be met with a career in IS were measured using these nine categories.

IS Professional Image

As discussed earlier, we argue that the students may be discouraged from pursuing IS careers because of a negative image of IT professions [AAUW, 2000; Beyer et al., 2004; Craig et al., 1998; ITAA, 1998; Jepson et al., 2002; Joshi and Schmidt, 2006, 2003; Margolis et al., 1998]. However, to our knowledge, no measures have been developed for this construct. Therefore, a scale was developed by asking students in a pilot study to describe a typical IS professional. Using the responses to this open-ended question, ten image items were developed. Only five of the ten items had adequate validity and reliability and thus were included in the main study. Similar to self-efficacy, this is also a multiplicative function of the person's beliefs about an IS professional and an evaluation of how important it is for the individual to avoid that image. The beliefs regarding stereotypic image were transformed from a scale of 1 to 7 to a scale of -3 to 3 with 4 transformed to zero, as with the other measures.

Social Beliefs

The social beliefs construct is also a multiplicative function of a person's beliefs about whether referent others' think they should choose an IS career and the person's motivation to comply with the referent's expectations. A four-item

scale, adapted from previous studies [Strader et al., 1990; Taylor et al., 1995], was developed to capture the belief and the corresponding motivation to comply. *Referent others* includes family, friends, teacher, and significant other. The evaluations of referent others' beliefs were transformed from a scale of 1 to 7 to a scale of -3 to 3 with response 4 transformed to zero. Therefore, the social norm score ranged from -21 to 21 (where a score of -21 implies strong motivation to comply with the referent others' negative beliefs regarding IS careers and a score of 21 implies strong motivation to comply with referent others' positive beliefs).

Attitude and Social Norms

The attitude construct captured students' personal interests, i.e., negative or positive attitude toward IS. A two-item scale was adopted from the Todd and Taylor [1995] study. Social norm was captured using two previously validated items [Todd and Taylor, 1995]—"Most people who are important to me think I should major in MIS" and "Most people who are important to me would approve if I decided to major in MIS." As discussed in the results section, this construct was dropped from the model based on the model fit modification statistics.

Behavioral Intentions about Pursuing an IS Career

The behavioral intentions construct was measured by asking students the likelihood of their majoring in IS.

Actual Behavior

The actual behavior variable was constructed by assigning a value of 7 (since a scale of 1 to 7 was used to capture intentions) to students who graduated with an IS degree, and a value of 1 was assigned to students who graduated with some other business degree (such as finance or accounting). This approach has been used in other studies (e.g., Thong and Yap, 1995).

Reliabilities

Scale reliability was assessed by calculating coefficient alpha. Reliability estimates are listed in Table 1. All the reliabilities scores are within the acceptable range of 0.6 or higher.

Table 1: Scale Reliabilities		
Scale	Number of Items	Alpha
Work Value—Technical	4	.80
Work Value—Leadership	4	.82
Work-Family—Balance	2	.75
Work Value—Security	2	.60
Work Value—Social Interaction	2	.71
Work Value—Social Responsibility	2	.68
Work Value—Variety	2	.75
Self Efficacy—Soft Skills	3	.71
Self Efficacy—Computer	3	.81
Self Efficacy—Software/programming Skills	2	.71
Social Beliefs	4	.95 [n=298]*
Image	5	.90
Attitude	2	.92

*Students had a choice of selecting a "not applicable" option, and thus not all response were included in the analysis.

Factor Structure

Responses to the work value items and items corresponding to the remaining items on the questionnaire were subjected to a principle component analysis. The principle axis method was used to extract the components, and this was followed by a varimax (orthogonal) rotation. A "critical value" of 70 percent or greater (i.e., cumulative percent of variance accounted for collectively by the factors) was used for determining the number of components to retain [Hatcher et al., 1994]. The size factors and their corresponding loadings, eigenvalues, and individuals and cumulative percentage variance are listed in Tables 2 and 3. In interpreting the rotated factor pattern, an item was said to load on a given component if the factor loading was 0.65 or greater.

Table 2: Factor Structure for Work Values								
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
	Technical	Leadership	Work-Family	Variety	Soc. Resp.	Soc. Inter.	Security	Flexibility
WVT1	**0.67**	0.37	0.2	0.08	-0.07	0.05	0.01	0.1
WVT2	**0.74**	0.08	-0.11	0.07	0.13	0.08	0.23	0.11
WVT3	**0.79**	0.07	0.05	0	0.2	-0.01	0.05	0.07
WVT4	**0.79**	0.02	0.04	0.22	0.12	0.05	0.04	0
WVL1	0.13	**0.86**	0.13	0.09	0.11	0.09	0.06	0.04
WVL2	0.11	**0.82**	0.02	0.13	0.21	0.06	0.14	0.17
WVWF1	0.03	0.04	**0.83**	0.1	0.13	0.2	0.09	0.02
WVWF2	0.04	0.12	**0.80**	0.11	0.15	0.19	0.11	0.07
WVV1	0.13	0.22	0.18	**0.82**	0.06	0.11	0.11	0.1
WVV2	0.14	0.06	0.05	**0.82**	0.24	0.1	0.05	0.17
WVSR1	0.16	0.27	0.22	0.23	**0.69**	0.11	0.09	0.12
WVSR2	0.18	0.14	0.12	0.09	**0.81**	0.09	0.1	0.08
WVSI1	0.08	0.1	0.26	0.13	0.06	**0.82**	0.08	0.01
WVSI2	0.04	0.06	0.16	0.07	0.13	**0.81**	0.08	0.26
WVS1	0.16	0.11	0.01	0.1	0.15	0.07	**0.85**	0
WVS2	0.1	0.13	0.32	0.05	0.02	0.09	**0.69**	0.1
WVF1	0.23	0.06	0.21	0.2	0.07	0.06	-0.05	**0.75**
WVF2	0.01	0.16	-0.08	0.07	0.1	0.19	0.13	**0.79**

Factor	Eigenvalue	% of Variance	% Cumulative Variance
Factor1	6.60	31%	31%
Factor2	1.96	9%	41%
Factor3	1.40	7%	47%
Factor4	1.30	6%	54%
Factor5	1.24	6%	60%
Factor6	0.98	5%	64%
Factor7	0.85	4%	68%
Factor8	0.75	4%	72%

Table 3: Factor Structure						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
	SB	Image	SE-Comp	SE-Soft	SE-S/P	Attitude
Image1	0	**0.73**	0.03	-0.04	0.13	-0.42
Image2	-0.08	**0.79**	-0.05	-0.01	-0.07	0.05
Image3	-0.04	**0.82**	-0.08	-0.07	0.05	0.01
Image4	-0.12	**0.83**	-0.16	-0.01	-0.1	0.19
Image5	0.03	**0.74**	0.08	-0.05	-0.01	-0.12
SESoft1	-0.06	-0.04	0.05	**0.64**	0.43	-0.02
SESoft2	0.11	-0.06	0	**0.80**	0.19	-0.05
SESoft3	0.04	-0.05	0.17	**0.88**	0.03	0.09
SECom1	0.17	0	**0.81**	-0.06	0.25	-0.01
SECom2	0.06	-0.04	**0.87**	0.09	0.12	0.07
SECom3	0.14	0.11	**0.86**	0.19	0.1	0.07
SES/P1	0.14	-0.01	0.25	0.26	**0.81**	0.07
SES/P2	0.24	-0.02	0.3	0.17	**0.73**	0.2
SB1	**0.85**	-0.04	0.08	0.04	0.13	0.04
SB2	**0.88**	0	0.05	-0.02	0.06	0.11
SB3	**0.83**	0.09	0.13	0.08	0.01	0
SB4	**0.80**	-0.04	0.1	0.05	0.08	0.18
Attitude1	0.61	-0.03	0.1	-0.02	0.28	**0.63**
Attitude2	0.53	-0.08	0.19	0.04	0.25	**0.70**

Factor	Eigenvalue	% of Variance	% Cumulative Variance
Factor1	5.41	28%	28%
Factor2	2.96	16%	44%
Factor3	2.44	13%	57%
Factor4	1.63	9%	65%
Factor5	0.95	5%	70%
Factor6	0.71	4%	74%

Model Testing

We used the structural equation modeling (SEM) with no latent variables (i.e., a path modeling) to test our research model. Path analysis was performed to test the theoretical model and to test path significance. All analyses were conducted using the SAS system's CALIS procedure. These estimates use the maximum likelihood method of the parameter estimation, and all analyses were performed on the variance-covariance matrix.

Table 4: Descriptive Statistics				
Variables	Entire Sample [N=508]	Earned IS B.A. [N=65]	Other [N=443]	Group Differences
Actual Behavior	1.77 [2.0]	7.0	1.0	NA
Behavioral Intention	3.15 [2.23]	6.44 [0.93]	2.67 [1.93]	***
Attitude	4.33 [1.80]	6.37 [0.82]	4.0 [1.71]	***
Self-Efficacy * Importance				
Self Efficacy-Soft Skills	8.94 [6.14]	9.57 [5.88]	8.85 [6.18]	ns
Self Efficacy-Computer	6.92 [7.98]	10.98 [7.88]	6.32 [7.83]	***
Self Efficacy-S/P Skills	6.32 [7.93]	11.86 [6.50]	5.51 [7.80]	***
Degree of Congruence between Work Values and IS Career Perceptions				
Flexibility	1.35 [1.0]	1.52 [1.07]	1.33 [1.04]	ns
Income	1.15 [1.1]	1.12 [1.03]	1.15 [1.11]	ns
Leadership	1.16 [0.9]	1.32 [0.98]	1.14 [0.90]	ns
Security	1.37 [1.2]	1.54 [1.00]	1.34 [1.18]	ns
Social Interaction	1.24 [1.0]	1.12 [0.95]	1.26 [1.03]	ns
Social Responsibility	1.14 [0.9]	1.30 [1.10]	1.12 [0.90]	ns
Technical	1.39 [0.98]	1.10 [0.93]	1.44 [0.98]	**
Variety	1.19 [0.90]	1.38 [0.98]	1.16 [0.93]	ns
Work-family Balance	1.57 [1.10]	1.52 [2.20]	1.58 [1.13]	ns
Image * Importance				
ImageNegative	5.2 [5.76]	5.68 [5.13]	5.13 [5.85]	ns
Normative Beliefs * Motivation to Comply				
Referent Others	0.13 [6.5]	5.68 [4.44]	-0.78 [6.32]	***

ns: Not Significant ; * p<0.05 ; ** p<0.01 ; ***p<0.001

Values for Self-efficacy, Image and Referent others range frm -21 to 21; the congruency items range from 0 to 6; and Behaviors, Intentions and Attitudes range from 1 to 7. For more details on the scale transformation and the corresponding interpretations refer to the method section.

V. RESULTS

Descriptive Statistics

Table 4 lists the means and standard deviations for the whole sample and for the two behavioral outcome groups (i.e., students who graduated with an IS degree or not). One noteworthy statistic in this table is the demonstrated support for the link between intentions and actual behavior. Students who eventually graduated with an IS degree had significantly higher behavioral intentions of choosing an IS career than those who did not (IS Graduates: M = 6.44, SD = 0.93; Other Majors: M = 2.67, SD = 1.93; F = 232.71; p < 0.0001).

Model Fit

Goodness of fit indices for the proposed and the refined model are presented in Table 5. The chi-square statistics included in the table provide a test of the null hypothesis that the reproduced covariance matrix has the specified model structure, i.e., that the model "fits the data." Table 5 also provides three additional goodness of fit indices: the GFI, the normed fit index, NFI [Bentler et al., 1980], and the comparative fit index or CFI [Bentler, 1989]. These fit indexes may range in value from 0 to 1, where 0 represents the goodness of fit associated with a "null" hypothesis model (one specifying that all variables are uncorrelated), and 1 represents that goodness of fit associated with a saturated model (a model with 0 degrees of freedom that perfectly reproduces the original covariance model). The fit values for the revised model are over 0.9, which indicate a good fit between model and data.

The initial model in Table 5 is this study's theoretical model, as presented in Figure 1. Estimation of this model revealed a significant model chi-square value. Moreover, only the value of GFI exceeded 0.9, the CFI and NFI values for this model are only 0.86 and 0.85 respectively, indicating that the fit between model and data can be

Table 5: Goodness of Fit Indices and Explained Variance for Proposed and Revised Models									
Model	Chi-Square	GFI	CFI	NFI	RMSEA	R^2 AE	R^2 Norm	R^2 BI	R^2 Actual Behavior
Proposed Model	234.54, df=31,	0.94	0.86	0.85	0.1168	0.27	0.47	0.52	0.26
Revised Model	105.40, df=30,	0.97	0.95	0.93	0.0820	0.53	NA	0.52	0.31

substantially improved. Therefore, we rejected the proposed model and attempted to identify the modifications that would improve the model's fit. In order to improve the model, we examined the model's normalized residual matrix. The largest residual in the normalized model was for a direct link between referent others and behavioral intentions and a relationship between referent others and attitudes. In addition, a Lagrange multiplier test [Bentler, 1989] suggested that the model could be significantly improved by including the aforementioned paths. Adding a direct path from normative beliefs to intentions would be consistent with some of the technology acceptance and adoption models (e.g., Venkatesh and Morris, 2000; Brown and Venkatesh, 2005). The path from referent others to attitudes has been found to improve model fits for TRA (see Arnold et al., 2006) and suggested or tested in some other TRA studies (e.g., Bock et al., 2005; Shepherd and O'Keefe, 1984; Shimp and Kavas, 1984; Vallerand et al., 1992). A path from subjective beliefs to attitude suggests that the favorableness or unfavorableness toward IS careers is shaped in part by how referent others perceive IS as a career choice. TRA predicts that behavioral beliefs positively impact attitude. Therefore, theoretically, it is quite reasonable to suggest that significant others have some role in the formation of the behavioral beliefs [Arnold et al., 2006]. Because the additions can be justified on theoretical grounds, these two paths were added to the proposed model. The resulting model, called the *revised model,* was then re-estimated.

The fit indices for the revised model are also presented in Table 5. The revised model shows significant improvements in all dimensions. The chi-square value decreased by a value of 129 with the drop in one degree of freedom. The goodness of fit statistics for GFI, CFI and NFI are greater than 0.93. Most importantly, the variance accounted for IS-related attitudes, intentions regarding pursuing IS careers, and actual behavior increased significantly in the revised model. The revised model reveals that intentions account for 31 percent of the variance in actual behavior; attitude and referent others account for 52 percent of the variance in behavioral intentions; and self-efficacy, work value congruency, and referent others account for 53 percent of the variance in attitudes. A lower R-square for the actual behavior is expected, given that the intentions and actual behavior are measured using different methods [Hatcher, 1994]. Moreover, high significant path coefficients and a very high correlation between intentions and actual behavior [0.57, p < 0.0001], in addition to an average intention score on a very favorable side of the mean for IS graduates [Mean = 6.44] and an average score on the unfavorable side for non-IS graduates [Mean = 2.67], all provide high confidence in this model's ability to discriminate between the two groups. The standardized path coefficients for the revised model are presented in Figure 2. The significant path coefficients are meaningful in absolute magnitude and are significant at p < 0.05. The correlation matrix is presented in Table 6.

Hypotheses Tests

The first hypothesis—that higher levels of software/programming skill and computer self-efficacy will lead to more positive attitudes toward IS than will soft-skill efficacy—was accepted for software/programming skill self-efficacy (b = 0.12; p < 0.05) and soft-skill efficacy (b = 0.05; ns), but not for computer self-efficacy (b = 0.06; ns). The second hypothesis—that greater congruency (between individual work values and perceptions of the extent to which IS careers will fulfill those values) will be associated with more positive attitudes—was accepted for income (b = .10; p < .05) and technical congruency (b = .17; p < .001) and significantly contradicted for leadership (b = -.25; p < .001) and variety congruency (b = -.05; p < .05). None of the remaining work value congruencies (namely, flexibility, security, social interaction, social responsibility, and work-family balance) significantly affect students' attitudes toward IS careers.

The third hypothesis, which postulates that the negative image of IS professionals would inversely influence attitudes toward IS was not accepted (b = -0.05; ns). In other words, this study suggests that negative image of IS professionals does not shape students' attitude toward choosing IS careers. The fourth hypothesis, which suggested that referents others' opinions will positively impact normative beliefs, was refined in the revised model and new relationships between referent others and attitudes (b = .50; p < .001) and referent others and intentions (b = .33; p < .001) were accepted. The remaining hypotheses that posited a positive association between attitudes and intentions (b = .47; p < .001) and a positive associated between intentions and actual behavior (b = .56; p < .001) were accepted.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Table 6: Correlation Matrix for Model Variables																	
1	1.0	**0.57**	**0.44**	0.04	**0.20**	**0.27**	0.06	-0.00	0.07	0.06	-0.05	0.06	**-0.13**	0.08	-0.02	-0.03	**0.35**
2		1.0	**0.74**	0.03	**0.21**	**0.31**	-0.01	-0.10	0.05	-0.04	-0.09	0.01	**-0.31**	-0.00	-0.08	**-0.09**	0.62
3			1.0	**0.2**	**0.25**	**0.38**	0.00	-0.09	-0.00	-0.06	**-0.12**	0.02	**-0.31**	0.00	-0.14	**-.18**	0.68
4				1.0	**0.31**	**0.42**	0.05	-0.04	-0.07	-0.5	-0.08	**0.11**	-0.02	0.03	**-0.12**	**-.17**	0.15
5					1.0	**0.56**	0.01	-0.08	0.04	0.01	-0.08	**0.19**	-0.04	**0.12**	-0.07	**-0.11**	0.17
6						1.0	-0.03	-0.03	-0.00	-0.03	**-0.12**	**0.10**	**-010**	0.07	-0.06	**-0.10**	0.35
7							1.0	**0.20**	0.17	0.04	**0.18**	0.16	0.12	0.16	0.14	0.10	-0.01
8								1.0	**0.28**	0.05	0.05	**0.21**	**0.26**	0.08	**0.14**	0.09	-0.04
9									1.0	**0.09**	**0.19**	**0.27**	**0.21**	**0.22**	**0.17**	0.08	0.06
10										1.0	**0.15**	-0.2	-0.03	0.09	**0.25**	0.07	**-0.13**
11											1.0	**0.21**	0.07	**0.15**	**0.3**	**0.28**	-0.09
12												1.0	**0.25**	**0.25**	0.7	**0.14**	0.03
13													1.0	**0.25**	0.6	**0.23**	-0.26
14														1.0	0.8	0.08	0.03
15															1.0	**0.14**	**-0.12**
16																1.0	**-0.09**
17																	1.0

1 Actual Behavior	5 SE Computer	9 Leadership	13 Technical
2 Intent	6 SE S/P	10 Security	14 Variety
3 Attitude	7 Flexibility	11 Social Interaction.	15 Work-Family
4 SE Soft	8 Income	12 Social Responsibility.	16 Image
			17 Referent Others
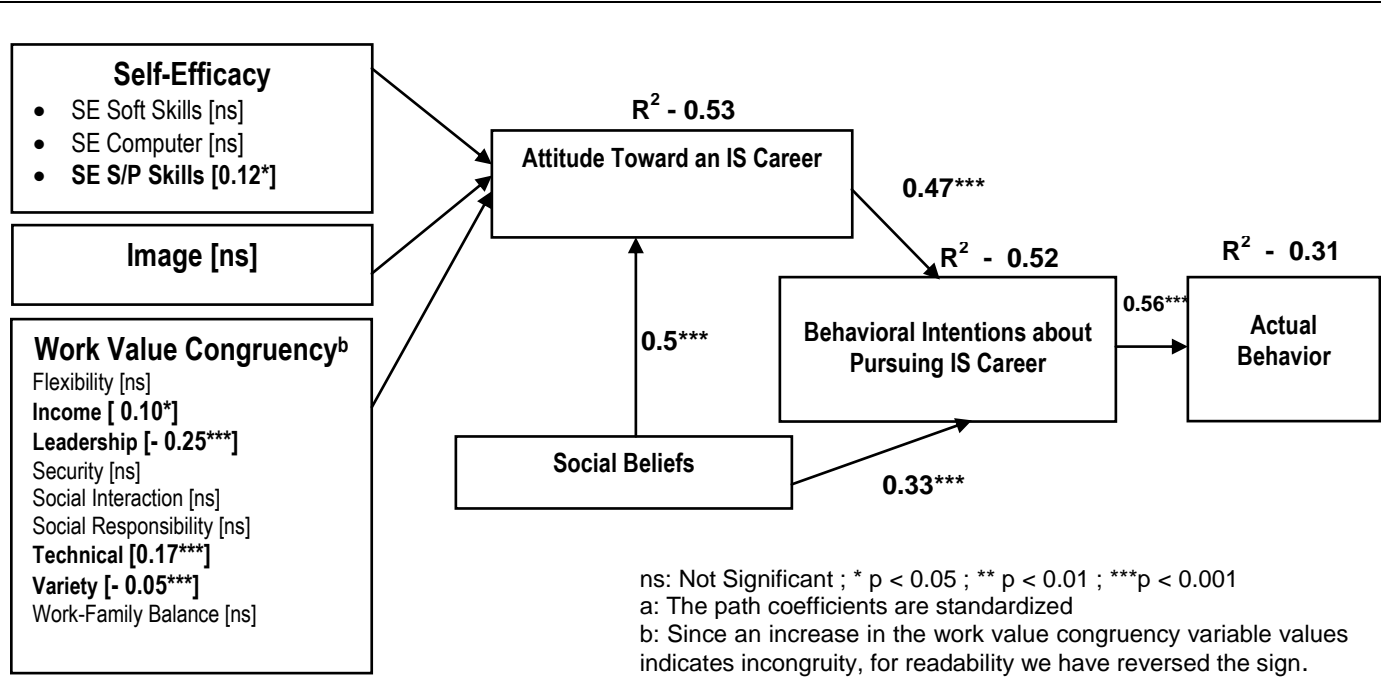
Figure 2. Revised Research Model

VI. POST HOC ANALYSIS AND DISCUSSION

Overall the results show that when making a career choice decision, individuals who are interested in IS majors are collectively motivated by self-efficacy, work value congruency, and normative beliefs. More specifically, students who have high confidence in their technical abilities, who believe that IS careers are compatible with their work values, and who receive positive encouragement to pursue IS careers are more likely to choose IS as their major.

Self-Efficacy

As expected, the results suggest that software/programming skill efficacy is a crucial determinant of attraction to an IS career. Although there were no significant group differences in the perceptions of the *importance* of

software/programming skills to an IS major (F = 1.12; ns), the individuals in the IS group had significantly higher (F = 21.23; p < 0.0001) *personal beliefs* regarding their software/programming skill competency. Interestingly, even though non-IS group had less confidence in their S/P skills, there was no significant difference between the IS graduates' and non-IS graduates' class performance (measured as grades received) (chi-square = 9.16, ns). These results suggest that students overemphasized the need for technical skills, perhaps due to a misconception that may persist among college students—that IS is essentially like a computer science discipline. Post hoc analysis also found that individuals who ultimately graduated with IS degrees had significantly higher IT-related experience than the non-IS graduates (chi-square = 43.8935 ; p < .0001).

As expected, both groups (IS and non-IS graduates) were equally confident about their soft-skills, such as problem solving, communication, and team management abilities (F = 0.02, n.s.). These skills are sought after by organizations looking for IS graduates [Luftman and Kempaiah, 2007, 2008; Lee et al., 1995; Todd et al., 1995; Vitello, 1997]. A good balance of technical, business, and communication skills is hard to find among new hires [Luftman and Kempaia, 2007]. Strikingly, however, students' attitudes toward IS were *not* affected by their beliefs about whether they possess these skills. Even though soft-skill efficacy did not significantly impact attitudes and the groups did not differ in their perceived soft-skill self-efficacy, it is interesting to note that the non-IS group perceived soft skills to be *less valuable* to an IS major; this difference in perception was significant (F = 9.45, p < 0.01). This result illustrates how deeply ingrained are students' misperceptions of IS careers as only technical careers. Another alternative explanation for this result could be that students are comparing IS majors with other business majors (such as marketing and management), that are traditionally perceived as emphasizing soft-skills. Therefore, students who believe they have good soft-skills and perceive soft skills to be less valuable to an IS major may be more attracted to other business majors. Luftman and Kempaiah [2008] describe a FedEx program (termed the "6x6" transformation initiative) that highlights the importance of soft skills for IT professionals. This initiative focuses on improving the business skills of IT professionals to allow the IT organization to be more agile, fluid, and responsive to business needs. Given that the business organizations are demanding that we develop an IT workforce that has a combination of both technical and nontechnical skills, future research needs to explore further this relationship in order to gain a better understanding of the non-significant impact of soft-skill self-efficacy on IS career attraction. For example, future work can conduct qualitative studies to explain why soft skills SE is not associated with student's perceptions about IS careers.

Interestingly, computer-related self-efficacy did not influence IS career-related attitudes. This could be because students recognize that just having good basic computer usage skills is not enough to be a successful IS professional.

Work-Value Congruency

The findings suggest that a high degree of congruity in technical and income values is associated with more positive attitudes toward IS careers. Oddly, this impact is negative for the values of leadership and variety. The results of this study suggest that not all forms of work value incongruity have similar interpretations. The complexity of a congruity variable can be untangled by independently looking at its components. Therefore, in order to fully understand these results, we have to examine the directionality of the work value score and its corresponding instrumentality.

As hypothesized, a high degree of technical and income value congruity leads to more favorable attitudes for IS careers. Students who actually graduated in IS show significantly greater technical congruity than those who did not. On the other hand, the income congruity level was similar for both groups, i.e., on average the entire sample viewed IS careers as high-paying careers that would satisfy their income needs.

The finding that a high degree of incongruity for the leadership and variety values led to more favorable attitudes for IS careers was unexpected. This unexpected result can be explained as a difference in how the incongruity perceptions regarding leadership and variety versus technical and income incongruity lead to different outcome expectations. The post-hoc analyses suggest students generally perceived IS careers to offer significant *opportunities* for exercising leadership skills and job variety. However, unlike technical and income incongruity which reflect negative outcomes, the leadership and variety valence gaps reflect potential positive outcomes. In other words, incongruity in these two outcome beliefs reflects a degree of choice, i.e., an option that can be exercised if they need more variety or leadership opportunities.

Although the results indicate that leadership, variety, income, and technical work value congruency significantly influence attitudes, they do not reveal how students differed on their work values and their instrumentality (we discussed a few of these variations above). Moreover, it would be helpful to evaluate the presence of these variations in light of actual behaviors (i.e., comparing those who graduated with an IS degree to those who did not). Table 7 summarizes the scores for the work values and their corresponding instrumentality for the entire sample and by group.

Table 7: Post Hoc Analysis—Means for Work Value-Related Items				
Variables	Entire Sample [N=508]	Earned IS B.A. [N=65]	Other [N=443]	Group Differences
Technical				
Importance	4.69 [1.09]	5.01 [1.00]	4.65 [1.11]	p < .05
Instrumentality (Perception that a career in IS will fulfill that value)	6.31 [0.83]	6.24 [0.93]	6.32 [0.81]	ns
Leadership				
Importance	5.31[1.00]	4.94 [1.01]	5.35[0.98]	p < .01
Instrumentality	5.59[1.13]	5.88[0.95]	5.55 [1.15]	p < .05
Variety				
Importance	4.89 [0.98]	4.79[1.10]	4.91[0.97]	ns
Instrumentality	5.29[1.27]	5.50[1.10]	5.26[1.29]	ns
Income				
Importance	5.53 [1.28]	5.50[1.39]	5.54[1.27]	ns
Instrumentality	6.03 [0.99]	5.84 [0.95]	6.05 [1.00]	ns
Flexibility				
Importance	4.71 [1.09]	4.60 [1.14]	4.73 [1.08]	ns
Instrumentality	4.83 [1.37]	5.09 [1.18]	4.79 [1.40]	ns
Social Responsibility				
Importance	5.07 [1.06]	4.95 [1.18]	5.09 [1.04]	ns
Instrumentality	5.36 [1.13]	5.59 [1.06]	5.32 [1.14]	ns
Social Interaction				
Importance	5.75 [1.11]	5.40 [1.28]	5.80 [1.07]	p < .05
Instrumentality	5.21 [1.18]	5.53 [0.99]	5.16 [1.20]	p < .05
Work-Family Balance				
Importance	6.17 [0.95]	5.96 [1.15]	6.20 [0.92]	p < 0.1
Instrumentality	4.87 [1.17]	5.11 [1.17]	4.84 [1.16]	p < 0.1
Security				
Importance	5.71 [1.04]	5.65 [1.14]	5.72 [1.02]	ns
Instrumentality	4.86 [1.39]	4.86 [1.31]	4.86 [1.41]	ns

Both IS and non-IS majors believe that careers in IS will fulfill their technical, leadership, variety, income, and social responsibility work values. However, their belief that IS careers would enable work-family balance, social interaction, and security fell significantly short of their desired needs for these values. These findings are similar in their *directionality* (except for social interaction) for both IS and non-IS majors, but differ significantly in their *magnitude* for the technical (importance: $F = 5.16$; $p < 0.02$; instrumentality: ns), leadership (importance: $F = 9.87$; $p < 0.005$; instrumentality: $F = 4.55$; $p < 0.03$), work-family balance (importance: $F = 2.93$; $p < 0.09$; instrumentality: $F = 3.06$; $p < 0.08$), and social interaction (importance: $F = 5.83$; $p < 0.02$; instrumentality: $F = 5.56$, $p < 0.02$) values. The IS and non-IS groups are also different in their beliefs regarding how well IS careers satisfied their social interaction needs: satisfied for the IS group ($t = -1.16$; ns) but failed to meet the non-IS group's expectation ($t = 7.72$, $p < 0.0001$). Overall, the results suggest that students who major in IS differ from those who do not both in their work values and in their perceptions of whether IS careers will help fulfill those values for four of the nine work values. More importantly, three out of those four work value incongruities significantly impact attitudes toward IS careers.

Referent Others

Our findings show that referent others' attitudes influence IS careers intentions. Although the influence of referent others on career decisions was significant for the entire sample, one critical observation that needs to be highlighted is that individuals who did not major in IS received significantly less positive encouragement ($F = 49.09$; $p < 0.0001$; mean = -0.05, sd = 1.1) than individuals who majored in IS (mean = 1.69, sd = 1.80).

Image of IS Careers

The hypothesis that a stereotypically negative image of IT professionals dissuades students from choosing an IS career was not supported, although the (insignificant) path coefficient was negative as postulated. This non-significant result indicates that either the image factor is not a critical factor for business students who are making career decisions or that other factors such as self-efficacy and work value congruency play a greater role. It is also possible that the findings are an artifact of the newly developed scale. As discussed in the measurement section, the scale was developed by asking students in a pilot study to describe a typical IS professional. Using the responses to

this open-ended question, ten image items were developed. Only five of the ten items had adequate validity and reliability and thus were included in the main study. In the absence of an existing Image Measure for IS professionals, this is a good starting point, but future research may develop this construct further. Note also that all the students in the main study had already been exposed to IS professionals and IS careers through their course work; thus there may have been a restriction of range problem in that image perceptions were not that negative. This construct may be significant in explaining attraction to IS careers for other populations.

Attitude, Intentions and Actual Behavior

The results indicate that IS career attitude is a crucial determinant of intentions. So to attract more students, it is critical to focus on changing people's attitudes toward IS careers and to implement programs and course content that will help create a more positive attitude. Moreover, this study, unlike most other career choice studies and for that matter TRA studies in general, included the actual behavior of interest in the model. Our findings illustrate that behavioral intentions are a strong predictor of actual behavior. This finding helps dispel some of the criticism that it is not certain that intention will translate into behavior (e.g., Davies et al., 2002).

VII. LIMITATIONS

One of the limitations of this work is that this study was conducted at only one university. Although this kind of sampling is common in this type of research [Butler, 2000], it limits the generalizability of these findings. Another concern in evaluating the results is the lack of direct comparisons to other alternative majors. For example, students who did not major in IS reported less social support for their majoring in IS than those who did major in IS, but we do not know if there would have been similar results for other majors. Future research could benefit from more comprehensive assessments of students' perceived alternative majors in comparison to perceptions of IS.

Although, the data was collected in early to mid-2000, the findings are generalizable over time because the results of the study's model are grounded in theory. The objective of conducting a study well-grounded in theory is to produce findings that are relatively time invariant. Moreover, the extant literature suggests that the beliefs modeled in this study (such as work-values, self-efficacy, social norms) are key antecedents of career choice behavior. However, we acknowledge that some of the results, such as concern over job security, are likely remnants from the time period the data was collected which limits the generalizability of these findings.

This career choice model incorporates critical constructs that clearly help explain and predict IS career choices. But, of course, there may be other factors, such as past IT-related experiences and the current job market that could be incorporated into this model to further our understanding of this process. Note, however, that factors such as past IT-related experiences and perceptions of market opportunities are indirectly captured via the self-efficacy and valence instrumentality measures, respectively. According to social cognitive theory, past experiences are critical antecedents that help shape self-efficacy beliefs [Bandura, 1986]. Our premise, accordingly, is that IS-related self-efficacy indirectly captures an individual's past IS-related experiences. And market-related factors, such as off-shoring, are reflected in instrumentality items such as assessments of likely income and job security. Even though the values included in this study reflect the values most commonly used in the career choice literature (see Brown et al., 1997) and in studies of IS professionals (e.g., Crepeau et al., 1992; Igbaria et al., 1993), future research may need to expand the work value inventory to capture occupation-specific emergent factors.

Although widely used, the difference score approach used in this study to compute congruency has been criticized by Edwards and Cooper [1990]. The academic community has debated these issues considerably and has concluded that more evidence in favor of Edwards' approach is needed before completely rejecting difference score models. Bedeian and Day [1994] caution such rejection by saying, "rejecting basic difference-score models in favor of more complex response surfaces may be letting the empirical tail wag the theoretical dog." Moreover, Edwards' approach does not compute a congruency score that could be used in the SEM analysis. There are other approaches such as agreement indexes that can be used instead of a difference score. Future research should compare various congruency approaches to evaluate their strengths and weaknesses.

In this study, previously existing scales for the computer and software/programming skill efficacy dimensions were used [Taylor et al., 1995]. The soft-skill self-efficacy scale was developed for this study. Although these efficacy items have good reliabilities and validities, future research should consider refining these three-dimensional scales further to fully capture the skill set required for various IS careers.

VIII. CONTRIBUTIONS

Theoretical Contributions

Although there is voluminous research on how college students choose majors and careers, there has been relatively little empirical research specifically on attraction to Information Systems. IS is a relatively new career option (relative to other business majors such as finance and marketing), which many students may be unaware of or may misconstrue, suggesting the need for discipline-specific understanding of IS career choices. This research contributes to our knowledge of the structure of factors underlying intentions of business students to major in IS, and is one of the few IS studies that comprehensively examines beliefs and values affecting IS career choices.

Social cognitive career theory [Lent, Brown, and Hackett, 1994] has been widely used to understand career choices and academic performance, and has been recently applied to examining interest in computing careers [Akbulut and Looney, 2007]. In this study, we used the Theory of Reasoned Action, which is a well-developed and widely-applied theoretical model but has only recently begun to be applied to understanding occupational intentions. We argue that the TRA is an especially useful model for developing an IS-specific model of career attraction because, unlike other theories of career choice, it specifies the effect of social environment, and it allows for a more nuanced understanding of the factors underlying attraction to IS.

Results support the utility of the TRA model, and the revision to the proposed model is theoretically justified. The findings of this work illustrate that TRA is able to explain greater variance in intent (52 percent) than the previous IS career choice models such as SCCT (in the range of 40 percent—e.g., Akbulut and Looney, 2007) and general expectancy models (which range from 21 percent to 41 percent of the variance, depending on the occupation—see Brooks and Betz, 1990).

Furthermore, this is one of the few career attraction studies that incorporates an actual behavior (completion of an IS degree) in the model; the inclusion of the actual behavioral outcome in itself makes a contribution to career choice literature. The inclusion of actual choice not only adds greater validity to our findings, but also helps dispel some of the criticism typically faced by other TRA models that have only examined intentions, i.e., it is not certain that intentions will translate into behavior (e.g., Davies et al., 2002). In the current study, intentions account for 31 percent of the variance in actual behavior, which, it should be noted, was assessed years after surveys were completed; this longitudinal component is, of course, also relatively rare in occupational interest research. Note that highly significant path coefficients, a very high correlation between intentions and actual behavior, plus an average intention score on a very favorable side of the mean for IS graduates (Mean = 6.44) and an average score on the unfavorable side for non-IS graduates (Mean = 2.67), all provide high confidence in this model's ability to discriminate between the two groups.

In this study, students' perceptions of the IT career-related views of people important to them (such as their family, friends, teachers) had a clear association with their attitude toward IS as a career and their intention to pursue. Although almost all research on occupational decision making demonstrates the importance of self-efficacy, here we uncovered the nuances associated with IT-related self-efficacy. The results show that *only* a student's perceptions of his/her abilities to learn new programming languages and software packages affected their attitudes toward IS as a career option; self-efficacy in other skills (such as communication skills) considered crucial by industry experts [Luftman and Kempaiah, 2007, 2008] had no impact on shaping IT-related attitudes. This suggests the importance of a more fine-grained understanding of "self-efficacy" to understanding career choices, particularly in a field such as IS where perceptions of the skill sets necessary for success may differ greatly between current professionals and potential professionals. Similarly, the model proposed and tested here demonstrated the usefulness of examining work value congruency in terms of what students specifically value as work outcomes and whether they perceive that an IS career will meet those desires.

Of course, the robustness of this model should be tested with *other* student populations. It is possible that the lack of a finding for career image may reflect the fact that students in this study did not have especially negative perceptions of IS as a "geeky" career. But these students had already been exposed to information about IS and to IS professionals as guest speakers through their experience in the course; other college freshmen, for example, might show a significant effect for this factor.

Results of this study also demonstrate the utility of assessing congruency, which is fairly under-studied in the IS literature. Although Schein's [1985] work value inventory has been widely used in IS, the notion of instrumentality has often been ignored. Examining the fit between valued valence and its corresponding instrumentality provides a more nuanced understanding of how values might impact attitudes.

Practical Implications

This study provides IS educators and policy makers with an empirically validated career choice model comprising IS-career relevant beliefs and values. Overall, IS career attitudes and social beliefs collectively form intentions about pursuing IS careers. More specifically, attitudinal beliefs such as software/programming skill self-efficacy and the technical, income, leadership, and job variety work values have significant influence over the formation of favorable attitudes. The normative beliefs derived from one's referent others, i.e., family members, friends, teachers, and significant others, significantly impact IS attitudes and intentions as well.

These findings suggest some practical recommendations for educators and administrators. Given that technical value incongruity negatively impacts attitudes, it is critical that business-minded students are made aware that IS career paths, although *technology centered*, are not all technical in nature. It is also imperative that business students be well-informed about the leadership opportunities and multiple career paths that exist in IS. For these two values, it is critical that individuals' perceptions that a career in IS will fulfill these values (i.e., instrumentality) is significantly higher than their current valence for these values. This is because a greater positive gap provides assurance about the future opportunities for excelling in leadership positions and diversifying into different job roles, both of which are often crucial. Business students probably are aware of the leadership opportunities available in finance and management careers. However, students often view technology careers as subordinate career paths, which may not *prepare* them for leadership positions.

On average, students in this study did not perceive that an IS career would fulfill three work values—social interaction, work-family balance, and job security—to their desired levels (see Table 7). However, the perceived gaps for these values did not significantly influence their attitudes toward an IS career. However, ignoring these values as insignificant would be a mistake. We believe that these three values could possibly influence one's attitudes indirectly via referent others. The very fact that many students believe that IS careers will not be able to meet their social interaction, work-family balance, and security needs is evidence that IS stereotypes still exist. IS educators and administrators need to consciously direct awareness efforts that emphasize the skill variety that exists within IS careers and dispel stereotypic perceptions of IS as a monolithic, primarily technical career which does not prepare individuals for leadership positions. It is also imperative to convey that IS careers include paths that have a social component, job security (not all jobs are going off-shore), and allow men and women to achieve work–life balance.

This study indicates that *software/programming skill* self-efficacy has a very strong impact on attitudes for the entire sample; however, individuals who did not major in IS had significantly lower software/programming skill self-efficacy than those who chose IS careers. We as educators need to focus on increasing students' confidence in their software/programming skill self-efficacy. Although with greater awareness students should realize that a diverse skill set is required to be successful in IS careers, they still need to be adequately confident that they have the ability to acquire software/programming skills necessary for course work. Introductory IS courses should help students to cultivate required skill sets and gain confidence in their ability to pursue IS careers. One troublesome finding of this study is that soft-skill efficacy did not significantly impact attitudes. Given the importance of these skills for success in IS, it is imperative that IS introductory courses emphasize the importance of soft skills for IS careers.

This study indicates that business students value the opinions of their family, friends, significant others, and teachers when making a career choice decision. Interestingly, as illustrated under the results section, students who chose IS careers received much greater encouragement to major in IS than students who did not. Therefore, it is not only important that students' misconceptions regarding IS are dispelled, but also that people who are involved in their career decision making be fully informed about IS careers.

The results suggest that, although dispelling misconceptions about IS professionals' image may be useful, this factor does not significantly drive business students' attitudes toward IS careers. As hypothesized, the impact of this factor on attitudes is negative, but it is not statistically significant. So, it is crucial to understand that individuals' career decision making is driven to a greater extent by their need to feel confident about their ability to successfully pursue a career, their perceptions that the career will meet their work value expectations, and the messages that their referent others are sending regarding IS careers.

Due to the lack of awareness regarding IS careers among college students, IS is a major that students often discover accidentally [Enns et al., 2006; Firth et al., 2008]. Unlike other business majors, such as finance and marketing, IS educators carry a greater burden of creating awareness regarding the various available IS career paths. Therefore, the first few courses in IS within a business school should be viewed by IS educators as a recruiting space where students not only gain IS career awareness, but also as a platform where students may gain confidence in their abilities to succeed in IS. Concerted efforts are needed in designing and developing an introductory IS course that provides a good overview of various IS career paths and the corresponding skill set

needed to pursue those paths. While effectively delivering course content, educators should also take care to avoid perpetuating stereotypes that persist, in general, for IT careers.

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APPENDIX A: MEASUREMENT SCALES

I. Work Value Importance

In this section you will be asked about your career preferences. Below is a list of outcomes that might be achieved in your future job or career. Rate the outcomes according to how important or desirable they are to you. Try to distinguish between what is truly most important and what is less important to you.
SCALE: 1: VERY UNIMPORTANT TO 7: VERY IMPORTANT

Technical

WVT1: Being able to work with the newest and most innovative computer technology
WVT2: Being able to use my programming skills
WVT3: Becoming an expert in a particular field of technology
WVT4: Being able to apply and develop my technical skills

Leadership

WVL1: To be in a position of leadership and influence
WVL2: Being able to supervise, lead, and influence others

Income

WFI: Earning a high income

Variety

WVV1: Having variety in job duties and activities
WVV2: Having different types of assignments and work projects

Security

WVS1: Being able to work for an organization that I can expect to stay at for a long time
WVS2: Having job security

Flexibility

WVF1: Having autonomy (self-direction) in my work.
WVF2: Being able to do things my own way and not be constrained by organizational rules.

Work-Family Balance

WVWF1: Being able to achieve a balance between my work and family lives
WVWF2: Being able to meet my family and personal responsibilities as well as my work responsibilities

Social Interaction

WVSI1: Having a good social climate (people I can talk to and socialize with) at work
WVSI2: Having friendly and congenial (easy to get along with) co-workers

Social Responsibility

WVSR1: Seeing other people change and learn because of my effort
WVSR2: Having the chance to benefit society through my work

The following items capture a student's perceptions regarding the degree to which the work values are likely to be met with a career in IS. [1: Very Unlikely   7: Very Likely]

In your opinion, how likely is it that someone working in Information Systems would earn a *high income*?

In your opinion, how likely is it that someone working in Information Systems would have the opportunity to exercise *leadership*?

In your opinion, how likely is it that someone working in Information Systems would have a lot of *variety* in work assignments and tasks?

In your opinion, how likely is it that someone working in Information Systems would have high job *security and stability*?

In your opinion, how likely is it that someone working in Information Systems would have a good balance between *work and family* activities?

In your opinion, how likely is it that someone working in Information Systems would need to use and develop strong *technical skills* to be successful?

In your opinion, how likely is it that someone working in Information Systems would have *good friends and social interaction* at work?

In your opinion, how likely is it that someone working in Information Systems would be able to have a *lot of control over when, how, and where they choose* to complete their work?

In your opinion, how likely is it that someone working in Information Systems would see that their work was having a *positive impact on other people*?

II. Information System Self-Efficacy

Please respond to the following questions about your skills and abilities. (1 Strongly Disagree to 7 Strongly Agree)

Soft Skill Self Efficacy

I am good at analyzing and solving business-related problems.
I am usually able to communicate effectively with people I don't know very well.
I am good at performing, coordinating, and managing teamwork.

Computer Self-Efficacy

I often find it hard to get a computer to do what I want it to do.
I often need assistance to do computer-related tasks/assignments.
I usually find computer-related assignments difficult/hard.

Software/Programming Skill Self-Efficacy

If I spend the effort I can learn to use different software packages to solve problems.
I can learn different programming languages.

The following items capture a student's evaluation of the importance of the above skills to an IS major.
(1: Very Unimportant   7: Very Important)

Soft Skill Evaluation

If you were to major in IS, then for you to able to analyze and solve business-related problems is:
If you were to major in IS, then for you to be able to communicate effectively with people you don't know very well is:
If you were to major in IS, then for you to be able to effectively perform, coordinate, and manage teamwork is:

Computer Evaluation

If you were to major in IS, then for you to be able to get a computer to do what I want it to do is:
If you were to major in IS, then for you to be able to do computer-related tasks/assignments without assistance is:
If you were to major in IS, then for you to be able to find computer-related assignments easy is:

Software/Programming Skill Evaluation

If you were to major in IS, then for you to be able to use different software packages to solve problems is:
If you were to major in IS, then for you to be able learn different programming languages is:

III. Image of IS Professionals

Most people working in Information Systems (1: Strongly agree   7: Strongly disagree):
Are "geeky" and "nerdy"
Are not outgoing
Are boring to be around
Lack social skills
Are not cool

Evaluation: The following items capture a student's evaluation regarding the importance of avoiding an IS type image (1: Very Important   7: Very Unimportan)]
1. It is very important to me that people do not view me as "geeky" and "nerdy."
2. It is very important to me that people do not view me as an introverted person.
3. It is very important to me that people do not find me a boring person.
4. It is very important to me that people do not think that I lack social skills.
5. It is very important to me that people think that I am cool.

IV. Social Beliefs

(1: Strongly disagree   7: Strongly agree   0: Not Applicable)

1. My close friends would think I should major in IS.
2. My family would think that I should major in IS.
3. My teachers would think that I should major in IS.
4. My significant-other would think that I should major in IS.

Motivation to Comply
1. Generally speaking, it matters to me whether my friends approve or disapprove of my choice of an academic major.
2. Generally speaking, it matters to me whether my family approves or disapproves of my choice of an academic major.
3. Generally speaking, it matters to me whether my teachers approve or disapprove of my choice of an academic major.
4. Generally speaking, it matters (or would matter) to me whether my significant-other approves or disapproves of my choice of an academic major.

V. Attitude

For me to major in IS would be a: *bad idea* (1) to *good idea* (7)
For me to major in IS would be *unpleasant* (1) to *pleasant* (7)

VI. Intention

Assuming I satisfy the requirements to major in IS, I intend/plan to major in IS.

VII. Background

Your Gender: Male   Female

What letter grade are you getting in this course? A   B   C   D   Don't know

If you had any computer-related job[s], then please briefly describe the nature of your job[s] and your work experiences in those job[s].

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